

artikel code	yr	Vol	Iss	Pgst	Pgend	authors	abstract	Titel
VOLUME 40 NO 1 1	1961	40	1	1	10	Overweel, C.J.	The Casapalca mining district in central Peru is a source of lead, zinc, silver and copper ores of the lepthothermal type. In the centre of the mine in the single zone of the most conspicuous parallel vein system a body of rock has been intersected that does not fit in the stratigraphical sequence. Various opinions about the origin have been brought forward. The results of a systematical thin-slide study of the rock type under discussion are in favour of alteration. The coincidence of ore shoots and alteration body with certain structural elements of the Casapalca anticlinorium is discussed.	The central alteration body of the Casapalca mines, Peru
VOLUME 40 NO 1 11	1961	40	1	11	25	Khadr, M.	The size-distribution analyses and the heavy mineral analyses of seventeen surface samples have been studied. The results are given in Figures 1-7. An outline is given of the most important means of sediment transport and deposition in the Nile-Valley. Under normal conditions transport of sediment in the channel is directed largely towards the sea. Only during floods and owing to the systems of irrigation practiced are sediments supplied to the soils. The coarser fluvial sediments are especially well defined in this area by granulometric analyses. Seven types (C 1-2-3, F 4-8) are distinguished, according to the distribution of grain size, to which all the sediments in the fluvial environments could be allocated. It appears that, in the Nile environment, all types may be represented' The heavy mineral analyses of all the samples have been formulated in Table 2. Except sample no. 31 and no. 10, no qualitative variations of the main mineral species occur and quantitative variations are not significant. One mineral association, viz. Augite-hornblende-epidote association is proposed.	Heavy residues of some Egyptian soils
VOLUME 40 NO 1 26	1961	40	1	26	38	Nijenhuis, G.H.W.	Two magnetic poles are determined for the lower Middle Permian based on measurements of 57 rock samples taken from two lava flows in the Permian volcanic series of the Nahe region in SW. Germany. The use of the palaeomagnetic measurements for tectonical analysis is demonstrated. It is emphasized that „magnetical cleaning" should always be applied, in order to remove younger induced magnetic orientations.	A palaeomagnetic study of the Permian volcanics in the Nahe region (SW. Germany)
VOLUME 40 NO 1 39	1961	40	1	39	40	Koeningswald, G.H.R. von		Kort verslag van het 21e internationaal geologisch congres, Kopenhagen 15-25 augustus 1960
VOLUME 40 NO 1 41	1961	40	1	41	41			Boekbesprekingen
VOLUME 40 NO 1 42	1961	40	1	42	43			Geologisch en mijnbouwkundig nieuws
VOLUME 40 NO 1 44	1961	40	1	44	46			Genootschapszaken

VOLUME 40 NO 2 49	1961	40	2	49	57	Rutten, M.G.; Everdingen, R.O. van	The Ramnes structure lies within the Permian igneous rocks of the Oslo Graben, west of Tönsberg. A granular inner oval of kjelsåsite is surrounded by porphyric rocks of a more acid composition. Originally interpreted as a laccolite with its acid marginal facies, we think it is a cross section through an ignimbritic volcano. The potphyritic mantle is formed by former ignimbrite fluidised tuff flows, and shows rheo-ignimbritic structures. The core is formed by the crater filling, which melted when the eruption stopped and then recrystallised as a granular rock. The difference in chemical composition between core and mantle rocks is thought to be due to selective degassing during eruption.	Rheo-ignimbrite of the Ramnes volcano, Permian, Oslo graben
VOLUME 40 NO 2 58	1961	40	2	58	70	Verspyck, G.W.	It is believed that the shape of zircon gives valuable information on the origin of metamorphic rocks; therefore several rocks have been examined on the habit of their zircons. Intrusive granodiorites and two types of metamorphic rocks all have different zircon. Several ways of representing the different observations have been used. The results of this study do not contradict the data compiled before, but form a valuable complement. Migmatites and quartzdiorites seem to have originated from a, possibly pelitic, sediment. Leucocratic gneisses possibly originated from a more sandy sediment.	Zircons of some metamorphic and intrusive rocks from the aston- and hospitalet massifs (central Pyrenees)
VOLUME 40 NO 2 71	1961	40	2	71	74	Kueneen, P.H.	It is argued that certain small structures described by Carozzi from sedimentary rocks are not produced mechanically by compaction and slumping, as he suggests, but result from burrowing and, or coprolites.	Some arched and spiral structures in sediments
VOLUME 40 NO 2 75	1961	40	2	75	78	Mente, A.	Palynological investigations by Florschütz and mrs. Anker-van Someren (1956), established a scheme and zone-division for deposits of Eemian-age in the southeastern Netherlands. These results have been obtained from analysis of samples gathered in various localities. The recent discovery of almost the complete zonation of the same scheme, this time however being the result of the analysis of a continuous series of examples coming from one boring, strongly confirmed the picture of Eemian-deposits, as revealed by Florschütz and mrs. Anker-van Someren.	Het resultaat van een palynologisch onderzoek van een Eemien-afzetting bij Liessel (N.-Br)
VOLUME 40 NO 2 79	1961	40	2	79	79	Booy, T. de; Egeler, C.G.		Remarks on the tectonic position of the betic of Málaga in SE Spain and on its relation to the subbetic
VOLUME 40 NO 2 80	1961	40	2	80	81			Geologisch en mijnbouwkundig nieuws
VOLUME 40 NO 2 82	1961	40	2	82	83			Boekbesprekingen
VOLUME 40 NO 3 86	1961	40	3	86	87	Raedts, C.E.P.M.		Ten geleide, speciale uitgave veiligheid in de mijnen
VOLUME 40 NO 3 88	1961	40	3	88	95	Martens, A.H.W.; Geven, J.L.		De ontwikkeling van wettelijke regelingen betreffende de veiligheid, de arbeid en de gezondheid in de Nederlandse mijnindustrie
VOLUME 40 NO 3 96	1961	40	3	96	102	Raedts, C.E.P.M.		Het Nederlandse staatstoezicht op de mijnen en zijn gezagsdragers
VOLUME 40 NO 3 103	1961	40	3	103	109	Dresen, J.P.A.		Taak en werkwijze van de veiligheidsdienst van de staatsmijnen in Limburg

VOLUME 40 NO 3 110	1961	40	3	110	114	Braaf, W. de		Werkzaamheden van het centraal proefstation van de staatsmijnen ten behoeve van de veiligheid en hygiëne
VOLUME 40 NO 3 115	1961	40	3	115	118	Mey, A.V.M.		Gezondheidszorg in het bedrijf
VOLUME 40 NO 3 119	1961	40	3	119	120	Matla, W.P.M.		Het staatstoezicht op de mijnen en het stofvraagstuk in de mijnen
VOLUME 40 NO 3 121	1961	40	3	121	124	Roos, G.		Het reddingswezen bij de Limburgse steenkolenmijnen
VOLUME 40 NO 3 125	1961	40	3	125	127	Asselbergs, J.		De veiligheid in het olie- en gaswinningsbedrijf
VOLUME 40 NO 3 128	1961	40	3	128	129			Geologisch en mijnbouwkundig nieuws
VOLUME 40 NO 3 129	1961	40	3	129	130			Boekbesprekingen
VOLUME 40 NO 4 133	1961	40	4	133	148	Gillavry, H.J.M.	This anniversary address discusses the history and situation of some geosynclines of intermediate type which do not fit into the standard Classification presented by Aubouin. Such intermediate geosynclines are not uncommon and their analysis leads to conclusions of more general significance. The discussion is primarily based upon the geology of the upper Paleozoic of the Baixo Alemtejo province (southern Portugal) and of the province of Huelva (southwest Spain). A comparison is made with the upper Paleozoic of the Rheinische Schiefergebirge, with the Cretaceous of Curaçao, and with the Ordovician-silurian of Wales and England. The acid rocks of the Alemtejo-Huelva area are initial volcanics of uppermost Devonian or lowermost Carboniferous age. They are not synorogenic intrusions as has often been thought. They are associated with radiolarites, and comprise rhyolitic rocks, keratophytes, spilites and diabases. The acid rocks predominate. and no serpentine has been found. The manganese and pyrite ores are thought to be primarily connected with the initial volcanism. It is suggested that the sea 'was shallow during the phase of submarine volcanism' This phase would thus not represent a periode de vacuité as conceived by Aubouin. During a later phase part of the original shallow basin would have subsided, another part would have been raised. Since volcanism has ceased by this time, it is thought that these movements are caused by compressional forces, whereas tensional forces would have reigned during the phase of volcanism' In the subsiding part of the area greywacke deposition took place; the phase of graywacke deposition is thus a phase of subsidence and not a période de comblement. The detritus in the graywackes is not derived from a pre-existing ridge or	Deep or not deep, fore-deep or "after-deep"

VOLUME 40 NO 4 149	1961	40	4	149	162	Agterberg, F.P.	<p>This paper deals with the following subjects: A - The theoretical meaning of the lognormal distribution of some ore minerals. B- The connection between sampling distance and frequency-curve, C - A discussion of the theory of de Wijs on the skew frequency-curves in ore assays. D - The variation of the mean concentration within an ore deposit, A - In statistics normal distribution often occurs. If x represents the concentration of a component in a certain rock, $z = \ln x$ is sometimes normally distributed for this component. If we assume that the gradual addition of a certain constituent to a rock is proportional to its existing concentration, this lognormal distribution of x is to be expected. B - The mutual dependence of adjacent samples can be determined in an exact way by the determination of correlation coefficients. As this dependence gradually diminishes with the distance we can introduce the concept of the independent cell distance. The size of an independent cell is defined in such a way that its deviation from the mean concentration of all samples together is only negligibly dependent on the concentration of the adjacent cells. If the ratio between independent cell distance and sampling distance is called a, we find that in the case $a \geq 1$ the histogram resembles the curve of the lognormal distribution. In the case of stoping units with $a < 1$ another frequency-curve appears the shape of which can be approximated by a lognormal frequency-curve with a smaller dispersion, as found by Krige. C - It is demonstrated that de Wijs's theory of repeating division into halves of an ore deposit, while the parameter d remains constant, is not an explanation for the skew frequency-curves of ore minerals. If this d was constant, it would not mean that the distribution of the samples</p>	The skew frequency-curve of some ore minerals
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VOLUME 40 NO 4 163	1961	40	4	163	174	Lüttig, G.W.; Maarleveld, G.C.	In the region of Hattem, Nijverdal and Lemele (southeast of the IJssel sea) coarse sands have been found in a buckled position. These sands are without bedding and carry Nordic boulders. With certainty they are older than the Holstein Interglacial, they belong to the formation of the „white sands" – probably to the sediments of the type Noord-Nederland (zone of Enschede) - which are assigned by many research workers at least to the Elster-age. The material of the gravel fraction as far as there is no influence of the river Rhine, comes from the Weser basin. Extraordinary is that the composition of the nordic boulder mass has values that the opposite to those hitherto stated for sediments of the pre-Saale glacial epoch. Not the east fennoskandian province of the key boulders is strongly represented but the south suedish. In connection with this determination attention is drawn to the fact that, up to the present, the assignment of the Netherland glacial sediments to the pre-Saale (Riss) is based solely on the predominance of the east fennoskandian boulders. The bedding complex did not allow to classify these sediments stratigraphically. We nominate these newly discovered boulder horizons in which, for the first time in the Netherlands, coarse, nordic material has been proved before the Hoistein stage, the „Complex of Hattem".	Nordic boulders in Pre-Holstein sediments in the netherlands (Complex of Hattem)
VOLUME 40 NO 4 175	1961	40	4	175	175			Geologisch en mijnbouwkundig nieuws
VOLUME 40 NO 4 179	1961	40	4	179	180			Genootschapszaken
VOLUME 40 NO 4 176(1)	1961	40	4	176(1)	176			Het voorkomen van schuifstenen in de duinen
VOLUME 40 NO 4 176(2)	1961	40	4	176(2)	178			Boekbesprekingen
VOLUME 40 NO 5 181	1961	40	5	181	188	Hammen, T. van der	This article deals with the general results of a study of the Upper Cretaceous and Tertiary of the Colombian Andes. A number (maximum 10) of rather constant and important sandstone (or conglomerate) horizons may be distinguished, which are often excellent guide horizons. The bases of these sandstones approximately coincide with the limits of periods and epochs, but are situated in general at least several metres higher than the palynological time-limits (based on climatic changes), The constant sandstones are related to tectonic-orogenic phases. A group of pre-andean phases (Lower and Middle Eocene), a- proto-andean phase (Upper Oligocene) and a group of eu-andean phases (Miocene and Pliocene) can be distinguished. The Tertiary (mainly terrestrial) sedimentation as a whole representing the continuation and termination of the (mainly marine) Cretaceous geosynclinal sedimentation, may be defined as synorogenic.	Late Cretaceous and Tertiary stratigraphy and tectogenesis of the Colombian Andes.
VOLUME 40 NO 5 181P1	1961	40	5	181P1	188	Hammen, T. van der	Plate (I)	Late Cretaceous and Tertiary stratigraphy and tectogenesis of the Colombian Andes.
VOLUME 40 NO 5 181P2	1961	40	5	181P2	188	Hammen, T. van der	Plate (II)	Late Cretaceous and Tertiary stratigraphy and tectogenesis of the Colombian Andes.

VOLUME 40 NO 5 181P3	1961	40	5	181P3	188	Hammen, T. van der	Plate (III)	Late Cretaceous and Tertiary stratigraphy and tectogenesis of the Colombian Andes.
VOLUME 40 NO 5 189	1961	40	5	189	193	Crommelin, R.D.; Plas, L. van der	The heavy fraction of some sandy deposits in the Netherlands contains conspicuous crystals of a remarkable pleochroism ranging from golden yellow to emerald green. The optical properties might indicate at first sight the presence of a member of the epidote group. In all of 9 cases observed, however, this mineral has proved to be viridine, a manganian andalusite. Its optical properties are described and the X-ray powder pattern is given. Possible source localities are indicated.	Viridine, a rare constituent of Pleistocene sands
VOLUME 40 NO 5 194	1961	40	5	194	196	Faber, F.J.		Barnsteen
VOLUME 40 NO 5 197	1961	40	5	197	199			Geologisch en mijnbouwkundig nieuws
VOLUME 40 NO 5 200	1961	40	5	200	202			Boekbesprekingen
VOLUME 40 NO 5 203	1961	40	5	203	208		Jaarverslag KNGMG 1960	Genootschapszaken
VOLUME 40 NO 6 209	1961	40	6	209	218	Booy, T. de; Egeler, C.G.	In the Sierras de Almagro, Cabrera and Alhamilla a considerable number of isolated outcrops occur of rocks belonging to the Betic of Málaga. The various elements distinguished tectonically overlie low-grade metamorphic rocks of the Alpujarrides. In the western part of the Sierra de Almagro (southeast of Huércal-Overa) distinction was made between: (1) a Graywacke Formation (Devono-Carboniferous); (2) sandstones and conglomerates (presumably Permo-Triassic); and (3) limestones (Mesozoic (post-Triassic) and early Tertiary).	The occurrence of Betic of Málaga in the Sierras de Almagro, Cabrera and Alhamilla (SE Spain)
VOLUME 40 NO 6 219	1961	40	6	219	226	Reyne, A.	Arguments are adduced to support Lyell's view, that the recent marine alluvium of the Guianas is mainly derived from the Amazon River. Samples of surfacewater were taken in the Atlantic Ocean off the coast of Surinam on voyages from Paramaribo to Amsterdam in 1922 and 1924, These samples showed a strip of low salinity at a distance of 85-170 km from the coast, which is almost certainly due to Amazon-water. The sediment of a sample, taken 37 km offshore, was examined by means of an X-ray diffraction diagram; its composition was similar to that of the clay-soils on the coast of Surinam. Some data are reported about the yearly accretion or erosion of the coast of the Guianas, especially of the district Coronie in Surinam (see fig. 1).	On the contribution of the Amazon river to accretion of the coast of the Guianas
VOLUME 40 NO 6 227	1961	40	6	227	229	Westerveld, J.		in memoriam prof. dr. Jozef Zwierzycki
VOLUME 40 NO 6 230	1961	40	6	230	232			Wetenschappelijke mededelingen
VOLUME 40 NO 6 233	1961	40	6	233	234			Geologisch en mijnbouwkundig nieuws
VOLUME 40 NO 6 235	1961	40	6	235	237			Boekbesprekingen

VOLUME 40 NO 7 241	1961	40	7	241	249	Kalsbeek, F.; Koning, H.; Tex, E. den	Recent work in the central portion of the Belledonne Massif, French Alps, has established the presence of two sets of wrench faults - one dextral, the other sinistral - with corresponding shear joints, strike-slip cleavages and microfabric S-planes, the latter virtually restricted to the main Sept-Laux granite. It is pointed out that megascopic „fish" structures, phyllonites and tension joints, observed in the same general area, are compatible with the movements on these wrench fault systems and fit in with a flattening deformation due to WNW-ESE compression having developed a subvertical B-axis. The age relations of the flattening phenomena with regard to folding, metamorphism and plutonic activity in the „Hercynian" basement of Belledonne are discussed and it is concluded that folding and progressive metamorphism are older than the flattening deformation, and that emplacement of the main Sept-laux granite is pene-contemporaneous with it. A brief comparison is made with similar features in other parts of the Alps and the possible occurrence of more than one phase of flattening is explored.	Complementary wrench faults and related structures in the crystalline rocks of the Belledonne Massif (French Alps)
VOLUME 40 NO 7 250	1961	40	7	250	252	Ruxton, B.P.; Landewijk, J.E.J.M. van	Continuous parallel slope retreat is defined as a continuous translation of all the slope facets above a plain resulting in a constant slope pattern. In the eastcentral Sudan the clay plain may be taken as a plane and the granite hills rising from this are best explained on the theory of continuous parallel slope retreat. Detailed measurements on one small hill, Jebel Qasim, give support for this theory. Continuous parallel slope retreat cannot occur unless the footslope retreats as rapidly as the slope facets above it. In the translation theory we have an inspace-constant velocity of retreat along the translation vector, the rate. Most theories of slope retreat assume that the footslope retreats at a slower rate than the slope facets above because it is protected by a migratory layer of rock-waste. In general, footslopes retreat in three ways, by lateral planation, by gradual incorporation of the sedentary weathered rock into the migratory layer, and by subsurface erosion. At Jebel Qasim subsurface erosion, including-mechanical eluviation, is the main agent responsible for continuous parallel slope retreat.	Notes on continuous parallel slope retreat
VOLUME 40 NO 7 253	1961	40	7	253	259			Geologisch en mijnbouwkundig nieuws
VOLUME 40 NO 7 260	1961	40	7	260	261			Geologische bibliografie van Nederland
VOLUME 40 NO 7 262	1961	40	7	262	263			Boekbesprekingen
VOLUME 40 NO 8 265	1961	40	8	265	290	Kimpe, W.F.M.		Stratigrafische ontwikkeling en correlatie van de koollagen van de Baarlo Groep, Onder-Westfalen A, in Zuid-Limburg met een vergelijking tot die in omliggende gebieden.
VOLUME 40 NO 8 265B1	1961	40	8	265B1	290	Kimpe, W.F.M.	Large enclosure B1	Stratigrafische ontwikkeling en correlatie van de koollagen van de Baarlo Groep, Onder-Westfalen A, in Zuid-Limburg met een vergelijking tot die in omliggende gebieden.

VOLUME 40 NO 8 265B2	1961	40	8	265B2	290	Kimpe, W.F.M.	Large enclosure B2	Stratigrafische ontwikkeling en correlatie van de koollagen van de Baarlo Groep, Onder-Westfalen A, in Zuid-Limburg met een vergelijking tot die in omliggende gebieden.
VOLUME 40 NO 8 265B3	1961	40	8	265B3	290	Kimpe, W.F.M.	Large enclosure B3	Stratigrafische ontwikkeling en correlatie van de koollagen van de Baarlo Groep, Onder-Westfalen A, in Zuid-Limburg met een vergelijking tot die in omliggende gebieden.
VOLUME 40 NO 8 265B4	1961	40	8	265B4	290	Kimpe, W.F.M.	Large enclosure B4	Stratigrafische ontwikkeling en correlatie van de koollagen van de Baarlo Groep, Onder-Westfalen A, in Zuid-Limburg met een vergelijking tot die in omliggende gebieden.
VOLUME 40 NO 8 291	1961	40	8	291	295			Geologisch en mijnbouwkundig nieuws
VOLUME 40 NO 8 296	1961	40	8	296	296			Genootschapszaken
VOLUME 40 NO 9 297	1961	40	9	297	318	Metcalf, B.L.		Applied science in the mining industry in Great Britain
VOLUME 40 NO 9 319	1961	40	9	319	325	Egeler, C.G.; Booy, T. de	The stratigraphic column and the tectonic evolution of the Cordillera Vilcabamba in south-eastern Peru are discussed. New data are given on the pre-Carboniferous stratigraphy. Attention is drawn to the pre-Carboniferous age of the widespread volcanic rocks of acid to intermediate character, hitherto assumed to be Permian. The Vilcabamba batholith is proved to be of Paleozoic age (post-Middle Devonian and pre-Middle Permian); it is assumed that the batholithic invasion is related to the major orogeny which marked the close of the Lower Paleozoic. The Mitu volcanic rocks (Permian) prove to be exclusively of intermediate to basic character. Six important orogenic phases are inferred and an estimation is made of their role in the development of the present structure pattern of the Cordillera. This leads to the conclusion that the structural evolution was largely completed prior to the deposition of the Cretaceous sequence. It is clear that the influence of the Andean movements in south-eastern Peru has been unduly stressed in the past.	Preliminary note on the geology of the Cordillera Vilcabamba (SE Peru), with emphasis on the essentially Pre-Andean origin of the structure
VOLUME 40 NO 9 326	1961	40	9	326	328			Geologisch en mijnbouwkundig nieuws
VOLUME 40 NO 9 328	1961	40	9	328	329			Boekbesprekingen
VOLUME 40 NO 9 330	1961	40	9	330	330			Genootschapszaken
VOLUME 40 NO 10 331	1961	40	10	331	332	Schieferdecker, A.A.G.		Geologie and mining in the Netherlands

VOLUME 40 NO 10 333	1961	40	10	333	346	Straaten, L.M.J.U. van	As yet very little is known about the movements of sediment along the Dutch North Sea coast. In this paper new data are presented regarding the directions in which sediment transport seems to take place. Some of the main conclusions are as follows. The directions of Dutch coastal dunes appear to vary with a) the primary orientation of the foredunes and b) the relative effect of winds of moderate strength blowing from angles that differ from those of the stronger but less frequent winds. The magnitude of this effect depends on the width of the wind-formed depressions in the dune areas. Wave observations show that sand drift must be strong along the northern barrier islands (from west to east), but that its importance must be small along the more south-north directed part of the coast between Katwijk and Texel. This conclusion seems to agree with direct sedimentological evidence. Comparison of meteorological data with beach measurements between Scheveningen and Bergen reveals that the relatively frequent westerly and southwesterly winds in the second half of the 19 th century resulted in an important (temporary) landward shift of the low tide line.	Directional effects of winds, waves and currents along the Dutch North Sea Coast
VOLUME 40 NO 10 347	1961	40	10	347	351	Thiadens, A.A.		In memoriam, Dr. Ir. P. Tesch m.i.
VOLUME 40 NO 10 352	1961	40	10	352	356			Het booreiland Triton
VOLUME 40 NO 10 357	1961	40	10	357	357			Geologisch en mijnbouwkundig nieuws
VOLUME 40 NO 10 358	1961	40	10	358	359			Boekbesprekingen
VOLUME 40 NO 10 360	1961	40	10	360	360			Genootschapszaken
VOLUME 40 NO 11 361	1961	40	11	361	362	Schieferdecker, A.A.G.		Coal mining section section steinkohlenbergbau Heerlen
VOLUME 40 NO 11 363	1961	40	11	363	391	Straaten, L.M.J.U. van		Directional effects of winds, waves and currents along the Dutch North Sea Coast
VOLUME 40 NO 11 392	1961	40	11	392	393	Egeler, C.G.; Booy, T. de		Preliminary note on the geology of the Cordillera Vilcabamba (SE Peru), with ephasis on the essentially Pre-Andean origin of the structure
VOLUME 40 NO 11 396	1961	40	11	396	396			Genootschapszaken
VOLUME 40 NO 11 394(1)	1961	40	11	394(1)	394			Geologisch en mijnbouwkundig nieuws
VOLUME 40 NO 11 394(2)	1961	40	11	394(2)	395			Boekbesprekingen
VOLUME 40 NO 12 397	1961	40	12	397	398	Schieferdecker, A.A.G.		Jubilee convention - Geology and mining in the Netherlands

VOLUME 40 NO 12 399	1961	40	12	399	411	Bemmelen, R.W. van	(1) An analysis of the orogenic and plutono-volcanic evolution of the Sumatra - Java arc of Indonesia, shows that three impulses of orogenic uplift occurred after its mesozoic geosynclinal subsidence. All three were accompanied by the rise and occasional ignimbritic eruptions of acid magma. Volcanic activity, producing igneous rocks of intermediary composition, developed during the intervening periods (Table I and fig. 1); the latter is the normal type of orogenic volcanism. The ignimbritic type of eruptions differs from the normal orogenic volcanism (Table II). The former produce extensive and voluminous sheets of acid "floodtuffs", which bury the landscape and which are partly welded and recrystallized during their cooling. These ignimbrite deposits are the synorogenic acid counterpart of the post-orogenic, basic plateau basalts, or "flood" basalts, as they were termed by Tyrrell. This ignimbrite type of eruptions may not be compared with "nuée ardente" eruptions. They represent different groups in the classification of volcanic eruptions according to viscosity and gas content of the magma (Table III). However, transitions will occur between ladu's and ignimbrites, between pumiceous air all tuffs produced by Plinian outbursts and ignimbrites, as well as between lava flows and ignimbrites (tufolavas, foam or froth lavas). (2) The quartz-latic ignimbrites of the Bolzano province in North Italy are related with a cauldron, about 65 km in diameter. From this basin ignimbrite flows of over 100 km length radiate in various directions. These ignimbrites erupted during an acme of volcanism of relative short duration, after an initial phase of volcanism, which had an intermediary composition. The total volume of the Bolzano ignimbrites amounts to several thousands of cubic	Volcanology and geology of ignimbrites in Indonesia, North Italy and the U.S.A.
VOLUME 40 NO 12 412	1961	40	12	412	421	Stam, J.C.	The geology and petrology of an area in the western part of the Cape Smith-Wakeham Bay Belt, Quebec is described. A comparison of the various formations and their metamorphic characteristics is made and a cross-section is given, indicating the tectonic structure of the Belt.	On the geology and petrology of the Cape Smith - Wakeham Bay belt, Ungava, Quebec
VOLUME 40 NO 12 422	1961	40	12	422	423			Boekbesprekingen
VOLUME 40 NO 12 424	1961	40	12	424	424			Geologisch en mijnbouwkundig nieuws
VOLUME 41 NO 1 1	1962	41	1	1	2	Schieferdecker, A.A.G.		Jubilee convention - Geology and mining in the Netherlands
VOLUME 41 NO 1 3	1962	41	1	3	7	Boeschoten, G.J.	Recent beachrock from Crete is described. The origin of the cementation here is thought to be caused by upwelling calciferous fresh ground water. Aquafacts have been modelled from the pebbles fixed firmly in the rock.	Beachrock at Limani Chersonisos, Crete
VOLUME 41 NO 1 8	1962	41	1	8	19	Hermans, J.M.A.	Quantitative analyses of uranium- and thorium ores by nuclear emulsion methods is a simple statistical procedure. A thin nuclear emulsion coating exposed to a mixture of uranium and thorium ore with plaster of Paris, provides an alpha track pattern that is measured. Poisson's distribution is applied to this track pattern.	Autoradiographic ore analyses

VOLUME 41 NO 1 20	1962	41	1	20	28	Schermerhorn, L.J.G.	A recent explanation of the emplacement of the late Hercynian granites of North and Central Portugal in terms of ring intrusions, cauldron subsidence and major stoping caused by tensional fracturing of the crust is discussed. It is argued that the tin-tungsten granite province of Portugal is not comparable to ring-complex provinces elsewhere that wrench-faulting took place, that granite emplacement here can be explained by uplift of the roof with subordinate forceful intrusion and piecemeal stoping, not wholesale crustal collapse, and that the vertical foliation in the porphyritic granites was caused by oriented growth in situ, not by magmatic flow.	The emplacement of the Late Hercynian granites in Portugal: a reply
VOLUME 41 NO 1 29	1962	41	1	29	29			Boekbesprekingen
VOLUME 41 NO 1 30	1962	41	1	30	33			Geologisch en mijnbouwkundig nieuws
VOLUME 41 NO 1 34	1962	41	1	34	36			Genootschapszaken
VOLUME 41 NO 2 37	1962	41	2	37	37			Jubilee convention - Geology and mining in the Netherlands
VOLUME 41 NO 2 39	1962	41	2	39	86	Arets, L.A.G.L.; Maas, W.; Muysken, P.J.; Stuffken, J.; Wijffels, F.C.M.	The first part describes the laboratory experiments carried out to determine the amounts of gas that can be adsorbed to the various Dutch coals (as characterized by their volatile matter contents) as a function of pressure and temperature. It further deals with experiments performed to measure the amounts of gas actually adsorbed to coal extracted underground. Whenever in these experiments coal was used that had been subjected to great mechanical pressure variations, whether during extraction or in the stages preparatory to extraction, very low values were found. However, with coal obtained from deep drillings and consequently virtually uninfluenced, the amount of adsorped gas could immediately be measured with fairly great accuracy. The second part gives data on firedamp release during extraction, collected over years, and on the influence on seams under and over the coal seam worked. These data are used for determining the maximum amount of firedamp to be expected in the coal seams of the Dutch mines. By the use of all this information (including the curve relating to the influence on neighbouring seams) it was possible to develop a method of predicting gas release during coalgetting. This part closes with a discussion of some instances in which firedamp had leaked away through breakages in the surrounding rock before extraction started. The third part describes the efforts made to reduce the firedamp hazard by means of gas drainage. A discussion is given of the various methods employed, and of their merits and limitations. It goes on to deal with the difficulties encountered at the start and at the termination of extraction in a panel. Finally there follows a survey of results obtained with firedamp drainage from various	Het voorkomen van mijngas en de strijd tegen te hoge concentraties bij de staatsmijnen in Limburg
VOLUME 41 NO 2 87	1962	41	2	87	94	Vandeloise, R.; Rosen-Meyer, P. de		Le captage et la valorisation du Grisou en Belgique

VOLUME 41 NO 2 95	1962	41	2	95	102	Theron-Mulder, J.C.	Beside the gases based on coal, which have been distributed for many years, a number of gases originating from the oil industry have come forward of late. Their combustion properties often show a strong deviation from those of the classical town gases. Several requirements are mentioned to be met by the combustion when the gas type is changed in a distribution grid. An explanation is given of the way in which a flame is stabilized on the burner mouth. A final exposition shows how burners can be adapted to other gas types by changing the orifice, provided the pressure and the Wobbe number of the gases are related	Enige technische aspecten van recente ontwikkelingen in de gasindustrie
VOLUME 41 NO 2 103	1962	41	2	103	103	Schuiling, D.D.		On joint-patterns in domes
VOLUME 41 NO 2 104	1962	41	2	104	105			Boekbesprekingen
VOLUME 41 NO 2 106	1962	41	2	106	107			Geologisch en mijnbouwkundig nieuws
VOLUME 41 NO 2 108	1962	41	2	108	108			Genootschapszaken
VOLUME 41 NO 3 109	1962	41	3	109	115	Haverschmidt, R.		Enige gedachten over het onderwijs op de mijnschool te Heerlen
VOLUME 41 NO 3 116	1962	41	3	116	124	Ulbo de Sitter, L.	The Palestine region occupies the western, and part of the northern slope of the Arabian shield. Basement faults play a dominant role in its structural features often masked at the surface by warping of the Cretaceous rocks over the deeper seated fault throws. Typical are the monocline structures. The Jordan rift is perhaps originally a large wrench fault, the later subsidence of the Dead Sea is due to a tensional stress field causing normal faulting on the wester border. Superposed successive stress fields of pre-Cretaceous, Pre-Eocene- and Pre-Neogene age can explain the particular features of the fold and fault pattern.	Structural development of the Arabian shield in Palestine
VOLUME 41 NO 3 125	1962	41	3	125	130	Ridder, N.A. de; Zagwijn, W.H.	This paper deals with a transitional mineralogical zone found intercalated between the zones of Sterksel and Veghel, which were deposited by the Rhine and the Meuse respectively in the S.E. Netherlands. This transitional zone, for which the name of "Zone of Rosmalen" is proposed, could be traced by means of heavy-mineral assemblages. Pollen-analytical investigations of a clay deposit, found near Rosmalen, prove this zone of mixed Rhine and Meuse sediments to be of Holsteinian (= Needian) age.	A mixed Rhine-Meuse deposit of the Holsteinian age from the south-eastern part of the Netherlands
VOLUME 41 NO 3 125F4	1962	41	3	125F4	130	Ridder, N.A. de; Zagwijn, W.H.	Enclosure	A mixed Rhine-Meuse deposit of the Holsteinian age from the south-eastern part of the Netherlands
VOLUME 41 NO 3 131	1962	41	3	131	134	Menéndez Amor, J.; Florschütz, F.	This paper deals with the results of a palynological analysis of a 20m layer of peat, calcareous mud and clay near Granada in southern Spain. Obviously, it has been formed during the whole last glaciation and a part of the Holocene	Un aspect de la végétation en Espagne méridionale durant la dernière glaciation et l'Holocène
VOLUME 41 NO 3 135	1962	41	3	135	135			On the so-called "konglomeratische mergel" in the Sierra de Los Filabres (SE Spain)
VOLUME 41 NO 3 136	1962	41	3	136	137			Boekbesprekingen
VOLUME 41 NO 3 138	1962	41	3	138	138			Geologisch en mijnbouwkundig nieuws
VOLUME 41 NO 3 139	1962	41	3	139	140			Genootschapszaken
VOLUME 41 NO 4 141	1962	41	4	141	141	Sitter, L.U. de		50 jaar Koninklijk Nederlands Geologisch Mijnbouwkundig Genootschap 1912-1962

VOLUME 41 NO 4 143	1962	41	4	143	146	Wijs, H.J. de		A dive into the history of the Royal Geological and mining society of the Netherlands
VOLUME 41 NO 4 147	1962	41	4	147	150			Presentation of the Van Waterschoot van der Gracht medal to Doctor E. Anderheggen, Doctor E. Kündig, Professor F.B. Hinsley, Professor P. Pruvost.
VOLUME 41 NO 4 151	1962	41	4	151	160	Faber, F.J.		Past, present and future subsidence
VOLUME 41 NO 4 161	1962	41	4	161	174	Pannekoek, A.J.		Geological research at the universities of the Netherlands 1877-1962
VOLUME 41 NO 4 175	1962	41	4	175	180	Krul, W.F.J.M.		Development of geo-hydrological knowledge and research in the Netherlands
VOLUME 41 NO 4 181	1962	41	4	181	183			Boekbesprekingen
VOLUME 41 NO 4 184	1962	41	4	184	189		Veiligheid in kolenmijnen	Geologisch en mijnbouwkundig nieuws
VOLUME 41 NO 4 190	1962	41	4	190	190			Genootschapszaken
VOLUME 41 NO 5 193	1962	41	5	193	194			Ansprache von Herrn A. Hellemans, generaldirektor der staatsmijnen
VOLUME 41 NO 5 195	1962	41	5	195	209	Debets, G.B.	The development, the preparatory work and the coalgetting required per 1000 n.t. production, since 1958 the driving of about 15 m roadway in the rock and in the coal. The roadways are generally trapezoidal with a working face of ca 9 m ² in the rock and of 5-8 m ² in the coal seams. The driving of roadways in the seams before the coalgetting has started has increased owing to a more extensive application of the retreating or semi-retreating system. The driving of roadways in advance of the face has consequently diminished. In order to obtain a decrease of the cost of driving the roadways, an increase of both the daily advance of the roadhead and its advance per manshift has been aimed at. In driving horizontal stone drifts an average daily advance of circ. 300 cm and an output per manshift of 28 cm have been attained by the application of higher speed drills, simultaneous loading of the muck by 2 throw shovel loaders or of high capacity shovel loaders. The introduction of safety explosives, class II and III enabled the blasting in one round of the complete lift consisting of coal and stone in the roads. For mechanical loading in the non-horizontal straight gate roads the scraper loader is mostly used. In these roadways, an average daily advance of 431 cm was obtained during the first half of 1961 with an output per manshift (all transportshifts included) of 30,5 cm. The corresponding results in gate roads in advance of the face were 298 and 29,2 cm. Machines suitable for breaking the coal and the stone and simultaneous loading are not yet applied in the Limburg coal district.	Die neueste entwicklung der Technik des Streckenvortriebes in den Limburgischen Steinkohlenbergwerken
VOLUME 41 NO 5 210	1962	41	5	210	227	Clercq, H. le		Der stand der Fördertechnik in den Niederlanden

VOLUME 41 NO 5 228	1962	41	5	228	254	Braaf, W. de	<p>The fifty years that have elapsed since the establishment of the "Koninklijk Nederlands Geologisch Mijnbouwkundig Genootschap" have witnessed a considerable advance in mining techniques. The more complicated the techniques became the greater was the necessity carefully to make a quantitative analysis of the facts and to base the work of development on the results of this analysis. In the Netherlands, where somewhere about 1930 research work has begun to be carried out in a more organised and centralised form at Staatsmijnen, the interest went out especially to the improvement of coal preparation methods at first. Later the underground workings, too, were brought within the scope of the research work, which led amongst other things to the development of the Titan Servo-prop. Afterwards, about 1950, with a view to the few shafts that had to be sunk, a large part of the available capacity was used to introduce improvements in the way of shaft linings and shaft sinking procedures. About 1957 the emphasis was placed on the increase of the productivity. Some characteristic aspects of the mining research work at Staatsmijnen are: 1) The necessity to make a choice from the great number of problems, which is due to the comparatively small size of the industry. The cost of research amount to half a guilder per ton as it is. 2) The close proximity of the mines to each other. I Coal face support After a fatal accident at Maurits Colliery in 1958 a jack ring (Fig. 1) was developed, permitting the Titan Servo-props to be put in piece with an initial load of 10 tons. Immediately after the introduction of hydraulic props in 1957 leakage of the relief pressure valve gave rise to difficulties. The design of this valve was therefore so changed, that it is now proof against polluted water</p>	Forschung und entwicklung im Bergbau
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VOLUME 41 NO 5 255	1962	41	5	255	273	Snell, A.W.	The present stage of the mechanization of coal getting in the Limburg mining district, and expected future developments. The rise in wages and social overheads, added to the shortage of labour, has necessitated the introduction of far-reaching mechanization programmes in the mining industry. The object of mechanization in coal getting can be described as: extracting the largest possible amount of coal per 24 hours and per working point by the use of mechanical means in an economically justified way with the employment of the smallest possible number of men. The various coal-getting installations used are discussed in succession. They include: the scraper box installation, the single standard plough, the multiplough, the rapid plough, and the Peissenberg ramming installation. A sketch describing the developments in face supporting makes it clear that excellent results are expected to be obtained With the hydraulic self-advancing support, which is now being introduced at an increased rate. The second part (Results obtained, and expected future developments) deals with the various aspects of the attainment of the object of mechanized coal getting stated above, viz. the degree of mechanization, the saving in manshifts, the concentration, and the improvement in the size variation. For each aspect a discussion is given of: - the results achieved so far; - the ways in which these results were obtained; - mining-technical and constructional problems, and the ways in which they are expected to be solved. Finally, some remarks are given on the signalling of operating troubles by remote control systems, the capacity of the conveyors for product removal, and the training of personnel.	Der derzeitige stand in der mechanisierung der kohlegewinnung im Limburgischen steinkohlenrevier und ausblick auf die zukunft
VOLUME 41 NO 5 274	1962	41	5	274	277			60 jaren staatsmijnen in Limburg
VOLUME 41 NO 5 278	1962	41	5	278	279			Boekbesprekingen
VOLUME 41 NO 5 280	1962	41	5	280	280			Genootschapszaken
VOLUME 41 NO 5 281	1962	41	5	281	281	Berndt, F.		Anwendung von sintronic hartmetall im bergbau
VOLUME 41 NO 6 281	1962	41	6	281	289			The inaugural session of the jubilee convention knight's hall (ridderzaal), the Hague, april 26th, 1962

VOLUME 41 NO 6 290	1962	41	6	290	302	Klompé, T.H.F.	This paper presents a survey of the igneous and structural features of Thailand and their possible ages of emplacement and development. Three groups of igneous rocks are distinguished. Oldest are mafic to ultra-mafic rocks in North Thailand, intrusive in the Silurian-Lower-Carboniferous Kanchanaburi Series, they might represent the results of an initial geosynclinal magmatic activity. The Mesozoic granites are represented by an older, Upper Triassic granite in the eastern, and a younger tin-bearing granite in the western part of the country. The age of this last granite is considered to be post-Triassic. Recent age determinations on granites from Billiton and Singkep have revealed that they were emplaced some 145-155 m.y. ago. The youngest representatives are various kinds of effusives and some dioritic intrusions of Upper Tertiary and Pleistocene age, they are related to important faulting features. Structurally Thailand can be divided in a western and northern mountainbelt, the Korat plateau in the east, and the depression of the Gulf of Thailand in between. The first unit consists of a conformable Paleozoic- sequence, locally conformably capped by Triassic deposits. The disconformities in the sequence are ascribed to epirogenic movements at times when in areas further east, important orogenic movements took place. The regularity of this sequence, the age of the granites and the unconformable contact between the folded layers and the overlying late Jurassic to early Cretaceous deposits in adjacent areas (Malaya, Borneo, Sumatra), favour an Upper Jurassic (young-cimmerian) phase of mountainbuilding. In the Korat Plateau the folded paleozoic sequence is unconformably overlain by the almost horizontal Rhaetic	Igneous and structural features of Thailand
VOLUME 41 NO 6 303	1962	41	6	303	303			Geologisch en mijnbouwkundig nieuws
VOLUME 41 NO 6 304	1962	41	6	304	304			Boekbesprekingen

VOLUME 41 NO 7 305	1962	41	7	305	314	Leine, L.; Egeler, C.G.	The origin is discussed of the problematic rock types within the Triassic of the Sierra de los Filabres, that are usually referred to in the literature as "konglomeratische Mergel" (conglomeratic marls). An explanation is suggested for the considerable variation in character and the often heterogeneous composition of these rocks, which in the Menas region are represented as concordant discontinuous bands and masses in epimetamorphic as well mesometamorphic structural units. Arguments are provided for a tectonic origin, the rocks being interpreted as breccias resulting from differential movements within the rock sequence during intensive thrusting – a process in which the lithology of the initial sequence and especially the presence of highly incompetent beds of anhydrite or gypsum, perhaps in association with other salts has played an essential role. It is shown that the brecciation proceeded, at least for an important part, during a relatively advanced stage of the tectonic evolution, i.e. after the kinematic stage of the regional metamorphism, which is tentatively linked with overthrust movements leading towards the development of the nappe structures. These structures are considerably disturbed by late overthrusting and the provisional results seem to suggest that the provisional largely during these late movements. Special attention is drawn to a superimposed static metamorphism, which has a contributed in considerable measure to the ultimate character of the breccias by giving rise to the growth of a number of new minerals. The close relation between the heterogeneous type of breccias and the associated "Rauhackes" is pointed out and it is suggested that the latter are tectonic breccias very poor in or devoid of fragments	Preliminary note on the origin of the so-called "Konglomeratische mergel" and associated "Rauhackes", in the region of Menas de Serón, Sierra de los Filabres (SE Spain)
VOLUME 41 NO 7 315	1962	41	7	315	320	Renz, O.; Verspyck, G.W.	Quartz-bearing amphibolites and metamorphosed basic dyke rocks are described and are compared with amphibolites known from the literature concerning the area. The presence of sodic plagioclase and blue-green hornblende seems to indicate that medium-grade regional metamorphism occurred. The age of the rocks is briefly discussed and their relation with the surrounding serpentinites reviewed	The occurrence of gneissic amphibolites in southwest Puerto Rico

VOLUME 41 NO 7 321	1962	41	7	321	326	Schuilings, R.D.; Widt, M.J. de	Tectonical and microtectonical data suggest that the emplacement of the gneissic dome de l'Agout took place under increase of volume, simultaneously with subsidence of the bordering schists. There can be no doubt that the gneisses possess a sedimentary frame, although their mineralogy shows a clear difference between schists and gneisses, which is also evident from a series of partial chemical analyses (Na, K, Cr). One is bound to suppose that here has been an important addition of mobile elements (in the order of 60-70%). These mobile elements, the "mobilisate" were expelled from the deeper levels of the micaschists (hence subsidence of these) along the planes of schistosity to higher structural levels, where they caused swelling of the schists in the places of deposition and their transformation into gneisses. The most mobile elements (Na, Si, B) were deposited in particular just below the schist-gneiss boundary (the front of migmatization). Chrome, a refractory element, is diluted beyond detectability in this particular outer zone; otherwise, compared to the schists, it is diluted 2-3 times in the normal gneissic succession. The rapid succession of metamorphic zones (biotite, garnet, andalusite, staurolite) surrounding the dome is indicative of a strong thermal gradient, i.e. a kind of contact-metamorphism. It is impossible to say whether this thermal metamorphism is mainly due to the tectonical emplacement of hot deep-level rocks in colder epizonal schists, with concomitant stretching and thinning of the limbs of the dome, or whether it was the hot "mobilisate" that was the principal cause of this metamorphism.	Sur la genèse du dôme gneissique de l'agout (dépts. Tarn et Hérault)
VOLUME 41 NO 7 327	1962	41	7	327	327			Geologisch en mijnbouwkundig nieuws
VOLUME 41 NO 7 328	1962	41	7	328	328		Terugtrekken van de gletschers in het Carstenszgebergte (Nederlands Nieuw-Guinea)	Geologisch en mijnbouwkundig nieuws
VOLUME 41 NO 7 329	1962	41	7	329	331			Boekbesprekingen
VOLUME 41 NO 7 332	1962	41	7	332	332			Genootschapszaken
VOLUME 41 NO 8 333	1962	41	8	333	350	Polak, B.; Maarleveld, G.C.; Nota, D.J.G.	A section of ice-pushed deposits in the southern Veluwe area was investigated. It was possible to ascertain its stratigraphical position by means of a combined palynological and sedimentary petrological study. The palynological data agree rather well with those of the warm-temperate section of the Cromer interglacial period, but show some similarity with Saalian (Eucomnia, Carya type). The results of the sedimentary petrological study have been summarised in Table 3.	Palynological and sedimentary petrological data of a section in ice pushed deposits (Southern Veluwe, Netherlands)
VOLUME 41 NO 8 351	1962	41	8	351	355	Rutten, M.G.	Cinérite is a local name for acid ash and tephra deposits of the mid-to late Tertiary volcanic region of the southeastern Massif Central, France. The two varieties distinguished, viz. fine grained cinérite and cinérite à blocs, are generically different. The former represent ash falls on a low, waterlogged peneplain, outside the actual volcanoes. The other is a lahatic breccia formed on the cones of stratovolcanoes.	Cinérites of the Mont Dore, Central France

VOLUME 41 NO 8 356	1962	41	8	356	362	Charlesworth, H.A.K.; Evans, C.R.	Slaty cleavage in the argillaceous strata of the Precambrian Old Fort Point formation is arranged in a fan-like manner about the axial planes of folds. The origin of the cleavage-fan may result from the tendency of cleavage to lag behind folding or from that of the maximum principal stress-axis trajectories to be refracted towards bedding. Deviation from the regular cleavage-fan may be caused by variation in competency of the argillaceous layers and by the effect of interbedded competent strata. Cleavage-boudinage, restricted to thin siltstones surrounded by cleaved argillaceous rocks, is present in the steep limbs of asymmetrical folds. An analysis of the extension involved in the development of the boudinage suggests that shear parallel to cleavage occurred during at least part of the fold-history. On the other hand, rotation of the boudins into the plane of slaty cleavage indicates that considerable shortening perpendicular to cleavage may also have taken place.	Cleavage-Boudinage in Precambrian rocks at Jasper, Alberta
VOLUME 41 NO 8 363	1962	41	8	363	364			Geologische bibliografie van Nederland
VOLUME 41 NO 8 365	1962	41	8	365	369		Aardgasnota	Geologisch en mijnbouwkundig nieuws
VOLUME 41 NO 8 369	1962	41	8	369	371			Boekbesprekingen
VOLUME 41 NO 8 372	1962	41	8	372	372			Genootschapszaken
VOLUME 41 NO 9 373	1962	41	9	373	383	Brandi, K.		Gegenwärtiger stand und Entwicklungstendenzen der mechanisierung der Abbaubetriebe im Ruhrgebiet bei verschiedenen Lagerungsverhältnissen
VOLUME 41 NO 9 384	1962	41	9	384	390	Valk, W.	In West Amberbaken andesitic rocks prevail. They are propylitized and mineralized, but no ore deposits of economic value have been formed. After andesitic vulcanism had come to an end, tilting and faulting in late Tertiary time created a bold relief. Then followed the deposition of a sedimentary series starting with coarse conglomerates. Folding of the sedimentary basin took place during the Mio-pliocene or Pliocene.	Geology of West Amberbaken (New Guinea)
VOLUME 41 NO 9 391	1962	41	9	391	395	Dun, F.W.P. van	Data obtained during earlier surveys (Zwierzycki, 1921) rendered it necessary to renew the geological exploration of the hinterland of Sarmi, where the central part of the Efar-Sidoas anticline was reported to consist mainly of basement (igneous rocks and crystalline schists). It appeared, however, that the Efar-Sidoas mountain ridge is made up almost entirely of Neogene folded sediments; the crystalline core occurring only in a few isolated areas. Consequently the attached sketchmap differs considerably from Zwierzycki's map. No mineralizations were detected neither in the basement nor in the Neogene sediments.	A survey of the Efar-Sidoas mountain ridge in Northern Netherlands New Guinea
VOLUME 41 NO 9 396	1962	41	9	396	398	Uytenbogaardt, W.	Indrukken van het derde I.M.A.-congres, Washington, 17-20 April 1962	Indrukken van het derde I.M.A.-congres, Washington, 17-20 April 1962
VOLUME 41 NO 9 399	1962	41	9	399	401			Boekbesprekingen
VOLUME 41 NO 9 402	1962	41	9	402	403			Geologisch en mijnbouwkundig nieuws
VOLUME 41 NO 9 404	1962	41	9	404	404			Genootschapszaken
VOLUME 41 NO 10 405	1962	41	10	405	408	Roever, W.P. de		in memoriam Prof. Dr. Ir. J. Westerveld

VOLUME 41 NO 10 409	1962	41	10	409	422	Mabesoone, J.M.	The method for the determination of size frequency distribution of sands by counting individual quartz grains, as developed by Faber, is compared with other methods in which either sieving or counting techniques are used. It appears that the results obtained by Faber's method have no relation to those obtained by the other methods, because the approach is fundamentally different. Faber's method is applied to determine roundness, spread, and median grain diameter of various fluvial deposits. Then a number of samples from the Netherlands is compared with the former. It appears that these Dutch sediments are much better rounded. It is presumed that they were derived from rocks which contained already rounded grains. Finally the method is applied to deposits of the marshy coastal plain of the Guadalete river in S.Spain. It is concluded that the former estuary of the river has been filled up by this river itself, and not by the sea.	Some applications of Faber's method for grain size analysis by counting
VOLUME 41 NO 10 423	1962	41	10	423	429	Roep, T.B.; Gillavry, H.J.M.	The Betic of Málaga is considered to be complex and to consist of a number of distinct tectonic units. These are from north to south: the Salud, Castillos, Cerro Colorado, and Casolidad units. The northernmost (uppermost) Salud unit is characterised by the presence of Oligocene transgressively overlying Triassic or Permo-Triassic. The Castillos unit, directly to the south of the former, is characterised by Eocene transgressively overlying Cretaceous or Upper Jurassic; its Mesozoic stratigraphy corresponds with that described from the region of Málaga (Azéma, 1961) and from the Sierra de Espuña (N. & Y. Peyre, 1960); Novakia- limestone intercalations in the Upper Paleozoic, and Carboniferous conglomerates of the Marbella-conglomerate type, seem to be restricted to this unit. The Cerro Colorado unit contains Paleozoic, Permo-Triassic sandy formations and Triassic dolomite. The Casolidad unit, situated furthest south, contains only Paleozoic and Permo-Triassic, the latter being characterised by the occurrence of thick, coarse quartz conglomerate intercalations; it shows some Alpine metamorphism. The separation of the two last-named units is still tentative. The stratigraphic and tectonic implications are discussed. It is suggested that the Betic of Málaga was imbricated by thrust movements after deposition of the Salud Oligocene, prior to the first nappe-movements of the Betic of Málaga complex as a whole.	Preliminary note on the presence of distinct tectonic units in the Betic of Málaga of the Vélez Rubio region (SE Spain)

VOLUME 41 NO 10 430	1962	41	10	430	437	Priem, H.N.A.; Boelrijk, N.A.I.M.; Boerboom, A.J.H.	Among the galenas of the lead-zinc ores in southern Limburg two groups of lead model ages can be distinguished, one averaging $430 \cdot 10^6$ years (Upper Ordovician-Lower Gothlandian) and the other averaging $345 \cdot 10^6$ years (Lower Carboniferous). This points to Caledonian and early Hercynian ages of generation of the lead ore. The ore deposits were emplaced in post-Westphalian time, at least in part during the Upper Cretaceous, so that we are dealing with B-type anomalous lead. This supports the hypothesis of a genesis of the ore by regeneration from older deposits. The calculation methods and some geochemical implications are discussed.	Lead isotope studies of the lead-zinc deposits in southern Limburg, The Netherlands
VOLUME 41 NO 10 438	1962	41	10	438	440			Boekbesprekingen
VOLUME 41 NO 10 441	1962	41	10	441	441			Geologisch en mijnbouwkundig nieuws
VOLUME 41 NO 10 442	1962	41	10	442	442			Genootschapszaken
VOLUME 41 NO 11 443	1962	41	11	443	485	Matla, W.P.M.	The first part, an introduction, gives an indication of changing opinions on dust limits which may be expressed in terms of weight, surface or number of dust particles, or in other parameters. The second part mentions foreign limits, adopted, recommended or derived. It is not always possible to give the motivation or the origin of the limits since, in many cases, this has not been published. 'the third part treats the dust limits adopted by the Netherlands Coal Mines on the advice of the Stofinstituut van de Gezamenlijke Steenkolenmijnen in Limburg (Dust Institute of the Association of the Netherlands Coal Mines); other dutch opinions on dust limits are given too. The fourth part gives, on the basis of available data, comparisons between different dust limits, in the first place comparisons between foreign dust limits and those recommended by the Stofinstituut. The fifth part considers the re-employment of pneumoconiosis cases. The sixth part is a list of references. To avoid possible misunderstandings the author makes ample use of literal foreign texts. Commentary is not given, and the report does not close with a conclusion by the author.	Stofgrenzen
VOLUME 41 NO 11 486	1962	41	11	486	486			Geologisch en mijnbouwkundig nieuws
VOLUME 41 NO 11 487	1962	41	11	487	489			Boekbesprekingen
VOLUME 41 NO 11 489	1962	41	11	489	490			Genootschapszaken

VOLUME 41 NO 12 491	1962	41	12	491	506	Bemmelen, R.W. van	The stages of cosmic evolution are characterized by leading principles of development. During the stellar evolution nuclear reactions , producing the chemical elements, were the leading principle. During the planetary evolution the energy production is chiefly based on molecular integrations (reactions of the electronic shells of the elements) and nuclear desintegrations (natural radioactivity). The successive stages of the universal of evolution with emergent principles of development are: galactic, stellar, planetary, biotic, and psychic (van Bemmelen, 1948; Teilhard de Chardin, 1958). For the scientific research of these stages the prognosis-diagnosis method can be applied (Fig.2). For instance, the model of a layered earth leads to the expectation that the earth will have a specific spectrum of vibrations, when struck like a bell by a heavy earthquake. The frequencies calculated by Pekeris and others are a prognosis which has been verified by the diagnostic observations at the observations at the occasion of the Chili-earthquake of May 1960. A fair correspondence between prognosis and diagnosis has been found up to the 38th overtone. This means a check of the correctness of our mental picture about the structure and physical of the inner part of the earth. Paleomagnetism is a new method of measuring geophysical properties, which provides the geologist with diagnostic observations for testing geotectonic concepts. It appears that indeed polar wandering and continental drift, as suggested by Wegener half a century ago, did occur on a grand scale during the geological evolution. A synthesis of our concepts concerning the geological evolution can be based on two leading principles: (A) Physico-chemical processes are the source of	Geologie en geofysica (werkwijze en enige resultaten)
VOLUME 41 NO 12 507	1962	41	12	507	520			Memorandum betreffende het energiebeleid
VOLUME 41 NO 12 521	1962	41	12	521	521			Boekbesprekingen
VOLUME 41 NO 12 522	1962	41	12	522	524			Geologisch en mijnbouwkundig nieuws
VOLUME 41 NO 12 525	1962	41	12	525	526			Genootschapszaken
VOLUME 42 NO 1 1	1963	42	1	1	2			In memoriam Dr. G. Zijlstra

VOLUME 42 NO 1 3	1963	42	1	3	12	Wegen, G. van der	Waigeo, Batanta, Salawati and numerous smaller islets of the western tip of the mainland of New Guinea form the Radja Ampat archipelago. Waigeo and its surrounding islands were visited for the first time by Verbeek in 1908, during his geological reconnaissance of the eastern part of the former Dutch East-Indies. Neither Verbeek nor subsequent visiting geologists (Brouwer, Molengraaff, oil geologists a.o.) penetrated deeply into the island's interior. We have, nevertheless, a reasonable clear insight into its geology, which is mainly due to Verstappen's geological interpretations of aerial photographs. Ultrabasic rocks are present in a narrow belt along the north and west coasts of Waigeo and on some of th islets in the immediate vicinity. They were followed by other basic and intermediate rocks, among which such charateristic effusiva as spillites and keratophyres. These ingneous rocks accompany the initial geosynclinals subsidence and present its simatic magmatism to a high degree of completeness. Together with pelagic limestones, pelites, radiolarites and chert they were strongly folded. Deposition of graywackes, conglomerates, volcanic breccias, quartz-) andesites and tuffs, cut by basalt dikes followed the folding. According to the oil geologists who visited some of the coastal areas of Waigeo the above mentioned rocks, with the exception of the ultrabasic rocks, belong to the so-called Batanta-formation and are of Oligocene to early-Miocene age. There are reasons to assume an uncomformity within the Batanta-formation. This intraformational uncomformity points to synorogenic conditions of sedimentation which, although of limited extent, led to the flysch sedimentation during early Miocene time. In a fully developed eugeosynclinal cycle the initial	De geologie van het eiland Waigeo
VOLUME 42 NO 1 13	1963	42	1	13	15			Geologisch en mijnbouwkundig nieuws
VOLUME 42 NO 1 16	1963	42	1	16	19			Boekbesprekingen
VOLUME 42 NO 1 20	1963	42	1	20	28		KNMGJ Jaarverslag 1961	Genootschapszaken

VOLUME 42 NO 2 29	1963	42	2	29	43	Mabesoone, J.M.	The coastal area of the W part of the province of Cádiz (Spain) shows various beaches alternating with some cliffs; near the city of Cádiz the Guadalete river flows into the sea. This coast can be divided into three parts: (1) the part N of Sta. Catalina, (2) the part S of Cádiz, and (3) the inner part of the bay. Recent beach sands point to a supply from the adjacent land, particularly where cliffs are exposed. The south-easterly longshore current had only a minor influence. These features are presented by means of so-called historiograms. The dunes received their material from the adjacent beaches by the action of onshore winds. Bottom deposits of the bay show a Pliocene sediment, sometimes mixed with younger material. Beach and dune sands can be distinguished by means of the skewness values of their grain size distribution, following indications provided by Mason & Folk. By means of this method a distinction between beach rock and eolianite could also be made with respect to the cemented deposits found alongside the modern shore. From ancient beach and dune sediments at various levels and the height of the cliffs, four stages of Quaternary coasts could be mapped. The oldest coast from the Milazzian time survives at present only in some isles in the investigated area. During later stages the coasts approached the site of the present one, although this latter, which is in retreat, lies somewhat landward from that presumed in the Tyrrhenian II and III periods.	Coastal sediments and coastal development near Cádiz (Spain)
VOLUME 42 NO 2 44	1963	42	2	44	57			Europa und die Energie
VOLUME 42 NO 2 58	1963	42	2	58	60	Martens, A.H.W.		10e Leobener Bergmannstag - 12-16 september 1962
VOLUME 42 NO 2 61	1963	42	2	61	61			Geologisch en mijnbouwkundig nieuws
VOLUME 42 NO 2 62	1963	42	2	62	63			Boekbesprekingen
VOLUME 42 NO 2 64	1963	42	2	64	64			Genootschapszaken

VOLUME 42 NO 3 65	1963	42	3	65	75	Engelen, G.B.	Geophysical, geological and topographical data about the continental margins of the northern Atlantic and the Arctic Ocean, collected by Heezen, Høltedahl and others, were studied by applying various working hypotheses to these primary data. In this way the picture of a big graben structure under these continental margins, parallel to the coast, was deduced. This riftzone fully developed during the Miocene in a sedimentary deltaic sequence, that was deposited from the early Cretaceous to the middle Tertiary as a long "ribbon" on the continental margins along the coasts. The adjacent continents seem to have been elevated temporarily at the end of the Tertiary. In the emerged continental slope (the limiting faultplane on the continental side of the graben) canyons could be formed by subaerial erosion. The continents should have sunken back again during the Pliocene with almost the same vertical amount and thus the canyons got drowned. Isostatic readjustment to compensate for the erosion on the continents and sedimentation in the continental margins seems to be one of the causes for the inferred sequence of events. The continental margin along the western side of the North Atlantic Ocean is treated in some detail as an example.	Indications for large scale grabenformation along the continental margin of the eastern United States
VOLUME 42 NO 3 76	1963	42	3	76	80	Baerts, J.W.R.		Het vierde internationale kolenwaterijcongres
VOLUME 42 NO 3 81	1963	42	3	81	85	Bitter, J.H.		De slikverwerking
VOLUME 42 NO 3 86	1963	42	3	86	87	Valk, W.		Note on geological developments in southeast Asia
VOLUME 42 NO 3 88	1963	42	3	88	91			Boekbesprekingen
VOLUME 42 NO 3 92	1963	42	3	92	92			Geologisch en mijnbouwkundig nieuws
VOLUME 42 NO 3 93	1963	42	3	93	94			Genootschapszaken
VOLUME 42 NO 4 95	1963	42	4	95	101	D'Arnaud Gerrens, J.C.		Geologisch begrip
VOLUME 42 NO 4 102	1963	42	4	102	111	Pruvost, P.		Comment varient dans l'Espace les structures geologiques
VOLUME 42 NO 4 112	1963	42	4	112	113	Crommelin, R.D.		Een vulkanisch sediment in de ondergrond van de Betuwe
VOLUME 42 NO 4 114	1963	42	4	114	116			Geologisch en mijnbouwkundig nieuws
VOLUME 42 NO 4 117	1963	42	4	117	118			Boekbesprekingen
VOLUME 42 NO 4 119	1963	42	4	119	120			Genootschapszaken

VOLUME 42 NO 5 121	1963	42	5	121	142	Johnson, M.R.W.	The paper attempts to summarise recent work on time relationships of deformation and crystallisation in the Moine and Dalradian rocks of the Caledonian orogenic belt in Scotland. Three or four deformation episodes, each accompanied by some kind of metamorphism, have been detected. Crystallisations of metamorphic minerals can be shown to have accompanied and, more especially, followed a particular episode of deformation and so the observed metamorphic fabrics result from a complex interplay of deformations and crystallisations. Rocks may contain disequilibrium assemblages, with the metastable survival of early crystallised minerals. In the Dalradians, and probably the Moines also, the earliest known movements, which caused great thickening of the sedimentary pile, were accompanied by only low-grade, dynamic, metamorphism. The main episodes of crystallisation occurred before, during and after the second deformation. The three episodes are part of a continuous, perhaps progressive, metamorphic process, which possibly embraced some local oscillations in P/T conditions. The third, final, episode of crystallization - an important and extended static period between the second and third fold movements - often marks the climax of the crystallisation and grain growth resulting in the build-up of schistose or gneissose fabrics. During this episode in the Dalradians there were regional crystallisations of kyanite-sillimanite ("Barrovian type") and andalusite-sillimanite ("Buchan type") sequences. The occurrence of these sequences at different structural levels is thought to have been controlled by orogenic P/T gradients. An account is included on current work on problems of dating the migmatites in the Scottish	Some time relations of movement and metamorphism in the Scottish Highlands
VOLUME 42 NO 5 143	1963	42	5	143	154	Zwart, H.J.	Four examples of relations between deformation and metamorphism are discussed. In the Bosost area a folding phase with N-S axes is accompanied by uniform rotation of minerals, indicating that the schistosity is a plane of shear and that the folds are shearfolds. Another phase of deformation consists of two sets of folds perpendicular to each other. Their shearfold character and contemporaneity cannot be proved in steeply dipping slates, but in the schists of the Hospitalet massif rotation of minerals again is demonstrative of this type of folding. A detailed scheme of the metamorphic history of the Bosost area can be established by dating the minerals with four phases of deformation. The order of crystallization shows increase in temperature during a large part of the metamorphic history. The mineral assemblages are formed under low confining pressure. Two types of gneisses occur in the Pyrenees, gneisses with regular schistosity and lineations and migmatitic gneisses with strongly folded schistosity. The relationships between these gneisses and their metamorphic grade indicate that metamorphism of the first group took place under drier conditions.	Some examples of the relations between deformation and metamorphism from the Central Pyrenees

VOLUME 42 NO 5 155	1963	42	5	155	169	Wunderlich, H.G.	The tectonic and metamorphic processes in the western Alps are characterized, by a regular chronological sequence of activities encompassing thrusting, folding and formation of secondary fabric elements. Alpine metamorphic crystallization and magmatism; all these events occurred in course of the deformation of the geosynclinal prism. Thrusting, folding and penetrative movements set in at the innermost parts of the Alpine chain and become successively younger when proceeding to the northern and western edges of the depositional basin. Folding and penetrative movements, giving birth to schistosity and lineation (in N-S and E-W direction), are always younger than the thrusting, when considering the individual and successively deformed sectors of the mountain chain. The Alpine regional metamorphism has been found to be restricted to certain areas within the internal, most strongly deformed parts of the area, where the metamorphic crystallization goes hand-in-hand with the penetrative movements, ultimately post-dating the same. A certain time-place relationship between the metamorphism and Alpine magmatism (Traversella, Biella, Iorio, Bergell, Adamello) is obviously present, pointing to a genetic relationship between the two. The depositional basins, filled up by orogenic sediments, are shifted slowly towards the outer edge of the Alpine chain and are themselves followed by thrusting and folding movements. All these events, however, were brought to an end with the late thrustings in the external parts of the mountain and folding of the sub-Alpine chain. Thereupon the regional uplift followed.	Ablauf und Altersverhältnis der Postvaristischen tektonik und metamorphose im Westalpenbogen
VOLUME 42 NO 5 170	1963	42	5	170	176	Tex, E. den		A commentary on the correlation of the metamorphism and deformation in space and time
VOLUME 42 NO 5 177	1963	42	5	177	179	Schuiling, R.D.		Some remarks concerning the scarcity of retrograde vs. progressive metamorphism
VOLUME 42 NO 5 180	1963	42	5	180	180			Geologisch en mijnbouwkundig nieuws
VOLUME 42 NO 5 181	1963	42	5	181	181			Boekbesprekingen
VOLUME 42 NO 5 182	1963	42	5	182	182			Genootschapszaken

VOLUME 42 NO 6 183	1963	42	6	183	201	Bitterli, P.	From the investigation of some 150 W. European, primary-bituminous rock sequences of Cambrian to younger Tertiary age, it is concluded that bituminous material occurs in a great variety of sediments (shales, carbonates, clays, siltstones, etc.), though predominantly in fine-grained and laminated rocks. Favourable situations for the formation of bituminous sequences seem to be often created at palaeogeographic turning points (orogeneses; epeirogenic or eustatic oscillations) which resulted in either transgressions or regressions and were followed by stagnation and anaerobic conditions. As regards environments of deposition of the sequences studied, a, great many occurrences are of a transitional or an alternating facies; brackish and mainly limnic deposits often show higher concentrations of organic matter and thicker beds than marine deposits. As regards the genesis of bituminous rock sequences, the interplay of various climatic, physico-chemical and other factors, governing or influencing type and amount of organic matter, inorganic components, anaerobic conditions, etc., is of great importance. Depending on whether these conditions continue more or less uniformly for a certain time, or alternate periodically, there will result: a) continuous (homogeneous) or b) cyclic (rhythmic) sequences; unsettled conditions and irregular repetitions will end in c) complex sequences. In an attempt to subdivide the many bituminous sequences studied. according to the original depositional environment, various types of basins and other aquatic realms are recognized, which can be grouped in: 1) open marine, 2) transitional, and 3) continental.	Aspects of the genesis of bituminous rock sequences
VOLUME 42 NO 6 202	1963	42	6	202	205	Polak, B.; Hamming, C.	A deposit, representing a zone of the Brørup Interstadial of the Würm glaciation is described. This deposit was found in the north-eastern part of the province of Overijssel. So far sediments of the Brørup Interstadial were only known to be present at Amersfoort and this find thus represents a second occurrence in the Netherlands.	A peat-layer of Early Würm glacial age
VOLUME 42 NO 6 206	1963	42	6	206	209	Kempen, W.; Reyen, C. van		Erfahrungen mit 865 V-Niederspannungsanlagen im Holländischen Grubenbetrieb
VOLUME 42 NO 6 210	1963	42	6	210	211			Geologisch en mijnbouwkundig nieuws
VOLUME 42 NO 6 212	1963	42	6	212	213			Boekbesprekingen
VOLUME 42 NO 6 214	1963	42	6	214	214			Genootschapszaken
VOLUME 42 NO 7 215	1963	42	7	215	222	Bianchi, M.; Hooijdonk, J. van		Ontwikkeling van de diepte-injectie op de mijn Julia
VOLUME 42 NO 7 223	1963	42	7	223	228	Allen, J.R.L.	The scheme of sandstone facies in relation to increasing intensity of fluid flow developed by Sorby is modified in the light of recent experimental studies, as follows: small scale cross-stratification + large scale cross-stratification (cosets) + flat-bedding with primary current lineation. A. cyclothem probably of fluvial origin from the Lower Old Red Sandstone (Lower Devonian) of the Anglo-Welsh Basin is analysed to demonstrate the practical value of the scheme in the interpretation of facies.	Henry Clifton Sorby and the sedimentary structures of sands and sandstones in relation to flow conditions
VOLUME 42 NO 7 229	1963	42	7	229	230			Geologische bibliografie van Nederland

VOLUME 42 NO 7 231	1963	42	7	231	232			Boekbesprekingen
VOLUME 42 NO 7 233	1963	42	7	233	239			Geologisch en mijnbouwkundig nieuws
VOLUME 42 NO 7 240	1963	42	7	240	240			Genootschapszaken
VOLUME 42 NO 8 241	1963	42	8	241	247	Boekschoten, G.J.	Several features of Cretan beaches are described. Some instances of the influence of recent tectonic movement are given. The advent of volcanic material from Santorini on Cretan beaches must have happened quite recently. Beachrock formation is due to mixing of calciferous fresh-water with alkaline sea-water in beach sands. Density currents create a suitable hydrological background for beach sand cementation. Solution basins of 50 cm diameter and 5 cm depth are formed in limestones within a period of 1500 years. Aquafacts and ventifacts from the Cretan coasts are described.	Some geological observations on the coast of Crete
VOLUME 42 NO 8 248	1963	42	8	248	259	Boogaard, M. van den	Conodonts were found in samples from limestone outcrops in the Baixo Alentejo, southern Portugal; five samples from outcrops in the Pomarão region and two samples from a limestone-quarry near Carvoeiro, north of Mertola. (See maps fig. 1). The conodonts from the limestones of the Pomarão area belong to the uppermost <i>Platyclymenia</i> - and lowermost <i>Gonioclymenia</i> -stage, Upper Devonian; those from the Carvoeiro limestone to the <i>Pericyclus</i> -stagg Lower Carboniferous. Some new forms are described.	Conodonts of Upper Devonian and Lower Carboniferous age from Southern Portugal
VOLUME 42 NO 8 260	1963	42	8	260	260			Twee zeventigjarigen en hun gedenkboek
VOLUME 42 NO 8 261	1963	42	8	261	261			In memoriam Prof. Dr. Th. H.F. Klompé
VOLUME 42 NO 8 262	1963	42	8	262	262			Gouden Doctoraat Dr Schurmann
VOLUME 42 NO 9 263	1963	42	9	263	277	Clercq, H. le		De losvloer van schacht IV van Staatsmijn Hendrik - Algemene richtlijnen voor het ontwerpen van losvloeren, leidende gedachten bij het ontwerp voor Staatsmijn Hendrik. Bijzonderheden over de uitvoering, speciaal wat betreft de automatisering
VOLUME 42 NO 9 278	1963	42	9	278	290	Dijkstra, H.; Steur, C.	A survey is given of the background-knowledge, necessary for the application of closed radio-active sources in the mining-industry. Several methods of measurement and control in use at the Staatsmijnen collieries are mentioned and shown by diagram or photograph. A suggestion is made of a method for sorting tubs, loaded with stone, loaded with coal, or empty.	De toepassing van gesloten radio-actieve bronnen voor bedrijfscontrole in mijnen en bovengrondse werken
VOLUME 42 NO 9 291	1963	42	9	291	303	Knoester, C.J.		Elektronische rekenmachines in het mijnbedrijf
VOLUME 42 NO 9 304	1963	42	9	304	305	Engelbert; van Bevervoorde, W.F.C.		In memoriam Prof Dr. Ir. C. Schouten
VOLUME 42 NO 9 306	1963	42	9	306	306			Boekbesprekingen
VOLUME 42 NO 9 307	1963	42	9	307	307			Geologisch en mijnbouwkundig nieuws
VOLUME 42 NO 9 308	1963	42	9	308	308			Genootschapszaken

VOLUME 42 NO 10 309	1963	42	10	309	328	Mabesoone, J.M.	The W part of the Subbetic region in the province of Cádiz is drained by the Guadalete river. The area consists of sediments ranging in age from Triassic to Recent. The chief alpine orogenic phase which affected this region took place after the deposition of the Oligocene sediments. The Miocene shows only slight undulations, and in the younger deposits only evidence of tilting towards the W could be demonstrated. The river Guadalete flows through a mountain area as far as Puerto Serrano; from there it winds through a syncline in the Miocene deposits almost to the Loma del Torno. Finally, it flows towards the sea through a wide valley which was drowned several times during the Pleistocene transgression stages. The first river terraces begin to appear S of Puerto Serrano. Three levels (30-40, 15-20, and 2-5 m) can be distinguished. Sedimentological analysis of their deposits point to: (1) a shaping of limestone pebbles strongly influenced by a local supply of fresh material; (2) a content of rounded-brilliant quartz sand grains determined by the content of these grains in the underlying deposits; (3) a grain size of the finer part of the terrace material that also depends on the underlying sediments. The modern river-bed has the same characteristics with one exception: the grain size of the river-bed sands becomes generally finer downstream, but coarser particles are mixed with the finer type where the river passes through a gorge in the lower valley area. Furthermore, the deposits have a bi-phasic character with a fairly high silt-content. Heavy mineral distributions in the terrace as well as in the river-bed sediments show that the Guadalere supplied a characteristic association to the area. The older deposits, those of the Villafranchian included, have an EGA-distribution (epidote-	Observations on sedimentology and geomorphology of the Guadalete drainage area (Cádiz, Spain)
VOLUME 42 NO 10 329	1963	42	10	329	336	Schürmann, H.M.E.; Burger, D.; Dijkstra, S.J.		Permian near Wadi Araba eastern desert of Egypt
VOLUME 42 NO 10 337	1963	42	10	337	337			Geologisch en mijnbouwkundig nieuws
VOLUME 42 NO 10 338	1963	42	10	338	339			Boekbesprekingen
VOLUME 42 NO 10 340	1963	42	10	340	340			Genootschapszaken
VOLUME 42 NO 11 341	1963	42	11	341	349	Patijn, R.J.H.		Het carboon in de ondergrond van Nederland en de oorsprong van het massief van Brabant
VOLUME 42 NO 11 349	1963	42	11	349	358	Patijn, R.J.H.		De vorming van aardgas ten gevolge van nainkoling in het noordoosten van Nederland
VOLUME 42 NO 11 359	1963	42	11	359	362	Ornstein, M.A.M.; Haug, G.M.W.		A recent discovery of Itaberite in southern Surinam

VOLUME 42 NO 11 363	1963	42	11	363	374	Nagtegaal, P.J.C.	This paper presents the results of a comparative study of convolute lamination, metadepositional rupture, and slumping. The observations concern one exposure near Pobra de Segur (Spain), where these three types of sedimentary structures are equally well developed. The exposed rocks consist of a regular alternation of Upper Cretaceous, mostly graded, carbonate-rich siltstones and shales. The type of grading and the presence of a certain percentage of allochthonous material point to deposition of the siltstones by turbidity currents. Field observations, laboratory analyses, and mutual comparison of the structures suggest that in this exposure the convolute lamination, metadepositional rupture, and slumping have a common origin. Strongly dependent on the mineralogical composition and grain size of the sediment as well as the various states due to differences of moisture content, these structures are the diverse results of gravity-induced, lateral movements during and shortly after deposition. Many samples from the exposure were ground in order to approximate the original sediment. Thixotropy tests of these powders support the conclusions.	Convolute lamination, metadepositional ruptures and slumping in an exposure near Pobra de Segur (Spain)
VOLUME 42 NO 11 375	1963	42	11	375	375	Seldenrath, T.R.		In memoriam Prof. ir. C.L. van Nes
VOLUME 42 NO 11 376	1963	42	11	376	377			Boekbesprekingen
VOLUME 42 NO 11 378	1963	42	11	378	379			Geologisch en mijnbouwkundig nieuws
VOLUME 42 NO 11 380	1963	42	11	380	380			Genootschapszaken
VOLUME 42 NO 12 382	1963	42	12	382	383	Hellwig, F.		Einleitung zur informationstagung auf dem gebiete der Grubengasbekaempfung
VOLUME 42 NO 12 384	1963	42	12	384	393	Linsel, E.		Het ontstaan en het vrijkomen van mijngas
VOLUME 42 NO 12 394	1963	42	12	394	404	Maas, W.		Mijngas en ventilatie
VOLUME 42 NO 12 405	1963	42	12	405	411	Renner, K.		Strahlausbreitung vor ort bei blasenden Sonderbewetterungsanlagen
VOLUME 42 NO 12 412	1963	42	12	412	428	Vergeron, M. de		Grubengasbekaempfung durch aufspueren
VOLUME 42 NO 12 429	1963	42	12	429	448	Stassen, P.; Vandeloise, R.		Bestrijding van gasuitbarstingen
VOLUME 42 NO 12 449	1963	42	12	449	452			Boekbesprekingen
VOLUME 42 NO 12 453	1963	42	12	453	454			Geologisch en mijnbouwkundig nieuws
VOLUME 42 NO 12 455	1963	42	12	455	456			Genootschapszaken
VOLUME 43 NO 1 1	1964	43	1	1	9	Rutten, M.G.	Three examples of periglacial solifluction in the Velay (France) are described. The difference between primary basaltic scoria and the same material resedimented through solifluction; the difference between phonolitic periglacial block fields and present day phonolitic block scree; and the difference between older and younger solifluction deposits at the Issarlès Maar are studied.	Three examples of periglacial solifluction in the southeastern plateau Central France

VOLUME 43 NO 1 10	1964	43	1	10	12	Voet, H.W.	To the north-west of Lijar "abnormal" tectonic successions are exposed, caused by relatively late thrusting. Elements of a Nevado-Filabride unit with a medium grade of alpine metamorphism are found overlying Alpujarride elements showing a low grade of alpine metamorphism, the separating thrust planes being subhorizontal. Within a restricted area the following succession is found (from bottom to top): Nevado-Filabride mica schists and marbles – Alpujarride phyllites - Nevado-Filabride "older schists", mica schists and marbles - Alpujarride phyllites - Nevado-Filabride marbles.	Evidence of "Late" Alpine overthrusting, in the region NW of Lijar, Sierra de Los Filabres (SE Spain)
VOLUME 43 NO 1 13	1964	43	1	13	17	Priem, H.N.A.; Boelrijk, N.A.I.M.; Verschure, R.H.		Stichting voor isotopen-geologisch onderzoek
VOLUME 43 NO 1 18	1964	43	1	18	19	Schieferdecker, A.A.G.		Ter herdenking Ir. L. W. Leyds
VOLUME 43 NO 1 19	1964	43	1	19	22	Simons, A.L.		In memoriam Prof. Dr. G.L. Smit Sibinga
VOLUME 43 NO 1 23	1964	43	1	23	25			Geologisch en mijnbouwkundig nieuws
VOLUME 43 NO 1 26	1964	43	1	26	27			Boekbesprekingen
VOLUME 43 NO 1 28	1964	43	1	28	32			Notulen Ledenvergadering Dec 1963 Genootschapszaken
VOLUME 43 NO 2 33	1964	43	2	33	51	Wunderlich, H.G.		Zur tektonischen synthese der Ost- und Westalpen nach 60 Jahren Ostalpiner Deckentheorie
VOLUME 43 NO 2 52	1964	43	2	52	64	Dijkers, A.J.		The function of geology in petroleum production
VOLUME 43 NO 2 65	1964	43	2	65	65			Geologisch en mijnbouwkundig nieuws
VOLUME 43 NO 2 66	1964	43	2	66	68			Boekbesprekingen
VOLUME 43 NO 2 69	1964	43	2	69	70			Genootschapszaken
VOLUME 43 NO 3 73	1964	43	3	73	73	Vlerk, I.M. van der; Hammen, T. van der; Zagwijn, W.H.; Heyst, F.J.J. van		Voorwoord, speciale uitgave professor Dr. Mr. F. Florschütz
VOLUME 43 NO 3 74	1964	43	3	74	76			Bibliografie professor Dr. Mr. F. Florschütz
VOLUME 43 NO 3 77	1964	43	3	77	82	Balland, R.		Un gisement du pléistocène inférieur aux environs de Bordeaux les Argilles de Bruges (Gironde)
VOLUME 43 NO 3 83	1964	43	3	83	93	Bout, P.		Étude stratigraphique et paleogéographique du gisement de Mammifères fossiles Pléistocène moyen de Solilhac près le Puy-en-Velay (Haute-Loire), France

VOLUME 43 NO 3 94	1964	43	3	94	102	Burger, D.	The Untersee pollen diagram was derived from a boring in the Untersee near Lunz. The geomorphological features of the area are briefly described. The pollen diagram pictures the vegetational history of an epoch that covers a good deal of the Lateglacial and nearly all of the Holocene. The section begins with a sterile glacial clay, that changes into stratified (varved?) clay at the beginning of what we assume to be the Bölling interstadial. During the Alleröd interstadial a brown organic calcareous mud was laid down. The boundary with the Holocene is marked by an abrupt change of the sediment into a lime gyttja. The formation of peat in the upper part of the section commenced some 3000 years ago during the Subatlantic. The Younger Dryas and possibly the lowermost part of the Holocene are missing because of a disturbance in the sedimentation. Palynologically the Holocene is developed quite traditional, and the Alleröd (established by radiocarbon dating GRN 2406) and the preceding Older Dryas are clearly discernable. The assumed Bölling oscillation shows a double-topped curve, and the corresponding part of the section exists of some 600-700 (varve) stratifications. This could point to a passage of an equal number of years, which is in agreement with the duration of the Bölling time.	Results of a pollenanalytic investigation in the untersee near Lunz in Austria
VOLUME 43 NO 3 94	1964	43	3	94	102	Burger, D.	Enclosure B	Results of a pollenanalytic investigation in the untersee near Lunz in Austria
VOLUME 43 NO 3 103	1964	43	3	103	112	Guillien, Y.		Grèzes, litées et bancs de neige
VOLUME 43 NO 3 113	1964	43	3	113	117	Hammen, T. van der; Gonzalez, E.	A provisional pollen diagram is presented from 200 m of lake deposits and peat from the Sabana de Bogotá (Colombia, South America), at an elevation of about 2600 m. It represents the major part of the Quaternary (fig. 3). The sedimentation must have started shortly after the upheaval of the Northern Andes. In the lower part the vegetation is poor in species, but gradually new types appear. Part of them (Alnus, Quercus etc.) entered this part of the Andes from the North (fig. 2). A clear zonation can be established (fig. 1), giving a clue for the dating and correlation of terraces in the region. A partly tentative correlation is given of the glacials and interglacials with those of Europe (fig. 1). The upheaval of this part of the Andes must have taken place at the very beginning of the Pleistocene or somewhat earlier, in the Pliocene.	A pollen diagram from the Quaternary of the Sabana de Bogotá (Colombia) and its significance for the geology of the Northern Andes
VOLUME 43 NO 3 118	1964	43	3	118	122	Menéndez Amor, J.; Amorós, J.L.; Galván, J.		Estudio palinológico de la turbera de estany (Olotm Gerona)

VOLUME 43 NO 3 123	1964	43	3	123	128	Zinderen Bakker, E.M. van	The pollen diagram of a swamp, 3.70 m deep, and situated at an altitude of 2900 m in Kenya has been studied. The swamp is at present surrounded by the uppermost montane forest. The diagram shows that the tree-line was much lower down in former times and a number of climatic zones could be inferred from the diagram. A C-14 date of 12,650 ± 100 B.P. (GRN 3048) obtained from the 2.85-3.00 m level enabled the author to calculate the age of these climatic zones. At the dated level, which is contemporaneous with the Oldest Dryas time (compare: Radiocarbon dates K-544, K-545, K-546), the climate has been cold and dry. All the zones correspond remarkably well in age and temperature characteristics with those of the European chronology from the Pleniglacial B of the Würm onward. Only the Bölling Interstadial has not yet been recognized. The close correspondence with the study of v. d. Hammen and Gonzalez in Colombia (1960 a,b) is apparent (Table I). The results prove again that the temperature fluctuations during the Quaternary were of cosmic origin. The Pluvial theory for Africa as well as the ecology of plants, animals and man will have to be studied in this continent against the background of the European temperature chronology. The Gamblian Pluvial was contemporaneous with the Würm Glacial and represented a hypothermal period in Africa. The objection that movements connected with the Rift valley could have caused the climatic changes can be ruled out as the climatic correlation with Europe is too convincing in detail to be casual.	A pollen diagram from equatorial Africa Cherangani, Kenya
VOLUME 43 NO 3 129	1964	43	3	129	129			Geologisch en mijnbouwkundig nieuws
VOLUME 43 NO 3 130	1964	43	3	130	133			Boekbesprekingen
VOLUME 43 NO 3 134	1964	43	3	134	134			Genootschapszaken
VOLUME 43 NO 4 135	1964	43	4	135	140	Sitter, L. U. de		Problemen van de geotektoniek
VOLUME 43 NO 4 141	1964	43	4	141	142			Uitreiking van de van Waterschoot van der Gracht Penning aan Dr. Ir. W. P. van Leckwijck
VOLUME 43 NO 4 143	1964	43	4	143	143	Wijmstra, T.A.; Hammen, T. van der		Palynological data on the age of the bauxite in British Guiana and Surinam
VOLUME 43 NO 4 144	1964	43	4	144	146	Poll, J.J.K.; Zwart, H.J.		On the tectonics of the Sulcis area, S. Sardinia
VOLUME 43 NO 4 147	1964	43	4	147	148			Boekbesprekingen
VOLUME 43 NO 4 149	1964	43	4	149	156			KNGMG Jaarverslag 1963

VOLUME 43 NO 5 157	1964	43	5	157	182	Nossin, J.J.	<p>The area discussed is located in eastern Malaya, bordering the China Sea (fig. 1). The morphological aspects are shown in fig. 2. Under the hot and humid climate with strong monsoonal influence, rocks undergo a deep and intense weathering. A biotite granite and an olivine basalt from the majority of the country rock. The granite weathers into an unsorted mass of sand and clay which is subjected to strong mass movements in spite of the dense vegetation. During colluviation, silt is washed out leaving the colluvium as a bimodal deposit. The granite landscape exhibits lateral planation from the base, resulting in comparatively flat piedmonts surrounding steep hills. Both carry a thick residual cover. Granitic colluvium occurs on the piedmonts as well, and also occupies large parts of the surrounding sedimentary flats. The basalt weathers into a heavy homogeneous clay which undergoes little or no mass displacement and produces a basically different landscape. It is lower and flatter than the granite zone and densely dissected by a dendritic network of insequent streams with steep valley-sides and heads. Other rocks and their weathering products are of subordinate consequence in this area. The coast is lined by a series of beach ridges which are Holocene of age. Between the higher land and these beach ridges large flats were filled in with fluvial and swamp deposits after the closure of the bars. The drainage on these flats is largely impeded and frequent shifts have occurred in the fluvial pattern. The beach ridges blocking the drainage system force rivers to converge upon common outlets; parts of the swamps have thick peat layers. The fluvial deposits have a remarkably high silt contents, much of which is supplied by washing-out from the granite colluvium. Seasonal</p>	Geomorphology of the surroundings of Kuantan (Eastern Malaya)
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VOLUME 43 NO 5 183	1964	43	5	183	195	Rutten, M.G.; Veldkamp, J.	Since 1956 paleomagnetic research is carried out in co-operation between geologists of Utrecht university and geophysicists of the Royal Netherlands Meteorological Institute in De Bilt. A number of studies on rock magnetism has been published on Iceland (Rutten and Wensink, 1959, 1960, a, b), Norway (van Everdingen, 1960), Germany (Nijenhuis, 1961; As and Zijdeveld, in press), France (Den Boer, 1957; As and Zijdeveld, 1958; Kruseman, 1962), Spain (van der Lingen, 1960; Schwarz, 1962, 1963) and Italy (Rutten, 1959; Dietzel, 1960; van Hilten, 1960, 1961, 1962b; de Boer, 1961). The position of the magnetic pole for these countries has been studied from rock samples of Paleozoic to Quarternary age. Special attention has been paid to the magnetic cleaning of the samples. A method of cleaning was developed by As and Zijdeveld (As and Zijdeveld, 1958; As, 1960), in which the remanent magnetization is observed after exposing the sample to alternating fields of increasing strength. This makes it possible in many cases to remove the unstable part of the magnetization, while saving a good deal of the more stable remanent magnetism which is supposed to have been induced during the geneses of the rocks. The special point in this method is that not only the intensity but also the direction of the magnetization is studied. It is found that the behaviour of the direction of the remanent magnetism during stepwise demagnetization is of greater importance than its intensity. To test the secular variation in the geologic past, Wensink and collaborators and Hantelman are studying continuous sections of lava flows in Iceland, respectively from the Plio-Pleistocene and from the earlier Tertiary. The variation is as large as in recent times; the magnetic	Paleomagnetic research in the Netherlands
VOLUME 43 NO 5 196	1964	43	5	196	200	Schürmann, H.M.E.	An international team produced 30 isotope age determinations of various Pre-Cambrian rocks and minerals from the Northern part of the Eastern Desert of Egypt, surprisingly showing - With a few exceptions of about 650 m.y. - Palaeozoic ages (500-550 m.y.). Fortunately fossil-bearing Lower Cambrian has been established lying flat and unconformably over Pre-Cambrian. As two major unconformities exist between the Pre-Cambrian proper and the Lower Cambrian (firstly, Hammamat series with boulder beds composed of Pre-Cambrian igneous and secondly Lower Cambrian unconformably above Hammamat series) one had expected an isotopic age of 600-1000 m.y. for the igneous of the Pre-Cambrian. In the Red Sea area no folded Cambrian and no cambrian orogeny has been proven; only epirogenetic tectonics exist. This also holds good for East and South Africa, where no fossil-bearing Cambrian has been established as yet, but where similar young isotope ages if igneous rocks are available. As explanation one could take into consideration the possibility of rejuvenation of young Pre-Cambrian rocks of the crust in Palaeozoic times due to rising convection currents increase in temperature, tension and epirogeny (taphrogeny), the major tectonic feature along the Red Sea and in East Africa.	Rejuvenation of Pre-Cambrian rocks under epirogenetical conditions during old Palaeozoic times in Africa

VOLUME 43 NO 5 201	1964	43	5	201	202	Crommelin, R.D.		Enkele opmerkingen over kalkzandsteenbanken in het preglaciaal van Midden-Nederland
VOLUME 43 NO 5 203	1964	43	5	203	203			Geologisch en mijnbouwkundig nieuws
VOLUME 43 NO 5 204	1964	43	5	204	207			Boekbesprekingen
VOLUME 43 NO 5 208	1964	43	5	208	208			Genootschapszaken
VOLUME 43 NO 6 210	1964	43	6	210	221	Hilten, D. van	Polar wandering paths have been constructed for imaginary continents performing simple drifting movements. The effect of both continental drift and polar wandering upon the shape of the polar wandering paths are analysed. The results have been compiled in the final section of this paper. The often-heard assumption that polar wandering paths should coincide when the corresponding continents are replaced in their original, pre-drifting configuration is only partly correct. A method is given to determine besides the ancient latitude also the relative longitudinal positions of continents from their paleomagnetic data.	Interpretation of the wandering paths of ancient magnetic poles
VOLUME 43 NO 6 222	1964	43	6	222	235	Agterberg, F.P.	The structure of the crystalline basement of the Dolomites can be divided in (1) a more regional Hercynian structure including almost all major and minor folds, and (2) a number of local Alpine structures which are disturbing the Hercynian structure. The Alpine deformations consist of lateral compression structures in the S. Stefano and Pusteria areas, respectively northeast and north of the Dolomites, and probably some rapid increments in thickness of the crystalline rocks in the Cima d'Asta and Gosaldo areas south of the Dolomites. The Hercynian minor folds in the S. Stefano area have been refolded into an anticlinal structure with a southeast directed Alpine axis. The limbs of this anticline have been rotated with respect to each other along the axial plane. The amount of rotation is locally as high as 63°. This large shearing movement took place during Alpine orogeny. The Alpine deformation is also found in the adjacent permian beds overlying the prepermian erosion plane. Similar conclusions can be drawn with respect to the Pusteria area. The regional schistosity of the Cima d'Asta and Gosaldo areas is probably subparallel to the prepermian erosion plane. Variations in the mean strike of this schistosity demonstrate that there are locally rapid increments in thickness in the crystalline rocks south of the Dolomites. A new explanation for this phenomenon is proposed. The regional schistosity in the Gosaldo area is generally a secondary schistosity. Distinction between primary and secondary schistosity cannot be made in many localities. However, the undefined schistosity planes show a mean attitude that, in terms of Student's t-test, cannot be distinguished from the mean attitude of the well-defined secondary S-planes in other localities. The combined groups	The method of statistical structural analysis (as applied to the crystalline basement of the Dolomites in North Italy)

VOLUME 43 NO 6 236	1964	43	6	236	244	D'Amico, C.	A stratigraphic series of epizonal metamorphic rocks can be recognized in the Agordo-Cereda region (crystalline of the Southern Alps); the metamorphic grade increases toward the deepest portions of this series. Tectonically, two sets of different S-surfaces are to be distinguished (S1 and S2). Agterberg's tectonic interpretation of the region is discussed and rejected. Some large changes of volume are postulated by that author as a consequence of the alpine movements: however, they are not supported by petrographic evidences. Some assumption are implicit in the statistics of the tectonic measures as considered by Agterberg i.e.: Hercynian deformation was homogeneous all over in the region; S1 and S2 are parallel; S of the metamorphic rock and S of the Permo-trias are parallel. These assumptions are not correct. The tectonic interpretation of other crystalline regions in the eastern Southern Alps, as made by Agterberg, is also called in question.	Petrography and tectonics in the Agordo-Cereda region (Crystalline of the Southern Alps)
VOLUME 43 NO 6 245	1964	43	6	245	247	Matla, W.P.M.		The Hexhlet instrument for dust determinations
VOLUME 43 NO 6 248	1964	43	6	248	249	Doeglas, D.J.		In memoriam Prof. Dr. Ir. C.H. Edelman, M.I.
VOLUME 43 NO 6 250	1964	43	6	250	250	Tromp, N.W.		Internationale hydrologische bibliografie
VOLUME 43 NO 6 251	1964	43	6	251	257			Geologisch en mijnbouwkundig nieuws
VOLUME 43 NO 6 258	1964	43	6	258	259			Boekbesprekingen
VOLUME 43 NO 6 260	1964	43	6	260	260			Genootschapszaken
VOLUME 43 NO 7 264	1964	43	7	264	267	Busnardo, R.		Hypothèses concernant la position des unités structurales et paléogéographiques de la transversale Jaén-Grenade (Andalousie)
VOLUME 43 NO 7 268	1964	43	7	268	272	Foucault, A.		Sur les rapports entre les zones Prébétiques et subbétiques entre Cazorla (Prov. De Jaén) et Huéscar (Prov. De Grenade, Espagne)
VOLUME 43 NO 7 273	1964	43	7	273	276	Chauve, P.; Didon, J.; Magne, J.; Peyre, Y.		Mise au point sur l'âge des phénomènes tectoniques majeurs dans les Cordillères Bétiques occidentales
VOLUME 43 NO 7 277	1964	43	7	277	281	Boulin, J.		Problemes structuraux dans le domaine Alpujarride au sud-ouest de la Sierra Nevada

VOLUME 43 NO 7 282	1964	43	7	282	298	Hoepfener, R.; Hoppe, P.; Dürr, S.; Mollat, H.	In fünf Abschnitten wird ein Querschnitt durch die westlichen Betischen Kordilleren beschrieben ² . In der "Einführung" geben wir einen Überblick über die verschiedenen Einheiten, die in diesem Raume unterschieden werden können und weisen auf ihre Beziehungen zu Einheiten der zentralen und östlichen Betischen Kordilleren sowie zu den Einheiten des Rifs in N-Afrika hin. Im zweiten Abschnitt, "Der Norden", steht die stratigraphisch-fazielle Entwicklung im Subbetikum und im Penibetikum im Vordergrund der Betrachtung. Das gegenseitige Verhältnis dieser beiden Einheiten wird diskutiert. "Die Mitte" umfasst die Front der Betischen Decken mit ihrer Vielfalt von Einheiten z.T. filabridisch-alpujarridischen Charakters. Die Beziehungen dieser Decken zu ihrem Vorland legen die Deutung nahe, dass die Sedimentationsräume der Decken südlich an die des Vorlandes anschlossen. Der Bereich der Mittelmeerküste, "Der Süden", erfährt eine neue Aufgliederung. Die stratigraphische Stellung der z.T. hochmetamorphen Gesteine und ihr Verband mit den basisch-ultrabasischen Massiven wird untersucht. Im "Ausblick" werden die wichtigsten Ergebnisse zusammengefasst und die Deurungen diskutiert, die die geologische Situation den Bearbeitern nahelegte.	Ein Querschnitt durch die Betischen Kordilleren bei Ronda (SW Spanien)
VOLUME 43 NO 7 299	1964	43	7	299	309	Gillavry, H.J.M.	A comparison of stratigraphic successions of different tectonic units along the meridian Vélez Rubio to Moratalla has failed to disclose obvious indications for a tectonic reversal of the original geographic arrangement. The hypothesis of deposition of Betic of Málaga upon the South flank of a Subbetic basin is considered and the logic consequences are examined. The zone of outcrops of the Betic of Málaga, from Sierra de Espuña through Vélez Rubio and perhaps to Málaga, would be subautochthonous. The proved extent of the Betic of Málaga nappe would be restricted. At least three major phases of movement are envisaged: 1) an early Oligo-Miocene northward thrust of the Alpujarrides, 2) a later Oligo-Miocene southward nappe movement of the Betic of Málaga, and 3) a Miocene northwest thrust of northern Subbetic over Prebetic. The main axis of compression would have moved episodically northward.	Speculations based upon a comparison of the stratigraphies of the different tectonic units between Vélez Rubio and Moratalla
VOLUME 43 NO 7 310	1964	43	7	310	315	Völk, H.R.; Rondeel, H.E.	Eine jungtertiäre Schichtfolge wird lithologisch gegliedert und kurz beschrieben. Dabei wird vor allem ein älterer und ein jüngerer Anteil unterschieden; beide sind durch Lithologie und tektonischen Stil gut charakterisiert.	Zur Gliederung des Jungtertiärs im Becken von Vera, Südostspanien

VOLUME 43 NO 7 316	1964	43	7	316	320	Egeler, C.G.; Bodenhausen, J.W.A.	The large scale horizontal translations in the eastern part of the Betic zone are ascribed to at least two distinct phases of overthrusting. It is emphasized that the later of these phases has been responsible for important changes in the original superposition of the major units in the deeper part of the orogene. This is illustrated by the widespread occurrence of "abnormal" tectonic successions, especially in the northern parts of the Sierra de los Filabres. The effects of subsequent folding and steep thrusting can be seen throughout the Betic zone to be superimposed on the overthrust structures. Cross-sections through the Sierra de las Estancias clearly illustrate the resulting imbricate pattern.	Distinct phases of Alpine overthrusting and subsequent thrusting in the Eastern part of the Betic zone of Spain
VOLUME 43 NO 7 321	1964	43	7	321	325	Nijhuis, H.J.		On the stratigraphy of the Nevado-Filabride units as exposed in the eastern Sierra de Los Filabres (SE Spain)
VOLUME 43 NO 7 326	1964	43	7	326	330	Fernex, F.		Essai de corrélations des unités Bétique dus la transversale de Lorca - Aguilas
VOLUME 43 NO 7 331	1964	43	7	331	334	Simon, O.J.	Recent investigations in the Sierras de Almagro and de Enmedio, situated in the south-eastern part of the Betic Cordilleras, have revealed the presence of a unit - named the Almagro unit - which tectonically underlies rocks of the Alpujarride complex and the Betic of Málaga. Several hypotheses are discussed-with regard to the zone of deposition of the rocks of this Almagro unit. At this stage of investigations the author favours the view that they were deposited to the north of the Nevado-Filabride complex. According to this line of thought the Almagro unit would represent a new structural element in the Betic Zone s.s. It is stressed, however, that further detailed investigations will be necessary to check this working-hypothesis.	The Almagro unit: a new structural element in the betic zone?
VOLUME 43 NO 7 335	1964	43	7	335	336	Collette, B.J.		Schatting van de maximale diepte van de bron van een warmtestroomanomalië
VOLUME 43 NO 7 336	1964	43	7	336	338	Schuilings, R.D.		Experimentele metamorfose
VOLUME 43 NO 7 338	1964	43	7	338	338	Roever, W.P. de		Activiteiten in 1963 van de "commission on new minerals and mineral names" van de "International mineralogical association"
VOLUME 43 NO 7 341	1964	43	7	341	341			Geologisch en mijnbouwkundig nieuws
VOLUME 43 NO 7 342	1964	43	7	342	345			Boekbesprekingen
VOLUME 43 NO 7 339(1)	1964	43	7	339(1)	339	Bosma, W.		De vlekken in de vlekkeien van steige (Vogezes) en Vogtland (Saksen)
VOLUME 43 NO 7 339(2)	1964	43	7	339(2)	340	Kutina, J.		On the establishment and activity of the provisional commission on the genesis of ore deposits
VOLUME 43 NO 8 347	1964	43	8	347	359	Maas, W.		De veiligheidscongressen Aix-les-Bains 1963 en Salzburg 1963

VOLUME 43 NO 8 360	1964	43	8	360	374	Montagne, D.G.	A description is given of a small complex Li-Ta-Sn pegmatite in heavily weathered prae-Cambrian rocks near the Marowijne River in Northeastern Surinam. Detailed exploration was carried out during a pilot exploitation of amblygonite and tantalite/cassiterite. The often enormous masses of amblygonite are conspicuous (up to at least 8 m). The absence of lepidolite and the great uncertainty about the presence of spodumene are also remarkable. The geological setting is mainly controlled by faulting. Heavy chemical weathering severely hampered the study of the internal structure. A two-staged genesis of the pegmatite is tentatively suggested	An interesting pegmatite deposit in Northeastern Surinam
VOLUME 43 NO 8 375	1964	43	8	375	379	Bouma, A.H.	Ancient turbidites are characterized by a single facies model which is composed of five intervals in a fixed succession. Each interval contains one dominant sedimentary structure. The intervals are from bottom to top: graded interval, lower interval of parallel lamination, interval of current ripple lamination, upper interval of parallel lamination and pelitic interval. Most of the turbidite layers do not have this complete succession of intervals, but only part of them without changing the order of the intervals. Investigations by means of radiography in deep-sea sands from submarine canyons and adjacent troughs have been carried out so as to compare these sands with the facies model of ancient turbidites. It appears that recent turbidites containing the turbidite facies model, can only be found on the outer part of the canyon fans and in the troughs.	Ancient and recent turbidites
VOLUME 43 NO 8 380	1964	43	8	380	382	Strachan, I.; Bodenhausen, J.W.A.; Booy, T. de; Egeler, C.G.		Graptolites in the "Tibetan zone" of the Nepalese Himalayas
VOLUME 43 NO 8 383	1964	43	8	383	384			Geologisch en mijnbouwkundig nieuws
VOLUME 43 NO 8 385	1964	43	8	385	387			Boekbesprekingen

VOLUME 43 NO 9 389	1964	43	9	389	402	Crommelin, R.D.	The aim of the investigation was to examine the mineralogy of Young Pleistocene cover sands as related to their depositional environment and more specifically to study the interrelationship between subsurface, Older and Younger cover sand in terms of heavy mineral composition. 75 profiles over the total cover sand area of the Netherlands were sampled in pairs. Heavy mineral analysis was confined to the 210-150 micron fraction so as to minimize confounding provenance and grain size effects. The results permit a subdivision into three distinct regions, each showing a characteristic heavy mineral composition which moreover appeared to be closely related to the mineralogy of the subsurface. Hence a more or less local provenance of the cover sand formation is advocated, "local" being taken in the opposite meaning to "conveyed over a long distance" as would be the case if the North Sea Basin for example, was taken as the source area. The relation between Older and Younger coversand was tested by the two-way analysis of variance method. It was found that within the three cover sand regions there is often a very significant locality contrast, whereas the stratum contrast is usually not significant. This brings us to the concept that local reworking of Older cover sand gave rise to Younger cover sand, whereas the absence in most cases of significant mineralogical changes when passing from Older cover sand to Younger cover sand usually indicates that no systematic agents were active in this process. Finally some remarks are made on the effect of the "closed-array system" on variables of constant sum, a frequent condition in sedimentary petrology to which Chayes has recently called attention and which is indirectly connected with	A contribution to the sedimentary petrology and provenance of young Pleistocene cover sand in the Netherlands
VOLUME 43 NO 9 403	1964	43	9	403	413	Wensink, H.	Oriented samples of Plio-Pleistocene basalts were collected in Eastern Iceland for a paleomagnetic investigation. Pole positions were determined for successive individual flows. These show an irregular course which can be explained as a result of the secular variation of the earth magnetism. The stratigraphical succession consists of the paleomagnetic series N2 and R1. In both series a maximum of three basalt flows is intercalated with an inverted direction of magnetization. These flows, nearly always accompanied by tillites and also by tuff breccias and globular basalts, have a wide distribution E of the Central Icelandic Graben, but were not found at its western side. The remanent magnetization of these flows may be explained either as a result of self-reversal or of induction from older lavas.	Secular variation of Earth magnetism in Plio-Pleistocene basalts of Eastern Iceland
VOLUME 43 NO 9 414	1964	43	9	414	415			Netherlands Mesozoic committee
VOLUME 43 NO 9 416	1964	43	9	416	417			Geologisch en mijnbouwkundig nieuws
VOLUME 43 NO 9 418	1964	43	9	418	419			Boekbesprekingen
VOLUME 43 NO 9 420	1964	43	9	420	420			Genootschapszaken

VOLUME 43 NO 10 421	1964	43	10	421	450	Goderbauer, L.	In dit artikel worden behandeld de verschillende aspecten die met het ondergrondse materiaalvervoer samenhangen. - Allereerst wordt het begrip secundair materiaalvervoer omschreven, als zijnde het materiaalvervoer in de kolenafdeling. - Vervolgens wordt het belang van het secundair materiaaltransport nader toegelicht, waarbij blijkt dat de kosten van het totaal vervoer ondergronds op circa 8-11 gld per ton neerkomen, terwijl de kosten van het materiaalvervoer circa. 4 à 5 gld per ton bedragen. - Daarna worden enige belangrijke aspecten van het vervoer belicht, zoals de economische kant, de wijze van aanlevering der materialen en de naar de tijd geregelde voorziening van de pijlers. - De verschillende vervoersmethodieken, zoals: sleepbak, monorail, bandvervoer enz. worden gezien naar hun systematiek, de inzetcondities en de transportmogelijkheden. - De vervoersorganisatie wordt qua opzet, beoordeling en haar mogelijkheden in ogenschouw genomen. - Tenslotte worden enige resultaten en gevonden betrekkingen weergegeven die op de mijnzetel Oranje-Nassau II zijn gevonden. Als conclusie kan worden vermeld: - dat het materiaaltransport in relatie tot de kostprijs, van dusdanige importantie is, dat hieraan ruime aandacht moet worden geschonken; - dat de keuze der middelen bepalend kan zijn voor de te bereiken mogelijkheden; - dat tijdige planning en ingepaste werkvoorbereiding der ondergrondse werken eveneens van doorslaggevend belang kan zijn t.a.v. de later te bereiken resultaten; - dat de organisatie wel het belangrijkste aspect is ter bereiking van optimale resultaten; - dat een regelmatige beoordeling van de resultaten enerzijds en het beschikken over een groep arbeidsanalysten anderzijds noodzakelijk is om steeds bij te	Secundair vervoer in een kolenmijn
VOLUME 43 NO 10 451	1964	43	10	451	461	Allen, J.R.L.; Narayan, J.	Cross-stratified units in the Folkestone Beds (Lower Albian) of the English Weald have foresets, graded from fine up into coarse, showing either abrupt or tangential contacts with the bases of the units. When the contact is tangential, thin silt bands may occur between groups of sandy foresets and bottomsets. The bottomsets then commonly show small-scale asymmetrical ripples and cross-stratification indicating currents in directions opposite to those which formed the larger foresets. Studies in a laboratory flume show that these features are consistent with the interpretation of the crossstratified units in terms of the migration of large-scale ripples in a shallow sea, under tidal conditions. Those units with silt bands could represent ripples moved only during storm conditions, when the normal tidal flows were enhanced by wind-induced currents.	Cross-stratified units, some with silt bands, in the Folkestone beds (Lower Greensand) of Southeast England
VOLUME 43 NO 10 462	1964	43	10	462	464			Geologisch en mijnbouwkundig nieuws
VOLUME 43 NO 10 465	1964	43	10	465	465			Boekbesprekingen

VOLUME 43 NO 11 467	1964	43	11	467	475	Faber, F.J.	Some volcanoes, although they are by no means "mud volcanoes", have erupted "mud balls", usually with a diameter of 0.5 to 1.5 cm, but there are specimens known of 7 cm. They are almost perfect spheres. Mud balls, found in and near the Indonesian volcanoes of Tankuban Prah and Kawah Idjen, were described by Stehn (1932). Smaller mud pellets are also collected near many other volcanoes. The large mud balls (sometimes called ash balls) are also known as accretionary lapilli or -pellets, as they have a composition of concentric layers. The smaller pellets may have been formed by isolated raindrops on dry ash, as already Poulett Scrope (1829) pointed out, and recently again Miura (1959) in Japan, but for the bigger specimens Miura (1959) in Japan, but for the bigger specimen this explanation is not applicable. For them the hypothesis presented by Stehn (1932) is accepted, summarized in the Nomenclature (Schieferdecker, 1959), under number 4225. The spherical mud balls, composed of concentric shells of volcanic ash are formed around a grain of sand or a lapillo and originated during prolonged rotation in whirling eruption clouds. In the literature the occurrence of mud balls with a diameter of more than one or two centimeter is rarely mentioned, which indicates that they must be rather scarce. A number of them is included in the Verbeek-Collection (Museum of the Technological University at Delft). Verbeek assembled them soon after the catastrophic eruption of 1883 at the Krakatao, the island volcano situated between the islands of Java and Sumatra in Indonesia. Also Escher collected many specimens; they are at present in the Rijksmuseum in Leiden. Verbeek (1885) in his famous treatise on Krakatao pays some	Modderkogels, mergelconcreties of askogels van Krakatau
VOLUME 43 NO 11 476	1964	43	11	476	489	Bosma, W.	New data are submitted about the genesis and the mineralogical composition of the spots in the spotted slates belonging to the well-known contact aureole in the Steiger Schiefer (Vosges). They are based on a comparative study of the spots in the spotted slates of Steige and of Vogtland (Saxony). The spots have been studied macroscopically as well as with the microscope and X-rays. The results indicate that the spots in the slates of both regions are pseudomorphs after cordierite. In the Vogtland slates relics of the characteristic twinning structure are often seen. Unaltered cordierite is generally only present in the hornfelses. The effects of contact metamorphism are discussed in relation with the theoretical temperature distribution around a cooling intrusive body.	The spots in spotted slates of Steige (Vosges) and Vogtland (Saxony)

VOLUME 43 NO 11 490	1964	43	11	490	492	Zonneveld, J.I.S.	De Ridder and Zagwijn (1962) described the "Zone of Rosmalen", a mixed Rhine and Meuse sediment of Holsteinian age in Eastern North Brabant. They supposed that this zone represents a gradual transition of the Formations of Sterksel and Veghel. In the course of the Holsteinian the influence of the river Rhine should have decreased gradually, the river Meuse gaining in importance. It is shown that this reconstruction cannot be in accordance with the reality: the Rhine did not flow continuous in the region under consideration, the "Zone of Rosmalen" is merely the lower part of the Formation of Veghel in which sediments derived from the subsoil (consisting of older augite free Rhine sand) have been contaminated.	De „Zone van Rosmalen"
VOLUME 43 NO 11 493	1964	43	11	493	494			Geologische bibliografie van Nederland
VOLUME 43 NO 11 495	1964	43	11	495	495			Geologisch en mijnbouwkundig nieuws
VOLUME 43 NO 11 496	1964	43	11	496	496			Boekbesprekingen
VOLUME 43 NO 12 499	1964	43	12	499	515	Montagne, D.G.	A short synopsis is given of the most important data on the stratigraphy of the "young", unconsolidated sediments in Central Northern Surinam, as collected in recent years in and around the Billiton bauxite mines. Some information on heavy minerals, clay mineralogy and grain size distribution is added. A "standard Section" for the area is constructed and a new stratigraphical table is presented. Attention is called to the possible regional importance of some of the data presented.	New facts on the geology of the "Young" unconsolidated sediments of Northern Surinam
VOLUME 43 NO 12 499PII	1964	43	12	499PII	515	Montagne, D.G.	Plate II	New facts on the geology of the "Young" unconsolidated sediments of Northern Surinam
VOLUME 43 NO 12 516	1964	43	12	516	526	Zwart, H.J.	The structures in the Devonian and Carboniferous along the west coast of Devon and North Cornwall are described. The Devonian north of the Culm synclorium contains steep cleavage-folds with E-W axes. In the northern part of the Culm measures vertical accordion folds occur. Farther south a second set, with E-W directed recumbent folds, deforms the first folds with a consistent southward overthrusting movement. South of Rusey Beach another kind of recumbent folding with N-S axes was found and on these, E-W recumbent folds are superposed. Here the first set constitutes the upper part of a metamorphic infrastructure and is accompanied by schistosity and extension in B. A possible link between the two sets of folds is proposed.	The development of successive structures in the Devonian and Carboniferous of Devon and Cornwall
VOLUME 43 NO 12 527	1964	43	12	527	530	Matla, W.P.M.; Terpstra, J.	The gravimetrically-determined dust-limit values of the "Stofinstituut" and the American dust limits published at the end of 1962 are first described. Both limit values can be represented by hyperbolic functions. With the aid of 133 dust measurements by gravimetric means and also by the American method with the midget impinger, carried out by the "Institut d'Hygiène des Mines" of the Belgian mining industry, it has been possible to compare the dust-limit values. It was found that for the given dust conditions both limits are the same.	Gravimetrische stofgrenzen van het stofinstituut en Amerikaanse stofgrenzen

VOLUME 43 NO 12 531	1964	43	12	531	534	Matla, W.P.M.; Terpstra, J.	A large number of dust samples were taken in the various working operations in mining and the quartz and ash contents determined. The results of the analyses have been processed statistically. A clear relationship was found between the quartz and ash contents of the dust, so that the ash content is a good measure of the quartz content.	Relatie tussen het kwartsgehalte en het asgehalte van pijlerstof
VOLUME 43 NO 12 535	1964	43	12	535	535			Geologisch en mijnbouwkundig nieuws
VOLUME 43 NO 12 536	1964	43	12	536	536			Boekbesprekingen
VOLUME 43 NO 12 537	1964	43	12	537	537			Genootschapszaken
VOLUME 44 NO 1 1	1965	44	1	1	21	Allen, J.R.L.	The visible portion of the Niger delta consists, in eastern Nigeria, of three geomorphological units. Behind a chain of barrier islands formed of sand ridges of two types, occurs a broad tidal flat colonised by mangroves and marked by a reticulate drainage pattern. The tidal flat is succeeded inland by a forested river floodplain. The tidal flat is also partly in contact with a low terrace formed on Late Tertiary and possibly Pleistocene sediments. The nature of the barrier islands and the tidal flat is related to the forces at work in the region. The mangrove swamp of the eastern delta is growing at the expense of the barrier islands, the floodplain, and the terrace because of erosion in tidal channels. It is suggested that the reticulate drainage pattern of the tidal flat is due to the stabilizing of deposited sediment by the mangroves and the manner in which these plants grow collectively. The Nigerian barrier complex, situated in the tropics, is compared with the temperate tidal flats of the Dutch coast. The main differences depend on the contrasted role of plants in the two areas, and thus finally on climate.	Coastal geomorphology of Eastern Nigeria: Beach ridge barrier islands and vegetated tidal flats
VOLUME 44 NO 1 22	1965	44	1	22	36	Kuening, P.H.		Value of experiments in Geology
VOLUME 44 NO 1 37	1965	44	1	37	39	Hammen, T. van der; Wijmstra, T.A.; Molen, W.H. van der	A pollen diagram from Macedonia, partly dated with C^{14} , suggests dense oak-forests during the early Holocene and a steppe-like open vegetation during the Würm-glacial. As similar conditions were found elsewhere in the northern Mediterranean, we think no proper pluvial conditions prevailed in that area during the last glacial.	Palynological study of a very thick peat section in Greece, and the Würm-glacial vegetation in the Mediterranean region
VOLUME 44 NO 1 42	1965	44	1	42	42			Geologisch en mijnbouwkundig nieuws
VOLUME 44 NO 1 40(1)	1965	44	1	40(1)	40	Poley, J.T.		Recente mogelijkheden voor geologische luchtverkenning
VOLUME 44 NO 1 40(2)	1965	44	1	40(2)	41			Boekbesprekingen

VOLUME 44 NO 2 45	1965	44	2	45	58	Aleva, G.J.J.	Data arc presented about the buried bauxite deposit at Onverdacht, Surinam (in the Guiana Lowlands). The upper boundary of the bauxite layer is an old topographic surface with a consequent drainage pattern. The lower boundary shows many features of a sedimentary nature, indicating the contact between two sedimentary beds of different physical composition. Statistical work on SiO ₂ and Fe ₂ O ₃ analyses of borehole samples is reported. The bauxite layer is formed by the bauxitization of a presumably arkosic or silty sedimentary bed, with a continued bauxitization at lower levels that attacked the underlying or intercalated kaolin. After having been buried by younger sediments, silica-rich solutions partly destroyed the top part of the bauxite bed. In principle, the bauxitization here was not different from that of most other bauxite deposits, viz. the extreme weathering and leaching of a pre-existing rock, the nature of this rock (igneous, metamorphic or sedimentary) being of no genetic importance.	The buried bauxite deposit of onverdacht, Surinam, South-America
VOLUME 44 NO 2 59	1965	44	2	59	63	Horowitz, A.; Langozky, Y.		Preliminary palynological study of hydrocarbons in Israel
VOLUME 44 NO 2 64	1965	44	2	64	65	Vogel, D.E.	Several ways exist for determining the composition of the light-mineral fraction of unconsolidated sediments. For not mounted samples: separation by heavy liquids, x-ray analysis, and the use of different immersion liquids; and for mounted samples staining with an organic dye, etching with HF and the use of the universal stage, These methods were investigated as to their suitability for exact sedimentpetrographical work but all were found to have limitations. A technique for making thin sections of unconsolidated sediments as described by Mamourofski and Samsonof was modified slightly and adapted to our needs. In the resulting slides the distinction of quartz from oligoclaseandesine proved to be quite easy. Moreover, the carbonate content of the sample can be retained because no treatment with HCl is necessary; if needed, subdivisions in the quartz- and rock-fragment groups can be made.	Thin sections for determination the composition of the light-mineral fraction of the unconsolidated sediments
VOLUME 44 NO 2 66	1965	44	2	66	67			Geologisch en mijnbouwkundig nieuws
VOLUME 44 NO 2 67	1965	44	2	67	71			Boekbesprekingen
VOLUME 44 NO 2 72	1965	44	2	72	72	Harsveldt, H.M.		Genootschapszaken

VOLUME 44 NO 3 73	1965	44	3	73	86	North, F.K.	Geosynclinal belts of mid-Mesozoic, pre-Cretaceous age form much of the western edge of the Americas from Alaska to Baja California, and from coastal Peru to a point far south in Chile. They also appear in the curvilinear belt of the Greater Antilles, and in the row of islands off the north coast of South America. It is suggested that these orogenic sectors arose out of a compound geosyncline originally more or less straight, and that the violently convolute portion, from Guatemala to Puerto Rico and thence back to the Goajira Peninsula, has undergone progressively increasing northeasterly curvature as a consequence of tangential migration. The migration is envisaged as being due to the tangential "squeezing out" of a segment of the crust and subcrust, between the opposed rotations of two plates of continental dimensions: that of South America (rotating clockwise), and that of the North Pacific (rotating anticlockwise). Acting as a moving agent behind the migrating orogenic arc was a prong of old rock, still recognizable at the surface. This moving agent is compared with similarly recognizable prongs behind similarly arcuate orogens in the Himalaya and in the Alps. The tangential migration reached a limit with the impingement of the migrating arc against a stable foreland. The foreland is the old crystalline platform on which the Bahama Banks and the Lesser Antilles now stand. From the time of this impingement onward, deformation has been taken up by other means, developing on the one hand large strike-slip faults, and on the other great arcuate or linear downthrusts of the oceanic crust. It is to these latter that the famous negative gravity anomalies are due. It is concluded that the ophiolitic belts on the two sides of the	The curvature of the Antilles
VOLUME 44 NO 3 87	1965	44	3	87	93	Omara, S.; Vangerow, E.F.	Foraminifera from marine Carboniferous shales, intercalating the Nubian-type sandstones at Abu Darag, Eastern Desert, Egypt, fix the age of this section as Westphalian, viz. stratigraphically lower than the Wadi Araba section of Lower Stephanian age. The Abu Darag section occupies thus, an intermediate stratigraphic position between the Lower Carboniferous (Tournaisian-Visean) of southwestern Sinai, and the Lower Stephanian of Wadi Araba.	Carboniferous (Westphalian) foraminifera from Abu Darag eastern desert, Egypt
VOLUME 44 NO 3 94	1965	44	3	94	95	Lammers, J.	In a flat country like the Netherlands field geologists have to rely largely on data derived from borings. As nearly the whole surface of unconsolidated sediments is of Quaternary age, geologists have to work with hand-drilling tools adapted to these special circumstances. A synopsis is given of these tools, and their use by the Geological Survey.	Hand-drilling tools for geological investigation
VOLUME 44 NO 3 96	1965	44	3	96	97	Rutsch, R.F.		Committee Du Neogene Mediterraeneen
VOLUME 44 NO 3 98	1965	44	3	98	99			Geologisch en mijnbouwkundig nieuws
VOLUME 44 NO 3 100	1965	44	3	100	103			Boekbesprekingen

VOLUME 44 NO 4 105	1965	44	4	105	132	Tex, E. den	<p>Firstly a tripartition of the orogenic plutonites based on their geological association and on the nature of their mafic minerals is proposed. Genesis of the micaceous and hornblendic granite-syenite-diorite-lamprophyre series through anatexis of water-saturated or slightly undersaturated rocks of suitable composition is discussed in the light of melting behaviour in the haplogranitic and wet basaltic systems. A similar derivation is argued for the orthopyroxenic charnockite-anorthosite-norite-pyroxenite series found to occupy deeper levels of the older orogenes especially. Here anatexis and palingenesis are presumed to operate in virtually water-free rocks in the granulite facies. The garnetiferous. Charnockite-eclogite-"alpine-type" peridotite series is believed to have suffered less anatexis and virtually no palingenesis. It is subdivided into a peripheral, low-temperature, ophiolitic suite of glaucophane-schist facies affiliation and a high-temperature eclogite-facies suite situated in the very root zones of mainly precambrian and caledonian orogenic terrains. Secondly an attempt is made to trace the origin of the three series of orogenic plutonites through their alleged metamorphic lineages. A high-temperature, an intermediate, and a high-pressure lineage are discerned on the basis of so-called persisters-minerals characteristic of the subfacies-series concerned. The high-temperature lineage leading towards the granitic series of plutonites is defined by the quasi-isochemical pairs: andalusite-sillimanite and biotite-cordierite. Its limiting geothermal gradients are discussed in the light of the stability field of "wet" Mg-Cordierite. The high-pressure lineage is shown to have many characteristic "persisters", but the low-pressure boundary curves of kyanite, zoisite + kyanite, pyrope,</p>	Metamorphic lineages of the orogenic plutonism
VOLUME 44 NO 4 133	1965	44	4	133	143	Stuffken, J.	<p>The paper deals with a study undertaken to determine what combination of mining method and ventilation system will give the lowest costprice per ton of coal output under conditions where the production level of the longwall face is limited by the release of methane. In these considerations attention was given to the following three non-related factors. 1. the cost per ton of coal as a function of the rate of the daily advance of the face; 2. the volume of methane released per ton of coal produced; 3. the possibilities with regard to supplying the air volume needed and mixing the released gas. On the basis of these data a calculation programme has been developed which often permits of choosing the preferable system. The choice frequently turns out to be a combination of an advancing-and-retreating method with downcast ventilation.</p>	Beschouwingen over het economisch meest gunstige ontginningsstelsel in een kolenmijn in verband met de mijngasbestrijding
VOLUME 44 NO 4 144	1965	44	4	144	145			Toekenning van de waterschoot van der gracht penning aan prof. dr. mr. F. Florschütz
VOLUME 44 NO 4 146	1965	44	4	146	147			Boekbesprekingen
VOLUME 44 NO 4 148	1965	44	4	148	155			Jaarverslag 1964
VOLUME 44 NO 5 159	1965	44	5	159	167	Clercq, H. le		Aandrijvingen voor kolenschaafinstallaties
VOLUME 44 NO 5 168	1965	44	5	168	175	Zeegers, J.J.		Directe aandrijving met draaistroommotoren voor kolenschaafinstallaties

VOLUME 44 NO 5 176	1965	44	5	176	183	Stalman, M.E.		Hydrostatistische aandrijvingen bij ondergrondse pijlerinstallaties
VOLUME 44 NO 5 184	1965	44	5	184	192	Omers, H.L.		Aanbouwplough met gelijkstroomaandrijving voor snelheidsregeling
VOLUME 44 NO 5 193	1965	44	5	193	194	Uytenbogaardt, W.; Tex, E. den		International association for the genesis of ore deposits
VOLUME 44 NO 6 197	1965	44	6	197	207	Bennema, J.	The differences between geology and pedology may be expressed as differences in depth scale and in rime scale. Pedology is studying only the uppermost part of the earth's crust, and is in the first place interested in recent and present changes induced by environmental forces in the geologic material. It is less than geology a historic science. There is, notwithstanding these differences, a strong relationship between geology and pedology, of which the following three aspects are considered: 1) Many soils are under the influence of the soil forming processes gradually developing into more mature or senile stages till the moment they are buried by sedimentation or destructed by erosion. Other soils are found in a steady state, the soil forming processes being in equilibrium with either sedimentation or erosion. The geologic phenomena of erosion and sedimentation are thus, to a great extent, governing the distribution of the soils of different stages of development 2) These different stages may, especially in the tropics, often be expressed as differences in weathering phases of the soil material. The knowledge of weathering is an important point of contact between geology and pedology. 3) Soils are mainly formed from geologic materials. Many characteristics of the soils are directly or indirectly related to the kind of geologic materials from which they are derived.	Geologie en bodemkunde
VOLUME 44 NO 6 208	1965	44	6	208	217	Tobi, A.C.	In the "southern tip of Norway" a charnockitic type of Precambrian is found in two regions, a smaller one around Arendal in the east and a larger one in Rogaland in the west. In Rogaland, a complex of intrusive masses, chiefly consisting of anorthosites and of rocks varying from monzonites to norites, is surrounded by charnockitic migmatites. Outside of the Egersund Border Fault, which follows the boundary of the intrusive masses at some distance, the charnockitic migmatites are accompanied by garnet-rich migmatites perhaps comparable to the khondalites of peninsular India. The charnockitic character of the region is due to granulite facies conditions. Probably, we are dealing here with a sillimanite-cordierite subfacies. An interesting feature of this high-grade metamorphism is the blurring of the difference between magmatic and metamorphic phenomena. Another point for further study will be the gradual transition to rocks to amphibolite facies belonging to the Telemark Precambrian in the east.	Fieldwork in the Charnockitic Precambrian of Rogaland (SW Norway)

VOLUME 44 NO 6 218	1965	44	6	218	225	Maas, W.		Symposium kool- en gasuitbarstingen gehouden te Nimes van 24 tot 28 november 1964
VOLUME 44 NO 6 226	1965	44	6	226	229			Boekbesprekingen
VOLUME 44 NO 7 231	1965	44	7	231	241	Mabesoone, J.M.	In tropical Brazil various types of ironstones occur. They have been sampled in the northeastern part of the country, observed in hand specimens and thin sections, and analyzed by X-ray, DTA, and chemically. From the data thus obtained two principal types of ironstones, occurring on top and in sedimentary rocks, could be distinguished. The first type, - conglomeratic ironstones crusts -, is of lateritic origin; however, the process of its formation remained unfinished. The other type, - iron-cemented conglomerates -, found in Cenozoic deposits, is a reworked and redeposited erosion product of the first type. The ironstone crusts occur in two levels. Their formation is closely related to the development of these levels. The crusts are fossil, and their age is presumed to be Middle Tertiary and Plio-Pleistocene, respectively.	Composition and origin of "Pedra Canga" and related ironstones in Northeastern Brazil
VOLUME 44 NO 7 242	1965	44	7	242	250	Crommelin, R.D.	A. versatile method for analysing and testing various kinds of differences in rock bodies was published by W.C. Krumbein and J.W. Tukey in 1956 but did not receive due attention outside the United States. The present paper aims at reintroducing the method in a Netherlands journal by discussing and elaborating the general trend of thought and then applying it to a current sedimentary petrological problem. The method is based on a sampling design at various areal levels (multistage or nested sampling design) by means of which the overall variability in, for instance, the mineral composition of a region studied can be split up into separate components each of which is characteristic of one of the various levels distinguished (e.g. formations, exposures within formations, samples within exposures, etc.). The variability at a certain level is expressed as an interaction-effect between the unities at that level and the mineral species which constitute the analysis. The significance of these interaction-effects is subsequently tested by analysis of variance technique. The principle of the Krumbein-Tukey method is illustrated by two imaginary examples and some concepts related to the model are discussed. The arrangement of data and computations are shown in the Appendix. The method was next applied to the problem of differentiating between several sandy deposits in the Netherlands ranging from Old Pleistocene to Middle Pleistocene which for the rest are very similar. The sampling design was planned at three levels, viz. regions, exposures within regions and samples within exposures. The 150-105 micron fraction was examined for heavy minerals. The highest level was formed by the Emmen, Sibculo and Hattem regions representing different stratigraphical formations.	De Krumbein-Tukey methode toegepast op de onderlinge vergelijking van Pleistocene zanden

VOLUME 44 NO 7 251	1965	44	7	251	253	Bodenhausen, J.W.A.; Simon, O.J.	Recent reconnaissance in the Sierra de Carrascoy has revealed the presence of at least four major tectonic units. These units show strong resemblances with the four major tectonic units distinguished in the Sierra de Almagro - viz., from below to above, the Almagro, Ballabona-Cucharón, Variiegato and Betic of Málaga units, - and also occur in the same tectonic order as in the last-mentioned mountain range. The presence of a counterpart of the Almagro unit in the Sierra de Carrascoy in a similar position as in the Sierra de Almagro substantiates a recent view that this unit - which now has been found in various ranges a considerable distance apart - constitutes a separate structural element in the Betic Cordilleras.	On the tectonics of the Sierra de Carrascoy (Province of Murcia, Spain)
VOLUME 44 NO 7 254	1965	44	7	254	258	Boer, N.P.; Hammen, T. van der; Wymstra, T.A.	In the first part of this paper the results of a palynological investigation of borehole samples from the Amazonas Delta Area are discussed. The samples of one of the holes showed a typical Lower to Middle Cretaceous age; the samples from the two others had a Lower Tertiary to Upper Cretaceous flora. In the second part of this paper the tectonical and stratigraphical consequences of these results are discussed and a comparison is made between the Marajó and Guiana Basins.	A palynological study on the age of some borehole samples from the Amazonas Delta Area, NW Brazil
VOLUME 44 NO 7 259	1965	44	7	259	261			International Mineralogical Association
VOLUME 44 NO 7 262	1965	44	7	262	264			Boekbesprekingen
VOLUME 44 NO 7 265	1965	44	7	265	266			Geologisch en mijnbouwkundig nieuws
VOLUME 44 NO 7 267	1965	44	7	267	268			Genootschapszaken

VOLUME 44 NO 8 269	1965	44	8	269	275	Bongaerts, J.M.P.	After the discovery of Slochteren gasfield on 14th August, 1959 further appraisal, organisation, development and production succeeded and overlapped each other in a rather rapid succession. At this moment the field is already in production and producing $\pm 3,5 \times 166$ m ³ /day from one cluster. The system followed is rather simple. the permeability of the field and consequently the productivity of the wells allows withdrawal of gas in large quantities at only a few drainage points, called "clusters". At each cluster a unit is installed to treat the gas and condition it to pipeline specifications i.e. a water and hydrocarbon dewpoint of -2°C at pressures varying from 74 to 1 kg/cm ² . This is necessary to prevent hydrate troubles and condensation of hydrocarbons in the pipeline system. The dehydration method followed is adiabatic expansion of the gas across a bean thereby using the Joule-Kelvin effect. This expansion results in a sharp temperature drop because of which water and heavier hydrocarbon condens and the gas gets a dewpoint of -12° C at 74 kg/cm ² . This low temperature is required because of possible retrograde conditions. After this the gas is measured with the orifice method which uses as "a first" the gas density instead of static pressure, static temperature and compressibility in the flow computation. Also instead of multiple orifice meter system "one orifice meterrun" is used with a number of DP cells of a varying range. The whole plant and wells are highly automated and the complete operation is unattended, being run and watched from one central point. Numerous safety measures are incorporated one of which is the "bottom hole safety valve" in the well which again is a new development.	Winning en conditionering van het aardgas van Slochteren
VOLUME 44 NO 8 276	1965	44	8	276	284	Stuffken, J.; Amstel, J.A. van	Fixing brackets to an existing concrete wall by means of anchor bolts provides a quick and simple method of mounting in place parts of a shaft installation, for instance the cage guides. This method saves much time in that it does away with the necessity of cutting holes in which beams have to be fixed with concrete. Neither is it necessary in the case of new shafts being planned to determine beforehand the places where recesses have to be made in the shaft wall, so that the choice of a particular type of shaft equipment can be postponed to a later stage.	Een nieuwe methode voor de bevestiging van de schachtuitrusting aan de wand van een hoofdschacht

VOLUME 44 NO 8 285	1965	44	8	285	294	Escher, E.F.	A summary is given of the geology of the arctic archipelago of Svalbard, mainly on the base of publications. A geologically attractive feature of the Svalbard Islands, which cover in total about 64,400 km ² , is the presence of a sedimentary sequence which belongs to the long time span from pre-Cambrian to Lower Tertiary inclusive; only few gaps exist. Probable pre-Cambrian basement, which is exposed in Northeast Land, is followed by the partly geosynclinal Hecla Hoek Group of formations, pre-Cambrian to Ordovician in age and up to 15,000 m thick. The lower part of the Hecla Hoek succession is metamorphosed. The sequence is strongly affected by the Caledonian orogeny and intruded by granites of which the youngest are Caledonian in age. Devonian sediments, which are developed in Old Red facies, are chiefly preserved in a downfaulted region in northern West Spitsbergen where their total thickness is estimated to be more than 5,000 m. They rest unconformably on Hecla Hoek and probably were eroded away in large areas in pre-Carboniferous time. From Carboniferous to Lower Tertiary Svalbard belonged to a shelf on which a predominantly marine sequence of clastic and, subordinate, carbonate rocks was laid down, interrupted by some intervals in freshwater or mixed facies. The principal region of exposure of post-Devonian sediments is central and southern west Spitsbergen. Formation thicknesses are variable; in the Isfjord region in West Spitsbergen approximate thicknesses are: Carboniferous-Permian 1,100-1,500 m; Mesozoic 1,300-2,000 m; Lower Tertiary 2,000 m. In Svalbard the dominant tectonic event is the Caledonian orogenic phase already mentioned. There followed the Svalbard phase in Upper Devonian time, which mainly caused	Geological sketch of Svalbard Islands (Spitsbergen)
VOLUME 44 NO 8 295	1965	44	8	295	297	Boeschoten, G.J.	Tentative explanations are given for the almost complete absence of mammoth fossils in the sediments of Saalian and Weichselian age of the Northern Netherlands. The northeastern provenance of the older fluvial strata is thought to account for the absence of reworked skeletal elements. The Weichselian finds are restricted to the valley of the only larger river this could be due to ecological factors.	Over de verspreiding van mammoetfossielen in noordelijk Nederland
VOLUME 44 NO 8 298	1965	44	8	298	298			Boekbesprekingen
VOLUME 44 NO 8 299	1965	44	8	299	299			Geologisch en mijnbouwkundig nieuws
VOLUME 44 NO 8 300	1965	44	8	300	299			Genootschapszaken

VOLUME 44 NO 9 301	1965	44	9	301	306	Thomeer, J.H.M.A.	Since the early twenties the occurrence was observed of hydrocarbon traces in the soil over oil and gas accumulations. These traces appear to form a halo pattern above the oil-water-boundary of the accumulation. Similar observations were made in respect to salt concentration and radioactivity. It would appear that these complex phenomena can be satisfactorily explained on the basis of rock load, subsequent fluid expulsion and capillary barrier effects. Whether, however, these halo's could satisfactorily be utilised for the explorarion and localisation of subsurface accumulations, seems rather doubtful. There are too many factors that rend to displace the halo or render its formation impossible. At best, emanometric surveys might supply supplementary information to orthodox geological and geophysical observations, and even this under locally favourable conditions only.	Exploration for oil and gas by emanometric methods
VOLUME 44 NO 9 307	1965	44	9	307	312	Mulder, F.G.	Orientated samples of dolerite and limestone were collected in Sweden for a paleomagnetic investigation. The limestone samples are of Ordovician age and the dolerite samples are from two sills intruded in Silurian shales. At demagnetization with the use of A.C. fields up to 900 Oe, the limestone samples show only a little decrement of magnetization. Therefore, only the magnetization of the non 'cleaned' samples is given, The average magnetic direction of the limestone samples is: decl. 198°; incl. -4°; with a cone of confidence $\alpha_{95}=11^\circ$ and a pole position of 31° N; 173° E. All the dolerite samples, also demagnetised with the use of A.C. fields up to 900 Oe, show a total loss of magnetism. Samples from the sill NW of Skövde (Billingen) gave the following results: decl. 198°; incl. -2°; with a cone of confidence $\alpha_{95}=3^\circ$ and a pole position of 31° N; 172° E. Samples from the sill E of Trollhättan (Hunneberg) gave the following results: decl. 203°; incl. with a cone of confidence $\alpha_{95}=3^\circ$ and a pole position of 38° N; 162° E.	Paleomagnetic investigation in the Vänern district (Sweden)
VOLUME 44 NO 9 313	1965	44	9	313	315	Minkhorst, J.H.K.; Muysken, P.J.	The raw coal from a long-wall face often contains large lumps of coal and stone, which may cause spilling and stoppages in the outbye conveyorbelt and transfer points. "Beien" coal crushers, comprising a single slow-speed toothed roll mounted in a swinging frame on the stageloader, have been used for many years. Dutch State Mines have developed an impact roll for the same of a similar frame. It consists of a heavy roil with one breaking ridge, which is excentrically suspended by compound leaf springs between two circular disks carried on the horizontal shaft driven at a speed of 240 r.p.m. Mass and speed give the roll sufficient kinetic energy to break hard material without slowing down. Fitted with this impact roll the crusher has satisfactorily handled large lumps of hard stone, which used to pass unbroken. Due to low cost this small unit may also compete against hand sledging of large lumps in a small crushing plant.	De ontwikkeling van een slagwalsbreker

VOLUME 44 NO 9 316	1965	44	9	316	319	Rutten, M.G.	The Late Precambrian Malani Rhyolites of western Rajasthan, India, are formed predominantly by ignimbrites. Several of the isolated outcrops of the Malani Rhyolites show extremely strong westward tilting. This is thought to be an effect accompanying transcurrent faulting inherent upon the northward drift of the Indian subcontinent.	Tectonics of the late Precambrian ignimbrites in western Rajasthan (India)
VOLUME 44 NO 9 320	1965	44	9	320	333	Bemmelen, R.W. van	After a short review of newer acquisitions of our geonomic knowledge, a mechanical model is conceived for the explanation of mega- and geotectonic processes. The motor, providing the gravitational energy, is sought in the lower mantle (turbulent or laminar flowcircuits in material with a Newtonian viscosity). The outer spheres (upper mantle and crust) are elevated and depressed by these deep-seated flowsystems, forming extensive deformations of the geoid, measuring thousands of kilometers across, called megaundations. The upwarps spread under gravity and the downwarps contract by means of a composite gravity flow of matter which is largely in a crystalline state. This flow is characterized by (hot-) creep deformations (Andradean viscosity), and it is accompanied by continental drift.	Mega-undations as cause of continental drift
VOLUME 44 NO 9 333	1965	44	9	333	333			Boekbesprekingen
VOLUME 44 NO 9 334	1965	44	9	334	334			Geologisch en mijnbouwkundig nieuws
VOLUME 44 NO 9 335	1965	44	9	335	335			Genootschapszaken
VOLUME 44 NO 10 337	1965	44	10	337	344	Cohen, C.L.D.	A short review is given of the principal biological characteristics of the little known group of the Coccolithophorids. The related Discoasters are shortly mentioned. Some of the technical details are described that are to be used when working with these very small forms. Their rôle as rockbuilders is briefly mentioned and some aspects are described of their use in stratigraphic paleontology. A few examples are given of their application in biostratigraphic zonation and correlation. Their advantages and disadvantages are shortly reviewed	Coccoliths and discoasters
VOLUME 44 NO 10 345	1965	44	10	345	346	Rees Vellinga, E. van; Ridder, N.A. de		Een vondst van marien icenien in de achterhoek
VOLUME 44 NO 10 347	1965	44	10	347	352	Nagtegaal, P.J.C.	Non-organic sedimentary structures are divided into three major groups according to the time and site of their formation. The three groups are: 1) syndepositional structures, 2) metadepositional structures and 3) postdepositional structures. The moment of final deposition of a sedimentary grain is taken as time reference and the depositional interface is used as spatial reference. On the basis of this threefold division a classification is developed which, to a limited degree, makes it possible to group together genetically related structures.	An approximation to the genetic classification of non-organic sedimentary structures
VOLUME 44 NO 10 353	1965	44	10	353	354	Priem, H.N.A.; Boelrijk, N.A.I.M.; Verschure, R.H.; Hebeda, E.H.		Isotopic ages of two granites on the Iberian continental margin: the Traba granite (Spain) and the Berlega Granite (Portugal)

VOLUME 44 NO 10 355	1965	44	10	355	356	Malta, W.P.M.; Terpstra, J.	The dust concentration limits I/II, II/III and III/IV of the "stofinstituut van de Gezamenlijke Steenkolenmijnen in Limburg" approximately can be described by the hyperbolic function $G=x/A+11$ mg/m ³ , in which: G= dust concentration in mg/m ³ ; A = ash content of the dust in % and x = respectively 1170,1750 and 2620. This holds for ash percentages between 10 and 100 %. The dust concentration limits of dust with ash percentages between 0 and 10 % are equal to those of dust with 10 % ash. Die Staubgrenzwerte Staubstuten I/II, II/III und III/IV des "stofinstituut van de Gezamenlijke Steenkolenmijnen in Limburg" werden annähernd durch die hyperbolische Funktion $G=x/A+11$ mg/m ³ dargestellt; hierin ist G= die Staubkonzentration in mg/m ³ A = Aschegehalt des Staubes in % und x= bezw. 1170, 1750 und 2620. Diese hyperbolischen Funktionen sind annähernd gültig für Aschegehalte zwischen 10 und 100%. Die Staubgrenzwerte von Stäuben mit Aschegehalten zwischen 0 und 10 % sind deren mit einem Aschegehalt von 10 % gleich.	De gravimetrische stofgrenzen van het stofinstituut
VOLUME 44 NO 10 357	1965	44	10	357	363	Harten, D. van	Counting methods, applied in order to obtain information on grain frequency in heavy mineral residues are critically reviewed. The method of line counting is discussed in some detail from a theoretical point of view, the conclusion being that this method should not be used as a means of obtaining relative grain frequencies in instances where mineralogical character and grain size are correlated. The technique of ribbon sampling, being insensitive to particle size, is proposed instead. Line and ribbon counting methods are tested in some artificial two-component slides of known composition. Finally, the results of comparative counts in slides prepared from a natural sediment are discussed.	On the estimation of relative grain frequencies in heavy mineral slides
VOLUME 44 NO 10 364	1965	44	10	364	365	Hammen, T. van der		In memoriam prof. dr. mr. F. Florschütz
VOLUME 44 NO 10 366	1965	44	10	366	366			Geologische Bibliografie van Nederland
VOLUME 44 NO 10 367	1965	44	10	367	369			Boekbesprekingen
VOLUME 44 NO 10 370	1965	44	10	370	371			Geologisch en mijnbouwkundig nieuws
VOLUME 44 NO 11 373	1965	44	11	373	383	Ulbo de Sitter, L.	In northern Spain many different orogenes have developed since the Pre-Cambrian and lasting into the Alpine period. In the western part a N-S strike predominates, in the central and eastern part an E-W trend. The intensity of both the Hercynian and the Alpine E-W striking tectonic deformation, increases eastwards. The Pyrenees are separated from the Cantabrian Mts and the Celtiberic chain by the Ebro block. Both the basin development and the tectonic deformation is largely dependent on fundamental faults and ridges of which the North-Pyrenean fault and the León line are the most important ones. Cross folding and divergent fold trends are partly due to successive N-S and E-W stress fields, partly to the block boundaries formed by these fault lines and their splays.	Hercynian and alpine orogenies in Northern Spain

VOLUME 44 NO 11 384	1965	44	11	384	390	Hammen, T. van der	The Mondoñedo Formation is found at the edges of the Sabana de Bogotá (Colombia), that was formerly a pluvial lake. The formation, known for its fossil Mastodon fauna, is here provisionally subdivided into Upper, Middle and Lower Mondoñedo Formation. The Upper Mondoñedo Formation consists of an upper recent soil, a series of sandy loams often with angular gravel, and a lower soil-complex. This soil-complex contains charcoal which was C14-dated on two places, as resp. $10,760 \pm 160$ and $10,840 \pm 110$ yrs. The charcoal from the Alleröd soil-layer of Europe has the same age. It corresponds there to the time that certain tree-species died as a result of the deterioration of the climate at the very end of the Alleröd-Interstadial, becoming an easy prey for natural forest-fires. Near the base of this soil-complex, or just below it, angular gravel is present together with fragments of "Limonitic Crust" (derived from erosion of the Lower Mondoñedo Formation). The Middle Mondoñedo Formation consists apparently mainly of the sandy "Brown Loams" and equivalents, and at its base (just on top of the "Limonitic Crust") the Mastodon-fauna is found. A molar of Mastodon was analysed for its fluorine content by C. J. Overweel. The percentage (0.90 %), suggests an approximate age of Early Würm-Glacial to Late Riss-Würm-Interglacial. The Lower Mondoñedo Formation consists of the "Red Loams" and equivalents, covered locally at the top by a "Limonitic Crust". This part of the formation may eventually be as old as, or perhaps even older than Riss-Würm-Interglacial	The age of the Mondoñedo formation and the mastodon fauna of Mosquera (Sabana de Bogotá)
VOLUME 44 NO 11 391	1965	44	11	391	399	Muysken, P.J.		De kolenproductie en energievoorziening van West-Europa
VOLUME 44 NO 11 400	1965	44	11	400	403	Porrenga, D.H.	The mineralised faecal pellets in Recent shallowwater sediments of the Niger and Orinoco deltas contain mainly authigenic poorly ordered chamosite with a fairly high magnesium content. Photographs, chemical- and X-ray data of these chamositic pellets are given and their origin and occurrence are discussed.	Chamosite in recent sediments of the Niger and Orinoco deltas
VOLUME 44 NO 11 404	1965	44	11	404	405	Rondeel, H.E.		A dip comparator for routine geological investigations of aerial photographs
VOLUME 44 NO 11 406	1965	44	11	406	408	Bouma, A.H.; Mutti, E.; Maarschalkerweerd, M.H.	A light weight tilt-compensating compass has been constructed, It enables the investigation to measure the pre-tectonic directions of linear sedimentary structures of a folded series. The compass can also be used to mark the orientation of samples before they will be collected.	Tilt-compensating compass
VOLUME 44 NO 11 409	1965	44	11	409	412			Boekbesprekingen
VOLUME 44 NO 11 413	1965	44	11	413	413			Geologisch en mijnbouwkundig nieuws

VOLUME 44 NO 12 415	1965	44	12	415	439	Clercq, H. le	<p>The top landing mine car circuits at four "Staatsmijnen" collieries were replaced or reconstructed in the period 1955-1965. The last renovation, that of the hang bench circuit at the "Emma" colliery was finished in 1965. Its design is the most advanced as it was based on the experiences gained in the previous reconstructions. Operations on the "Emma" landing stage, serving a four cage shaft with a capacity of 340 mine cars of 2500 litres or 1000 tons gross per hour, are full automatic and supervised by two bankmen only. The track scheme was kept as simple as possible; for reversing the cars turn-tables are used. There are two tipplers, each for three products and no provision was made for a stand-by tippler. Full automation was obtained by regarding the car circuit as a whole from the functional point of view. Descriptions are given of the principle of automation as well as of some examples,</p>	Hot ontwerp van de nieuwe losvloer van staatsmijn Emma
VOLUME 44 NO 12 440	1965	44	12	440	457	Wunderlich, H.G.	<p>A characteristic of advancing orogenic fronts is a phase shift in successive movements, which expresses itself in a retardation of the movement maxima and a lateral shift in the zones of strongest movement with respect to the region in which activity takes place at present. In this connection, it is possible to consider the movements at the orogenic fronts as cycles that bear a formal resemblance to the propagation of an impulse in the form of waves. Vertical and horizontal crustal movements are interrelated like the orbital movements of point masses. The horizontal and vertical movements as well as the sum of the elevation and depression and the sum of the compression and stretching of the crust during the passage of the front can be described by curves of trigonometrical functions. The maxima and minima of these curves form clues as to the location of gravitational anomalies in the orogen, the region of most severe crustal shortening or stretching, local steepening of the temperature gradient and the paths ascending plutonics and volcanics are most likely to take. Comparing the undulatory propagation of the zone of maximum horizontal movement towards the foredeep with the motion of water waves provides a simple explanation of the long-distance transport of tabular crustal fragments: they are carried forward like surf boards. This assumption makes superfluous both the expulsion of such crustal fragments from distant steeply dipping root zones and the long slopes required by gravitational sliding. Kennzeichen vorrückender Orogenfronten ist die Phasenverschiebung der Bewegungsvorgänge, die sich in einer Verzögerung der Bewegungsmaxima und einer seitlichen Verschiebung der Zonen stärkster Effektivbewegungen</p>	Zyklischer bewegungsablauf beim vorrücken orogener fronten und der mechanismus des Deckschollentransports nach dem surf riding-prinzip

VOLUME 44 NO 12 458	1965	44	12	458	461	Sijperda, W.S.	During a field-trip the yellow parts in variegated clay lenticles in a triassic pebble deposit near Reichlingen, Luxemburg, were recognised as cat's clay, a basic ferric sulphate, comparable to the car's clay occurrences in certain holocene soils in The Netherlands. Cat's clay originates by oxidation of pyrite in the absence of calcium carbonate. If calcium carbonate is present gypsum is formed. At Reichlingen the pyrite left cubic holes after oxidation. The pebble deposit is likely to belong to the same time - stratigraphic unit as the variegated marls near Diekirch. These marls contain bands of gypsum and cubic pseudomorphs, known as halite pseudomorphs. It is argued that the pseudomorphs at Diekirch and the cubic holes at Reichlingen are similar: in both cases pyrite cubes were oxidized. This oxidation gave rise to the development of cat's clay in the near-shore facies (no presence of calcium carbonate), and to the formation of gypsum in the "normal" facies where calcium carbonate was present. The cubic pseudomorphs in the triassic marls, therefore, are not halite pseudomorphs but pyrite pseudomorphs. The gypsum did not originate by primary sedimentation but by weathering of pyrite.	De relatie tussen katteklei, pyriet en gips in de Luxemburgse Trias
VOLUME 44 NO 12 462	1965	44	12	462	465			Boekbesprekingen
VOLUME 44 NO 12 466	1965	44	12	466	467			Geologisch en mijnbouwkundig nieuws
VOLUME 45 NO 1 1	1966	45	1	1	9	Niggli, E.	The Meteorite of Kangean (an island of Indonesia, NE of Java) fell on September 27th, 1908; it is described here for the first time. The original weight is not known, as the meteorite was broken up by the people who found it. A mass of 1632.973 g could be recovered, certainly more than half the original stone. This meteorite is deposited in the Mineralogical-geological Museum in Delft (Technical Institute), Netherlands. The surface of the meteorite is covered with a black fusion crust; the front face of the lenticular body shows well developed piezoglypts. The structure is chondritic. The meteorite is rather strongly weathered. The mineralogical composition is: olivine (Fo ₈₀₋₈₂), bronzite (~ En ₈₂), nickel-iron, troilite, chromite, ? plagioclase, glass and secondary iron hydroxydes. The meteorite is an <i>olivine-bronzite-chondrite</i> . The nickel-iron bodies of the meteorite were investigated with the electron microprobe. Profile analyses were made for Fe, Ni and Co. Most of the bodies (type A) consist mainly of kamacite with few inclusions of taenite grains; we found also however bodies (type B) of which the main mass is taenite with regularly distributed small inclusions of kamacite. In the taenite grains in bodies of type A the Ni-content is higher at the borders than in the middle parts of the grains. The distribution of the cobalt in the nickel iron bodies coincides roughly with that of iron and not with that of nickel.	Der meteorit von Kangean (Indonesien) (Ein olivin-bronzit-chondrit)

VOLUME 45 NO 1 10	1966	45	1	10	15	Antkowiak, W.A.	The forty years old pithead of Emma Colliery, Dutch State Mines, was designed for one type of coal only. Gradually, more types of coal had to be handled, involving a number of complications that acted as a check on the pithead capacity and stood in the way of technical developments, such as automation. Consequently technical adaptation of the existing pithead was not a sufficient answer to the problems associated with the introduction of larger mine cars, but demanded a more fundamental approach.	Probleemstelling bij het ontwerp van de nieuwe losvloer van staatsmijn Emma
VOLUME 45 NO 1 16	1966	45	1	16	19	Priem, H.N.A.; Boelrijk, N.A.I.M.; Verschure, R.H.; Hebeda, E.H.		Isotopic age determinations on Surinam rocks
VOLUME 45 NO 1 20	1966	45	1	20	22			Geologisch en mijnbouwkundig nieuws
VOLUME 45 NO 1 23	1966	45	1	23	23	Thiadens, A.A.; Plas, L. van der; Snell, A.W.		Genootschapszaken
VOLUME 45 NO 2 25	1966	45	2	25	32	Mabesoone, J.M.	The river Guadalete in SW. Spain has excavated a 8-10 m deep estuary of which. two thirds have been filled up with almost clayey deposits mainly in postroman times. Many samples were taken with a hand auger. The amount of material thus obtained was only small. This made some special investigation techniques necessary. The grain size of the thin sand layers was determined by a counting method in which at the same time roundness is measured. It appears that the centre of the northern estuary part was filled up by the Guadalete, whereas the lateral parts are derived from recent and subrecent beaches. The southern estuary part, however, got its few sand layers chiefly from reworked older marine deposits exposed in the valley slopes. By means of geochemical methods, furthermore the environment has been reconstructed in which the clay was deposited. The ratio calculated from exchangeable K, Na, Ca, and Mg indicates that this environment has always been marine to brackish. Only the uppermost clays at the beginning of the northern marsh part show some fresh water influence. Boron and lithium, which occur in a greater quantity in marine clays than in fresh-water clays, confirm these results.	Depositional environment and provenance of the sediments in the Guadalete Estuary (Spain)

VOLUME 45 NO 2 33	1966	45	2	33	35	Hammen, T. van der; Vogel, J.C.	During a recent pollen analytical study of a Holocene and Late-Glacial section from Ciénaga del Visitador (Susaça, Eastern Cordillera of Colombia; van der Hammen & Gonzalez, 1961), an "interstadial" was recognized, earlier than Allerød and Bølling s.s.. A C 14 date showed that this interstadial must be somewhat older than 12,770 + 130 B.P. (GRN 3053), a date for the cold phase between Bølling and the above mentioned interstadial. This fact led us to reinvestigate a number of dated pollen diagrams from different parts of the world. Several facts seemed to confirm the existence of a pre-Bølling Late-Glacial interstadial, and we therefore think it justified to introduce a name for it: the Susaça -Interstadial. It lasted from about 13,700 to 13,100 B.P. The pertinent data from various parts of the world relevant to the dating of the interstadial are presented, as well as a more complete subdivision of Late-Glacial time resulting from this work.	The Susaça-interstadial and the subdivision of the late-glacial
VOLUME 45 NO 2 36	1966	45	2	36	40	Priem, H.N.A.; Boelrijk, N.A.I.M.; Verschure, R.H.; Hebeda, E.H.; Floor, P.		Isotopic evidence for Upper-Cambrian or Lower-Ordovician granite emplacement in the Vigo area, North-Western Spain
VOLUME 45 NO 2 41	1966	45	2	41	47	Freshney, E.C.; McKeown, M.C.; Williams, M.; Dearman, W.R.		Structural observations in the bude to tintagel area of the coast of North Cornwall, England
VOLUME 45 NO 2 48	1966	45	2	48	49	Mackintosh, D.M.		Tectonics of the North Cornish coast England
VOLUME 45 NO 2 50	1966	45	2	50	50	Zwart, H.J.		Structural observations in the bude to tintagel area of the coast of North Cornwall, England and Tectonics of the North Cornish coast, England, a reply
VOLUME 45 NO 2 51	1966	45	2	51	51	Houbolt, J.J.H.C.; Hilten, D. van; Zijdeveld, J.D.A.		Sedimentatie in de zuidelijke bocht van de Noordzee - Tektonische consequenties van het paleomagnetische onderzoek aan de permische porfieren van Lugano, Noord-Italië
VOLUME 45 NO 2 52	1966	45	2	52	53			Geologisch en mijnbouwkundig nieuws
VOLUME 45 NO 2 54	1966	45	2	54	57			Boekbesprekingen
VOLUME 45 NO 2 58	1966	45	2	58	59	Plas, L. van der		Genootschapszaken
VOLUME 45 NO 3 59	1966	45	3	59	69	Maas, W.; Sadée, C.	The calculations given in this paper show that the temperature of the gases in the return airways behind a fire greatly influences the chance of a reversal of the ventilating air in parallel districts. A method to predict these temperatures behind a fire is given. The temperature in the fire has to be known. Calculations give this temperature for a fully developed timber fire. Some general conclusions which are important for fire-fighting are drawn.	Reversal of air flow by a fire
VOLUME 45 NO 3 70	1966	45	3	70	74	Zwart, H.J.; Oele, J.A.	The rotation about the B-axis of magnetite crystals in Cambrian phylites from the Rocroi massif is described. A possible explanation for this rotation in connection with the folds is given.	Rotated magnetite crystals from the Rocroi massif (Ardennes)
VOLUME 45 NO 3 75	1966	45	3	75	82	Driessen, C.F.		De mijnwetgeving op de Noordzee
VOLUME 45 NO 3 83	1966	45	3	83	86			Cosmos and the Evolution of Life
VOLUME 45 NO 3 86	1966	45	3	86	89			Boekbesprekingen
VOLUME 45 NO 3 90	1966	45	3	90	90			Genootschapszaken

VOLUME 45 NO 4 91	1966	45	4	91	101	Kraak, J.		Rationalisatie in het ondergronds bedrijf van een kolenmijn - organisatie en techniek
VOLUME 45 NO 4 102	1966	45	4	102	109	Hammen, T. van der	The age and the correlation of the Pliocene and Quaternary formations of the Sabana de Bogotá (Colombia) are discussed. New data of pollen analysis, C14 dating etc. lead to the differentiation of two postfolding formations: one of Pliocene age, containing a tropical pollen flora, and one representing the Quaternary, containing an upland pollen flora. It is argued that the first one probably corresponds to the type Tilatá Formation, and the second one to the Sabana Formation as basically proposed by Hubach. An attempt was made to date the morphological units distinguished by Julivert (1961) in the Southern Sabana de Bogotá. His "high-terrace" of the Tunjuelo Valley was cut into Würm-Glacial sediments. The "cone" of the Tunjuelo Valley is most probably a fluvioglacial deposit of Riss-Glacial time. The altered, often kaolinitic, marginal sediments, found above the proper level of the flat part of the Sabana, correspond only partly to the "high-terrace". They are eroded sediments of different (Quaternary) ages, deposited when the lake-level was high, and eroded when it was low, a cyclic phenomenon that recurred at least 12 times.	The pliocene and quaternary of the Sabana de Bogotá (the Tilatá- and Sabana formations)
VOLUME 45 NO 4 110	1966	45	4	110	111			Uitreiking van de Waterschoot van der Gracht penning aan Ir. A. Hellemans
VOLUME 45 NO 4 112	1966	45	4	112	113	Simon, O.J.		Note préliminaire sur l'âge des roches de l' "unité cucharón" dans la Sierra de Carrascoy (Province de Murcie, Espagne)
VOLUME 45 NO 4 114	1966	45	4	114	115			Geologisch en mijnbouwkundig nieuws
VOLUME 45 NO 4 116	1966	45	4	116	123			Koninklijk Nederlands Geologisch Mijnbouwkundig Genootschap - Jaarverslag 1965
VOLUME 45 NO 5 125	1966	45	5	125	136	Rutten, M.G.	The Dala Porphyries, recently mapped by Hjelmquist, from a volcanic province of late Precambrian age in central Sweden, attaining a minimum volume of volcanics of 150 km ³ . The Siljan ring of early paleozoics, distinguished from the early Paleozoic epicontinental cover of the Fennoscandian Shield by its thicker facies, with reef limestones, and by its peculiar, strong tectonization, occupies a ring 45 km in diameter and 5 km to 10 km wide, to the east of the Dala Porphyries. It is postulated that the Siljan ring structure developed as a result of posthumous movements at the site of the ring-complex surrounding a caldera from which the Dala Porphyries had erupted earlier.	The Siljan ring of Paleozoic, Central Sweden: A posthumous ringcomplex of a late Precambrian Dala porphyries caldera
VOLUME 45 NO 5 137	1966	45	5	137	146	Bruens, F.P.; Moonen, J.G.D.; Weehuizen, J.M.		Versterking van een gietijzeren schachtbekleding door middel van een deformeerbare manchet
VOLUME 45 NO 5 147	1966	45	5	147	149	Hilten, D. van		De invloed van de inclinatiefout bij paleomagnetische waarnemingen op continentverschuivingen en aardexpansie
VOLUME 45 NO 5 150	1966	45	5	150	156	Hospers, J.		Fouten in palaeomagnetische poolposities ten gevolge van systematische fouten in de palaeomagnetische inclinatie

VOLUME 45 NO 5 157	1966	45	5	157	164	Hermes, J.J.	A fauna of planktonic Foraminifera from the Subbetic near Caravaca contains <i>Globigerinelloides blowi</i> (Boll), <i>Globigerina graysonensis</i> Tappan and some other species, probably including <i>Hedbergella infracretacea</i> (Glaessner). This association is believed to indicate an early Aptian, possibly a late Barremian, age. The succession of planktonic foraminiferal faunas of the early Cretaceous is discussed and shown to be far from settled.	Lower Cretaceous planktonic foraminifera from the subbetic of Southern Spain
VOLUME 45 NO 5 165	1966	45	5	165	165			Geologisch en mijnbouwkundig nieuws
VOLUME 45 NO 5 166	1966	45	5	166	167			Boekbesprekingen
VOLUME 45 NO 5 168	1966	45	5	168	168			Genootschapszaken
VOLUME 45 NO 6 169	1966	45	6	169	174	Maas, W.; Sadée, C.		Internationaal congres van directeuren van mijnbouwkundige veiligheidsinstituten - Sheffield 1965
VOLUME 45 NO 6 175	1966	45	6	175	183	Dam, A. ten	This paper gives a very general summary of the presently known distribution of geothermal fields; geology and mechanism of such fields, exploration methods and technical means are discussed. In the last chapter the economic aspects of geothermal energy are discussed. Geothermal exploration has much in common with petroleum prospection and should interest any country where on geological grounds this new form of energy could be present. Taking into account the risk factor involved in any exploratory operation, electricity can be generated with natural steam at lower cost than with other sources of energy.	Aspects techniques et économiques de l'énergie géothermique
VOLUME 45 NO 6 184	1966	45	6	184	187	Priem, H.N.A.; Boelrijk, N.A.I.M.; Hebeda, E.H.; Verschure, R.H.		Isotopic age determinations on tourmaline granite-gneisses and a metagranite in the eastern Betic Cordilleras (South-Eastern Sierra de Los Filabres), S.E. Spain
VOLUME 45 NO 6 188	1966	45	6	188	190	Priem, H.N.A.; Boelrijk, N.A.I.M.; Verschure, R.H.; Hebeda, E.H.; Lagaay, R.A.		isotopic age of the Quartz-diorite batholith on the island of Aruba, Netherlands Antilles
VOLUME 45 NO 6 191	1966	45	6	191	192	Priem, H.N.A.; Boelrijk, N.A.I.M.; Hebeda, E.H.; Verschure, R.H.; Bon, E.H.		Isotopic age of tin granites in Rondônia, N.W. Brazil
VOLUME 45 NO 6 193	1966	45	6	193	196	Mukherjee, A.		Tectonics of Late Precambrian ignimbrites in western Rajasthan (India) - Discussion
VOLUME 45 NO 6 197	1966	45	6	197	198			Boekbesprekingen
VOLUME 45 NO 6 199	1966	45	6	199	199			Geologisch en mijnbouwkundig nieuws
VOLUME 45 NO 6 200	1966	45	6	200	200			Genootschapszaken

VOLUME 45 NO 7 201	1966	45	7	201	209	Kreulen, D.J.W.	<p>Considerations on the composition, the origin and the classification of peat, lignite and coal. In this paper it is attempted to bring under one common denominator certain specialized, professional views on the composition and genesis of peat, lignite and hard coal. The chemical part starts with the conception rank and ends with information about aromaticity, ringcondensation index and molecular size of the mean structural unit. The H/C versus O/C diagram (fig. 3) is noticed. Thereupon the conditions which control the formation of peat, lignite and hard coal are discussed. The objections made by W. Gothan and R. Kräusel against the swamp theory of H. Potonié are mentioned and appreciated. The transformation of plant debris is conceived as the result of biochemical transformation together with oxidation and reduction phenomenae. It is stressed that humic acids are often improperly considered as intermediate stage during coalification. Their structure points clearly to a formation by oxidation. Consequently it is supposed that the transformation of plant debris resulted in lignite or hard coal respectively according to predominance of oxidation or reduction reactions. This idea is on the root of a new classification scheme (fig. 6) in which all immature coals have an appropriate place. The author fails to see pressure as a controlling factor of rank. Experiments are mentioned (fig. 4, A and B) in which the appearance of an earthy brown coal (brown and dull) changed to black and glossy under a pressure which was equivalent to that of a normal, average, overburden. During this treatment the ultimate analysis, however, did not change. Other experiments are mentioned which demonstrate an increase in carbon content of cellulose and lignine when exposed to relatively low temperatures</p>	<p>Considérations sur la composition, la genèse et la classification de la Tourbe, du lignite et de la houille</p>
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VOLUME 45 NO 7 210	1966	45	7	210	230	Krs, M.	Palaeomagnetic research conducted on several types of Central European mineral deposits (pneumatolytic, cata - to epithermal), distributed throughout metallogenic regions of various tectonic development, has fully bore out the view that under certain conditions palaeomagnetism can be used for dating epigenetic mineralization. New palaeomagnetic data, supplemented by an extensive laboratory study of palaeomagnetic stability, provide new interpretation aspects for palaeomagnetism concerning the reconstruction of tectonic development, and thermal history of mineral deposits, as compared with earlier results (V. Flanus and M. Krs, 1963a). The polar wandering path derived from the palaeomagnetism of products of various mineralization processes coincides remarkably with the polar wandering path for the Eurasian continent as derived from the palaeomagnetism of biostratigraphically dated rocks (ranging from the Carboniferous to the Quaternary). A discussion is presented concerning the possibility of tentatively determining the intensity of the geomagnetic field in the geologic past, based on investigating thermoremanent magnetization of cassiterite (SnO ₂) with Fe-ions attached to its lattice. A study of the "thermal memory" of cassiterite yielded data strongly contradicting the regeneration of cassiterite deposits in the past. A similar conclusion was reached previously (M. Krs, 1964b) for hydrothermal deposits where haematite acts as carrier of palaeomagnetism.	Palaeomagnetism of some central European mineral deposits and its geophysical significance
VOLUME 45 NO 7 231	1966	45	7	231	237	Kauffman, M.E.		Using quantitative methods in geology
VOLUME 45 NO 7 238	1966	45	7	238	245			Geologisch en mijnbouwkundig nieuws
VOLUME 45 NO 7 245	1966	45	7	245	247			Boekbesprekingen
VOLUME 45 NO 7 248	1966	45	7	248	248			Genootschapszaken
VOLUME 45 NO 8 249	1966	45	8	249	261	Wegen, G. van der	In 1960 the Bureau of Mines in former Netherlands New Guinea took up the investigations in those areas of the southern part of the territory, where-a-private enterprise explored for alluvial gold deposits before the Second World War. The gold finds were not of largescale mining importance. The investigations, renewed by the Bureau of Mines, intended to trace the possibility of exploitation on minor scale. The problem of the origin of the alluvial gold is of academic importance, since the investigations of 1960 and 1961 led to negative results. The area in question must be sought on the south flank of the crestal part of the Central Mountains. The Bureau of Mines commenced the survey of the geologically most unknown region of the Central Mountains in 1961. The survey was restricted to several reconnaissances and ended with the transfer of the administration of West New Guinea to the United Nations Temporary Executive Authority on the first of October,1962.	Contribution of the bureau of mines to the geology of the central mountains of West New Guinea

VOLUME 45 NO 8 262	1966	45	8	262	264	Collinson, J.D.	Massive beds from a channel fill sequence in the Namurian of Derbyshire are described. From a comparison with modern, flume-produced, structures and from a hydrodynamic interpretation of the sequence of sedimentary structures, it is concluded that the massive beds were deposited in the upper part of the upper flow regime and therefore represent the first recognised antidune deposits in ancient sediments.	Antidune bedding in the Namurian of Derbyshire, England
VOLUME 45 NO 8 265	1966	45	8	265	268	Collette, B.J.; Lagaay, R.A.	A reflection profile along the Netherlands coast from Walcheren to Den Helder is presented, obtained with the so-called air gun profiler. The penetration was one second. The downdipping of the layers from the Brabant massif, the extension of the Saxonic 'anticlinal' zone Rotterdam- The Hague, and the thickening of the sediments towards the North are recognized. The base Quaternary and the base Tertiary are tentatively identified.	A continuous reflection profile along the Netherlands coast from Walcheren to Den Helder
VOLUME 45 NO 8 269	1966	45	8	269	274	Manten, A.A.	Described here are a number of observations on stylolites, found in Silurian limestones in the island of Gotland (Sweden). The three current theories on stylolite formation are briefly summarized. Only the solution-pressure theory of Stockdale can satisfactorily explain the origin of the stylolites in Gotland.	Note on the formation of stylolites
VOLUME 45 NO 8 275	1966	45	8	275	280	Vries, G. de; Sijperda, W.S.	A rapid chromatographic technique using a thin layer of silica gel impregnated with liquid anion exchangers on small glass plates is introduced in mineral analysis. The principles of the ion exchange process and the practical application are outlined.	Mineral analysis by means of thin layer chromatography using liquid ion exchangers
VOLUME 45 NO 8 281	1966	45	8	281	282			Boekbesprekingen
VOLUME 45 NO 8 283	1966	45	8	283	283			Genootschapszaken
VOLUME 45 NO 9 285	1966	45	9	285	290	Colette, B.J.		In memoriam - Professor Dr. Ir. Felix Andries Vening Meinesz
VOLUME 45 NO 9 291	1966	45	9	291	300	Verhofstad, J.	A collection of hand polished stone adzes and other stone implements in use by native tribes in the Central Highlands of West New Guinea (West Irian) is described. All the specimens are glaucophanites containing epidote, glaucophane and lawsonite as principal minerals. Glaucophane-bearing rocks have not been described earlier from New Guinea. No field data are available but there is evidence that the rocks come from a zone of low-grade metamorphic and basic to ultrabasic igneous rocks existing along the northern edge of the Central Ranges. The blue to green rocks are very fine grained and many show a fine undulating banding. Mineralogical aspects include the occurrence of several members of the glaucophane-riebeckite series, of lawsonite in subradiating "sheaves" and of colourless pumpellyite; the last mineral however was not identified with certainty. It is concluded that these glaucophanitic rocks from New Guinea belong to the lawsonite-pumpellyite-epidote-glaucophane sub-facies as defined by Miyashiro and Seki (1958) from Japanese metamorphic terrains.	Glaucophanitic stone implements from West New Guinea (West Irian)

VOLUME 45 NO 9 301	1966	45	9	301	309	Dekker, L.; Rooijen, P. van; Soediono, H.	Evidence has been found that layers of oolitic limestones and other calcarenites, intercalated in Aptian-Albian marls rich in Radiolaria and planktonic Foraminifera, consist largely of redeposited oolites and rock fragments carried into the marl basin by gravitational transport. This proves the existence, during Aptian-Albian times, of an eroded area, probably within the Subbetic paleogeographic realm. As shown by the age of redeposited material in the oolites, the hiatus involved covers a sequence from Upper Dogger or Lower Malm to Aptian-Albian age	On the occurrence of oolitic limestones, intercalated in pelagic Aptian-Albian marls in the subbetic WNW of Iorca (Prov. Murcia - Spain)
VOLUME 45 NO 9 310	1966	45	9	310	314	Gramberg, J.		Diaklaasvorming in de diepte (t.g.v. de lithologische druk), als oorzaak van open trekscheuren in de hogere gesteentelagen
VOLUME 45 NO 9 315	1966	45	9	315	318	Sijperda, W.S.; Vries, G. de	Thirty sulphide minerals have been analysed using the rapid thin layer technique described in part I. After preparation of the test solution chromatograms were run using 2, 6 and 10 N HCl as eluants. Then the constituents were visualized with the aid of suitable reagents. Combination of R _f value and mode of detection reveals the identity of the constituents. The results are discussed.	Mineral analysis by means of thin layer chromatography using liquid ion-exchangers. Part III Data on non-sulphidic minerals. Part II: Qualitative analysis of sulphide ore minerals
VOLUME 45 NO 9 319	1966	45	9	319	322	Boelrijk, N.A.I.M.		Chemical procedures for the preparation of rubidium and strontium samples for isotopic age determination
VOLUME 45 NO 9 323	1966	45	9	323	325			Boekbesprekingen
VOLUME 45 NO 9 326	1966	45	9	326	327			Genootschapszaken
VOLUME 45 NO 10 328	1966	45	10	328	341	Walkate, H.J.		Het aardgastransportnet in Nederland
VOLUME 45 NO 10 342	1966	45	10	342	354	Nagtegaal, P.J.C.	Conglomerate-filled scour-and-fill structures are of frequent occurrence in Eo-Oligocene fluvial piedmont deposits in the Southern Pyrenees (Spain). Many scour-and-fills occur at the erosive bases of conglomeratic sheetflood deposits which alternate with sandy siltstones; others are found both within the conglomerates and isolated in the sandy siltstones. The latter type develops out of the downstream terminations of the conglomerate sheets. Of 376 scour-and-fills eroded into sandy silt, 35% shows load deformation. The most frequently deformed structures are those having an estimated initial width/depth ratio of about 2. diagrams show that the scour-and-fills, which were locally found to occur in a braided pattern, are very nearly parallel to each other in restricted areas. The general orientation pattern is related to an underlying unconformity surface carrying a pronounced relief. The width/depth ratio of the scour-and-fills eroded into sandy silt tends to increase in the downstream direction. In the Poble de Segur area the downstream increase of the width/depth ratio is accompanied by a decrease of the cross-sectional area of the scour-and-fills.	Scour-and-fill structures from a fluvial piedmont environment

VOLUME 45 NO 10 355	1966	45	10	355	359	Beuken, H.; Absil, P.	Until recently, the crushing strength of rock adjacent to coal seams was measured by means of hydraulic jacks. The crushing strength of coal could not be determined underground owing to the required vertical positioning of the jack. The use of the "Betonprüfgerät Type N" (Testhammer) was known from German mining practice. This hammer has now been tested at Emma-Hendrik colliery. It was found to be a simple and handy appliance for measuring the crushing strength of rock and coal in situ. Its low weight and small dimensions, added to the circumstance that the measurements can be performed both easily and at low cost, have contributed towards making the "Testhammer" a widely used tool in mining practice. The crushing strength figures obtained with the Testhammer have proved to be very reliable.	Prallhammermessungen im steinkohlenbergwerk Emma-Hendrik der Staatsmijnen in Limburg
VOLUME 45 NO 10 360	1966	45	10	360	361			Boekbesprekingen
VOLUME 45 NO 10 362	1966	45	10	362	362			Geologisch en mijnbouwkundig nieuws
VOLUME 45 NO 10 363	1966	45	10	363	364			Genootschapszaken
VOLUME 45 NO 11 366	1966	45	11	366	374	Baran Roy, A.	The metamorphic rocks in central Singhbhum show two periods of metamorphism, the earlier progressive regional metamorphism having been followed by retrogressive metamorphism in zones of shearing. The isograds of the progressive regional metamorphism are roughly parallel to the trends of the sub-horizontal fold axes and the index minerals formed during this metamorphism form a progressive series in time. The metamorphism is broadly coeval with the folding movements and predates the shearing movements which initiated the retrogressive metamorphism. No cause-and-effect relationship exists between the regional metamorphism and the granites of the region.	interrelation of metamorphism and deformation in Central Singhbhum, Eastern India
VOLUME 45 NO 11 375	1966	45	11	375	385	Geel, T.	The <i>Nannoconus</i> zones recognized by Brönnimann in Cuba and by Baldi Beke in Hungary and the <i>Tintinnina</i> zones found by Remane near Grenoble are reported from a section near Caravaca in southern Spain. In the same section planktonic Foraminifera and ammonites occur. The correlation and the age of the various biozones is discussed.	Biostratigraphy of Upper Jurassic and Cretaceous sediments near Caravaca (SE Spain) with special emphasis on <i>Tintinnina</i> and <i>Nannoconus</i>
VOLUME 45 NO 11 386	1966	45	11	386	390	Dekker, L.	Attention is drawn to the discovery of a rudist which surprisingly was found embedded in limestones, developed in the "Couches Rouges" facies. The "Couches Rouges" are usually assumed to have been deposited in relatively deep water, while this rudist must have been derived from a reef, and thus from relatively shallow water. Rudist and sediment are both of Late Cretaceous age.	Report on the discovery of a rudist in Upper Cretaceous pelagic limestones near La Parroquia (Prov. Murcia - SE. Spain)
VOLUME 45 NO 11 391	1966	45	11	391	397	Veen, G.W. van	In the Subbetic, south-west of the town of Caravaca, a relatively undisturbed sequence of Jurassic and Cretaceous calcareous sediments has been found. A number of rock- stratigraphic units have been distinguished in this sequence. Their lithology is described and their ages are discussed.	Note on a Jurassic-Cretaceous section in the subbetic SW of Carvaca (Prov. Murcia, Spain)

VOLUME 45 NO 11 398	1966	45	11	398	400	Rooijen, P. van	Dekker, van Rooijen and Soediono (1966) have demonstrated that during, Aptian-Albian times an area undergoing erosion existed, most probably situated in the Subbetic realm, which supplied detrital material of mainly Jurassic tocks. In the present note it is shown that this situation continued at least until late Albian or early Cenomanian times.	Further data on oolitic limestones, intercalated in the pelagic sequence of the Subbetic, WNW of Lorca (Prov. Murcia - Spain)
VOLUME 45 NO 11 401	1966	45	11	401	402			Boekbesprekingen
VOLUME 45 NO 11 402	1966	45	11	402	402			Geologisch en mijnbouwkundig nieuws
VOLUME 45 NO 11 403	1966	45	11	403	403			Genootschapszaken
VOLUME 45 NO 12 405	1966	45	12	405	444	Bemmelen, R.W. van	The present author has worked in the Southern Alps with students of the Geological Institute of the State University of Utrecht during the past fourteen years (1953-1966). The intent of this work was to test the author's concept of gravity tectonics by means of detailed geological studies of selected areas, statistical analyses of microtectonic elements, and paleomagnetic researches. This testing of the theoretical concept occurred by means of the scientific method of verification, called the "Prognosis-Diagnosis Method". A number of examples are presented as the diagnostic facts of observation, which all confirm the predictions (prognoses) of the concept of gravity tectonics. Therefore, this concept appears to provide an entirely satisfactory model for the mechanics of the structural deformations in this part of the Alps.	The structural evolution of the Southern Alps
VOLUME 45 NO 12 445	1966	45	12	445	448	Dreimanis, A.	Late-Glacial interstadials, contemporaneous with the recently introduced Susacá-Interstadial, have been recognized for some time in the Great Lakes Region of North America (the Cary-Port Huron, or Cary-Mankato, or Bowmanville, or Arkona, ending approximately 13,000 B.P.), and in Northern Europe (the Raunis Interstadial, 13,390 ± 500 B.P., and the correlative Plyusna Interstadial). It is suggested that the name Raunis Interstadial be used for the region affected by the North European continental glaciation.	The Susacá - interstadial and the subdivision of the late-glacial discussion
VOLUME 45 NO 12 449	1966	45	12	449	452			Geologisch en mijnbouwkundig nieuws
VOLUME 45 NO 12 453	1966	45	12	453	454			Boekbesprekingen
VOLUME 45 NO 12 455	1966	45	12	455	456			Genootschapszaken
VOLUME 46 NO 1 457	1967	46	1	457	466	Kalsbeek, F.; Zwart, H.J.	The presence of many subrounded and irregular zircons in the leucocratic gneisses from the Aston-Hospitalet massif does not indicate a sedimentary origin of these rocks. The gneisses are probably orthogneisses, and the rounding of the zircons is the result of two phases of metamorphism which the rocks underwent. The zircons in the granites of Axles-Thermes and Lys-Caillouas resemble those of the Aston-Hospitalet gneisses, zircons in the granite of the Valle de Aran are different.	Zircons from some gneisses and granites in the central and eastern Pyrenees

VOLUME 46 NO 1 467	1967	46	1	467	481	Stam, J.C.	The tectonic picture of Paleozoic formations, occurring in a ring-shaped structure near Lake Siljan, Central Sweden, is discussed. Evidence, based on the surface geology and the logging of the cores from a number of drillholes, points to the existence of several thrustfaults, which indicates a more complicated structure than believed thus far.	On the geology and tectonics of the lake Siljan area, central Sweden
VOLUME 46 NO 1 482	1967	46	1	482	486	Priem, H.N.A.; Boelrijk, N.A.I.M.; Verschure, R.H.; Hebeda, E.H.		Isotopic age determinations on Surinam rocks
VOLUME 46 NO 1 487	1967	46	1	487	490			Boekbesprekingen
VOLUME 46 NO 1 491	1967	46	1	491	494			Genootschapszaken
VOLUME 46 NO 2 40	1967	46	2	40	60	Wunderlich, H.G.	The movement of orogenic zones in the Alps, the northern Apennines and the Dinarides and the insertion of rootless nappes. For the Alps, the northern Apennines and the Dinarides a gradual shift can be demonstrated of the zone of active folding toward the foreland during Cretaceous and Tertiary times. By plotting the development of facies and tectonics in space-time diagrams it is easy to establish that the orogenic fronts were moved askew from the centre to the marginal parts of the respective orogenic systems. The earlier the start of the synorogenic facies and, accordingly of the folding processes within an orogenic zone, the more central was the position of this zone within the whole orogenic belt. By applying this method it becomes possible to determine the original position of rootless nappe complexes.	Orogenfront - verlagerung in Alpen, Apennin und Dinariden und die einwurzelung strittiger deckencomplexe
VOLUME 46 NO 2 61	1967	46	2	61	68	Kruseman, G.P.	South of Lodève (Dépt. Hérault) in the southern part of France Lower Permian (Rotliegendes) rocks crop out. Grey Autunian shales are followed by red beds of the Saxonian. The latter are generally fine sandy siltstones and claystones, however, in the western part of the region conglomerates and coarse sandstones are present. The sedimentary structures, the texture of the rocks and their mineralogical composition, as well as the remains of the Permian flora and fauna give us the clues necessary for a palaeoclimatic reconstruction. The Autunian was deposited in a swampy environment under a uniformly warm and humid, rain forest climate. The hematite, which provides the red pigmentation, and the detrital material which furthermore builds the Saxonian red beds, were formed in the erosional area under a warm and alternately wet and dry, savanne climate and deposited in the much drier depositional area of Lodève by river and, perhaps, wind action. The differences in climate between the erosional and depositional areas are due to differences in altitude which are a normal phenomenon in a continental environment. Finally, it is tentatively suggested that the wet and dry seasons of the Saxonian found their origin in a summer high pressure and a winter low pressure belt over the East European Permian sea which could have resulted in a wet eastern monsoon and a dry western monsoon, respectively.	The Permian climate in the basin of Lodève, Hérault, France

VOLUME 46 NO 2 69	1967	46	2	69	70	Stenuit, R.; Maas, W.; Hammen, T. van der		Reversal of air flow by a fire - Verslag van de Viith Guiana geological conference
VOLUME 46 NO 2 71	1967	46	2	71	71			Boekbesprekingen
VOLUME 46 NO 2 72	1967	46	2	72	74			Geologisch en mijnbouwkundig nieuws
VOLUME 46 NO 2 75	1967	46	2	75	77			Genootschapszaken
VOLUME 46 NO 3 79	1967	46	3	79	95	Hammen, T. van der; Maarleveld, G.C.; Vogel, J.C.; Zagwijn, W.H.	Field-data, pollen-analysis and some 30 radiocarbon dates have been the basis for the construction of a climatic curve for the Last Glacial in the Netherlands. The coldest part, the Pleniglacial (between more than 50.000 and 13-14,000 years ago). witnessed at least two phases of a rise in temperature: about 38,000 and 30,000 years ago, the Hengelo and Denekamp Interstadials; the period is classified as Middle pleniglacial. The maximum cold. with polar desert conditions, lasted from about 26,000 to 13.000 years ago. This phase is mainly characterized by the presence of a desert pavement associated with large frost-wedges on top of an arctic soil; organic remains are completely absent. In contrast to other parts of the Last Glacial sedimentation was almost at a standstill. The sequence in Holland is compared with the loess-area of Austria. The Paudorf soil complex can be correlated with the Middle pleniglacial. There is a close resemblance of the climatic curve with palaeotemperature curves obtained from deep-sea sediments.	Stratigraphy, climatic succession and radiocarbon dating of the last glacial in the Netherlands
VOLUME 46 NO 3 96	1967	46	3	96	104	Bosma, W.	Quantitative data are submitted about the mineral composition of the altered cordierite porphyroblasts appearing as black spots in contact rocks and regional metamorphic rocks from several places in the Central Pyrenees. These spots have pseudo-hexagonal forms. The combined results of quantitative microscopic and X-ray investigations indicate that the alteration products consist of roughly equal amounts of muscovite and chlorite. These minerals form micro- and cryptocrystalline aggregates, which may resemble the unaltered cordierite in optical properties.	The alteration of cordierite in spotted schists from the Central Pyrenees
VOLUME 46 NO 3 105	1967	46	3	105	108	Saar, A. du		Results and problems in diatom investigation at the geological survey in Haarlem
VOLUME 46 NO 3 109	1967	46	3	109	109	Regteren Altena, C.O. van		Note on the history of a Jurassic turtle skull in the Teyler museum
VOLUME 46 NO 3 110	1967	46	3	110	111			Boekbesprekingen
VOLUME 46 NO 3 112	1967	46	3	112	115			Geologisch en mijnbouwkundig nieuws
VOLUME 46 NO 3 116	1967	46	3	116	116			Genootschapszaken
VOLUME 46 NO 4 117	1967	46	4	117	130	Loonen, H.E.	In the past five years Staatsmijnen/DSM have experimented, on the surface and underground, with two types of self-advancing support designed by their own staff. The object of the present paper is, on the one hand, to give an insight into the ideas underlying the development programme, and, on the other, to report on the experience obtained.	Entwicklung des schreitenden ausbaus durch die Bergbauforschungsanstalt

VOLUME 46 NO 4 131	1967	46	4	131	146	Oosten, M.F. van	The article describes certain aspects of the Pleistocene geology of the western part of the province of Noord-Brabant. An old Pleistocene clay layer is mostly present at a depth of a few metres. The surface of the clay consists of a very humic or peaty layer of Eemian age. In a deep erosion valley in the old clay near Breda, the Eemian is represented by a thick peat layer, resting on sand of unknown origin and age. A second peat layer reflecting a cold, arctic flora, probably of Riss- glacial age, has been found in this sand. Fluvial sands, some with cross-lamination and solifluction phenomena and with thin intercalations of peat containing a subarctic parklandscape flora, are overlying the Eemian or the old-pleistocene clay. They date from the Pleniglacial A-stage of the Würm-glacial. In the Breda valley this stage is represented by a humic loess also with a peat layer. A highly cryoturbatic loam layer, called „Wouw-Loam" and a medium to slightly coarse-textured sand containing some gravel, on top of this loam, may be of Paudorf-interstadial age or somewhat older or younger. By solifluction and/or fluvial influence reworked material of the latter is often present as a thin layer of coarse sand with much gravel. A second loess deposit, of the same age or more probably dating from the younger Pleniglacial-B stage, can be found in the Breda-valley. During the Pleniglacial-B stage, the eolian Older coversand was deposited. A thin gravel layer, being a deflation and/or washout horizon of the coarse sand with gravel, marks the sharp boundary between this Older coversand and the underlying horizons. A strongly Loamy coversand, which in many places covers the „typical" Older coversand, most probably dates from the end of the	Bijdrage tot de kwartair-geologie van westelijk Noordbrabant
VOLUME 46 NO 4 147	1967	46	4	147	149		Boekbesprekingen	
VOLUME 46 NO 4 150	1967	46	4	150	155		Geologisch en mijnbouwkundig nieuws	
VOLUME 46 NO 4 156	1967	46	4	156	165		KNMG Jaarverslag 1966	

VOLUME 46 NO 5 167	1967	46	5	167	187	Burton, C.K.	<p>The subject of this communication is a rock-stratigraphic unit from northwest Malaya comprised essentially of highly carbonaceous, more or less siliceous, shale and mudstone, with subsidiary arenite, minor chert and very limited calcareous argillite and limestone. The name "Mahang Formation" proposed by Courtier (in manuscript) is now formally adopted for this rock unit in accordance with the American Code of Stratigraphic Nomenclature. Fossil trilobites in the Mahang Formation are considered to be Ordovician, abundant graptolites are clearly Lower to Middle Silurian whilst the contained tentaculites appear to be Lower to Middle Devonian in age. Of singular interest is the intimate association of Silurian graptolites with Devonian tentaculites at 15 localities. It is evident that the Mahang Formation corresponds closely to the euxinic facies of Pettijohn (1957). The Mahang basin of deposition seems to have originated upon a platform in Upper Ordovician times with the development of a geanticlinal barrier to the east on the approximate site of the modern Main Range. Shelf conditions probably persisted to the west. Initially there was free communication with the open ocean across the submerged barrier and in the Lower Silurian a graptolitic plankton flourished in the surface waters. As the orogenic cycle developed however, the geanticline was progressively raised until external connections were effectively severed. This isolation is expressed in the apparent absence of Ludlow forms in the prolific Mahang plankton. In the Lower Devonian the geanticline is believed to have collapsed in a chain of islands, whereupon a tentaculite plankton invaded the Mahang basin. Associated orogenic movements may now have caused the surface to become polluted</p>	<p>The Mahang formation: a Mid-Palaeozoic euxinic facies from Malaya - With notes on its conditions of deposition and palaeogeography</p>
VOLUME 46 NO 5 188	1967	46	5	188	194	Vogel, J.C.; Hammen, T. van der	<p>In this article the stratigraphical position, pollen diagrams and C 14 dates of the Denekamp Interstadial are discussed. The C 14 dates for the Paudorf Interstadial are evaluated, and the most reliable dates and data are compared with those of the Denekamp Interstadial. The conclusion is drawn, that the end of both interstadials is contemporaneous. It is possible, however, that the beginning of the Paudorf Interstadial corresponds to the beginning of the Hengelo Interstadial.</p>	<p>The Denekamp- and Paudorf interstadials</p>

VOLUME 46 NO 5 195	1967	46	5	195	205	Boekschoten, G.J.; Veenstra, H.J.	Forty-seven measurements on groups of oriented pebbles in Dutch tills of the Saale Glaciation have been carried out at four localities. The tills possess a variable composition according to their source area and the amount of fluvial gravel that has been taken up from older deposits. No distinct orientation of the erratics could be found. The enclosure of glacial rafts and sand lenses in the tills is a common phenomenon, but a preferred orientation of these enclosures is also absent. Either a primary orientation of the effects in the moraine did not occur, or the orientation disappeared by secondary causes. The latter are summarized in the following. The Dutch boulder clays have been deposited on unconsolidated sediments, chiefly sands. Some boulder clay areas are ice-pushed from various directions by glacier tongues belonging to the oscillating edge of the ice cap. Another cause is decalcification, which is a normal process in the boulder clays of the Netherlands. It must be expected that this leaching has influenced the volume and texture of the boulder clays causing settlement. Finally, the rather thin boulder clay layers were disturbed by cryoturbation, which reached a depth of 1.50 m or more. An interesting side-effect of cryoturbation is the occurrence of disintegrated, but chemically unaltered, gneisses and crystalline schists. Periodical thawing and freezing could account for these rotten stones in the boulder clay.	Over stenen-oriëntatie in het Nederlandse keileem
VOLUME 46 NO 5 206	1967	46	5	206	207	Clarke, R.F.A.	Dinoflagellates and their stratigraphic use	
VOLUME 46 NO 5 208	1967	46	5	208	210	Priem, H.N.A.; Boelrijk, N.A.I.M.; Hebeda, E.H. ; Verschure, R.H.; Szumlas, F.	Isotopic age determinations on a biotite granodiorite and a biotite-hornblende diorite in the coastal area west of Accra, Ghana	
VOLUME 46 NO 5 211	1967	46	5	211	214		Geologisch en mijnbouwkundig nieuws	
VOLUME 46 NO 5 215	1967	46	5	215	215		Boekbesprekingen	
VOLUME 46 NO 5 216	1967	46	5	216	216		Genootschapszaken	

VOLUME 46 NO 6 217	1967	46	6	217	235	Boersma, J.R.	A fluvialite sequence probably laid down in recent times by a meandering distributary of the Rhine system was investigated in a large weir-lock excavation in the present E.-W. alluvial valley of the Rhine. It consists mainly of medium to fine grained sands on a large scale grading fine upwards. The predominant sedimentary structure is a mega cross-stratification with considerable set-length. Its analysis in differently orientated sections brought to light that the fluvial megaripples (dunes), which have given rise to this structure, had straight rather than winding crestlines. A large clayey body (width 20 m, max. height 2.5 m) consisting of silts and clays in regular alternation was found to fill an elongated, channel-like depression. Its lower boundary is convex downward and cuts into the above mentioned sands. Highly uncommon types of mega cross-stratified sets were observed in the upper part of the sandy sequence. Sets of relatively coarse-grained large scale cross-strata are seen to be underlain by, and structurally tied up with fine so-called bottomset layers of considerable thickness. These bottomset layers can have a very complex upbuilding in fact the most complete succession of structures observed in them, covers from top to bottom: 1. straight or wavy lamination, 2. small scale climbing cross-stratification with foresets dipping in a direction opposite to that of the mega foresets, 3. irregular trough-shaped sets with foresets variable in direction and steepness, 4. small scale tabular sets of cross-stratification having the same direction as the mega foresets. The structures 1-4 are considered to have been formed simultaneously in this downstream order at the lee of the megaripple (dune) front by: backflow in the vortex. area (1, 2);	Remarkable types of mega cross-stratification in the fluvialite sequence of a subrecent distributary of the Rhine. Amerongen; the Netherlands
VOLUME 46 NO 6 236	1967	46	6	236	244	Michel, W.F.E.	To find out the relationship between a paleocurrent and the orientation of molluscshells, the Pleistocene "Zanden van Kruisschans 2" north of Antwerp were studied. Maximum dip direction of the trough-shaped cross-bedding (fig. 2, 5 and 6) and orientation of the long axis of pebbles (fig. 8 and 9) were measured to determine the paleocurrent direction. Of four mollusc species which were studied, one species showed random orientation (fig. 11), but the other species, two lamellibranchs (fig. 10 and 12) and one gasteropod (Fig. 13) showed a marked orientation to the paleocurrent that moved 260°-080°. It is even possible to find the paleocurrent direction by only using fig. 10 and 13. Of the bivalve shells, 87% lies with its convex side up because this is the most stable orientation in a current as fig. 14 and 15 clearly show.	De oriëntatie van scheve gelaagdheid, rolstenen en enkele molluskensoorten in de zanden van Kruisschans
VOLUME 46 NO 6 245	1967	46	6	245	246	Collette, B.J.		Over de daling van het Noordzeegebied
VOLUME 46 NO 6 247	1967	46	6	247	251			Geologisch en mijnbouwkundig nieuws
VOLUME 46 NO 6 252	1967	46	6	252	254			Boekbesprekingen

VOLUME 46 NO 7 255	1967	46	7	255	264	Ruiter, H.J. de; Laan, G. van der; Udink, H.G.	The discovery well of the Groningen gas field was drilled in 1959. At the end of 1963, when more wells had been drilled, and a re-interpretation of seismic data had been made, the large size of the field became apparent. At present proven reserves are estimated at 1650 x 109 m ³ (58 x 1012 ft ³). The favourable properties of this huge sandstone reservoir (permeability 0.1 - 1 Darcy) and the results of the first production tests led to the decision to concentrate the wells in "clusters" (groups of closely spaced wells). After the first clusters of 6 to 8 wells with a capacity of 6 x 106 m ³ /day per cluster had come on stream, field tests and additional studies indicated that larger clusters would be possible. Future field observations may lead to further adjustments in the drainage pattern. In order to solve the complicated problem of optimization of the field's development, mathematical reservoir and economic models are being programmed for an electronic computer.	Development of the North Netherlands gas discovery in Groningen
VOLUME 46 NO 7 265	1967	46	7	265	278	Oomkens, E.	The post-glacial delta complex of the Rhône river is a sediment lens in which, volumetrically, coastal-plain deposits and marine deposits are almost equally important. An analysis of the lithological relationships shows that the deltaic sediments can be grouped in one of the following depositional sequences: 1. Regressive sequences 2. Channel-fill sequences 3. Transgressive sequences. Regressive sequences are due to a process whereby sediment-laden river water enters a basin that is filled with water of higher density (e.g. sea or lagoon). This process produces a sediment body that contains finegrained sediment at its base and dominantly coarse grained sediment at its top (upward coarsening). The topmost sand member may reach a thickness of 10 metres. The sand is deposited in sheets hundreds of square kilometres in extent. The sand has a gradational contact with the underlying marine clay. Channel-fill sequences are due to a process whereby a decrease in current velocity occurs in a channel. This process produces a sediment body that contains coarse grained sediment at its base and dominantly fine-grained sediment at its top (upward fining). The basal sand member varies widely in shape and texture. Commonly the sand member is elongate and has a width/thickness ratio of as much as 1000. Transgressive sequences are due to a process whereby the rate of subsidence exceeds that of sedimentary buildup. This process leads to deposition of a sediment body in which coastal-plain deposits are overlain by coarse grained coastal-barrier deposits (upward coarsening) what are in turn overlain by marine deposits. The sand member varies in thickness but is seldom more than 2 metres thick. It occurs in sheets. The sand commonly has a	Depositional sequences and sand distribution in a deltaic complex
VOLUME 46 NO 7 279	1967	46	7	279	280			Geologisch en mijnbouwkundig nieuws
VOLUME 46 NO 7 281	1967	46	7	281	281			Boekbesprekingen
VOLUME 46 NO 7 282	1967	46	7	282	282			Genootschapszaken

VOLUME 46 NO 8 283	1967	46	8	283	309	Zwart, H.J.	A twofold classification of the orogenic belts of the world is proposed, based in first instance on the facies series of the metamorphic rocks. The Hercynian and Alpine orogens of Europe are reviewed in detail and are found to differ respectively in several ways: (1) low pressure metamorphism with andalusite and cordierite vs. high pressure metamorphism with glaucophane, sodium pyroxene, lawsonite and kyanite, (2) thin vs. thick metamorphic zones, (3) abundant vs. few granites and migmatites, (4) few vs. abundant ophiolites and ultrabasites, (5) broad vs. narrow orogen, (6) small vs. large uplift, (z) scarce vs. dominant nappe structures. The Caledonian orogen of Europe is examined and found to be intermediate in nature between the "Hercynotype" and "Alpinotype" orogens. The Svecofennian- Karelian belt of the Baltic shield is found to be a typical Hercynotype orogen. The paired metamorphic belts of the Circumpacific region appear to be a new element in the earth's history and tend to emphasize the peculiar character of the Pacific Ocean. It seems probable that the thermal history of the earth has not appreciably changed during the last 2500 million years. The pressure-temperature fields of the various facies and facies series based on field and experimental work are discussed. Finally the causes of regional metamorphism are considered.	The duality of orogenic belts
VOLUME 46 NO 8 310	1967	46	8	310	312			In Memoriam Professor Pierre Pruvost
VOLUME 46 NO 8 313	1967	46	8	313	313			Boekbesprekingen
VOLUME 46 NO 8 314	1967	46	8	314	314			Genootschapszaken
VOLUME 46 NO 9 315	1967	46	9	315	315	Sitter, L.U. de		Van de voorzitter
VOLUME 46 NO 9 316	1967	46	9	316	317	Faber, F.J.		In memoriam - Dr. P. Kruizinga

VOLUME 46 NO 9 318	1967	46	9	318	332	Broek, J.M.M. van den; Waals, L. van der	South Limburg formed the border-zone of a large West European peneplain during the Tertiary and the Late Tertiary. Thin local deposits of strongly weathered and corroded sand and gravel, strongly weathered outcrops of underlying formations, deep fossil soils and extensive surface silicifications are the characteristic features of this peneplain. Through a combined geological and pedological survey these features were found to be interrelated. They are the result of typical climatic circumstances and the associated vegetation acting on the earth surface. Such influences can leave their marks on the surface only during a period of geological calm: a period without any noticeable sedimentation or erosion. Such periods generally escape a geologist's observation; they are of utmost importance to the soil scientist. In South Limburg the Late Tertiary peneplain is partly covered by Pleistocene Maas deposits (in the western parts); the rest of this surface is dissected and remodeled during the Pleistocene (the eastern part). From our systematic inventory a tentative description can be given of the important features of the environment during these times. In the long periods of geological calm a strong weathering developed as a result of a warm, humid climate with dry periods of several weeks. Erosion has been unimportant and restricted mainly to the strongly weathered surface material, this material has been shifted over short distances only. A thin discontinuous sheet of sediments developed on the peneplain, that has been named the Basal gravel complex. The deposits of the borders of the peneplain and of the contiguous graben are much thicker and easier to unravel stratigraphically. This fringe area has been called the accumulation	The late Tertiary peneplain of South Limburg (The Netherlands) silicifications and fossil soils; a geological and pedological investigation
VOLUME 46 NO 9 333	1967	46	9	333	340	Bisdorn, E.B.A.	The phenomenon of spheroidal weathering is related to the development of micro-crack systems. Between the "unweathered coarse granite" of zone 1 and the boulder surface a "limonite" band can be distinguished, which can be divided into two zones (2 and 3) according to the pattern of the micro-cracks. Scales are formed in zone 1 along cracks lying roughly parallel to the boulder surface and becoming macro-cracks in zone 4, where the scales are released. The results of this study of the crack system formed during the spheroidal weathering of a coarse-grained granite throw doubt on theories that explain the spheroidal shape as being due to either magmatic cores or the release of confining pressure. Two terms are used in a special sense in this paper, viz. concentric banding, resulting from the crack system involved in spheroidal weathering, and ghost structure, which is here defined as the phenomenon seen in a regolith in situ after the boulder has completely weathered away.	The role of micro-crack systems in the spheroidal weathering of an intrusive granite in Galicia (NW Spain)
VOLUME 46 NO 9 341	1967	46	9	341	347			Geologisch en mijnbouwkundig nieuws
VOLUME 46 NO 9 348	1967	46	9	348	349			Genootschapszaken

VOLUME 46 NO 10 351	1967	46	10	351	355	Lagaay, R.A.; Collette, B.J.; Schouten, J.A.	Seismic sections of the upper sedimentary layers and an isochron map of the base Tertiary in the southern part of the North Sea basin are presented. They are the result of an instrument testing program with an air gun profiler. Several structural features of the Cenozoic can be correlated with the geology of adjacent areas. An important aspect of the formation of the North Sea basin is the differential sagging, leading to the formation of subbasins that shift place in time.	Seismic profiling in the North Sea Basin
VOLUME 46 NO 10 356	1967	46	10	356	360	Rutten, M.G.	Flat-bottomed glacial valleys on the northern continents owe this feature not to aggradation by braided rivers, but to the beaver.	Flat-bottomed glacial valleys, braided rivers and the beaver
VOLUME 46 NO 10 361	1967	46	10	361	362	Meer Mohr, C.G. van der; Okulitch, V.J.		On the occurrence of the scyphomedusa in the Cambrian of the Cantabrian mountains (NW Spain)
VOLUME 46 NO 10 363	1967	46	10	363	368	Soediono, H.	Brandy's suggestions that <i>Orbulina</i> is biphyletic and the <i>Orbulina</i> datum diachronous are rejected	In defense of the <i>Orbulina</i> datum
VOLUME 46 NO 10 369	1967	46	10	369	373	Priem, H.N.A.; Boelrijk, N.A.I.M.; Verschure, R.H.; Hebeda, E.H.		Isotopic age determinations on granitic rocks in Northern Portugal
VOLUME 46 NO 10 374	1967	46	10	374	375	Jong, J.D. de		Seventh international sedimentological congress, Great Britain 1967
VOLUME 46 NO 10 375	1967	46	10	375	377			Boekbesprekingen
VOLUME 46 NO 10 378	1967	46	10	378	379			Geologisch en mijnbouwkundig nieuws
VOLUME 46 NO 10 380	1967	46	10	380	381			Genootschapszaken
VOLUME 46 NO 11 383	1967	46	11	383	391	Puschmann, H.	A section published by Triguero (1961) from the area north of Torrecampo (Prov. Córdoba) was remapped. Some different stratigraphic and tectonic points of view resulted from this investigation. Bed rocks were identified as the "Armorikanische Quarzit" (deep seated Ordovician) up to the deep lying part of the Lower Carboniferous series in the area which is highly tectonically disturbed. Facies and stratigraphy correspond to those of northern Sierra Morena. A stratigraphical break includes the higher Siegen, Ems and Middle Devonian. (Triguero, however, suggested a stratigraphical break from Ludlow up to Siegen.) Upper Devonian (Frasnien) lies conform on the Siegen-Quarzit (deeper seated Siegen) contrary to the former conception.	Das paläozoikum im gebiet zwischen San Benito und Torrecampo (Sierra Morena/Spanien)

VOLUME 46 NO 11 392	1967	46	11	392	396	Tjia, H.D.	The direction with smoother touch along a fault plane parallel to the slickensides does not invariably correspond with the direction of fault displacement. There are more fault plane features which produce coarser touch in the direction of motion than there are markings which feel smooth in that direction; therefore, the smoother touch criterion for interpreting fault movements should be discarded. Excellent directional indicators on fault planes include: Prod marks, tension fractures and associated steps, crescentic gouges, the attitude of secondary shear fractures, chattermarks, and knobby protuberances resembling "roches moutonnées". Separately the following markings are not reliable, because similar-looking features may be caused by more than one process: Pluck marks and steps formed through stick-slip and spalling; triangular scratches and bruises; spurs and trails; drag which may have experienced elastic rebound.	Sense of fault displacements
VOLUME 46 NO 11 397	1967	46	11	397	399	Bodenhausen, J.W.A.; Fontboté, J.M.; Simon, O.J.		Sur la présence d'éléments du Bétique de Málaga au sud de la Sierra Nevada, près de cherín (Espagne Méridionale)
VOLUME 46 NO 11 400	1967	46	11	400	405	Geel, T.	An interpretation of the geology of the La Yesera and El Cumbre locations near Fuensanta-La Parroquia is given, which differs from that of Fernex et al. (1965). In La Yesera evidence has been found for major tectonic movements which took place in the interval between the deposition of Bolli's (1957) <i>Globorotalia kugleri</i> Zone and the lower part of Bolli's (1957) <i>Globigerinatella insueta</i> Zone, that is probably in the upper Oligocene-lower Miocene.	The relation between the Betic of Málaga and some post-eocene formations in the area near la Fuensanta-La Parroquia (Provincia de Murcia, SE Spain)
VOLUME 46 NO 11 406	1967	46	11	406	409			A comparative table of recently published geological time-scales for the Phanerozoic time - explanatory notice
VOLUME 46 NO 11 410	1967	46	11	410	412			Geologisch en mijnbouwkundig nieuws
VOLUME 46 NO 11 413	1967	46	11	413	415			Boekbesprekingen
VOLUME 46 NO 11 416	1967	46	11	416	416			Genootschapszaken
VOLUME 46 NO 12 417	1967	46	12	417	422			In memoriam - Prof. dr. B.G. Escher
VOLUME 46 NO 12 423	1967	46	12	423	424	Escher, B.G.; Plas, L. van der; Veen, A.H. van der		L'Unakite du cotentin

VOLUME 46 NO 12 425	1967	46	12	425	445	Read, R.A.	<p>In an area of differential, regional metamorphism, the main aspects of the structural history are basically similar to those established for the eastern Pyrenees (Zwart, 1963a), and are related to at least two generations of folding and an intermediate phase of deformation. The first period of folding is associated with an axial plane slaty cleavage and has produced the most prominent structures in the region (EW trending). Two sets of small scale, asymmetric folds are associated with axial plane, strain slip cleavages (NS and EW striking) and post-date first phase structures. These later generation fold systems show differential development on all scales and although, in certain instances, they can be physically distinguished, their chronological relationship remains undecided. Andalusite and staurolite porphyroblasts grew between the first and second phases of deformation and have internal fabric configurations compatible with a period of movement occurring towards the end of the growth period of the porphyroblasts and involving renewed slip on the first phase cleavage about NS trending axes of internal rotation. This subsidiary movement phase appears to be kinematically related to the NS striking strain slip cleavage system. A concept of large scale internal rotation associated with the strain slip cleavage systems is basically consistent with derivation of flat-lying first phase cleavage orientations from initially steeper attitudes.</p>	<p>Geometrical and time relationships for three fold systems and a subsidiary movement phase in metamorphic rocks south of Bagnères-de-Bigorre, French Pyrenees</p>
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VOLUME 46 NO 12 446	1967	46	12	446	452	Brinkman, R.	Major differences in clay mineralogy correspond to the major landscape boundaries in the Guyanas. Two of the landscapes have a rather uniform clay mineral composition and two are more variable. Small amounts of accessory non-clay minerals occur in the clay fraction of many samples; clay-size quartz is generally present. The young coastal plain and the tidal river (estuary) alluvium belong to a rather uniform clay mineral association containing a mixture of smectite, illite and kandite with a cation exchange capacity of about 40-50 me/100 g clay. Parent material appears to be Amazon mud reworked by the sea. The old coastal plain is a complex of three clay mineral associations containing smectite, illite and kandite; illite and kandite; and kandite. The last two of these have exchange capacities of about 25-35 me/100s clay. The three associations may have a common parent material similar to that of the young coastal plain; the variability may be caused by acid destruction of part of the clays due to pyrite oxidation. The white and Brown Sands plateau appears to be part of one vast uniform clay mineral association, also occurring in Brazil and containing kandite with very low exchange capacity: 2-4 me/100g clay. The low exchange capacity may have been caused by differential transport seaward of the finest clay fraction during deposition of the sediments. The interior residual and alluvial areas consist of two clay mineral associations, containing kandite with or without illite. Exchange capacities are about 10-20 me/100g clay.	A rapid reconnaissance of the main clay mineral provinces in the Guyanas
VOLUME 46 NO 12 453	1967	46	12	453	458	Vangerow, E.F.; Schloemer, W.	By making use of Coccolith spectra an attempt is made to compare the "Vetschauer Kalk" of the Aachen cretaceous and the "Kunrade chalk" with the wellknown chalkprofiie of the Maas Valley. Most likely 'we may assume that the "Vetschauer Kalk" corresponds only with the lowest Maastricht Chalk, i.e. the lower part of the foraminiferal zone H, whereas the "Kunrade Chalk" belongs to the region of foraminiferal zone H - K. The Postmaastrichtian Chalk from Houthem shows a distinct floral cutting as opposed to the subjacent Maastrichtian layers. So this chalk might be attributed to the Danian.	Vergleich des "vetschauer-kalkes" der Aachener kreide mit dem Kreide-profil von Süd-Limburg anhand von coccolithen
VOLUME 46 NO 12 459	1967	46	12	459	462	Veen, G.W. van	Fragments of larger Foraminifera have been found in sandy intercalations of an Upper Cretaceous pelagic limestone sequence of the Subbetic south of Caravaca. The author believes that these larger Foraminifera have been derived from the Prebetic in the north, and emplaced by turbidity currents.	Upper Cretaceous larger foraminifera in the subbetic south of Caravaca (Prov. Murcia - SE Spain)

VOLUME 46 NO 12 463	1967	46	12	463	470	Teunissen, D.; Oorschot, H.G.C.M. van	A study was made of the peat in the beds in the central part of a fossil braided river system of Würm- (Wisconsin-) glacial age in the vicinity of Nijmegen (Guelderland province, The Netherlands). The results of these investigations point to the fact that this system was vacated by the rivers Rhine and Meuse in late glacial times. The dispersal- and gathering channels were abandoned in the beginning of the Bølling Interstadium and the main channels in the beginning of the Allerød Intersadium. After that time, the gathering channels drained away the rain and melted snow of the region, because they were situated in a faint depression in the landscape. Thus the filling material in the gathering channels remained more or less sandy until Boreal times whereas, for a long period prior to that, the main channels had been filled with peat deposits. After the end of the Boreal all investigated channels have filled exclusively by peat until Subboreal or Subatlantic times.	De laatglaciale geschiedenis van het verwilderde riviersysteem ten zuidwesten van Nijmegen
VOLUME 46 NO 12 471	1967	46	12	471	474	Völk, H.R.	Essentially the sedimentary rock sequence of the Neogene basin of Vera in south-east Spain can be divided into an older and a younger group of formation, which are separated by an angular unconformity. Both groups are clearly distinguished by a different deformational pattern and a different detritus composition. In the Younger Neogene formations – in contrast to the Older ones - a striking domination of clastic components were found originating from higher grade metamorphic rocks of the deepest tectonic units of the Betic orogene, viz. the "Nevado-Filabrides". The almost complete lack of higher metamorphic clastic material in the Older Neogene formations together with the absence of these older formations along the western margin and the adjacent uplands of the Vera basin - as far as it is bordered by rocks of the "Nevado-Filabrides" - points to a rapid uplift of the central Betic zone in Middle Miocene times (Völk 1967, p. 136/137. These movements are supposed to have affected large parts of the eastern Betic Cordilleras. Further arguments are advanced for a tentative correlation with the "younger phase of the later tectogenesis" (Voet), 1967)2 of the Betic orogene as working hypothesis.	Relation between Neogene sedimentation and late orogenic movements in the eastern Betic Cordilleras (SE Spain)
VOLUME 46 NO 12 475	1967	46	12	475	479			Boekbesprekingen
VOLUME 46 NO 12 480	1967	46	12	480	484			Geologisch en mijnbouwkundig nieuws
VOLUME 46 NO 12 485	1967	46	12	485	486			Genootschapszaken
VOLUME 47 NO 1 1	1968	47	1	1	2	Jong, J.D. de		Change of command

VOLUME 47 NO 1 3	1968	47	1	3	16	Allen, J.R.L.	A consideration of the structure of the region of separated flow generated at a negative step when Reynolds numbers are large, and of the mechanics of the turbulent suspension of sediment, leads to two criteria for the continued growth of flute marks fashioned on a mud bed by a current. These marks are well known from turbidites, and are not uncommon in other sedimentary facies. The criteria have the general form $U_{crit} = f_1(V_g) = f_2(D)$ in which U_{crit} is the critical flow velocity of a current bearing sediment of physical size D or of effective falling velocity V_g . Flutes continue to grow provided that $U > U_{crit}$ but when $U < U_{crit}$ become infilled with grains or completely covered over by a grain layer. Alternatively, the criteria can be expressed in terms of flow power, whence an inverse correlation emerges, in the case of turbidites bearing flutes, between the Bouma division which begins the turbidite and a characteristic value of D for that division.	On criteria for the continuance of flute marks, and their implications
VOLUME 47 NO 1 17	1968	47	1	17	20	Priem, H.N.A.; Hebeda, E.H.; Boelrijk, N.A.I.M.; Verschure, R.H.	K-Ar measurements show that basalt magma has intruded the basement rocks and Roraima deposits in Surinam (Dutch Guiana) 1690 ± 100 m.y. ago (Early to Middle Proterozoic) and 221 ± 10 m.y. ago (Lower Triassic or Upper Permian). The Permo-Triassic dolerites are augite dolerites rich in iron ore and with K/Rb ratios between 267 and 309. The Proterozoic dolerites carry hypersthene in addition to augite, contain less iron ore and have K/Rb ratios between 128 and 233.	Isotopic age determinations on Surinam rocks, 3. Proterozoic and Permo-Triassic basalt magmatism in the Guiana shield

VOLUME 47 NO 1 21	1968	47	1	21	27	Tewari, A.P.	Existence of a deep/fundamental fault in parts of the Mirzapur district, Uttar Pradesh, India, which lies along the northern limits of Peninsular India, has been examined in places by the author. The fault, which is trans-subcontinental in dimension and recurrent in activity, gives a sharp tectonic break in Peninsular India, and not only divides the Vindhya from the Pre-Vindhya (Flysch and Molasse Formations) but also limits the extension of the lower-Gondwanas in Peninsular India, Hence the author feels that it should be designated as a Great Boundary Fault, Westward extension of the Great Boundary Fault through the vast area covered with the Deccan Trap, leads one to believe that this fault has provided channel for the upwelling of the Deccan Trap. It is interesting to note that earlier (1938), Heron had established a similar fault over a length of 800 KM in Rajasthan. He did not, however, discuss the lateral extension of the fault towards the south when it was lost under the Trap country. The author is led to believe that the Great Boundary Fault of Rajasthan swings to the east to form the Narmada-Son valleys, now filled with Pleistocene and alluvium terraces, and extends not only in the Mirzapur District under an identical geological set up and tectonic framework but also continues eastwards to the Palamau and Gaya districts of Bihar. With this correlation the author has deciphered a new tectonic picture of northern Peninsular India, The author is also of the view that this new concept would be helpful in deciphering the continuity of the important sulphide and other mineralized belts/zones of Rajasthan in the Mirzapur district and their correlation with that of the Bihar area. The author also points out in this paper the possibility of crustal folding involving the	A new concept of the Paleotectonic set-up of a part of northern Peninsular India with special reference to the great boundary faults
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VOLUME 47 NO 1 28	1968	47	1	28	36	Kisch, H.J.	The mineralogy of sedimentary rocks associated with Upper Permian coals in eastern Queensland, ranging in degree of coalification or "rank" from medium-volatile bituminous to semi-anthracite, is described. Kaolinite is the predominant clay mineral associated with the lower-rank coals: chlorite is absent and siderite is the predominant carbonate. At Bluff chlorite makes its appearance in a kaolinite tonstein in coal with 89% carbon. In the shales, feldspathic wackes, and tonsteins associated with the Baralaba semi-anthracites (90-91,5% carbon), kaolinite has completely given way to chlorite and illite, and ankerite is the major carbonate. The previously described chlorite-dioctahedral 1M illite crystal tonsteins at Baralaba (Kisch, 1966a) are probably laterally equivalent to kaolinite tonsteins in medium-volatile bituminous coal at Moura. The absence of zeolites from the rocks investigated is considered to reflect the high $\mu\text{CO}_2/\mu\text{H}_2\text{O}$ chemical potential ratio during burial metamorphism. The coal rank in association with which chlorite and illite formed at the expense of kaolinite at Baralaba is higher than that at which laumontite-rich assemblages appear in tuffs and volcanic sandstones in the Sydney Basin of New South Wales (Kisch, 1966b). Coal rank may be an important aid in correlating burial metamorphic assemblages in areas with and without zeolites, and other hydrous calciumaluminosilicates.	Coal rank and lowest-grade regional metamorphism in the southern Bowen Basin, Queensland, Australia
VOLUME 47 NO 1 37	1968	47	1	37	46	Dow, D.B.	In 1961 an attempt to make the first climb of the Carstenz Pyramid in West New Guinea ended in failure, but during the approach to the mountains much new country on the northern side of the Nassau Range was explored. The observations made during the trip are the only geological information at present available for a large area of the Nassau Range. Remarkably clean quartz sandstone of probable Mesozoic age forms the basement on which Lower Tertiary marine sediments were deposited, probably unconformably. Faulting commenced at an early stage of the sedimentation, breaking the area into a series of horsts and grabens which had a considerable influence on sedimentation. The sedimentation was punctuated, probably in the Lower Miocene, by andesitic volcanism. Well-preserved erosion features and moraine deposits due to a late Pleistocene glaciation are found over about 12,000 feet: there is also some evidence of an earlier glaciation. The Tertiary rocks are generally only gently folded but they are dislocated by long, slightly curved, faults of considerable vertical displacement. They show many features characteristic of transcurrent faults, and it is possible that horizontal movement on the faults was predominant.	A geological reconnaissance in the Nassau range, West new Guinea
VOLUME 47 NO 1 47	1968	47	1	47	48	Visser, W.A.	Discussion; On A geological reconnaissance in the Nassau range, West new Guinea	

VOLUME 47 NO 1 49	1968	47	1	49	52	Nota, D.J.G.		Geomorphology and sedimentary petrology in the southern gulf of St. Lawrence
VOLUME 47 NO 1 53	1968	47	1	53	55	Hospers, J.		Paleomagnetisme en aardexpansie
VOLUME 47 NO 1 56	1968	47	1	56	60	Strachan Hutchison, C.	The Billiton granite is shown both stratigraphically and radiometrically to be invalid for setting the base of the Jurassic at 180 ± 5 m.y.. A review of the more recent stratigraphic and radiometric developments in this region shows that the evolution of the Thai-Malayan orogen and the emplacement of the "tin-belt" granite is much more complex than the model upon which the age of the Billiton granite was based.	Invalidity of the billiton granite, Indonesia, for defining the Jurassic/Upper Triassic boundary in the Thai-Malayan orogen
VOLUME 47 NO 1 61	1968	47	1	61	61	Schürmann, H.M.E.		Comments on: Invalidity of the billiton granite, Indonesia, for defining the Jurassic/Upper Triassic boundary in the Thai-Malayan orogen, by C.S. Hutchison
VOLUME 47 NO 1 62	1968	47	1	62	68			Boekbesprekingen
VOLUME 47 NO 1 69	1968	47	1	69	75			Geologisch en mijnbouwkundig nieuws
VOLUME 47 NO 1 76	1968	47	1	76	80			Notulen van de Buitengewone Ledenvergadering
VOLUME 47 NO 2 81	1968	47	2	81	97	Hermes, J.J.	The geologic history of the Papuan geosyncline is shortly described. Attention is drawn to the fact that due to the collision between the Asian and the Australian continent, a segment of the size of the Papuan geosyncline was torn loose, and both bent and broken, leading to the present sinuous shape of the western part of the island (fig. 5). It is suggested that some other sinuous mountain chains may have acquired their present shape in this manner. The development of the Papuan geosyncline is compared with the model of Aubouin based on the Hellenides of Greece and that of Dietz based on his interpretation of the Atlantic Coastal Plain geosyncline. Important differences exist between the three models. The nomenclature of geosynclines is discussed.	The Papuan geosyncline and the concept of geosynclines
VOLUME 47 NO 2 98	1968	47	2	98	101	Riezebos, P.A.	Methods devised to collect mineral data for specific purposes have sometimes been used rather indiscriminately in weathering, sedimentological and soil studies. This may partly be due to insufficient knowledge about the dispersion of mineralogical information within the sample material. As an illustration of such a distribution the results of a fractionated optical analysis of light as well heavy concentrates from two well-known glacial deposits are here presented. At the same time the results of an ore microscopic analysis of the opaque grains in the heavy concentrates from the total 50-500 micron size range are given.	Mineralogical composition of material less than 500 micron from a red and grey boulder clay sample in the Netherlands
VOLUME 47 NO 2 102	1968	47	2	102	105	Milliman, J.D.; Supko, P.R.	San Andres Island is an uplifted limestone island in the Western Caribbean. Analogy with the surrounding islands and nearby mainland of Central America suggests San Andres to have a volcanic base, although bathymetric and magnetometer data indicate it to be deep-seated.	On the geology of San Andres islands, western Caribbean

VOLUME 47 NO 2 106	1968	47	2	106	111	Hulshof, A.K.; Jungerius, P.D.; Riezebos, P.A.	A volcanic ash deposit was found in a peat bog in the Semois valley near Arlon, Belgium. Palynological evidence points to an Allerød age. The volcanic minerals in Belgium and Luxembourg have previously been correlated with ash deposits of the same age in central Germany which resulted from eruptions in the Laacher See area at a time of westerly winds. Although the Laacher See is not excluded as a possible source of origin, the ash in Belgium differs from known Laacher See deposits in relative importance of brown amphibole and sphene, and absence of volcanic glass and pumice ("Bims"). The ash is the product of an eruption in the Eifel region during a period of northeasterly wind.	A late-glacial volcanic ash deposit in southeastern Belgium
VOLUME 47 NO 2 112	1968	47	2	112	113	Schot, E.H.; Park, W.C.		Note on the formation of stylolites
VOLUME 47 NO 2 114	1968	47	2	114	115	Manten, A.A.		Pre- or post-induration formation of stylolite seams: a reply
VOLUME 47 NO 2 116	1968	47	2	116	120	Butzer, K.W.; Freeman, L.G.	The published paleo-environmental data from the Cueva del Toll are discussed. The two pollen profiles by Donner-Kurtén and by Florschütz-Menéndez refer to the same stratigraphic units although there are small but ecologically significant differences between these profiles. The faunal evidence suggests strongly that the pollen sequence covers part or most of the Last glacial, as suggested by Donner and Kurtén. However, the climatic interpretation suggested by these authors to account for the fluctuations of AP: NAP pollen ratios seems open to question.	Pollen analysis at the Cueva del Toll, Catalonia: a critical re-appraisal
VOLUME 47 NO 2 121	1968	47	2	121	125	Vlerk, I.M. van der	A worldwide correlation based on an association of genera of larger foraminifera is unreliable. It proceeds from the wrong assumption that all these genera lived in the same milieu. Instead of this method of correlation another one is introduced. It is based on the experience that the curvature of the wall between the first and second chamber of the embryo of a megalospheric Lepidocyclina increases persistently when going from older to younger strata. This parameter is called the "degree of curvature". Investigations on both lepidocyclinas and planktonic foraminifers (by J.A. Postuma; see: Proc. Kon. Ak. Wet. Amsterdam, B,4, 1967,391-398) from a well documented section in East Java & Madura and 5 localities in Europe and America, combined with the examination of lepidocyclinas from Chattian, Aquitanian and Burdigalian localities in Europe led to the hypothesis: "same degree of curvature" = same age". Starting from this hypothesis the following conclusions are drawn (see table): 1 the boundary Oligocene/Miocene should be placed in the Globorotalia Kugleri - zone. 2. the Tertiary-e5 of the Far East is to be correlated with the Chattian, the Aquitanian and part of the Burdigalian of Europe. 3. the boundary Tertiary e/f should be placed within the Burdigalian. 4. the lepidocyclinas from an Aquitanian and from a Burdigalian locality in Europe have "degree's of curvature" which do not differ significantly (Student's t-test).	Evolutie van een embryo

VOLUME 47 NO 2 126	1968	47	2	126	130	Tjia, H.D.	The Lembang fault consists of a northward facing scarp, exposed over 22 kilometers, which in general strikes parallel to Java's longitudinal axis. Former investigators have attributed predominantly dip slip displacements to this fault. However, topographic, morphologic, and structural evidences indicate the western part of the Lembang fault, west of the Tjikapundung valley, during its latest development to be essentially strike slip in nature and possessing sinistral sense. The horizontal displacement ranges between 75 m and 250 m with an average of 140 m. Using the latter figure, it is found that the annual displacement amounts to at least 3 centimeters. The average ratio of strike slip to dip slip is 2 to 1, which is in agreement with the youngest recorded movement. The eastern part of the fault between Maribaja and Mount Pulusari is a dip slip fault and has exposed throws which range from 130 m to 450 m. Three important, tranverse faults caused the crestline to increase stepwise in elevation from west to east.	The Lembang fault, West Java
VOLUME 47 NO 2 131	1968	47	2	131	148	Houbolt, J.J.H.C.; Jonker, J.B.M.	The sedimentation in the eastern part of the Lake of Geneva was studied from cores and seismic profiler records, It was found that off the mouth of the Rhône river a sublacustrine channel with natural levees leads down to a depth of about 200m. The channel bottom and natural levees were found to be sandy, but outside the natural levees mud was encountered. Below a depth of about 200 metres the natural levees along the channel disappear and sand layers are found in the vicinity of the channel. The channel disappears completely at a depth of about 280 m. Around and below the point where the channel fades out, a fan-shaped sand body occurs, which reaches to the deepest part of the Lake, the central plain, at 309 m. The sediments on this central plain contain only a few very thin sand layers. The bottom of the sediment fill of the Lake was found to plunge to the east, The "top Molasse" reflector was lost halfway up the delta foreslope, at about 750 milliseconds.	Recent sediments in the eastern part of the lake Geneva (Lac Léman)
VOLUME 47 NO 2 150	1968	47	2	150	151	Booy, T. de		Mineral assemblages in Rotliegendes
VOLUME 47 NO 2 153	1968	47	2	153	153	Bijl, P.C.J.		Surface installations and operations
VOLUME 47 NO 2 154	1968	47	2	154	162			Boekbesprekingen
VOLUME 47 NO 2 163	1968	47	2	163	170			Geologisch en mijnbouwkundig nieuws
VOLUME 47 NO 2 171	1968	47	2	171	172			Genootschapszaken
VOLUME 47 NO 2 149(1)	1968	47	2	149(1)	149	Zwaan, P.C.		Edelstenen en hun dubbelgangers
VOLUME 47 NO 2 149(2)	1968	47	2	149(2)	150	Groen, D.M.W. te; Steenken, W.F.		Exploration and delineation of the Groningen Gas Field
VOLUME 47 NO 2 151(1)	1968	47	2	151(1)	151	Laan, G. van der		Petrophysics Groningen Gas Field
VOLUME 47 NO 2 151(2)	1968	47	2	151(2)	152	Udink, H.G.		Reservoir behaviour and field development Groningen Gas Field
VOLUME 47 NO 2 152(1)	1968	47	2	152(1)	152	Bor, A.M.W.		Drilling experience Groningen Gas Field
VOLUME 47 NO 2 152(2)	1968	47	2	152(2)	153	Willems, J.F.J.		Subsurface installations and operations Groningen Gas Field

VOLUME 47 NO 3 173	1968	47	3	173	185	Allen, J.R.L.	A bed form is any deviation from a flat bed, that depends for its origin on an interaction between a bed material and a fluid flow such that there occurs a spatially non-uniform transfer of material from bed to flow or between bed and flow. The occurrence of bed forms is independent of the precise nature of the fluid, whether a liquid or gas or a flow of granular matter, and also of the nature of the bed material, whether cohesionless or cohesive. In nature bed forms are generated by the wind and by sand avalanches, as well as by river, wave and tidal currents. Bed forms arise on surfaces of loose sand or gravel, on beds of mud or rock, and on surfaces of ice or hardened snow. An analysis of the more important of the determinative physical processes allows bed forms to be classified according to: 1) the orientation of the form and the directional properties of the parent flow system, 2) the character of the boundary on which the form arises, and 3) the dependence of the scale of the form on the scale of the parent flow system. By an application of these criteria, bed forms hitherto treated disparately are brought into revealing juxtapositions that suggest where general explanations of bed forms can be obtained in future.	On the character and classification of bed forms
VOLUME 47 NO 3 186	1968	47	3	186	190	Voo, R. van der	The results of detailed geological mapping in an anticlinal structure of Lower Triassic sediments are presented. For paleomagnetic studies 60 samples were collected of fine-grained red sandstones and their magnetic behaviour is analysed. Most of the samples contained only one type of magnetization, directed along the recent local geomagnetic field, and it is assumed that these magnetizations are secondary. About 25% of the samples appeared to have stable magnetizations with directions diverging from the present-day geomagnetic field in Spain. These directions, however, proved not to be characteristic for the Triassic geomagnetic field, since after unfolding their data were inconsistent.	Geology and Paleomagnetism of an anticlinal structure in Lower Triassic sediments near Atienza (Guadalajara, Spain)

VOLUME 47 NO 3 191	1968	47	3	191	196	Priem, H.N.A.; Boelrijk, N.A.I.M.; Hebeda, E.H.; Verschure, R.H.; Verdurmen, E.A.T.	(1) Rb-Sr measurements show that in the Avanavero region (Kabalebo River, north-western Surinam) deposition of the Dalbana and Matapi volcanics, and subsequent emplacement of the granite-quartzdiorite batholiths took place in a single orogenic period, approximately 1800-1900 million years ago. Since the Dalbana volcanics are generally correlated with the Iwokrama Formation in Guyana, this raises some doubts on the K-Ar age of $(2595 \pm 125) \times 10^6$ yr measured on riebeckite from the Makarapan Granite intruding the Iwokrama Formation (Snelling & McConnell, 1966). (2) A $(1200 \pm 100) \times 10^6$ yr old metamorphic event, designated as the Nickerie Metamorphic Episode, caused widespread rejuvenation of micas in north-western Surinam. Probably, a long, broad belt of overprinted age values down to $(1200 \pm 100) \times 10^6$ yr extends from south-eastern Guyana east-to-eastnortheastward through Guyana and northeastward through Surinam to the Atlantic coast. (3) Rb-Sr and K-Ar age determinations on a tuff from the Roraima Formation at Tafelberg, central Surinam, point to an age of $(1610 \pm 60) \times 10^6$ yr. Probably, both Roraima sedimentation and subsequent dolerite intrusions took place, approximately, 1600-1700 million years ago.	Isotopic age determinations on surinam rocks, 4 ages of basement rocks in North-Western Surinam and of the Roraima tuff at Tafelberg
VOLUME 47 NO 3 197	1968	47	3	197	198	Sijperda, W.S.; Vries, G. de	Using the rapid chromatographic technique described in part I 25 minerals have been analyzed. in order to obtain data concerning detection and Rf value	Mineral analysis by means of thin layer chromatography using liquid ion-exchangers. Part III Data on non-sulphidic minerals
VOLUME 47 NO 3 199	1968	47	3	199	205	Jungerius, P.D.; Riezebos, P.A.; Slotboom, R.T.	Laacher See ash of Allerød age, with a characteristic heavy mineral assemblage of brown amphibole, pyroxene and sphene, occurs as intercalations in the peat bogs of the western Eifel. Previously this ash has been attributed to eruptions of local maars and has erroneously been used to date these maars. It is here shown that the maar volcanism of the western Eifel terminated prior to the final Laacher See eruption.	The age of Eifel Maars as shown by the presence of Laacher See ash of Allerød age
VOLUME 47 NO 3 206	1968	47	3	206	208	Brunnacker, K.	The Quaternary deposits in the clay-pit of Kärlich near Koblenz have been re-examined. There are two gravel beds at the bottom, followed by a loam of back swamp deposits. They are followed by loess beds of some glaciation phases, the lowest of which is far more complex than the others, similar as has been found at Regensburg3Bavaria. The loess beds can be correlated with the four classical Alpine glaciations. A more detailed description is under preparation.	Das Quartärprofil von Kärlich/Neuwieder Becken
VOLUME 47 NO 3 209	1968	47	3	209	210	Heybroek, P.		Geologische waarnemingen op de Noordzee
VOLUME 47 NO 3 209F1	1968	47	3	209F1	210	Heybroek, P.	Big plate F1	Geologische waarnemingen op de Noordzee
VOLUME 47 NO 3 209F2	1968	47	3	209F2	210	Heybroek, P.	Big plate F2	Geologische waarnemingen op de Noordzee
VOLUME 47 NO 3 209F3	1968	47	3	209F3	210	Heybroek, P.	Big plate F3	Geologische waarnemingen op de Noordzee
VOLUME 47 NO 3 211	1968	47	3	211	212	Buskingm B.E.; B.I.P.M.		Het boren naar olie en gas op zee
VOLUME 47 NO 3 212	1968	47	3	212	213	Overzee, B.		A new coring apparatus for unconsolidated sediments
VOLUME 47 NO 3 214	1968	47	3	214	223			Boekbesprekingen
VOLUME 47 NO 3 224	1968	47	3	224	231			Geologisch en mijnbouwkundig nieuws
VOLUME 47 NO 3 232	1968	47	3	232	243			Genootschapszaken

VOLUME 47 NO 4 245	1968	47	4	245	273	Houbolt, J.J.H.C.	The recent sediments of the southern bight of the North Sea were studied mainly as a possible model for the interpretation of fossil sand bodies, The area examined lies between England, Belgium and the Netherlands. It is an area of strong tidal currents. A group of ridges were found to consist of sand and to rest on an essentially flat surface which is a continuation of the surrounding sea bottom. The ridges of the Well Bank area are asymmetric in cross section and are oriented parallel to the current direction. Sand seems to be transported obliquely over the gentle southwest slope of the ridges in a northerly direction towards the crest, whence it is deposited on their steeper northeast flank. This process gives rise to an internal cross-stratification which is visible on the sparker records. The ridges of the Well Bank area seem to be moving slowly northeastwards. Sparker records of the ridges formed by sand accumulation outside the Well Bank area revealed no internal structures and foreset directions observed in cores of them were found to be erratic and their asymmetry in cross section was found to be irregular. It is therefore impossible to deduce their internal structures from surface observations. It is certain, however, that they are all isolated sand bodies standing on a flat subsurface that is exposed outside their flanks. The fact that the flood current does not follow the same path as the ebb current gives some of these ridges very complicated forms (e.g. Flemish Banks and Haisborough Sand), In all cases, it can be stated that the sand of which these sand ridges consist is derived from the sea bottom and not directly from a river mouth. The sand in the ridges of the Well Bank area seems to have been derived from a glacial outwash fan formed in the area during the last glaciation.	Recent sediments in the southern Bight of the North Sea
VOLUME 47 NO 4 245	1968	47	4	245	273	Houbolt, J.J.H.C.	Large enclosure E1	
VOLUME 47 NO 4 245	1968	47	4	245	273	Houbolt, J.J.H.C.	Large enclosure E2	

VOLUME 47 NO 4 274	1968	47	4	274	279	Heide, S. van der	In this publication a review is given of the hydrogeological investigations in the Netherlands, After incidental research by private companies for water supply the first systematical studies in hydrogeology have been carried out by the Government Institute for Water Supply, which was founded in 1913. It was also this institute which stimulated the hydrogeological investigations by the Zuyder Zee Works. These developed to one of the most extensive in the Netherlands. Modern methods of investigations were introduced in 1951 with the application of geo-electrical methods to determine the boundary between fresh and salt water in the subsoil. As a result of the success of these methods geo-electrical research was further developed in the Netherlands and is applied now in several cases. Among other modern methods the investigations on C ¹⁴ and stable isotopes by Dr. J.C. Vogel have to be mentioned. Extensive new hydrogeological investigations commenced after 1953 as a consequence of the Delta Works in the southwestern part of the Netherlands, Extremely detailed hydrogeological information was obtained by these investigations. On the other hand hydrogeological research was undertaken, mainly after the war, in connection with agricultural problems. These are now dealt with by the Institute of Land and Water Management Research in Wageningen. Studies on ground water in the coal mines in South Limburg have been made and hydrogeological mapping of South and Central Limburg has been carried out by the Geological Bureau in Heerlen. Meanwhile a new institute has been founded with the special task of making hydrogeological maps of the Netherlands. This institute, Dienst Grondwaterverkenning TNO (Ground-Water Survey), includes both	A survey of the geohydrological and hydrological investigations in the Netherlands
VOLUME 47 NO 4 280	1968	47	4	280	290	Hermes, J.J.	Planidonic Foraminifera from the Seroe Mainsjie Formation of Curacao cannot be fitted with certainty into one of the biostratigraphic zones recognized by Bolli in Trinidad, although there is no doubt that the fauna is restricted to the upper part of the Middle Eocene.	Planctonic foraminifera from the Seroe Mainsji formation of Curacao
VOLUME 47 NO 4 291	1968	47	4	291	297	Suggate, R.P.	Radiocarbon-dated samples are discussed in relation to the local stratigraphic sequence, which records post-glacial transgression of the sea followed by regression during progradation of the shoreline. They indicate that sea level apparently rose from -17 m (-58 ft) 8,000 years ago and was still rising when it reached its present level about 5,000 years ago; less certainly the sea was at about -22 m (-73 ft) 9,400 years ago. A sea level 5,000 years ago substantially below that of the present day has been commonly advocated in The Netherlands and elsewhere, but a single post-glacial sea-level curve may not be applicable universally.	Post glacial sea-level rise in the Christchurch metropolitan area, New Zealand
VOLUME 47 NO 4 298	1968	47	4	298	298	Groot, K. de		De invloed van Mg ⁺⁺ -ionen op de precipitatie van calcium carbonaat.
VOLUME 47 NO 4 299	1968	47	4	299	304			Boekbesprekingen
VOLUME 47 NO 4 305	1968	47	4	305	308			Geologisch en mijnbouwkundig nieuws
VOLUME 47 NO 4 309	1968	47	4	309	310			Genootschapszaken

VOLUME 47 NO 5 311	1968	47	5	311	315	Hinte, J.E. van	The fundamental chronostratigraphic unit is the Stage. Each Stage has its own standard, a type section or stratotype. It is irrelevant whether these sections are "complete" and whether successive stratotypes overlap or not. The stratotypes merely form "reference points" in the ideal chronostratigraphic scale. In the future chronostratigraphic units will be defined as the rocks formed during the years a - b B.C.. Once the age is measured for beds of a known relative age, the traditional time-scale has done its service, Until then the definition of Stage boundaries mostly will be biostratigraphic and therefore cannot be but subjective and susceptible to changes with evolving paleontologic knowledge and concepts; rigid definitions lead only to fruitless discussions.	On the stage
VOLUME 47 NO 5 316	1968	47	5	316	329	Riezebos, P.A.	Knowledge of the mineralogical composition of silt fractions in weathering material is essential, as it may contribute to understand the relationships between mineral assemblages in sand and clay fractions. The shortcomings of bright field microscopy in the identification of such mineral fragments are discussed. The principles of phase contrast are briefly reviewed, as the application of phase contrast accessories, combined with the use of dispersion staining and variable monochromatic light, considerably facilitates the optical identification of these small mineral particles. A further advantage is that mineralogical information from both sand and silt fractions is obtained in the same way, so that alteration of mineral properties and other features are similarly observed and evaluated with decreasing grain sizes, The results of some investigated samples are presented and the data indicate that the mineral constituents produced by alteration and already present in the sand fractions, increase with decreasing silt sizes and that these alteration products are of detrital nature. It is concluded that in order to characterize and to understand the weathering sequence, a mineralogical analysis of sand and silt fractions is needed.	Phase contrast applied in the microscopic study of mineral particles in saprolites

VOLUME 47 NO 5 330	1968	47	5	330	339	Rocci, G.; Juteau, T.	After giving the definition of the initial magmatism, the authors insist on the typical petrographic associations without tackling the so much debated problem of spilitisation. The petrographic range of products given off during the initial magmatism goes from ultrabasic rocks to hypersiliceous acid keratophyres and includes plutonic rocks as well as true lavas. In so big a range it is difficult to know what kind of associations fits to reality. The American geologists for instance, represented by Turner and Verhoogen (1960) introduce a definite distinction between the spilite-keratophyre serie and the peridotite-serpentinegabbro association, considering the fact that the setting of these two groups appear independent. On the other hand the alpine geologists as their spokesman Vuagnat (1963) remarks, after precise field work observations, consider that the ultrabasicgabbro-diabase group cannot be dissociated and constitutes the ophiolitic suite. Therefore the authors of the present work wonder whether; 1) There are really two distinct associations, a basic and acid one i.e. spilite - keratophyre, the other one being ultrabasic and basic i.e. ultrabasites- gabbros-diabases. 2) And if so are the two associations really compatible in the same geosyncline? To answer these two questions two types of observations are made: one concerning the initial volcanism in the northern limb of the hercynian orogen, the other the geosynclinal magmatism in the alpine ranges. A brief comparison of the characteristics of these two types of phenomena leads to the following conclusion: the ultrabasic rocks are widespread in the alpine orogen but are very uncommon in the hercynian one, meanwhile the volcanic acid rocks appear in important masses only in the hercynian range. Consequently the	Spilite-Keratophyres et ophiolites influence de la traversee d'un socle sialique sur le magmatisme initial.
VOLUME 47 NO 5 340	1968	47	5	340	344	Levelt, T.W.M.; Quakernaat, J.	The mineralogical composition of clay fractions in samples of a series of borings between Onverwacht and Zanderij admits a subdivision of the sediments south of the lowland bauxite excavations near Onverwacht, Surinam. Layers with kaolinite, an abundance of illite, and with or without montmorillonite are Lelydorp and Demarara sediments. Deeper layers dominant in kaolinite, with traces to moderate amounts of illite, and sometimes montmorillonite seem to be Para sediments. These beds are deposited over sediments with kaolinite clays belonging to the Onverwacht/Coesewijne series. Where borings reach the weathered bedrock the clay is mostly pure, well crystallized kaolinite. A cross section of the zones of equal clay composition show a sedimentation pattern of layers with incised and refilled gullies. A correlation with the stratigraphy in the coastal plain is given.	Some results of profile drilling along the railroad between Onverwacht and Zanderij, Surinam

VOLUME 47 NO 5 345	1968	47	5	345	348	Buurman, P.; Plas, L. van der	In sands of the Onx and Om formations on the Belgian Condroz Peneplain both hydrated halloysite and dehydrated halloysite have been found in sandpits near Louveigné and Florzé. The occurrence of Florzé is accompanied with gibbsite. X-ray diffraction patterns, electronmicrographs, DTA, TGA, scanning calorimetric analyses and chemical analyses have been made of both samples and are reported. The material may have derived from the type locality of halloysite discovered near Angleur and described in detail by Berthier. Another possible origin is related with the climatological history of the early Ardennes peneplain.	The occurrence of halloysite and gibbsite in peneplain deposits of the Belgian Condroz
VOLUME 47 NO 5 349	1968	47	5	349	357	Jäger, E.; Zwart, H.J.	A number of radiometric Rb/Sr age determinations on muscovites, biotites and whole rock samples from various gneisses and granites of the Aston-Hospitalet massif have been executed. All apparent muscovite ages fall in the range of 255-274 m.y. dating the end of the Hercynian metamorphism. The biotites of the Aston massif give distinctly younger ages, as young as 113 m.y. This is probably due to a period of heating during a metamorphic episode in Mesozoic times. Total rock analyses were performed on eight granites and gneisses. Three of these analyses define an isochron of 475 m.y.; the other five scatter near a straight line corresponding to 300 m.y. Geological observations and Rb-Sr results suggest that these rocks were formed 475 m.y. ago and were remobilized during Hercynian metamorphism 300 m.y. ago. Because of the low initial Sr^{87}/Sr^{86} combined with extremely high Rb/Sr-ratios, a formation in Precambrian time can be excluded. The high Rb/Sr-ratios point to magmatic and not sedimentary origin. We therefore explain these rocks as Ordovician granites which were metamorphosed during the Hercynian orogeny.	Rb-Sr age determinations of some gneisses and granites of the Aston-Hospitalet Massif (Pyrenees)
VOLUME 47 NO 5 358	1968	47	5	358	359	Snelling, N.J.; Bignell, J.D.; Harding, R.R.	The results of Rb:Sr whole rock age determinations on Malayan granites are summarised. They indicate intrusion during the Upper Carboniferous, Triassic, and Upper Cretaceous. The Triassic granites appear to have been intruded during two episodes at circa 230 m.y. and 200 m.y. Most K:Ar ages on micas from the various granites show evidence of having been disturbed by both younger intrusions and other tectonic phenomena, and the simple assumption that K:Ar ages date the intrusion of the host granite is not necessarily valid.	Ages of Malayan granites
VOLUME 47 NO 5 360	1968	47	5	360	366			Boekbesprekingen
VOLUME 47 NO 5 367	1968	47	5	367	373			Geologisch en mijnbouwkundig nieuws
VOLUME 47 NO 5 374	1968	47	5	374	376			Genootschapszaken
VOLUME 47 NO 6 377	1968	47	6	377	377	Roorda, H.J.; Eisma, E.		Introduction Instrumental Analysis
VOLUME 47 NO 6 379	1968	47	6	379	393	Dijkstra, G.		Instrumental methods in the chemical analysis of minerals

VOLUME 47 NO 6 395	1968	47	6	395	404	Das, H.A.; Sijperda, W.S.	In geochemical work neutron activation analysis is rapidly gaining upon "classical" techniques such as wet analysis and emission spectrography. The main reason is that activation analysis permits the determination of both major and trace elements; it is a convenient method for the simultaneous determination of a large number of elements in small samples. Moreover, the method is very sensitive for most elements. The present paper deals with neutron activation analysis of rock samples, as performed at the Reactor Centrum Nederland, Petten (NH). The principles of activation analysis are discussed. Then, the determination of silicon, aluminium, iron, potassium, sodium, manganese, scandium, chromium, cobalt, rubidium and cesium is described in more detail. Results, obtained for rock standard G-2, are given.	The application of neutron activation analysis in geochemistry
VOLUME 47 NO 6 405	1968	47	6	405	406	Porrenga, D.H.; Versmissen, J.L.		A new automatic sample changer for the Philips X-ray diffractometer PW 1050
VOLUME 47 NO 6 407	1968	47	6	407	413	Porrenga, D.H.; Versmissen, J.L.	In X-ray spectrometry, full or partial automation of the sample preparation, intensity measurement and data processing has both advantages and drawbacks. Special attention is paid to a new automatic sample changer, which has been made at the Koninklijke/Shell Exploratie en Productie Laboratorium at Rijswijk as an accessory to a Philips vacuum X-ray spectrometer.	Aspects of automation in X-ray spectrometry
VOLUME 47 NO 6 415	1968	47	6	415	422	Fontijn, L.A.; Bok, A.B.; Kornet, J.G.	The article describes an electron probe X-ray micro-analyzer specially designed for mineralogical investigations and constructed for the Department of Mining Engineering of the Technological University, Delft. A miniature magnetic lens is used in the electron optics making it possible to employ a standard Leitz polarization microscope. The specimen can be rotated around the microscope axis and translated in two orthogonal directions.	The TPD electron probe X-ray micro analyzer
VOLUME 47 NO 6 423	1968	47	6	423	433	Vries, H.A.W. de; Bokhoven, C.	After giving a description of the reflectance-measuring equipment, the authors discuss the relation between degree of coalification (rank) and reflectance. Coal appears to become ever more anisotropic with increasing rank. The anisotropy observed in coal is reminiscent of the optical behavior of a negative mono-axial crystal. The respective merits of reflectance measurements in polarized and non-polarized light are compared; in this connection attention is given to the accuracy of the rank analysis. Further, a method of approximation is indicated for calculating the reflectance in non-polarized light from the reflectances measured parallel to the ordinary and extra-ordinary rays. In conclusion, the optical behaviour is correlated with the coal structure.	Reflectance measurements on coal

VOLUME 47 NO 6 435	1968	47	6	435	441	Jongbloed, W.L.; Porrenga, D.H.	Photographs have been made of a specimen of Operculina with an X-ray projection microscope, a light microscope and by means of microradiography. Comparison of the pictures obtained shows that, if original unsectioned specimens are examined, the two X-ray methods are superior to the lightmicroscope technique as regards both depth of focus and penetration power, These methods are moreover non-destructive and time saving. Results obtained also show that for the rapid and routine investigation of microfossils or for detailed study, the microradiography and X-ray microscopy methods are, respectively, equal or superior to the light-microscope technique,	Microradiography and X-ray microscopy in geology
VOLUME 47 NO 6 443	1968	47	6	443	449	Poole, J.B. le; Bok, A.B.; Boogerd, W.J.		An electron luminescence microscope
VOLUME 47 NO 6 451	1968	47	6	451	467	Dijkstra, S.; Bot, A.C.W.C.	The present paper deals with a number of aspects of different disciplines relevant to a geochemical investigation which was carried out in the southern part of the Dutch province of Limburg, in an area just north of a former Belgian lead-zinc mining district. Some information on the local geography and geology is briefly summarized, and the structural and stratigraphical controls of ore localization at depth are outlined. From the geochemical point of view the area showed several complex features regarding soil formation and lithology. Metal contamination by human activities constituted an additional problem, Soils and stream sediments displayed low lead and zinc contrast, and metal determinations of high precision were therefore required. Under these conditions dithizone field methods proved to be unsatisfactory, whereas good results were obtained with analytical methods based on atomic-absorption spectrophotometry. The laboratory procedures, which satisfied the particular precision requirements, are described and their applicability for general use in various types of geochemical exploration surveys is discussed. A new statistical method for the grouping of spatially related data is introduced, with the aid of this method geochemical contour maps were drawn and significant differences between a number of broad geochemical patterns could be established.	Some aspects of a geochemical investigation in an area with low anomaly contrast in S. Limburg (Netherlands)
VOLUME 47 NO 6 469	1968	47	6	469	478	Veen, A.H. van der	A linear relation is found between the available alumina content of bauxites from the mine Onverdacht in Suriname and the gibbsite-peak area as determined by d.t.a. (differential thermal analysis). Available alumina is an economic value, which can be determined by means of bomb digestion and subsequent filtration and titration procedures. These procedures are described in detail. The quantitative d.t.a. method, the apparatus applied and the procedures used, are also described and discussed in detail, Special attention is paid to reproducibility of the d.t.a. and to the systematic operator's errors in order to eliminate such errors as far as possible.	Quantitative analysis of the available alumina content by (D.T.A.) in bauxite from "Onverdracht", Surinam

VOLUME 47 NO 6 479	1968	47	6	479	486	Schenck, P.A.	This article is a short introduction to the theoretical and practical aspects of gas chromatography. Several applications in - mainly organic - geochemistry are presented. References are given to general and more specialised literature.	Gas chromatography its principles and applications in organic geochemistry
VOLUME 47 NO 6 487	1968	47	6	487	493	Engelhardt, E.D.		Mass spectrometry and some of its applications in organic geochemistry
VOLUME 47 NO 6 495	1968	47	6	495	498	Uytenbogaardt, W.	A review is given of the organisation of the Second International Summer School on Quantitative Methods in Reflected-Light Microscopy, held in Bensheim (near Frankfurt), Western Germany, 28 August - 2 September, 1967. The lectures given at this Summer School are mentioned and summarized.	Report on the second international summer school on quantitative methods in reflected-light microscopy
VOLUME 47 NO 6 499	1968	47	6	499	508			Boekbesprekingen
VOLUME 47 NO 6 509	1968	47	6	509	516			Geologisch en mijnbouwkundig nieuws
VOLUME 47 NO 6 517	1968	47	6	517	518			Genootschapszaken
VOLUME 47 NO 6 I	1968	47	6	I	I	Krol, G.L.		Van de voorzitter aan de leden
VOLUME 47 NO 6 II	1968	47	6	II	IV	Dijkstra, S.; Weeda, J.; Hols, A.; Tobi, A.C.; Visser, W.A.; Weehuizen, J.M.		Naar een genootschap - nieuwe stijl?
VOLUME 48 NO 1 1	1969	48	1	1	1	Krol, G.L.		Van de voorzitter aan de leden
VOLUME 48 NO 1 3	1969	48	1	3	7	Allen, J.R.L.	From a knowledge of the topography of skin-frictionlines, the paths of transported grains relative to the ground and to bed features are presented for different kinds of wave-like bed form encountered in aqueous flows. In the case of a sinusbed (antidunes), the height of the forms and their propagation velocity can be used without correction to measure the rate of downstream transport of sediment involved in the movement of the waves. The flow over a ripple or dune bed is separated' however, and within the forms there occurs a sediment stream moving backward relative to the external flow direction. The rate of downstream transport of sediment involved in movement of the waves is in these cases a net rate depending on the ratio of the thickness of the forward-moving and backwardmoving sediment streams. Thus estimates of bedload transport rate based on the full heights of ripples or dunes can be in substantial error.	The paths of grain through wave-like bed forms

VOLUME 48 NO 1 9	1969	48	1	9	33	Naha, K.; Mukherji, P.	In the "hook syncline" of central Rajasthan, India, the large metasedimentary bands of early Precambrian age, considered to form synclinal cores in the older basement gneisses, represent extensively migmatized palaeosomes. The curious, hook-shaped double closures in the map pattern of these palaeosomes are due to a superposition of tight upright folds with NS-striking axial planes on isoclinal reclined folds plunging westward, a feature duplicated in numerous examples in hand specimen and outcrop. The later folds, which vary in style from open in the southeast to isoclinal in the northwest, have caused a wide scattering in the orientation of the axes and axial planes of the first set of folds. Although the later folds always trend NS, they range in plunge from subhorizontal to vertical, depending on their location in the limbs and hinges of the early folds. Flexure modified by flattening and flow seems to have been the dominant mechanism in the evolution of the folds. Migmatization, which has transgressed the stratigraphic levels, is broadly synkinematic with the first deformation. The style and orientation of the folds of the two systems are mutually incompatible in any single deformation plan. The increase in the intensity of the second deformation westward near the contact of the younger Precambrian (Proterozoic) Delhi System of rocks suggests that it is connected with the Delhi orogeny, whereas the first folding on an EW trend is linked with an earlier orogeny, hitherto unrecognized in Rajasthan.	Analysis of large scale superposed folding in a migmatite terrain
VOLUME 48 NO 1 35	1969	48	1	35	65	Hermes, J.J.	A fauna of planktonic Foraminifera from the Late Albian of southern Spain is described. The genus <i>Ticinella</i> is discussed in some detail. The species of <i>Hedbergella</i> from the Albian and Cenomanian are reviewed	Late Albian foraminifera from the subbetic of Southern Spain
VOLUME 48 NO 1 67	1969	48	1	67	72	Hoorn, B. van	This preliminary study shows the existence of a submarine canyon during Upper Cretaceous time in the South-Central Pyrenees. Deposits filling up this canyon are mainly an alternation of thick limestone breccias and calcareous quartz sandstone layers in the western part of the area, grading into an alternation of limestone breccias, turbidites and blue marls in the east. A western location of the source area of breccia components is demonstrated by their stratigraphic record and measured current directions. After a short transport on a relatively steep slope in a submarine canyon, material was deposited in the canyon mouth building up submarine fans.	Submarine canyon and fan deposits in the Upper Cretaceous of the South-Central Pyrenees, Spain
VOLUME 48 NO 1 72	1969	48	1	72	74	Hermes, J.J.; Kuhry, B.	Observations in the Sierra Espuña region disprove paquet's assumption (1966a, 1966b, 1967, 1968) of the transgressive character of his "Auversian conglomerates" and thus of the emplacement of the upper tectonic units of the Betic of Málaga before the Auversian and after the Lutetian.	Remarks on the age of emplacement of the Betic of Málaga in the Sierra Espuña, Spain
VOLUME 48 NO 1 75	1969	48	1	75	78	Priem, H.N.A.		Strontium-isotopen en Rb-Sr chronometrie
VOLUME 48 NO 1 78	1969	48	1	78	79	Huisman, L.		De toekomstige drinkwatervoorziening van Nederland

VOLUME 48 NO 1 79	1969	48	1	79	80	Golterman, H.L.; Hogendijk, C.J.		Evenwichten tussen calciumcarbonaat en fosphaationen in zoet water.
VOLUME 48 NO 1 80	1969	48	1	80	80	Heege, J.P. ter		Karstverschijnselen
VOLUME 48 NO 1 81	1969	48	1	81	92			Boekbesprekingen
VOLUME 48 NO 1 93	1969	48	1	93	104			Geologisch en mijnbouwkundig nieuws
VOLUME 48 NO 1 105	1969	48	1	105	106			Genootschapszaken
VOLUME 48 NO 2 108	1969	48	2	108	109			Reakties op "naar een genootschap - nieuwe stijl?"
VOLUME 48 NO 2 110	1969	48	2	110	110	Pannekoek, A.J.		In memoriam Prof. Dr. J.P. Bakker
VOLUME 48 NO 2 111	1969	48	2	111	116	Voorthuysen, J.H. van		Introduction and summary of the stratigraphical and sedimentological results of boring alliance-28 in the coastal plain of Surinam (Dutch Guiana)
VOLUME 48 NO 2 117	1969	48	2	117	119	Porrenga, D.H.	The boron content of the clay fraction of 66 samples from the 338-m deep core hole Alliance-28 in Northern Surinam, indicates a marine palaeosalinity in the Paleocene-Eocene interval at about 295, 240 and 223 m depth, in the Pleistocene interval at about 80 m depth and also in the larger part of the Holocene interval. It furthermore suggests deposition in (almost) fresh water in the upper and lower part of the Paleocene-Eocene interval and in the Pliocene interval. Brackish water is indicated for some parts of the Paleocene-Eocene and the larger part of the Pleistocene intervals. The boron content is relatively high (60-140 ppm) in the clay fraction of calcareous and/or glauconitic sediments, markedly less (30-60 ppm) in sediments intercalated with brown coal and generally lowest (1040 ppm) in white kaolin layers.	Boron content of core samples from alliance-28, Surinam, as an indicator of paleosalinity
VOLUME 48 NO 2 121	1969	48	2	121	123	Hartman, P.	The clay mineralogical composition of about 75 samples is reported. Kaolinite and anatase are always present, and in some layers these are the only minerals in the clay fraction. In other layers kaolinite is associated with montmorillonite and/or disordered illite-montmorillonite mixed-layer minerals. In two layers illite is found, but always associated with the other clay minerals. In some samples traces of vermiculite and pyrite occur.	The clay minerals from the boring Alliance-28, Surinam
VOLUME 48 NO 2 125	1969	48	2	125	133	Wijmstra, T.A.	In this article the palynology of the Alliance well is discussed. From the pollenzones observed in this well the presence of Upper Cretaceous, Paleocene, Eocene, Miocene and Plio-Pleistocene strata could be proved. Also a correlation with marine micropaleontological horizons has been established.	Palynology of the Alliance well, Surinam
VOLUME 48 NO 2 125	1969	48	2	125	133	Wijmstra, T.A.	Large Enclosures	
VOLUME 48 NO 2 135	1969	48	2	135	161	Voorthuysen, J.H. van	This paper presents a description of the Foraminifera of the marine part of the geological column of the coastal plain of Dutch Guiana (Surinam) derived from the cored waterwell Alliance 28 to a depth of 337.50 m.	Holocene and paleocene foraminifera of boring Alliance-28 in Surinam (Dutch Guiana)
VOLUME 48 NO 2 163	1969	48	2	163	164	Noordermeer, E.J.; Wagner, C.W.	Large Enclosures	Preliminary note on the ostracod faunas of the boring Alliance-28 in Surinam (Dutch Guiana)
VOLUME 48 NO 2 163	1969	48	2	163	164	Noordermeer, E.J.; Wagner, C.W.		Preliminary note on the ostracod faunas of the boring Alliance-28 in Surinam (Dutch Guiana)

VOLUME 48 NO 2 165	1969	48	2	165	175	Lagaaij, R.	Two species of Bryozoa, identified as belonging to the genera <i>Nellia</i> and " <i>Vincularia</i> ", occur in some quantity in the Paleocene interval in the boring Alliance-28, drilled in the coastal plain of Surinam (Dutch Guiana). Both the <i>Nellia</i> and the " <i>Vincularia</i> " occur in assemblages virtually consisting of one single species. Recent assemblages in which <i>Nettia</i> makes up 80-100% of the total count indicate shallow inner-neritic (2-10 fathoms) conditions, coupled with slightly reduced salinities (<33‰). A similar environment is inferred for the Paleocene <i>Nellia</i> assemblage in the boring.	Paleocene bryozoa from a boring in Surinam
VOLUME 48 NO 2 177	1969	48	2	177	179	Regteren Altena, C.O. van	Molluscan remains have been studied from depths of 12.25, 15.00 and, 16.25 m and from sixteen levels from depths between 258.85 and 311.00 m. The fauna of the first series of samples agrees with the Recent fauna of the Surinam coast and seems to have lived at moderate depth, say about ten fathoms, off the coast in and on a muddy clay bottom with occasional sand bars, but without hard rock. The fauna of the second series is supposed to be of Palaeocene age on the base of the associated Foraminifera. The molluscan remains consist mainly of fragments and young specimens, for the greater part of oysters. These remains are too poor for specific identification. About ten families or genera can be recognised, among which <i>Vulsella</i> is remarkable. This genus, which is rare in the Tertiaries of the New World, is represented by several hinge fragments.	Mollusca from boring "Alliance-28" in Surinam (Dutch Guiana)
VOLUME 48 NO 2 181	1969	48	2	181	183	Hughes Clarke, M.W.	A problematic single-chambered microfossil is described from the Paleocene of boring Alliance 28 in Surinam (Dutch Guiana). Its possible affinities are briefly discussed.	A microproblematicum from the Paleocene of Surinam
VOLUME 48 NO 2 185	1969	48	2	185	188	Nota, D.J.G.		Geomorphology and sediments of Western Surinam shelf; a preliminary note
VOLUME 48 NO 2 189	1969	48	2	189	200	McConnell, R.B.; Masson Smith, D.; Berrange, J.P.	Geological and geophysical evidence points to the existence in the Guiana Shield between latitudes 3°N and 4°N of a steep-walled graben structure which is filled with a thick packet of sediments of which the uppermost is the Takutu Formation showing rare outcrops beneath a blanket of laterite and Quaternary alluvium. The Takutu Formation has been dated on palynological evidence (van der Hammen and Burger, 1966) as Jurassic to Cretaceous. A gravity reconnaissance was carried out over the western portion of the structure and revealed anomalies which indicate a depth to basement of several km. The strike of the geological structure appears to be ENE-WSW over 160 km, with a width of 50 km, and it is suggested that it is in the nature of a rift valley: it has been considered to constitute a major structural break which divides the folded Precambrian formations of Guyana into northern and southern geological provinces.	Geological and geophysical evidence for a rift valley in the Guiana Shield

VOLUME 48 NO 2 201	1969	48	2	201	213	Snelling, N.J.; McConnell, R.B.	The Precambrian rocks of Guyana occur in two geological provinces separated by a structural break followed in part by an infilled rift valley which traverses the country to the immediate south of latitude 4°N. North of this structure the folded and more or less metamorphosed sedimentary and volcanic rocks of the Barama-Mazaruni Assemblage and the gneissose granitic rocks of the Bartica Assemblage are intruded by members of the Younger Granite Group, and all are overlain with marked unconformity by the tabular, continental deposits of the Roraima Formation. Both the Roraima Formation and the pre-Roraima rocks are cut by dolerite dykes and sills which constitute the Younger Basic Intrusive Group, including the Roraima Intrusive Suite and a minor dyke suite. Age determinations indicate a younger limit to the post-Barama-Mazaruni-Bartica diastrophism of c.2000 m.y. This diastrophism is now termed the Akawaian episode and is believed to correspond closely in time to the emplacement of most of the Younger Granites. One member of the Mazaruni Group is possibly older than c.2500 m.y. A younger limit to the Roraima Formation of c.1700 m.y. is set by K-Ar and Rb-Sr age determinations on the dolerites of the Roraima Intrusive Suite and on micas of a contact hornfels in the Roraima Formation. In the southern geological province the major rock unit is the South Savanna Granite which intrudes high-grade gneisses (granulite facies) of the Kanuku Group and metasediments of the Marudi Group. A uranium-lead determination, though affected by uranium leaching, sets a maximum limit to the age of this granite of 2075 m.y., and Rb-Sr determinations indicate emplacement at c.1850 m.y. The granite shows evidence of dynamic	The geochronology of Guyana
VOLUME 48 NO 2 215	1969	48	2	215	224	Roeleveld, W.	Pollen diagrams have been made of two sections in the young coastal plain of Surinam (S. America). According to C 14 dates the clayey and peaty sediments have an early Holocene age. The pollen diagrams clearly show the changes of the vegetation caused by the postglacial ingression of the sea.	Pollen analysis of two sections in the young coastal plain of Surinam
VOLUME 48 NO 2 225	1969	48	2	225	259		VERSLAG VAN LEZINGEN GEHOUDEN OP DE HYDROGEOLOGISCHE DAG VAN DE KNGMG OP 24 JANUARI 1969 TE DELFT	Short communication
VOLUME 48 NO 2 261	1969	48	2	261	276			Boekbesprekingen
VOLUME 48 NO 2 277	1969	48	2	277	286			Geologisch en mijnbouwkundig nieuws
VOLUME 48 NO 2 287	1969	48	2	287	289			Genootschapszaken
VOLUME 48 NO 3 291	1969	48	3	291	292			Rede, uitgesproken door de voorzitter van het KNGMG, bij de aanbieding van de van Waterschoot van der Gracht penning aan Ir. C.E.P.M. Raedts op 15 maart 1969
VOLUME 48 NO 3 292	1969	48	3	292	294			Rede, uitgesproken door de voorzitter van het KNGMG, bij de aanbieding van de van Waterschoot van der Gracht penning aan Prof. Dr. L.U. de Sitter op 15 maart 1969
VOLUME 48 NO 3 294	1969	48	3	294	295			Afscheidscollege Prof. Dr. F.J. Faber

VOLUME 48 NO 3 296	1969	48	3	296	305	Egeler, C.G.; Simon, O.J.	The structure in the southeastern section of the Betic Zone reflects a highly complex evolution during the Alpine cycle, including several orogenic phases of different character. At least two major phases of overthrusting appear to have played a role in the formation of the nappe structures. A number of problems are briefly commented upon, including the direction and the age of the nappe movements and the amount of shortening.	Orogenic evolution of the Betic Zone (Betic Cordilleras, Spain), with emphasis on the nappe structures
VOLUME 48 NO 3 296	1969	48	3	296	305	Egeler, C.G.; Simon, O.J.	Large Enclosure 1	Orogenic evolution of the Betic Zone (Betic Cordilleras, Spain), with emphasis on the nappe structures
VOLUME 48 NO 3 296	1969	48	3	296	305	Egeler, C.G.; Simon, O.J.	Large Enclosure 2	Orogenic evolution of the Betic Zone (Betic Cordilleras, Spain), with emphasis on the nappe structures
VOLUME 48 NO 3 306	1969	48	3	306	306	Hageman, B.P.		Preface INQUA Subcommission on the Study of the Holocene and that on Baltic and North Sea Shorelines, held in the Netherlands in October 1968
VOLUME 48 NO 3 307	1969	48	3	307	334	Kukla, J.	The worldwide repeated changes of climate through the whole Quaternary era make it clear that the recent general weather conditions will not last forever, but will be substituted by a severe Glacial stage, similar to those recorded in the close geological past. It is highly important for humanity to know, at what time the climate deterioration is to be expected, which processes are ruling it and how to fight the incoming cooling trend. The first results of a new method are described, based on the calculation of the main part of the past earth's heat budget. The heat reaction of the snowline is detected as being the principal key controlling the global climate change and as strongly amplifying any slight thermal impulse of interplanetary or terrestrial origin. The perturbations of the earth's orbital elements are found to be responsible for the general long-time climatic changes including the start and the end of the Holocene interglacial. The convincing proof for this statement lies in the isotope dated geological evidence of the past 250,000 years. We are now able to date astronomically the various gross past climatic trends with a relatively high accuracy. The short-range oscillations of climate observed during Holocene, may partly reflect the short-time movements of earth's rotational axis and/or the changes of the solar constant, both up to now very poorly investigated. Strong suspicion, however, exists that the Little Ice Ages of the Late Holocene and the global warming which started at around A.D. 1890 are both the results of mans activity. Further investigation in this branch is urgently needed, because the pronounced weather deterioration is expected to come in the close future.	The cause of the holocene climate change
VOLUME 48 NO 3 335	1969	48	3	335	342	Jelgersma, S.; Regteren Altena, J.F. van		An outline of the geological history of the coastal dunes in the Western Netherlands

VOLUME 48 NO 3 343	1969	48	3	343	347	Hoffmann, D.	Investigation of the marsh area of Sylt during 1965-66-67 yielded new data regarding the development of Sylt during the Holocene. Three transgressions of the sea were established. The deposits of the first belong to the Calais (according to Brand et al. 1966) and the others to the Dunkirk. The ages of the transgressions were determined by means of ¹⁴ C-analysis and cultural layers. South of Westerland, the finegrained facies of the second transgression indicates that the area was well protected by the "Geestkerne" and the southern beach-barrier of the island.	The marine holocene of sylt - discussion of the age and facies
VOLUME 48 NO 3 349	1969	48	3	349	361	Olausson, E.	Due to the present drainage pattern the North Atlantic receives much more weathered products than the other oceans do. Dissolutions and oxidations at the bottom of the North Atlantic seem to change in time, being climatologically controlled. The dissolution of carbonates in North Atlantic has been intensified during ice ages mainly in the zone of Polar Bottom Water. During the Main (Upper) Würm the Arctic Ocean was not ice covered because of the absence of a salinity discontinuity (halocline). It is believed that an intense formation of bottom water occurred there and that this water then flushed the North Atlantic bottom and caused the increased dissolution of carbonates. At the transition Alleröd/Younger Dryas (Würm/Flandrian boundary) the Arctic Ocean was covered by a pack-ice. The developed halocline stopped the sink water formation. Then the outflow of cool bottom water to the Norwegian Sea dropped suddenly. The lack of this bottom water caused an increased carbonate deposition in the North Atlantic approximately 11,000 B.P., and somewhat later on, a decrease of it occurred in the Indian and Pacific Oceans (see fig. 1). The isotopic paleotemperature method has been found invalid. The percentages of warmwater-indicating foraminifera suggest that the North Atlantic gradually became warmer from the Alleröd up to the climatic optimum about 6000 B.P. The precipitation in the arid lands around the Gulf of Aden during the late Würm and Flandrian are given in Fig. 6. The highest precipitation during aforementioned times occurred during the Atlantic subage and the lowest one during the Preboreal subage. It is suggested that the Red Sea was dry during maximum of the Main (Upper) Würm Ice age. A marked change in the vertical circulation	on the Würm - Flandrian boundary in Deep-sea cores
VOLUME 48 NO 4 363	1969	48	4	363	371	Morrison, R.B.		The pleistocene-holocene boundary: an evaluation of the various criteria used for determining it on a provincial basis, and suggestions for establishing it world-wide
VOLUME 48 NO 4 373	1969	48	4	373	388	Hageman, B.P.		Development of the western part of the Netherlands during the holocene

VOLUME 48 NO 4 389	1969	48	4	389	399	Mörner, N.A.	This is a short description of the results concerning shorelevel displacement, isostasy, eustasy and climatic changes obtained from a comprehensive investigation of the Late Quaternary history of the Kattegatt Sea and the Swedish West Coast (Southern Scandinavia). This investigation has been described in its entirety in a thorough monography (Mörner 1969), to which I refer for further information.	Eustatic and climatic changes during the last 15,000 years
VOLUME 48 NO 4 401	1969	48	4	401	408	Kliewe, H.		Zur Pleistozän/Holozän-grenze im südlichen peribaltischen raum
VOLUME 48 NO 4 409	1969	48	4	409	414	Boersma, J.R.	Ebb mega-ripples on a sandy shoal in the Westerschelde estuary (SW-Netherlands) were studied in crosssection. The internal structure is dominated by large scale ebb-directed cross-stratification of a particular type showing flood induced erosional and/or depositional modifications. The characteristics betraying the tidal origin of the crossstratified structure are: 1.. Erosional unconformities (diastems) between the successive cross-stratal bundles that build one large scale set. 2. Regular alternations between such bundles and conformably inclined solitary trains of small scale sets containing upslope directed cross-strata. 3. The isolated occurrence of a ± 1 dm thick coset of small scale cross-strata conformably intercalated between two of the above mentioned bundles. 4. (Sub)horizontal cosets of small scale cross-stratification erosively separating vertically successive large scale ebbsets. The above mentioned features confirm the subordinate and rather erosional activity of the flood currents as compared with that of the ebb.	Internal structure of some tidal mega-ripples on a shoal in the Westerschelde estuary, the Netherlands report of a preliminary investigation
VOLUME 48 NO 4 415	1969	48	4	415	426			Boekbesprekingen
VOLUME 48 NO 4 427	1969	48	4	427	447			KNGMG notulen van de 57e Gewone Algemene Vergadering 1969
VOLUME 48 NO 5 0	1969	48	5	0	0			VERHANDELINGEN, DEEL 26, 1969, rectificatie pagina 157
VOLUME 48 NO 5 449	1969	48	5	449	450	Vooy's, G.J. de		Ter herdenking Dr. Ir. Th. Groothoff
VOLUME 48 NO 5 451	1969	48	5	451	465	Jones, M.P.		The tin industry

VOLUME 48 NO 5 467	1969	48	5	467	480	Oele, E.	A geological map of the Dutch part of the North Sea, north of 53°20' lat. is presented. Fluvioglacial clays of the Elsterian glaciation are presumed to underlie the younger deposits. During the Saalian glaciation the clay was partly eroded by glaciers, which led to the formation of the central deep southeast of the Dogger Bank, the bank itself being an erosion rest. At the same time boulder clay of Scandinavian origin was deposited. Deposits of the Holsteinian and Eemian interglacials have not been found. Owing to the rapid rise of the sea level supply and sedimentation could not keep up with it. During the Early- and Late-Weichselian fluvial clays were deposited, while coversands were laid down during Weichselian Pleniglacial times. The surface of the fluvioglacial clay in the central deep remained uncovered owing to strong winds. The Holocene sequence starts with a basal peat bed, on top of which fresh-water clay settled. The transgressing sea led to the formation first of brackish to marine clayey, later of sandy deposits. (Elbow deposits). During the Atlantic and Subboreal no sediments were deposited. In the present Subatlantic a reworking and deposition of the material present led to the formation of the young seasand bed.	The quarternary geology of the Dutch part of the North Sea, north of the Frisian Isles
VOLUME 48 NO 5 467	1969	48	5	467	480	Oele, E.	Large Enclosure	The quarternary geology of the Dutch part of the North Sea, north of the Frisian Isles
VOLUME 48 NO 5 481	1969	48	5	481	493	Hutchison, C.S.; Dhonau, T.J.	The island-arc system of the Philippines, which includes the well-known Zambales alpine complex, continues westwards along Palawan island and along the Sulu archipelago into North Borneo. Within this arc, there is a characteristic association of ultramafic rocks, banded amphibolites of gabbroic composition, and a younger flysch sequence characterised by abundant spilites. In the Darvel Bay area of east Sabah (North Borneo), the ultramafic rocks are shown to be concordantly interfoliated with the banded amphibolites. The folding, which is predominantly along an east-west axial direction, has been accompanied by dynamothermal metamorphism characteristically to almandine-amphibolite facies. An increase in metamorphism to hornblende-granulite facies occurs in a "thermal aureole" of the syntectonic ultramafic body in central Darvel Bay. The island-arc system has been subjected to several periods of deformation, the youngest of which was accompanied by greenschist facies metamorphism, which has affected not only the ultramafic-metabasite association, but also the overlying flysch sequence and has converted many of the spilites to amphibolites. Structural data indicate that ultramafic intrusions accompanied both the older and the younger periods of deformation. Subsequent intense faulting has further obscured the earlier tectonic history of the ultramafic association.	Deformation of an alpine ultramafic association in Darvel Bay, East Sabah, Malaysia

VOLUME 48 NO 5 495	1969	48	5	495	496	Visscher, H.		Palynologie en classificatie van Perm en Trias in West-Europa
VOLUME 48 NO 5 496	1969	48	5	496	496	Gradstein, F.M.		Palynostratigrafische problematiek van de "Lettenkohle" in Zuid-Frankrijk
VOLUME 48 NO 5 497	1969	48	5	497	497	Schilp, R.		Surface protection around abandoned mine shafts
VOLUME 48 NO 5 499	1969	48	5	499	508			Boekbesprekingen
VOLUME 48 NO 5 509	1969	48	5	509	523			Geologisch en mijnbouwkundig nieuws
VOLUME 48 NO 5 525	1969	48	5	525	527			Genootschapszaken
VOLUME 48 NO 6 529	1969	48	6	529	544	Westra, L.; Elbers, F.J.; Sijperda, W.S.	A geological map, short description and general petrological discussion is given of a small part of Svecofennian in SE-Sweden. The problems concern a relatively small sedimentary complex and surrounding granite gneisses, hybrid diorites, migmatites and associated "younger" granites. Structural analysis has revealed that deformation has taken place in at least two phases. The first phase is characterized by isoclinal folding of the bedding plane with horizontal axial plane and generation of axial plane schistosity of newly formed mica. The second and dominant deformation phase is characterized by parallel, often plastic, folding with vertical axial plane. The metamorphism linked with this second phase is characterized by the crystallization of andalusite and sillimanite in sediments of appropriate composition. Moreover, this deformation is accompanied by extensive migmatization and the intrusion of granite dikes, the so-called "younger" granites. A mushroom-like interference pattern of superposed folds from both phases is extensively discussed. A new geochemical test is applied to establish the depth of intrusion of the "younger" granites. This test is based on the variation of the eutectic composition of a granitic melt at varying pressures, as determined experimentally by von Platen and Höller (1966). The results suggest a rather shallow depth of intrusion, which corresponds to the type of the broadly contemporaneous metamorphism of the associated sediments. Results of the analysis of trace elements of the "younger" granites, especially the low K/Rb-ratio, indicate an anatectic origin of these granites.	Investigations in the Västervik area, southeastern Sweden - 1. Structural geology and genesis of the "younger" granites
VOLUME 48 NO 6 529	1969	48	6	529	544	Westra, L.; Elbers, F.J.; Sijperda, W.S.	Large Enclosure	Investigations in the Västervik area, southeastern Sweden - 1. Structural geology and genesis of the "younger" granites
VOLUME 48 NO 6 545	1969	48	6	545	547	Priem, H.N.A.; Boelrijk, N.A.I.M.; Hebeda, E.H.; Verschure, R.H.; Verdurmen, E.A.T.	Whole-rocks of three granites and a gneiss from the Västervik area, south-eastern Sweden, have a Rb-Sr age of 1750 ± 50 million years: (late) Svecofennian. Age measurements on three separated biotites disclose the imprints of younger, probably Gothian events, but a discordance exists between the K-Ar and Rb-Sr ages: 1465 ± 30 and 1380 ± 50 million years, respectively. A pegmatite yielded a Rb-Sr whole-rock age of 1425 ± 50 million years.	Investigations in the Västervik area, southeastern Sweden - 2. Isotopic age determinations
VOLUME 48 NO 6 549	1969	48	6	549	558	Botman, A.G.	A description is given here of the development of ideas and activities that have led to the introduction of a new method of mining deep, thick, flatly dipping pegmatite reefs at Kamativi, Rhodesia.	Mining of wide, flatly dipping reefs at Kamativi tin mines LTD., Rhodesia

VOLUME 48 NO 6 559	1969	48	6	559	564	Zijderveld, J.D.A.; Jong, K.A. de	The directions of magnetization of five volcanic units of the Late Paleozoic rock sequence from the Eastern Lombardic Alps, each sampled at one site, display small within unit dispersion and rather large between-unit dispersion. They yield a mean direction of $D = 135^\circ$, $I = -21^\circ$ ($\alpha_{95} = 20^\circ$), which is as divergent from the Late Paleozoic paleomagnetic field in the Alpine Foreland as the directions of contemporaneous rocks in other places in the Southern Alps. The characteristic magnetization direction of the Middle Triassic porphyrite of Valle di Scalve is $D=161^\circ$, $I=-21^\circ$. It is remarkably similar to the Late Paleozoic results and rather different from other Triassic paleomagnetic directions from the Southern Alps. Both the Late Paleozoic and the Triassic paleomagnetic directions indicate a counterclockwise rotation of the Southern Alps with respect to the Alpine Foreland (about 50°). There is no clear paleomagnetic evidence of large translational megatectonic movements between the Southern Alps and the Alpine Foreland.	Paleomagnetism of some Late Paleozoic and Triassic rocks from the eastern Lombardic Alps, Italy
VOLUME 48 NO 6 565	1969	48	6	565	571	Montfrans, H.M. van; Hospers, J.	Continental sediments of Quaternary age from the Netherlands have been investigated palaeomagnetically. The evidence available at present concerning the stratigraphical position of the Matuyama-Brunhes geomagnetic field reversal (0.70 m.y. ago) places this boundary in or directly above the "Cromerian" interglacial stage. It is known that in the Netherlands the "Cromerian" interglacial stage was preceded by and followed by three glacial stages.	A preliminary report on the stratigraphical position of the Matuyama-Brunhes geomagnetic field reversal in the Quaternary sediments of the Netherlands
VOLUME 48 NO 6 573	1969	48	6	573	581			Boekbesprekingen
VOLUME 48 NO 6 583	1969	48	6	583	588			Geologisch en mijnbouwkundig nieuws
VOLUME 48 NO 6 589	1969	48	6	589	592			Notulen van de Buitengewone Ledenvergadering oktober 1969
VOLUME 49 NO 1 1	1970	49	1	1	11	Maas, W.	Dutch Statemines conducted until 1965 research for underground operations in the <i>Centraal Proefstation</i> . The present paper sketches the image formed on the occurrence of methane in the underground works, its release during mining operations, the method of safe dilution, and the removal in high concentrations. It gives measures taken to prevent ignition possibilities and finally describes how using the results of this research the Inspectorate allowed to increase the methane percentage in the general body of the air from 1.5 to 2 %.	Research on ventilation and safety and its application at Dutch state mines

VOLUME 49 NO 1 13	1970	49	1	13	21	Allen, J.R.L.	The maximum slope angle assumed by heaped granular solids is of considerable interest in geology, geomorphology and soil mechanics, as also is the slope stability of such heaps. Representing the solids by equal spheres, we here deduce that the relationship between the maximum slope angle (angle of initial yield) and the concentration of equal spheres arranged haphazardly in bulk in the gravity field is $\tan \Phi_i = k_1 C - k_2 + A$, in which Φ_i is the angle of initial yield, C is the fractional volume concentration, k_1 and k_2 are known constants depending on the properties of equal spheres in regular cubical and rhombohedral array, and A is a variable dimensionless coefficient representing frictional, electrostatic and other non-gravitational forces. This relationship is broadly confirmed by experiments using glass beads of two different narrow size ranges, though the experiments are not of a high order and accuracy. It is of interest that a natural sand, well sorted compared with other sands but still showing an approximately 1 : 4 range of sizes, also conforms to the relationship deduced for equal spheres.	The angle of initial yield of haphazard assemblages of equal spheres in bulk
VOLUME 49 NO 1 23	1970	49	1	23	39	Engelen, F.H.C.	In 1881 flint-working sites were discovered in the south of the Netherlands, in the neighbourhood of Maastricht near the Belgium border. Specially Belgium archeologists from the university of Liege did field work in this site till 1953. In 1914 the first shaft and a mining gallery were found in the wall of a small ravine. During 1923-1925 Prof. Dr. v. Giffen and Dr. v.d. Sleen were the first archeologists of Dutch origin who did some succesful excavations. In 1964 Prof.Dr. Waterbolk from the Biological Archeological Institute of the Groningen University discovered a couple of shafts more than 140 meters from the ravine. So he proved that a very extended mining-activity had existed in neolithic times. At that time, twelve members of the Netherlands Geological Association planned to continue the excavations by digging a gallery from the first-discovered flintmines up to the new shaftfield. This gallery will have a total length of ± 140 m. At both sides 10 meters of the chalk-rock had to be explored on prehistorical mining activities. The members of the group, working in the week-ends during more than 4 years, made a gallery of 100 meters length already and penetrated into the prehistorical flintmines. They have dug out more than 500 meters of ancient galleries and discovered about 35 shafts. A deep insight has been obtained in the mining-system of the neolithic miners, who used the pillar and room system and made shafts of ± 10 meters deep. More than 7500 flint-picks, used during the work, have been found, some deerhornpicks, charcoal and a human skull. A radio-carbon determination of the charcoal dated the prehistorical mining activities at 3150 (± 60) before Christ. During the more than four years of excavations the working method was modernized. Starting	De oudste mijnbouw in Nederland

VOLUME 49 NO 1 41	1970	49	1	41	55	Loon, A.J. van	Pebbly mudstones are known from many syntectonic sediments. Since particles of clay size can only be deposited in very quiet water, in which pebbles cannot be transported, the occurrence of pebbles and, a clayey matrix proves that such sediments must have been transported by mass movement. If the matrix of the pebble-containing sediment consists of sand grains, the sediment could have been deposited grain after grain. But here too it may have been transported by mass movement, which can sometimes be proved if the matrix grades from sand to silt or even clay size. Three examples from the Upper Carboniferous of the Cantabrian Mountains (N. Spain) are described. Attention has been paid to the characteristics of the pebbles, from which the mechanism of deposition can be reconstructed.	Grading of matrix and pebble characteristics in syntectonic pebbly mudstones and associated conglomerates with examples from the carboniferous of Northern Spain
VOLUME 49 NO 1 41	1970	49	1	41	55	Loon, A.J. van	Large Enclosure	Grading of matrix and pebble characteristics in syntectonic pebbly mudstones and associated conglomerates with examples from the carboniferous of Northern Spain
VOLUME 49 NO 1 57	1970	49	1	57	60	Voorthuysen, J.H. van		Preliminary note on pleistocene sealevel fluctuation in the southwestern parts of the Netherlands
VOLUME 49 NO 1 61	1970	49	1	61	64	Paquet, J.		Transgressivite de l'eocene suprieur dans les malaguides de la Sierra de Espuña (Cordilleres Betiques, Sud est de l'Espagne) mise au point
VOLUME 49 NO 1 65	1970	49	1	65	69			Boekbesprekingen
VOLUME 49 NO 1 71	1970	49	1	71	84			Geologisch en mijnbouwkundig nieuws
VOLUME 49 NO 1 85	1970	49	1	85	87			Genootschapszaken: AAPG zusterorganisatie

VOLUME 49_NO 2_89	1970	49	2	89	118	Kuenen, P.H.; Sengupta, S.	<p>In a circular flume (diameter 4 m) suspension currents were generated with various kinds and concentrations of clay (lutum) and sand. Starting from maximum velocity (230 or 300 cm/sec) samples were drawn off at successively lower velocities at three levels. The amount in suspension coarser than 33 microns was measured and for a number of representative cases grain size analyses of these sands were made. There is an increase in median and amount from the higher to lower levels. At current velocity of 48 cm/sec particles smaller than 38 microns are not concentrated towards the bottom. At higher velocities there is even concentration upwards in some cases for grains smaller than 150 microns. The results demonstrate that the concepts of competency and capacity are strongly interrelated, the grain size distribution of the load in suspension depending on the original charge placed in the flume. The deposits tended to show log-normal distribution, the steepness of the cumulative curve depending on the composition of the suspension. All grain sizes in suspension were involved in the deposit forming. This was not due to current fluctuations and only partially to entrapment of fines between coarser grains. The coarser the fraction the more is abandoned relatively. For this reason the remaining suspension does show a decreasing median. The lutum greatly increases the carrying power, especially for finer grain sizes, the strongly flocculated Wadden Sea lutum having the greatest influence. The quantitative results are presumably roughly applicable to the lower part of turbidity currents. However, the exchange with higher levels is excluded in the experiments, and the paddles cause increased turbulence. Spiral flow is another drawback.</p>	Experimental marine suspension currents, competency and capacity
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VOLUME 49 NO 2 119	1970	49	2	119	133	Riezebos, P.A.; Slotboom, R.T.	<p>Descriptions of cores from Holocene sediments in the Mark and Weerijns valleys (Province of Noord-Brabant, The Netherlands) allow the distinction of two groups of profiles. Those of the first group show humous sand at the top, underlain by peat. The sand may be more clayey at the base. In the present paper, this sand is indicated as a type I deposit. In the second group of profiles the peat contains an intercalated fine-sandy clay layer, indicated as a type II deposit. The thickness of this layer varies strongly, and the over- and underlying peat may be partially or wholly absent. Field observations point to a high-water origin of the type I deposits.</p> <p>Micropaleontological data from deposits of type II appear to indicate deposition in a fresh-water environment. Heavy-mineral data from type I and II deposits suggest a common source of origin. Grain size analyses, however, show a marked difference between the two types. This difference in grain-size distribution is attributed to an enrichment of type I deposits by cover sand. Palynological investigation of four complete cores showed that sediments of type I have been deposited in both valleys since the early Middle Ages. In the Mark valley, the deposition of type II started with the Atlantic and continued at least up to the Subatlantic. The formation of this type of deposit in the Weerijns valley appears to be confined to the Subboreal. The earlier sedimentation in the Mark valley is thought to be due to the post-glacial rise of the phreatic surface and to a deeper level of the Mark valley bottom. The presence of type II sediments of Atlantic and Subboreal age intercalated in peat, suggest that this relative rise of the phreatic surface was stronger during the Atlantic and Subboreal.</p>	Some data on the Holocene deposits in the Mark and Weerijns valleys (prov. Of Noord-Brabant, the Netherlands)
VOLUME 49 NO 2 135	1970	49	2	135	144	Tjia, H.D.	<p>All frequently occurring positive shore lines and a few of the submerged strand lines of the Sunda Land, i.e. comprising the Sunda Shelf, Malayan Peninsula, eastern rim of Sumatra, South and West Kalimantan (Borneo), can be correlated with the classical examples of Quaternary shore lines of the Mediterranean and elsewhere. The submarine shore lines of the Sunda Land are at depths of -82-90 m, -67 m, -60 m, -50-51 m, -45 m, -36 m, -30-33 m, -28 m, -18-22m, -13 m, -10 m, and -7 m. Elevated beaches above the present sea level are at +10-12 m, +16-18 m, +30-33 m, and +50 m. Variable sea levels of the past 6,000 years left traces at a few meters below till about 6 meter above the present sea stand. Warping appears to be indicated along the western margin of the Sunda Land where on one side submergence amounting to 30 m and on the other side emergence of 30 m have occurred since the last glaciation.</p>	Quaternary shore lines of the Sunda land Southeast Asia

VOLUME 49 NO 2 145	1970	49	2	145	157	Eden, J.G. van	A regressive sequence of Eocene sediments is exposed in an area West of Tremp (South-Central Pyrenees, Spain). The sequence forms part of deposits formed in the Upper Cretaceous-Eocene marginal basin south of the Pyrenees. Insignificant amounts of continental and littoral deposits are preserved on the north coast of this marginal basin. In the studied areas, however, on the eastern margin of the basin, a variety of continental environments is found. Three formations are distinguished within the Eocene deposits. At the base is the Roda Formation with a regressive marine series of limestone, marl, and sandstone. Partly overlying this formation and partly laterally transitional to it is the Montaña Formation, with continental and littoral deposits. The Santa Liestra Formation, formed after a major regressive phase, is the youngest. The distribution of these formations on the geological map and their main sedimentary facies are presented in figure 1. The Montañana Formation is regarded as a deltaic association. Two major sedimentary environments are distinguished: (1) a flood-plain environment with fluvial sandstones, conglomerates and finer sediments of the inter-distributary lagoons and swamps, and (2) a transitional environment with channel mouth, bay, tidal flat, and deltafront deposits, containing marine fauna. Two types of large-scale cross-bedding, with different origins are compared. One is interpreted as river subdeltaic formations in lagoons, while the other has been formed by lateral deposition in a migrating river channel. Several small sedimentary structures occur, of which "current crescent marks" and "longitudinal furrows-and-ridges" are discussed in some detail. Excellent exposure of the Montañana Formation provided the opportunity for an almost	A reconnaissance of deltaic environment in the Middle Eocene of the south-central Pyrenees, Spain
VOLUME 49 NO 2 159	1970	49	2	159	160			Jhr. Dr. Ir. P.J.C. de Wijckerslooth de Weerdesteijn (1904-1969)
VOLUME 49 NO 2 161	1970	49	2	161	163	Reinhardt, B.M.		On the genesis and emplacement of the ophiolites in the Oman mountains "Geosyncline"
VOLUME 49 NO 2 165	1970	49	2	165	173			Boekbesprekingen
VOLUME 49 NO 2 175	1970	49	2	175	184			Geologisch en mijnbouwkundig nieuws
VOLUME 49 NO 2 185	1970	49	2	185	187			Genootschapszaken
VOLUME 49 NO 3 189	1970	49	3	189	189			Van de voorzitter aan de leden
VOLUME 49 NO 3 191	1970	49	3	191	196			Rede uitgesproken door de voorzitter van het genootschap bij de uitreiking van de van Waterschoot van der Gracht penning aan de Prof. Dr. Ir. R.W. van Bemmelen
VOLUME 49 NO 3 197	1970	49	3	197	198	Drent, S.		Ter herdenking Prof. Dr. G.J.A. Grond 1890-1970
VOLUME 49 NO 3 199	1970	49	3	199	210	Zussman, J.		Lunar rocks and minerals

VOLUME 49 NO 3 211	1970	49	3	211	220	Allen, J.R.L.	The use of the sphere as the ideal sedimentary particle is criticised and the prolate spheroid (ellipsoid of revolution) is proposed as a more realistic alternative. Equal prolate spheroids identically oriented in space can be packed in six ways analogous to the six packings of equal spheres. The volume concentration of spheroids in systematic packing is identical with the concentration of spheres in the equivalent packing, except in cases of "cubic" packing in which concentration is a function of spheroid orientation and axial ratio. The dilatation angle of assemblages of prolate spheroids is a function of type and orientation of packing and of spheroid orientation relative to the direction of displacement. The maximum angle of initial yield of packings of spheroids is also dependent on type and orientation of packing and on spheroid orientation. The implications of these findings for the steepness and stability of slopes formed on loose granular materials are discussed.	The systematic packing of prolate spheroids with reference to concentration and dilatancy
VOLUME 49 NO 3 221	1970	49	3	221	233	Trojer, F.		Mikroskopische untersuchungen an gesteinhüttenprodukten und schlacken
VOLUME 49 NO 3 235	1970	49	3	235	240	Burke, E.A.J.; Kieft, C.; Felius, R.O.; Adusumilli, S.M.	Two varieties of wodginite, Fe-rich and Mn-rich, occur in pegmatites at Seridózinho, Paraíba State, Brazil. The mineral is monoclinic with $a=9.46 \text{ \AA}$, $b=11.43 \text{ \AA}$, $c=5.12 \text{ \AA}$, $\beta=91^\circ 12'$ (for the Mn-variety). Optical properties, micro-indentation hardness and reflectance values, and electron-microprobe analyses are presented. A discussion of previously published analyses leads to the conclusion that there seem to be two possible systems to fit the analyses of wodginite into a formula.	Wodginite from northeastern Brazil
VOLUME 49 NO 3 241	1970	49	3	241	244	Ruhrmann, G.	A special re-mapping of the Esla region (Province of Léon) brought to light an isolated block of allochthonous limestone in the frontal area of the Esla nappe. Three interpretations are discussed: 1. The block is a squeezed out remnant of the north flank of an anticlinorium. There was no movement of a nappe. 2. The block remained attached to autochthonous material during an eastward movement of the Esla nappe. 3. The limestone was isolated during movement of the nappe and was overrun by its own nappe. We can therefore call it a "Stirnschuppe" sensu Tollmann (1967). The third interpretation is most probable.	Zur genese einer stirnschuppe der Esla-decke (Kantabrisches Gebirge, Spanien)
VOLUME 49 NO 3 245	1970	49	3	245	246	Brouwer, A.; Fischer, M.M.		Algemene' of 'Fysische' geologie
VOLUME 49 NO 3 247	1970	49	3	247	248	Raaf, J.F.M. de		Environmental studies concerning Upper Devonian (and Lower Carboniferous) coastal sections of the South County Cork
VOLUME 49 NO 3 249	1970	49	3	249	254			Boekbesprekingen
VOLUME 49 NO 3 255	1970	49	3	255	265			Geologisch en mijnbouwkundig nieuws
VOLUME 49 NO 3 267	1970	49	3	267	284			KNMG jaarverslag 1969

VOLUME 49 NO 4 285	1970	49	4	285	296	John, B.S.; Ellis-Gruffydd, I.D.	There are many difficulties involved in both the interpretation and correlation of Weichselian deposits in South Wales - a fact illustrated by the multiplicity of viewpoints in the literature. It is suggested that the Weichselian stage was characterised by (1) an early prolonged periglacial phase, possibly with local upland glaciation and with some climatic fluctuations; (2) a major glaciation in which Irish Sea ice and Welsh ice played different relative roles in different areas; and (3) a shorter periglacial phase with some corrie glaciation in the uplands. There are four radiocarbon dates for the Late-glacial. The dates from Port Talbot (Glam.) confirm the age of organic deposits from Swansea Bay and provide an approximate date for the onset of the Flandrian transgression; and the date from Aberaeron (Cards.) points to the existence of Zone II organic deposits beneath solifluction earth and above glacial drifts of probable Weichselian age. There are also four dates for the Middle Weichselian, supporting other evidence for an interstadial at this time and for a later extensive glaciation by the Irish Sea glacier in Cardigan Bay. There is no unequivocal age determination for the organic content of the calcareous Irish Sea till. Palaeobotanical investigations undertaken so far have revealed that a wide range of organic material exists in the glacial drifts, including a significant amount of Tertiary pollen and spores and many fragments of Tertiary lignite. It is therefore difficult to relate the palaeobotanical evidence with any confidence to either the stratigraphy or the radiocarbon dates. However, an interglacial deposit discovered in situ at West Angle (Pemb.) may provide another pointer to the true age of the South Wales drifts; and the radiocarbon date for the human skeleton from	Weichselian stratigraphy and radiocarbon dating in South Wales
VOLUME 49 NO 4 297	1970	49	4	297	303	Leutwein, F.; Saupé, F.; Sonet, J.; Bouyx, E.	La datation par les méthodes Rb-Sr et K-A de la roche totale et de plusieurs minéraux de deux échantillons de la granodiorite de Fontanosas (Ciudad Real, Espagne) a donné pour celle-ci un âge de 302 M.a. L'âge de ce stock tardi-ou post-tectonique, joint à des critères stratigraphiques permet d'attribuer le plissement principal de la région d'Almadén à la phase sudète.	Première mesure géochronologique en Sierra Morena
VOLUME 49 NO 4 305	1970	49	4	305	310	Zodrow, E.L.	The Smallwood Mine at Labrador City, Newfoundland, contains two recoverable iron ore minerals: specularite and magnetite. This paper inquires specifically into the genesis of magnetite using a model that statistically relates the measured variation of four variables to ideal causes that were responsible for these variations. Through the interpretation of the results of factor analysis, a theory of magnetite genesis is proposed which tentatively identifies the Grenville orogeny as the factor largely responsible for the formation of magnetite. However, it is proposed to enlarge the factor model to include additional chemical variables which may reduce the unexplained variance in this system of variables and more clearly specify the common factors.	An application of factor analysis to the interpretation of the genesis of magnetite in the smallwood mine, Labrador

VOLUME 49 NO 4 311	1970	49	4	311	317	Buurman, P.; Plas, L. van der	Crandallite has been found in a sinkhole near Florzé where recently also halloysite was discovered. The mineral occurs in a pocket in a residual clay derived from Visean limestones. The clay is found on top of Om and Onx deposits and below Pleistocene solifluction material. X-ray diffraction patterns, D.T.A.-traces, specific density separation, refractive indexes, X-ray fluorescence patterns and chemical composition have been determined and are reported. The samples are rich in uranium.	The occurrence of crandallite in a sinkhole near Florze (Belgian Condroz)
VOLUME 49 NO 4 319							In 1968 Maarleveld published the results of a research of the coversand area in The Netherlands, based on geomorphological evidence and on the evaluation of macroscopical characteristics of the coversands mainly in the 105-75 micron fraction, resulting in a subdivision into 29 subareas. Each subarea could be described in terms of specified amounts (per mil values) of the three characteristics: white, black and green grains. In this study the analytical results of these principal characteristics are considered in a more objective way, in order to arrive at a numerical comparison for all possible pairs of subareas. For any pair this comparison may be expressed as the sample-size N required to detect a difference as large as the one stated between the respective sample means. The N-numbers - which may be considered as difference- or similarity-coefficients have a practical significance in that they provide a measure for the discrimination between any pair of areas as to the characteristic in question: large N-numbers stand for a high degree of similarity, whereas small N-numbers mean that the areas under consideration are very different and consequently may be distinguished with relative ease. The relation between the N-number and the statistical parameters of the characteristics is discussed. A way is indicated how to arrive at defining areas such that they fit classes with a maximum contrast between the analytical data.	The statistical discrimination between coversand areas in the Netherlands
VOLUME 49 NO 4 329	1970	49	4	329	333	Zeck, H.P.; Soediono, H.	A well-preserved fauna of planktonic Foraminifera indicates a Tortonian age for a calcilutite directly overlying pyroclastic orthopyroxene-labradorite pheno-andesite. The rock series belongs to the autochthonous of the Betic Cordilleras	A Tortonian age for sedimentary rocks directly overlying volcanics in the Western part of La Serrata, Nijar, prov. Almería, SE Spain

VOLUME 49 NO 4 335	1970	49	4	335	338	Tjia, H.D.	Quaternary folding, faulting, tilting, uplift, and subsidence for several localities in Indonesia yield the following information with regard to rates of diastrophic movement. In the mobile regions the average rate of uplift with or without attendant folding amounts to 0.5 to 1.0 mm/yr. Subsidence occurs at rates of 2.0 mm/yr. As expected, diastrophic movements in the continental areas are much slower and are measured in hundredths of a millimeter annually. Wrench faulting possesses most rapid movements; rates of strike-slip movements are at least 5 mm/yr. It was also found that observation on deformational phenomena for shorter periods yields anomalously high values of diastrophic rates. This evidence is in accordance with the spasmodic nature of diastrophism which is also reflected by the occurrence of multiple elevated terraces.	Rates of diastrophic movement during the Quaternary in Indonesia
VOLUME 49 NO 4 335	1970	49	4	335	338	Tjia, H.D.	Large Enclosure	Rates of diastrophic movement during the Quaternary in Indonesia
VOLUME 49 NO 4 339	1970	49	4	339	342	Vletter, D.R. de		Significant changes and developments in Zambian mineral industry
VOLUME 49 NO 4 343	1970	49	4	343	344	Dijkstra, S.		Beknopt verslag van het derde international geochemical exploration symposium
VOLUME 49 NO 4 345	1970	49	4	345	345	Eckhart, D.; Bosman, E.R.		Het onderzoek naar de toepassing van moderne luchtopnametechnieken
VOLUME 49 NO 4 347	1970	49	4	347	354			Boekbesprekingen
VOLUME 49 NO 4 355	1970	49	4	355	360			Geologisch en mijnbouwkundig nieuws
VOLUME 49 NO 4 361	1970	49	4	361	365			Genootschapszaken
VOLUME 49 NO 5 369	1970	49	5	369	373	Shimron, A.E.; Zwart, H.J.	The occurrence of metamorphic minerals, like andalusite and cordierite indicating formation under low pressures, is described from the Elat area in Israel and the Sinai Precambrian. The study of the timing of metamorphism with regard to folding phases has shown that the metamorphism is progressive in time. The possibility that the Precambrian of the Arabian shield belongs to a Hercynotype orogenic belt is discussed.	The occurrence of low pressure metamorphism in the Precambrian of the Middle-East and North East Africa
VOLUME 49 NO 5 369	1970	49	5	369	373	Shimron, A.E.; Zwart, H.J.	Large Enclosure	The occurrence of low pressure metamorphism in the Precambrian of the Middle-East and North East Africa

VOLUME 49 NO 5 375	1970	49	5	375	379	Buurman, P.; Groot, G.E. de; Winkler Prins, C.F.	In many places in the Belgian Condroz heavy solifluction clays occur on top of Tertiary sands. These deposits are generally found in conjunction with fair amounts of chert and silicified fossils. In order to determine the origin of the clays, investigation of the fossils (mainly brachiopods and corals) and the granulometric and mineralogical compositions were carried out. The fauna collected in the clay deposits is typical for the upper Tournaisian and lower Viséan (Lower Carboniferous). For comparison fossils were also collected from residual clays in situ on Viséan and Tournaisian limestones. No important differences between the fossil groups could be detected. The clay mineralogical analysis also indicates that the clays in the solifluction deposits are residues of soil formation on Carboniferous limestone.	On the origin of several heavy clay layers in solifluction deposits of the Belgian Condroz
VOLUME 49 NO 5 381	1970	49	5	381	390	Buurman, P.	Four pollen diagrams from the Helvoirt river valley (Noordbrabant, The Netherlands) are presented and discussed. Several conclusions concerning the formation of the valley and its deposits are drawn.	Pollen analyses of the Helvoirt river valley
VOLUME 49 NO 5 391	1970	49	5	391	395	Voo, R. van der; Klein, P.H. van der	The analysis of the NRM of 27 Permocarbiniferous samples from a nappe in the Tauride Chains revealed that in most samples three magnetic components were present. Two of the components are thought to be secondary due to remagnetization in Early Tertiary, and Recent times. The third and hardest component is assumed to be Permocarbiniferous. It yielded an anomalous paleomagnetic direction, though the low inclination value indicates an equatorial position during the Permocarbiniferous.	The complex NRM of the Permocarbiniferous Bademli Redbeds
VOLUME 49 NO 5 397	1970	49	5	397	404	Mook, W.G.		Stabiele isotopen van koolstof en zuurstof in water en kalk
VOLUME 49 NO 5 405	1970	49	5	405	409	Aldershof, W.G.		Zwavelisotopen en olie geochemie
VOLUME 49 NO 5 411	1970	49	5	411	418			Boekbesprekingen
VOLUME 49 NO 5 423	1970	49	5	423	424	Hyvert, G.		Les alterations des materiaux en oeuvre sous climat tropical
VOLUME 49 NO 5 425	1970	49	5	425	427			Genootschapszaken
VOLUME 49 NO 6 431	1970	49	6	431	431	Jong, J.D. de		To our readers
VOLUME 49 NO 6 433	1970	49	6	433	438	Thiadens, A.A.		In memoriam Prof. Dr. M.G. Rutten
VOLUME 49 NO 6 439	1970	49	6	439	449	Schermerhorn, L.J.G.	Lower Carboniferous mafic volcanism in the Hercynian geosyncline of South Portugal produced spilite flows, often pillow lavas, and albite diabase intrusions. Spilites only occur in a central zone. Felsic volcanism took place at about the same time in this geosyncline: in South Portugal the mafic volcanism followed the felsic eruptions but in Southwest Spain the succession is reversed. The relationships between the mafic and the felsic activity indicate a rough juxtaposition in space and time but no genetical link. The mafic volcanics are considered to derive from the upper mantle and the felsic volcanics are thought to have been generated in local magma chambers by melting in the deep crust.	Mafic geosynclinal volcanism in the Lower Carboniferous of South Portugal

VOLUME 49 NO 6 451	1970	49	6	451	456	Dijkstra, S.; Sutthitavil, S.	The present paper deals with a trace element study of terrace materials in southern Limburg. Uncertainties and limitations of these types of studies are discussed and special attention is paid to matters like the relation between trace element content and heavy mineral association, metal ratios in various materials, and trace element trends in gravels of different age. It is suggested that discontinuities in these trends might represent important events in the development of the river system.	A trace element study of terrace materials from Southern Limburg, the Netherlands
VOLUME 49 NO 6 457	1970	49	6	457	488	Ernst, L.F.; Ridder, N.A. de	This paper deals with the results of a geohydrological investigation carried out in the eastern part of The Netherlands (province Gelderland). In this region the demand for water for domestic and industrial use is rapidly increasing. The present demand of 34 million m ³ per year is entirely met by extraction of groundwater. With a view on the agricultural interests the problem arises what effect a further increase of the groundwater extraction may have on the productivity of the drought-sensitive soils. This study was made to provide basic data for the solution of this problem. The geological investigations have given a much better insight in the suitability of the aquifers for groundwater exploitation than existed. The transmissivity of the aquifers according to field pumping tests and well logs, varies from about 300 to 10,000 m ² /day. This variation is chiefly due to fluvio-glacial erosion and aggradation during the Saale Ice Age (buried glacial channels). Utilizing a finite differences equation, in which the available transmissivity values and water table gradients had to be substituted, a map has been prepared showing the intensity of the net subsurface inflow. This flow rate is of practical importance because adding to it the mean precipitation and evaporation values immediately yields the mean drainage intensity. Transmissivity values and values of the drainage resistance were used for the calculation of the drawdown of the water table by extraction of groundwater from deep wells. In general, the groundwater is fresh but remarkable differences in electrical conductivity, sulphate-chloride ratio, hardness and iron content were found in the region. At some places the groundwater temperature was also measured. The differences in chemical	A geohydrologic study of east Gelderland (Netherlands)

VOLUME 49 NO 6 489	1970	49	6	489	501	Terwindt, J.H.J.	An investigation of submerged sand ripple fields with ripple heights from 30-200 cm in the fluvial tidal and tidal channels of the S.W. Netherlands was made. Such rippled surfaces were found in fluvial tidal channels, at the confluence of tidal channels and in pronounced ebb and flood channels. However, over large areas no ripple fields of this kind were observed. Ripple areas do not distinguish themselves from non-rippled areas by a difference in general current characteristics or composition of the bottom material, although no ripple (30-200 cm) fields were found in areas where the bottom material contains more than 15% mud. The asymmetry of ripples with heights of 30-100 cm is sometimes determined by the prevailing tidal current especially in ebb and flood channels; change of the asymmetry with the turn of the tide does occur. The asymmetry of ripples with heights from 100-200 cm showed much more constancy. It mostly did not change with the turn of the tide. The dimensions of the ripples in the fields may change rather rapidly. There is no relation between ripple height and water depth. It was observed that the orientation of the ripple crests is influenced by the spiral flow in tidal channels.	Observation on submerged sand ripples with heights ranging from 30 to 200 cm occurring in tidal channels of S.W. Netherlands
VOLUME 49 NO 6 503	1970	49	6	503	505	Dozy, J.J.		"Engineering geology" in Nederland
VOLUME 49 NO 6 507	1970	49	6	507	516			Boekbesprekingen
VOLUME 49 NO 6 517	1970	49	6	517	540			Geologisch en mijnbouwkundig nieuws
VOLUME 49 NO 6 541	1970	49	6	541	544			Genootschapszaken
VOLUME 50 NO 1 1	1971	50	1	1	1	Krol, G.L.		Van de voorzitter aan de leden
VOLUME 50 NO 1 3	1971	50	1	3	8	Straaten, L.M.J.U. van		Origin of Solnhofen limestone
VOLUME 50 NO 1 9	1971	50	1	9	27	Buurman, P.; Plas, L. van der	Different analyses were carried out on several Dutch and Belgian flints and cherts. As a result of the observations conclusions are drawn about the properties of flint and chert and a theory on the formation of flint and silicification of limestones through a calcium silicate intermediary is presented. Calculations on the physico-chemical aspects of this theory are presented, These calculations turned out to accord with several field observations.	The genesis of belgian and Dutch flints and cherts
VOLUME 50 NO 1 29	1971	50	1	29	33	Hardjosoestastro, R.		Note on chamosite in sediments of the Surinam shelf
VOLUME 50 NO 1 35	1971	50	1	35	40	Creusot, M.R.; Geirnaert, W.		Processing of water-quality data by digital computer
VOLUME 50 NO 1 41	1971	50	1	41	58	Zagwijn, W.H.; Montfrans, H.M. van; Zandstra, J.G.	A subdivision of the lower part of the Middle Pleistocene ("Cromerian") of The Netherlands is proposed. At least 3 interglacials are now recognized. The Matuyama-Brunhes boundary (0.7 M.y.) has been located within this sequence.	Subdivision of the "Cromerian" in the Netherlands; pollen-analysis, palaeomagnetism and sedimentary petrology
VOLUME 50 NO 1 59	1971	50	1	59	60	Gill, W.D.;		A consideration of the continuity of the Tertiary orogenic systems of Europe and Asia
VOLUME 50 NO 1 61	1971	50	1	61	65			Boekbesprekingen
VOLUME 50 NO 1 67	1971	50	1	67	87			Geologisch en mijnbouwkundig nieuws
VOLUME 50 NO 1 89	1971	50	1	89	93			Genootschapszaken
VOLUME 50 NO 2 95	1971	50	2	95	95	Krol, G.L.		Foreword Special Issue on the closure of the coal mines in the Netherlands
VOLUME 50 NO 2 97	1971	50	2	97	97	Block, L. de		Preface Closure Coal Mines

VOLUME 50_NO 2_99	1971	50	2	99	104	Rooy, C.J.M.A. van		The melting pot of the black gold - De smeltkroes van het zwarte goud
VOLUME 50_NO 2_105	1971	50	2	105	120	Raedts, C.E.P.M.	<p>Since the early middle ages the northern part of the Netherlands have followed its own independent energy policy. As naturally it was paramount that the supply of raw materials for the generation of energy had to be as cheap as possible, thereby benefiting local trade and industry, this policy sometimes was of disadvantage to the national coal industry. Napoleon's Mine Law of 1st May, 1810 promoted the activity in the mining industry. Towards the end of the period of French domination and during the early years of the kingdom of the Netherlands, there was only one coal mine in southern Limburg: the Domanial Mine. After the Belgian revolution of 1830 and the resulting separation of Belgium and the Netherlands the two countries went their own individual routes of industrial developments. In the area of Liege we saw the beginning of a continental industrial revolution while the northern Netherlands placed more emphasis on trade and shipping. The Domanial Mine was followed in 1852 by another one, which, however, was stopped even before the Domanial Mine closed down in 1970. The first 2 concessions after the French domination, signifying the first real emphasis on mining in Limburg, date from the years 1860-1861. It was not until 1902 that the first coal was produced from the unified Willem Sophie Mine, which exploited these two concessions. Between 1870 and 1880 another 13 mining concessions were awarded and a great number of holes were drilled. No new mines were started, however, and between 1891 and 1892 most of these concessions were cancelled. The initiative of Sarolea who obtained a concession in 1889 as a reward for the construction of the railroad from Sittard to Herzogenrath and of the Aachen (Germany) coal</p>	De opgang en teleurgang van de Limburgse Steenkoolindustrie (een historisch overzicht)

VOLUME 50 NO 2 121	1971	50	2	121	133	Molkenboer, J.A.M.	<p>A unique feature of the termination of Netherlands coal mining for which there is no precedence is the planned and gradual run down of a complete industry, because developments in the energy market made continued economic exploitation of coal impossible. Moreover, the liquidation is being carried out rather quickly and in an area of very limited extent and is therefore creating unique problems in the search for new employment opportunities. As the state owns the largest coal mining enterprises, involvement by the government was unavoidable, the more so as the mines had to be closed down before they were technically depleted with the timing being set by the availability of cheaper replacing fuels. The author discusses all the reasons which lead to the decision to close down the mines and wonders whether in retrospect these reasons justified the policies followed. In 1965 it became apparent that solid fuels were losing their importance in the Netherlands supply of energy. It could be assumed that our steel industry would require less domestic coal, while power generation was increasingly being taken over by oil and natural gas. The competitive position of the Netherlands industry demanded the use of the cheapest possible source of energy. Even the mines' own consumption of coal for the generation of electricity and the manufacturing of coke and coke-gas could no longer be economically justified. In the meantime a significant expansion of crude oil refining capacity in the Netherlands was noticeable. Its input is subject to a certain risk - as it does in all of western Europe - of being interrupted. Groningen gas, however, could absorb satisfactorily this risk element which previously has been absorbed by the coal mining industry. The decline in the share</p>	De liquidatie van de kolenmijnbouw in Limburg in het licht van het Nederlandse energiebeleid
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VOLUME 50 NO 2 135	1971	50	2	135	150	Geertman, G.H.M.	<p>This article outlines the development of primary energy demand by the various consumer categories in the Netherlands since 1950, and discusses the shifts that have taken place in the contribution by the various energy sources. In addition, an attempt is made at extrapolating energy consumption towards the year 1980. At first, solid fuels held the dominant position, but when energy prices began to drop after the first Suez crisis, Dutch coal in particular felt the impact, and began to be gradually ousted from the inland market. Up to 1965, the decrease of the coal consumption was compensated almost entirely by liquid fuels, while after that year also natural gas began to play an important role. The consumption of natural gas increased so rapidly that between 1965 and 1969 the sales of fuel oil to industry showed a decline. Also the demand for natural gas for the generation of electric power and for home heating purposes has gone up sharply. In 1969 the share of natural gas in the overall energy consumption was already as high as 25% that of oil being 59%. Between 1965 and 1969 the overall demand for energy rose more than 8% annually, to reach a level of over 60 million tons of coal equivalent. The increase estimated for the period 1969-1980 is almost 6% per annum, which means that in the latter year the overall consumption will be more than 110 million tons of coal equivalent. The consumption shift on the Dutch energy market is expected to continue. Eventually, natural gas will provide more than 40% of energy demand in the Netherlands, while the share of mineral oil will drop to below 50%.The growth of the gas consumption by the three categories referred to above will persist. Special mention should be made in this connection of the increasing</p>	De energievoorziening van Nederland voorheen en in de toekomst
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VOLUME 50 NO 2 151	1971	50	2	151	161	Jochems, D.B.	In this contribution the author discusses the fundamental social aspects that have prevailed during the personnel reductions amounting to 30,000 workers during the last 5 years. Individual problems have of course occurred and the transition has been more successful for some than for others. In sum total we can say that the consequences of the closing of the mines for its personnel has been less severe than one might have expected. In mid 1970 the Netherlands coal mining industry still employed some 15,000 people. By analogy with the reduction of some 30,000 workers in the previous 5 years one might expect the remainder to be run down in another 2,5 years. Mr. Hellemans in his paper will explain why this is not so. The author of this paper limits himself to a review of experience gained so far. One is inclined to forget that the Dutch State Mines (DSM) employed 5 years ago some 10,000 workers in its chemical industry (now some 12,000), this number is not included in the highest number of workers that the mining industry had in its service since World War II of some 55,000. Programmed reductions started in July, 1965. Before, between 1958 and 1965 there had been a quiet attrition of some 1,500 men per year. In 1965 the rate of reduction was accelerated to 6,000 men per year. DSM led with reducing its personnel in the solid fuels business to 1/6th of its former number, the privately-owned mines (8 in total) to somewhat less than half. Contractors and suppliers suffered of course also, but reliable information on their position is not available. As far as coal mining is concerned, the reductions affected some 1 in 4 workers in southern Limburg and even 1 in 2 workers in the eastern area where the mines are located. Re-employment opportunities are naturally of	Vijf jaar mijnsluiting en de gevolgen voor het personeel de periode 1965-1970
VOLUME 50 NO 2 163	1971	50	2	163	172	Hellemans, A.		Het gecoördineerde personeelsafvloeiingsbeleid voor de nog resterende jaren van het mijnsluitingsproces - de periode 1970-1975
VOLUME 50 NO 2 173	1971	50	2	173	178	Loos, J.	Due to the closing of the coal mines a significant source of employment is disappearing. Many of the skilled professionals of the mining industry are, from the point of view of education, training and aquired skills, unfit for the types of alternative employment that is being offered. Training of various types, from adding to a man's skills to complete retraining is needed and forms the subject of this paper. One of the types of training is provided by the centres of professional training for adults, another and by far the most important is the reschooling by the employers or by special job training centres, following the guidelines as laid down by the Directory General of the provincial employment office. Certain aspects of reschooling are already covered by other authors in this booklet. The favourable results obtained in the retraining and reschooling programs of the ex-miners is for a large measure due to the excellent co-operation between the provincial employment authorities, industry, the labour unions and the European Coal and Steel Community.	Scholingsactiviteiten in het kader van de herstructurering in Limburg

VOLUME 50 NO 2 179	1971	50	2	179	186	Haverschmidt, R.	<p>In 1965 the Mining School in Heerlen was employed for the re-education of underground mining technicians in order to achieve that these staff could obtain equivalent jobs in industries outside the mines. In previous years the Mining School, an acknowledged institution for advanced technical training, had trained 2,250 mining supervisors and 150 mine surveyors. Retraining would therefore be carried out in a familiar place where the material was being modified on a routine basis to be suitable for changing employment conditions. In 1964 the Mining School occupied new premises which allowed the re-educational program to be handled in the most efficient manner. The cost of re-education could be paid out of contributions received from the Dutch Government together with allowances from the European Authority for Coal and Steel. Although initially it was assumed that only staff under 40 years of age would be re-educated, this upper limit was successfully increased in the course of the years. The paper deals with the didactics, including the various streams of re-education and the placement of those who passed the final exams, 10 different reschooling possibilities could be recognized. At present 380 people have been re-educated with over 190 still at school. Continuous contact is maintained between teacher and pupil when the latter is following practical courses in various industries, one of which may employ him eventually. Much special effort is asked the schooled staff in planning the reschooling programs and in guiding the pupils through the process. Some thought is given to the future of this school in these days of accelerated obsolescence of technical skill due to rapid technical developments. The Mining School has proven that</p>	Taak van de mijnschool in het herstructureringsproces
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VOLUME 50 NO 2 187	1971	50	2	187	199	Koene, G.B.M.L.	<p>The tenths workers who are still employed in the mining industry are very much involved in the further closing of the coal mines. For alternative employment away from the mines, a planned reschooling program is essential. When selecting candidates for each of the reschooling courses all those data are collected from superiors, personnel services, psychological and medical staff, which may be relevant to a man's reschooling program and further employment. In general terms all ex-mining staff such as technical, administrative, supervisory or subordinate adjust well to employment in unrelated industries. Results of reschooling are, so far, very favourable, and hereby we specifically include the "older" workers. The latter are personally highly motivated as society and industry were of the preconceived opinion that older people would be difficult to change over to other types of work. This last point is subject to intensive study these days, and there are indications that reality is quite different and varied and that older workers have been very much prejudiced against. Experience with miners has contributed to the studies mentioned. The closure of the mines and the re-industrialization of the mining region of Southern Limburg has not only created serious problems for thousands of workers, but has especially affected those that were handicapped, physically or mentally, which can be due to physical/psychological conditions or age. Realization of these handicaps by employers and the studies thereof can lead to results that reach further than the mere re-employment of ex-miners. Anyone providing selective and adjusted employment can benefit from what has been learned in Southern Limburg.</p>	Omscholing en wederaanpassing van ex-mijnwerkers
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VOLUME 50 NO 2 201	1971	50	2	201	203	Heiligers, G.J.	<p>The second phase of the restructuring of Southern Limburg has only just started. A redrawing of the municipal boundaries has only reached the planning stage. Yet the education of the youth and, simultaneously, the reschooling of the not-so-young are of immediate concern. The new educational system will again have to be of a very special nature and content like the existing system which is now going to be abandoned. The new system calls for: - institutes for reschooling - new technical institutes offering a wide and diversified program - institutes specializing in refresher courses. These three elements form the basis for an incipient "Permanent Education", the primary aim of which should be the personality-development of its students. Additional fresh capital will have to be invested in what is most important: the potential of our youth, which potential will shape the future of the region. The financial means which this will require will have to-be found. A first start has been made with the design of a new type of school in which technical developments will be constantly taken into account. In the future one will have to ask himself in what ways a certain educational system will influence society, as a matter of fact: modern education is entitled to play a leading role in today's society. There is no lack of professional men in Southern Limburg to give this type of education. For the time being the accommodation is also sufficient. The financial backing, however, is still lacking. It is here that the assistance of the Government is most urgently needed. The University which Limburg will have must be supplemented by "intermediate level" schools, And, last but not least, expeditious and strong action is required.</p>	Naar de education permanente
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VOLUME 50 NO 2 205	1971	50	2	205	210	Lebens, P.J.C.	<p>The shutdown of the mines affects the social climate in Southern Limburg to a large extent, necessitating intensive social assistance for all concerned. The author recognized 4 distinct phases in the restructuring process. Initially the Provincial Administration of Limburg studied possible social repercussions of the shutdown of mines on the miners, the other professional population, housing, municipal financial matters and mental public policies had to be developed. Thereafter a start was made to carry out the suggested plans and proposals and two management-advice committees were instituted for proper planning and execution of the projects. The third phase saw several additional measures and precautions which had not been taken into account before. For example, after it was found that some 4,500 semi-invalid workers would come out of the mines, special workshops had to be provided for, which operate satisfactorily due to the present favourable economic climate. Favourable economic conditions also are the reason for the successful placement of the other miners that became available on the labour market. Of course, much attention has been paid, in particular during the first years, to all other personnel which had to leave the mining industry. There was a definite need for advice on the legal status and assistance in legal and financial matters. In 1968 some 6,000 persons made use of a special office dealing with these matters, which was operated by the unions, but also assisted non-union members. One of the problems one had to face was the reduction of income the ex miners had to get used to when working in non-mining industries. Not only were the miners and their families suffering but so did other groups of the population in the area. The</p>	De sociale begeleiding der industriële herstructurering
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VOLUME 50 NO 2 211	1971	50	2	211	216	Hubben, A.J.	<p>Since 1945 the Catholic Federation, together with the Netherlands Catholic Mining Union (NKMB, 65 per cent organized personnel) and the Catholic Union of Mining Officials (KVM, 85 per cent organized) requested the Government repeatedly to define its point of view regarding the difficulties of the mining industry. The author, chairman of the KVM, describes the active influence which the Federation exerts on the restructuring of the mining region, a logical consequence of the good and positive relationship that has prevailed for years between employers and employees in the mining industry. The role of the Trade Unions was in this manner formerly recognized by the authorities. Trade Unions were involved in policy making for the mine closures, the resulting personnel reductions and the control thereof. They also contributed positively to the re-industrialization of the region. The one-sided industrialization over the last 70 years in Southern Limburg had brought about a monoculture; that dislocation of the work and living environment and the end of prosperity should be avoided was a subject of much concern to the Federation' The guiding principle therefore was that the shutdown of the mines should only be organized in such a way that equivalent employment opportunities would be available. This problem both qualitatively and quantitatively is unique in the Netherlands, involving directly or indirectly some 300,000 people. The unions themselves assumed responsibility for these events and their consequences. They worked closely together with the Government and employers to achieve the best results. Much personal grief still remains, however, it is only fair to mention that at least partly due to the role of the unions, the Netherlands is the only</p>	De rol van de vakbeweging bij de afbouw van de mijnindustrie
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VOLUME 50 NO 2 217	1971	50	2	217	219	Stollman, E.H.M.	<p>A few years ago few housewives could believe that the mines really would be closed down, but now they are already suffering the consequences of the closures. In certain cases their husbands found employment outside the mining industry, others went on early pension. A third group was transferred to the chemical side of their employers' business, for which they were not trained, more often than not resulting in friction with their new colleagues. Many housewives have quite some trouble in containing their husbands' unhappiness with respect to the changed situation, he has to worry about different things than he was used to, the daily routine had to be changed and naturally the changed circumstances affected the peace in the family and the relationships between parents and children. It was realized that children probably need a better education than father ever had and it generally is the mother, being closer to her children, who had to bear the brunt of the problems. Not only had the housewives to adjust themselves and the children to the enormous changes in the social circumstances, she often had to go to work in order to make up part of the loss of income suffered by her husband, as most new job opportunities were less lucrative than those of underground miners. Generally, the greatest part of the burden of the changed climate will have to be carried by the housewives according to the author. It will depend mainly on her whether future living in Southern Limburg will be worthwhile. The paper ends with a discussion along the different activities underway in the different women's organizations to alleviate the problem which can be catalogued as follows: a. Activities focussed on the housewives directly; b. Co-operation with other agencies in</p>	<p>Wat betekenen de veranderingen in de mijnstreek voor de vrouwen en voor de gezinnen?</p>
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VOLUME 50 NO 2 221	1971	50	2	221	224	Martens, A.H.W.	<p>No one objected to the principle of closing the coal mines when oil and gas pushed coal out of the energy market. Social repercussions were successfully contained. Technically, however, there are two problems which could lead to legal complications but for which there exist no juridical precedence. There are firstly the necessity to fill up the main shafts and secondly the continued certainty that mining damage would be compensated for even after the abandonment of the mines. The mining law of 1810, dating from the days of occupation by the French, which is, at least partly, still valid in the Netherlands, has no chapter dealing with closures of mines. Only in 1964 a very general and largely incomplete regulation covering this matter was incorporated in the law. The initial requirement to have the shaft completely filled was after all not necessary. The question of the subsurface water level is dealt with in another paper.</p> <p>Regarding mining damages, a system was chosen in which the mines Oranje Nassau, Laura and Vereniging and Willem-Sophie quaranteed voluntarily to remain fully responsible for all possible damages, also after the shutdown of these mines. A special foundation has been established by the abovementioned private companies to ensure payment of any future claims towards damages, and particulars concerning the funding of the capital is fully described. The Dutch Government took over the Domanial Mine, for which mine, as well as for the four existing State Mines, no special regulations are thought necessary.</p>	Mijnsluiting en mijnwetgeving
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VOLUME 50 NO 2 225	1971	50	2	225	236	Schilp, J.P.	<p>In the South Limburg coal mining district, abandoned pit shafts have to be filled up - at least in the overburden section - in view of the loose nature of the overburden, and the presence of dangerous gasses in the underground workings. In other coal basins with comparable conditions, shafts have been filled down to the bottom with clastic material, generally with special provisions near the shaft insets. In several cases this method resulted in severe subsidence of the filling material and release of firedamp at the surface. In view of this, the following methods have been applied in South Limburg, also taking into account the urbanization of the area. Method I: The supported plug In nine shafts, a concrete closing plug has been placed in the shaft, at the level of the highest loading station. The plug is supported by the floor of the station. The shaft section above the plug is filled up with clastic material. The shaft mouth is capped with concrete. This method was used where the overburden is thick (average: 210m), the shaft opening large (average: 23 sq.m), and the shaft wall smooth. Method II: The shear prop a. In five cases the shaft has been filled up with concrete from the highest loading station to the surface. This method has been followed in the case of a thin overburden (average 43 m), with a short distance from the highest level to the overburden (average: 7 m) and a small shaft opening (average: 11 sq.m). b. In four shafts a shear plug has been placed above the highest level. The section above the plug is filled with clastic material. The required length of the plug depends on the distance to the surface, the size of the shaft opening and the roughness and nature of the shaft wall' The shaft mouth is capped with concrete. The average length of the filled section is 104 m, the</p>	Beveiliging van het maaiveld van verlaten mijnschachten in Zuid-Limburg
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VOLUME 50 NO 2 237	1971	50	2	237	253	Crasborn, J.R.P.; Heuvel, H.N. van den; Kimpe, W.F.M.; Maas, W.	<p>The mine water problem is dealt with by 4 authors in 4 parts and a review. In the first part "Problem definition and preliminary studies", the study made in 1966 on the possible difficulties operating mines might expect as a result of the closing of surrounding mines, is discussed. It was evident that operating mines had to be protected from yet unforeseen water breakthroughs. In the beginning in 1968 it became known that the German Mine Gouley of the "Eschweiler Mining Co." would be closed and that in 1969 their main pumps would be shut down. The water influx of this mine was about 13 m³/minute (57 US gallons/second) with a peak of 15 m³/minute (66 US gallons/second). As there exist many underground connections between the different mines on and between both sides of the border this water was expected to flow directly across the border into the Netherlands Domanial Mine and from there, together with the water of the condemned Mines Domanial and Willem-Sophie, to other mines in the Netherlands. However, the pump capacity of the remaining Netherlands mines would be insufficient to cope with this additional water influx. After numerous discussions between the different mine owners it was recommended to proceed with the execution of project "Pump Mine Domanial". As can be seen from the drawings several water retaining dams would have to be built, to protect the mines and to collect the water of the mines Gouley, Domanial and Willem-Sophie in one basin. With the assistance of vertically submerged pumps the water level in the basin could be maintained at 310-315 metres (1030-1050 ft) below the surface level of pump shaft "Beerenbosch II". In part II the execution of project "Pump Mine Domanial" is discussed, dams were built and pumps</p>	Mijnwaterproblemen in het kader van opeenvolgende mijnsluitingen
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VOLUME 50 NO 2 255	1971	50	2	255	269	Kimpe, W.F.M.	<p>At the end of his paper the author provides his own summary, when he states "that the character of the activities of the Geological Bureau did not essentially change as the years went by". What did change was the quantity of certain investigations which were done for third parties. The article contains a tabulation of the number of reports, publication and of papers presented during the last decade. There is an increase in recent years in the number of studies on surface minerals, and also in the number of times the Bureau's advice was sought in connection with the exploration and exploitation of potable or industrial water. This directly reflects the increasing industrialisation of Southern Limburg. The Bureau was also more frequently consulted on matters of road construction. Surprisingly in these days of mines closing down. requests for advice on their part appear to be more frequent than had been expected. As from 1st January, 1968 the two geological institutions then existing in this country were re-organized into the one Geological Survey. After 60 years the Geological Bureau for the mining area ceased to be an independent unit. Its history goes back to 1907, the year in which the mining industry became actively interested in the geology of Southern Limburg. Geological mapping was also started, and likewise the Bureau was put in charge of the study of palaeobotany, the drawing up of a stratigraphy of the Carboniferous and the correlation of the individual coal seams. Both in 1927 and 1935 as in 1951 and 1958 congresses of carboniferous stratigraphy and geology were held at Heerlen. These contributed to the reputation the Bureau enjoyed abroad. The above re-organization was primarily prompted by the direct interest which the Ministry of</p>	<p>Werkzaamheden van het geologisch bureau van de Rijks Geologische Dienst te Heerlen, voorheen en thans</p>
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VOLUME 50 NO 2 271	1971	50	2	271	284	Bloemendal, J.	This article gives a brief historical outline of the decline of Holland's coal mining industry - concentrated in South-Limburg - as well as a description of what has been achieved in the field of industrial redevelopment of the region and of the future prospects. At the same time, it outlines, the steps taken by the Dutch Government and the activities displayed by DSM in this reindustrialization process. These activities are enumerated in the following items: 1. Analysis of labour potential according to quantity, quality and time of availability. 2. Stocktaking of needs of industrial sites that are offered and that are available or about to become available, and of the positive and negative qualities of these sites. 3. Promotion of cooperation with and between the bodies concerned, viz., the Ministry of Economic Affairs, the Provincial Authorities, the various municipalities united in "industrieschappen" - and the mining companies. 4. Gathering as much information and literature as possible about all subjects that may be of importance to the parties interested, so as to be able to keep parties fully informed. This information has been summarized in an attractive book entitled "Facts and Facilities; South Limburg, an excellent location in the Common Market". 5. Giving effective publicity to the possibilities offered by South Limburg. 6. Assisting entrepreneurs in the development and legalization of their plans and, in so doing, acting as their sparring partner. 7. Designing financial structures for filling the gaps in the "Grant Schemes". 8. Carrying out constructional engineering work (the only assistance for which a fee is levied). 9. In certain cases, offering participation in projects that are in need of risk-bearing capital. 10. Offering temporary accomodation in DSM	De herindustrialisatie van Zuidelijk Limburg
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VOLUME 50 NO 2 285	1971	50	2	285	290	Wilbers, J.H.M.	<p>In this paper the problems related to the restructuring policy in Southern Limburg (including that part of the middle of Limburg eastward of the Meuse river) are discussed. In mid 1965 the mining industry employed 45,000 men which represented 50% of the industrial population. The total number of male employables in the area of restructuring defined above amounted to 186,000 in late 1965 and is expected to reach 190,000 by the end of 1975 and 228,500 by the end of 1985. How these figures are arrived at is discussed in detail and it is concluded that new employment opportunities to be created during the period 1960-1975 amount to 49,400 and to 39,300 for the period 1916-1985. The author claims that initially far too much attention has been given to employment opportunities in industry and not to service and other peripheral activities. Since 1965 more than 30,000 mining jobs have disappeared. From 1966 till 1971 86 new industrial projects have been created with a forecasted number of 17,000 jobs, of which 61 projects of 8,000 jobs have been realized. Already existing industry grew by 2,800 jobs. Since the end of 1969 growth has been stagnant, mainly due to emigration from Limburg, the early pensioning of miners, the employment of handicapped miners in social schemes and the commuting the highly paid employment in labour - short Germany. Furthermore the active recruiting by Belgian industries and the personnel policies followed by the mining concerns have aggravated this situation. Even during the present boom, results of restructuring have fallen off and if a mild depression were to occur, trouble on the employment side might be expected. According to the author the limited restructuring policy</p>	Regionaal beleid in het herstructureringsgebied
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VOLUME 50 NO 2 291	1971	50	2	291	294	Smeets, J.G.	<p>The chief executive of one of the largest mining communities, Kerkrade, who also is Chairman of the industrial board of the Eastern mining area, poses some critical comments on the social measures taken in connection with the mine closures and some of the favourable opinions expressed by other authors. By the 1st of January, 1970, a total of 8,000 new employment opportunities had been provided for by industry in Southern Limburg. With governmental support only 3,300 of these jobs were filled by ex-miners, although at that time 32,000 mining jobs had already disappeared. The guiding policy that no mine closures would occur without having provided for alternative employment opportunities, proved to have a theoretical value only. As a result one is at the present time feeling much less confident about coming developments in the labour market of the Eastern mining region that one felt a year ago. In reality, the situation is even worse than the figures indicate and according to the author "the real problem has been circumvented". Re-industrialisation is practically stagnant, mainly because of the competitive forces in the labour market which are aggravated by the large scale of commuting of labour to Germany. According to the author, the statistics at the moment give a confused picture and fail to show an improved employment climate. Commuting across the border gives the impression of full employment in the area, but it would only take a small fluctuation in the economic climate across the border to create a serious problem in Limburg, for which no employment vacancies are being reserved. The consequences of the re-structuring process are most severely noticed in the Eastern mining region. It is therefore necessary that</p>	De oostelijke mijnstreek als sluitpost van de herstructurering
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VOLUME 50 NO 2 295	1971	50	2	295	301	Woude, J. van der	<p>About 70 years ago the geological and geomorphological aspects of Southern Limburg were going to be used to advantage. The first aspect gave rise to coal mining and the exploitation of marl, sand, gravel and clay; the second aspect stimulated the tourist trade. Mining, however, had a negative influence on its environment from different points of view, such as natural beauty and living conditions for the community. In the eastern part of the mining area ten mines were opened up; in the western part only one. In addition to the development of roads, railroad and canals, accelerated and often haphazard housebuilding was the result, creating, however, an economic mono-structure with the exception of the chemical industry of the DSM. Like everywhere else in the Netherlands, environmental planning was not taken seriously until after world war II. Firstly the western mining region was tackled; the plan for the eastern mining region is at present under review. Planning for the western region appears to deal with the various villages and town separately. The north-south running highway (E-9) will be the backbone for all traffic. In addition attention should be paid to touristic attractions. The western region, however, is less of a problem as it already has a new car manufacturing plant and less workers. Planning for the eastern region, where about 40,000 out of in total 50,000 miners of Southern Limburg live, had to be approached in a completely different way when compared to the western region. Industrial areas had to be developed for suburban developments. One notices a clearly defined regional policy, for the eastern region a completely revamped road system is an essential requirement and it puts planning in the eastern and western regions</p>	Herstructurering en ruimtelijke ordening
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VOLUME 50 NO 2 303	1971	50	2	303	309	Horsmans, G.A.A.	In a first Governmental note it was concluded that some 10,000 new jobs would have to be created as a result of the closing down of the mines. The government appropriated Hfl 62.5 million (US \$ 172,500) for the improvement of the infrastructure in Southern Limburg. In addition a number of public works would be carried out earlier than planned systems, which did not help to stimulate the construction of a modern road-system. Any other industry employing several tens of thousands of workers would have required better roads. With the imminent closure of all the mines in 1975 a much more extensive program for the improvement of the infrastructure is necessary. The author deals successively with the following categories of public works: 1. roads, 2. waterways, 3. railroads, 4. airport and 5. purification of sewage and industrial water 1. Ever since Roman times the north-south link (the present E-9 motorway) has been the main artery, if one excepts the road Maastricht-Aachen-Cologne. At this moment a complementary east-west road system is being developed. The mining district is bypassed by the E-3 road (Antwerp-Eindhoven-Venlo-Ruhr area) to the north, and by the E-5 road (Brussels-Liege-Aachen-Cologne) to the south. The E-39 (Antwerp-Elsloo-Heerlen-Bochholtz-Aachen), however, runs right through the mining district and the bridge crossing the Meuse will undoubtedly become inadequate. The planned road Maastricht-Heerlen (estimated costs 90 million guilders or US \$ 25 million) can be linked up to the E-9 near Maastricht. The second major provincial road construction project is the completion of the north-south link Roermond-Kerkrade. Before long the province will be connected to the European road system by the E-9, E-3 and E-39 roads. Other	De ontwikkeling van de infrastructuur i.v.m. de sluiting van de mijnen
VOLUME 50 NO 2 311	1971	50	2	311	319	Westen, J.M.J.		Statistisch overzicht van productie, bezetting en prestaties van de Limburgse steenkolenmijnen
VOLUME 50 NO 2 321	1971	50	2	321	325			Samenvatting van de eerste nota inzake de mijnindustrie en de industriële herstructurering van Zuid-Limburg
VOLUME 50 NO 2 326	1971	50	2	326	333			Samenvatting tweede nota inzake de mijnindustrie en de industriële herstructurering van Zuid-Limburg
VOLUME 50 NO 3 339	1971	50	3	339	339	Jong, J.D. de		Preface Special Issue "Research on Sedimentology and Sedimentary Geology in The Netherlands"
VOLUME 50 NO 3 341	1971	50	3	341	348	Augustinus, P.G.E.F.; Riezebos, H.T.	The fluvioglacial outwash plain near Soesterberg (The Netherlands) is a deposit, built up during the melting of the Saalian ice, by a braiding river system on the ice-free side of the ice-pushed ridge of Amersfoort. The variation in the grain-size distribution of the sediment is great. Sorting is very poor to moderate. This indicates a high stream velocity, though fluctuating, combined with a huge supply of debris. The parallel to the principal stratification plane bedded strata alternate frequently with depressions, which are filled up laterally, showing a "festoon lamination".	Some sedimentological aspects of the fluvioglacial outwash plain near Soesterberg (The Netherlands)

VOLUME 50 NO 3 349	1971	50	3	349	357	Burri, P.; Masse, J.P.; Wagner, C.W.	In the Barremian Orgon limestone of southern Provence, a belt of high-energy coastal deposits of regional extent can be traced over approximately 90 km along an east-west axis from the border of the Massif des Maures to Martigues. In this belt, coarse-grained beach beds are closely associated with muddy protected shallow marine or intertidal deposits. Such an alternation is typical for a system of migrating carbonate spits and their protected lagoons, as observed in the Recent of the Persian Gulf. The Barremian belt of coastal deposits seems not to coincide with an ancient regional shore line. It appears to be controlled by east-west striking structural trends, which have been active in Provence since the Late Jurassic. The formation of this belt anticipates the most conspicuous tectonic event in this area during Cretaceous times - the Albian uplift, known in literature as "Isthme Durancien".	Characteristics and regional implications of a belt of high-energy coastal deposits in the Barremian of Provence (SE France)
VOLUME 50 NO 3 359	1971	50	3	359	365	Coo, J.C.M. de; Deelman, J.C.; Baan, D. van der	Three lithofacies are distinguished in the Santa Lucía Formation: grainstone facies, packstone facies and birdseye facies. The lithofacies pattern suggests three depositional environments. An area of wave and current action (grainstone facies), a quiet and sometimes restricted lagoon protected by the extensive shallowness of the entire platform (packstone facies) and an intertidal to supratidal part (birdseye facies).	Carbonate facies of the Santa Lucía Formation (Emsian-Couvinian) in León and Asturias, Spain
VOLUME 50 NO 3 367	1971	50	3	367	372	Doeglas, D.J.	The use of Q_1MdQ_3 indices for classification and distinction of environments has been advocated by the author. He mentioned that the indices could be handled by data-processing machines used in trend-surface analysis. The present paper shows the value of Q_1MdQ_3 indices for presentation of the regional distribution of grain size on maps (figs. 1-3).	Q_1MdQ_3 indices showing grain-size distribution on maps
VOLUME 50 NO 3 373	1971	50	3	373	382	Ente, P.J.	Topics of the Holocene sedimentary geology based upon detailed investigations in the third polder of the Zuiderzee project are presented. They comprise distribution, composition and dating of sediments of the Calais-transgression phases, strongly bound to the evolution of the western Netherlands. Mainly after the first Duinkerke-transgression phase the development evolves towards a separate history of the Zuiderzee. Its evolution from a complex of lakes towards a brackish-saline lagoon is shown by the described sediments of different composition. The development of the delta of the river IJssel is brought into relation with that of the lagoon. The displacement of sands along the coast by wind/wave effects is shown, together with the phenomenon of numerous megaripples present at the edges of the sand masses.	Sedimentary geology of the Holocene in lake IJssel region

VOLUME 50 NO 3 383	1971	50	3	383	391	Gradstein, F.M.; Gelder, A. van	In Neogene deposits of the eastern Sitia district (eastern Crete), a lateral succession from fluvial to marine deposits has been reconstructed. Paleocurrent analysis indicates mainly southwest-directed sediment transport. The reddish deposits in the east (Kastti Formation) display braided-river characteristics. The fluvio-marine deposits in the central part of the area (Toplou Formation), lie laterally of the braided-river deposits eastward. The fluvio-marine deposits include thick conglomerate sheets, which display giant foresetting in sets between 5 and 30 m. high. This giant foresetting probably reflects the depositional slopes of large fans built by the discharging river below sea level. The submarine nature of deposition is confirmed by <i>Ostrea</i> between or on the pebbles. In the extreme southwestern part of the area marine marls occur (Akhladia Formation) with clastic intercalations, which bear evidence of mass transport, and which probably have been derived from the discharging river courses northeastward. Uniserial <i>Uvigerina</i> and <i>Globorotalia</i> in these marine marls point to a Late Miocene age of these deposits and hence of the fluvio-marine and the fluvial sediments.	Prograding clastic fans and transition from a fluvial to a marine environment in Neogene deposits of Eastern Crete
VOLUME 50 NO 3 393	1971	50	3	393	398	Groot, A.J. de; Goeij, J.J.M. de; Zegers, C.	Mercury is one of the various waste substances transported by the river Rhine across the German-Dutch border. Together with a number of other heavy metals mercury is present in large quantities. Upstream these metals are predominantly fixed to the suspended solids in the water and may be deposited on river flats and flood plains. From the fresh-water tidal area of the river onward, however, these elements are more or less solubilized during their transport as organo-metallic complexes. The mobilization of mercury is most pronounced in this respect. Leading to more normal amounts of this element in sediments from the Wadden Sea. This article deals with the behaviour of mercury through the whole Rhine estuary as compared with a number of other heavy metals. As a counterpart of the Rhine the same processes are described for the river Ems. The latter may be regarded as a classic example of an unpolluted stream.	Contents and behaviour of Mercury as compared with other heavy metals in sediments from the rivers Rhine and Ems
VOLUME 50 NO 3 399	1971	50	3	399	415	Jong, J.D. de	Post-orogenic sediments supplied by the Cantabrian Mountains during successive stages of uplift, were of the molasse type during the Stephanian and later of the clastic-wedge type. Sedimentological research has provided information on the source area and the environmental and climatic conditions under which these generally coarse grained sediments were deposited: warm and humid for Upper Carboniferous, warm and relatively arid for Triassic and Tertiary times. The depositional environments were in all cases torrential, alluvial fans grading into flood plains with finer grained sediments.	Molasse and clastic-wedge sediments of the Southern Cantabrian Mountains (NW Spain) as geomorphological and environmental indicators

VOLUME 50 NO 3 417	1971	50	3	417	424	Jong, J.D. de; Waals, L. van der	White Miocene sands occur in a block-faulted area near the southern limitation of the marine Miocene deposits in The Netherlands. Sedimentary structures, granulometric parameters, and the occurrence of fossil shells and burrows, point to shallow-marine tidal and littoral depositional environments. The mode of occurrence of silicifications in sand and lignite, the occurrence of red-yellow podzolic soils, and the absence of any unstable components among the heavy minerals point to a post-depositional strong chemical weathering in Tertiary times. The white colour of the sands should not be considered as an effect of bleaching by the lignites.	Depositional environment and weathering phenomena of the white Miocene sands of Southern Limburg (The Netherlands)
VOLUME 50 NO 3 425	1971	50	3	425	427	Jungerius, P.D.; Wiggers, A.J.	The surface of the ice-pushed ridges of Uelsen is marked by parallel ridges of Pleistocene material rich in gravel' and intervening depressions in gravel-free Pleistocene and Tertiary deposits. This relief results from selective erosion by runoff in a humid temperate or a nivation climate. Later periglacial conditions with solifluction and wind action disrupted the drainage system and suppressed the relief. Present geomorphic processes tend to diminish the effects of the periglacial environment.	The effects of selective erosion by overland flow on the ice-pushed ridges of Uelsen (County Bentheim, Germany)
VOLUME 50 NO 3 429	1971	50	3	429	442	Kuenen, P.H.	The efficiency with which turbidity currents have carried large volumes of sand for great distances on slight slopes of the deep-sea floor is remarkable. This seems to argue against high flow resistance by 'Jostle" viscosity and floor impacting. The grading of the deposits is inexplicable by thin, dilute currents because these would have to be fed at the origin over a period of a dozen hours or longer, to supply the observed volume of larger beds, and with decreasing grain size. High densities (over 1.16) seem more probable than great thicknesses (over 100 m). Experiments on viscosity of suspensions showed moderate values up to densities of 1.2 for clay and 1.5 for mainly sandy mixtures. Eddies large in comparison with the grain size do not meet serious obstruction by jostling. Measurements in a circular flume of bottom drag for suspension currents indicate that resistance is less than for clear water on a cohesive rough bottom of the same grain size and less than 2 X that of clear water on a smooth hard floor. These results, although of a tentative nature and without refinement by considerations of scale or of the paddle turbulence, appear to show that densities over 1.16 up to 1.5 as deduced from velocity cum thickness of the currents and from grading in the turbidites, are not contradicted by flow resistance. True experimental turbidity currents are being studied to gain further insight.	Tentative data on flow resistance in suspension currents

VOLUME 50 NO 3 443	1971	50	3	443	450	Kuijpers, E.P.	Along the east coast of Seven Heads peninsula (southern Ireland) a more than 1000m thick north dipping succession of Upper Devonian strata is investigated. The lithology and sedimentary structures of the facies types are described and briefly compared with recent sediments. They indicate a gradual transition from a continental "Old Red Sandstone" facies along a coastal plain facies into overlying (tidal) marine facies.	Transition from fluviatile to tidal-marine sediments in the Upper Devonian of Seven Heads Peninsula (South County Cork, Ireland)
VOLUME 50 NO 3 451	1971	50	3	451	459	Mabesoone, J.M.	Samples of recent limestones and calcareous sandstones dredged from the continental shelf off northern and northeastern Brazil have been studied. Three types of rock can be distinguished: (1) calcarenites composed of many organisms and fragments, classified as biomicrites in thin section; (2) algal accretionary limestones, showing almost entirely algal structures, named algal biomicrites; (3) calcareous sandstones, lime-cemented shelf sands of fluvial origin. Besides these, one sample was collected from the continental slope, determined as a foraminiferal intrabiosparite. Study of fauna and mineralogical composition revealed a recent age for all types, confirmed by the faunal assemblage and the dominance of aragonite and high-Mg calcite. The lithification of calcarenites and calcareous sandstones occurred by cementation of the loose bottom sediment under favourable conditions, in a marine open shelf environment, up to depths of about 100 m. The algal limestones are growth structures of calcareous algae, chiefly <i>Lithothamnium</i> .	Recent marine limestones from the shelf off tropical Brazil
VOLUME 50 NO 3 461	1971	50	3	461	473	Oele, E.	A map of the southern area of the Dutch part of the North Sea is presented. The geological history of the Quaternary can be summarized as follows. During the Late Tertiary and Early Pleistocene sedimentation of fine sands and clays took place in a marine environment. Gradually the westwards progradation of the "Rhine-Meuse" delta caused these sediments to be covered by a veneer of fluviatile sediments of about the same grain size. In the Middle Pleistocene the sediments became coarser, but were still of fluviatile origin. Meltwater clay of the Elsterian glaciation, present in the north, marks the first observed interruption of the fluviatile sequence. After the Holsteinian interglacial, the Saalian glaciation reshaped the topography, creating ice-pushed and morainic ridges. During the Eemian interglacial a marine environment persisted, whilst the marine sedimentary series was closed by the deposition of a fresh water clay in the Early Weichselian. 3) Later during this cold phase the coversands were formed in the north, the Kreftenheye Formation being deposited by the Rhine in the south. The Holocene sea level rise resulted in the deposition of the Lower Peat Bed and a cover of tidal flat sands on top of which, after a period of non-deposition, the young seasand was deposited.	The quaternary geology of the southern area of the Dutch part of the North Sea

VOLUME 50 NO 3 461	1971	50	3	461	473	Oele, E.	Large Enclosure	The quaternary geology of the southern area of the Dutch part of the North Sea
VOLUME 50 NO 3 475	1971	50	3	475	478	Otto, L.	Frequency distributions of current velocities were determined from the Netherlands lightvessels in the North Sea. Near the lightvessel "Texel" the frequency distribution shows a considerable degree of symmetry. By means of a simple model for transport of sediment the consequences of such a frequency distribution for the transport of particles of different sizes are investigated. There appears to be a distinct maximum in the transporting velocity near the lightvessel "Texel" for a certain particle size. This particle size is estimated to be about 300 μ , a value that corresponds with a relative poverty of particles between 200 μ and 300 μ "downstream" of the position of the lightvessel.	The frequency distribution of the current speed at the Netherlands lightvessels and its possible influence on the composition of sediments in the Southern North Sea
VOLUME 50 NO 3 479	1971	50	3	479	503	Raaf, J.F.M. de; Boersma, J.R.	Seven examples of tidal sedimentation ranging between modern and Devonian age are illustrated and briefly discussed. They cover known (modern intertidal and subtidal) and mostly undetermined ancient tidal subenvironments, and have been taken from: 1. The estuarine reach of a tidal river, subtidal, Holocene, Barendrecht excavation, The Netherlands. 2. An estuarine channel, subtidal, Holocene, Haringvliet excavation, The Netherlands. 3. A Lower Pleistocene (Tiglian), possibly subtidal estuarine succession, Hattem (Veluwe), The Netherlands. 4. A dune-bearing estuarine sand-bank, intertidal, modern Western Scheldt, The Netherlands. 5. The Lower Cretaceous (Lower Greensand) Woburn sands \pm 50 km NW of London, England, being probably deposited in an open marine tidal environment. 6. The Oligocene (Tongrian) Kerkom- and Neerrepn sands SE of Brussels, Belgium, representing an as yet uncertain type of tidal subenvironment. 7. An Upper Devonian tidal succession belonging to the transgressive complex (Cork beds) overlying the Old Red, W. of Cork, Eire. The following features were considered to be diagnostic for these (and other?) tidal deposits (a) vectorial bimodality of the cross-stratification, (b) common joint occurrence at different proportions of largescale and smallscale structured units in super- of juxtaposition. (c) Usually poorly developed sequential regularity with occasional occurrence of fining upward sequences. (d) Unidirectional cross-stratified sets displaying several kinds of features resulting from the intermittent and bidirectional character of the currents (discontinuity planes). (e) Fairly common occurrence of flaser- and/or lenticular bedding respectively consanguineous mud-sand interlaminations in smallscale-structured units. (f) Slight to intense	Tidal deposits and their sedimentary structures (Seven examples from Western Europe)

VOLUME 50 NO 3 505	1971	50	3	505	513	Riezebos, P.A.	From the Plio-Pleistocene series of sediments deposited by the river Maas on the Late Tertiary peneplain of southern Limburg.(The Netherlands) three samples, one of Pliocene and two of Pleistocene age have been taken. From these samples the grains between 500 and 2 micron have been subjected to microscopic investigations. The acquired mineralogical data confirming in broad outline previous investigations, reveal that the Pleistocene materials deviate from the Pliocene especially on account of a very great content of goethite particles. It is suggested that the great amount of goethite may be of use to discern the Quaternary Maas deposits from other contemporary fluvial sediments.	A contribution to the sedimentary-petrological description of the Maas deposits in Southern Limburg (The Netherlands)
VOLUME 50 NO 3 515	1971	50	3	515	525	Terwindt, J.H.J.	Three litho-facies may be distinguished in inshore estuarine and tidal-inlet deposits. In general these litho-facies are related to the intensity of the current action over the bottom. The current action shows rapid variations in time due to alternating spring and neap tides and/or wind influences and to shifts of the channel axis. As a result fining and coarsening upward sequences of the sediment types are found. The frequency of occurrence of the litho-facies varied with depth in the estuary studied, but not in the tidal inlets.	Litho-facies of inshore estuarine and tidal-inlet deposits
VOLUME 50 NO 3 527	1971	50	3	527	546	Veen, F.R. van	Outcrops and cored sections of the Lower-Middle Eocene Mirador and Misoa formations in and around Lake Maracaibo have been analysed sedimentologically and palaeontologically in order to establish depositional environments. Three genetically distinct sandstone units could be recognised: the fluvial point bar, the deltaic distributary channel-fill and the offshore bar or barrier beach. Each of these units is characterised by a specific vertical grain-size trend and sequence of bedding types. A fluvial environment is typical for the Mirador Formation, whereas deltaic plain and delta-fringe environments obtained during deposition of the Misoa. The Misoa constitutes overall a transgressive sequence interrupted by several phases of delta-building which become less important upwards. The Mirador and Misoa sediments are thought to form parts of one alluvial deltaic complex of Mississippi size. A deltaic source for the basal turbidites of the Trujillo Formation, which is the lateral equivalent of the lower part of the Misoa, is likely. The Misoa grades vertically and laterally into the holo-marine shales of the Pauji Formation.	Depositional environments of the Eocene Mirador and Misoa Formations Maracaibo Basin, Venezuela

VOLUME 50 NO 3 547	1971	50	3	547	558	Veenstra, H.J.; Winkelmolten, A.M.	<p>The article presents a general survey of the coversands in The Netherlands and northern Belgium. About 50 samples were taken mainly in a N-S run and in 15 localities oriented cores were taken with plexiglas tubes. Of all the samples a grain-size analysis was made by sieving and all the sieve fractions were tested for rollability, a functional shape parameter. After impregnation, the cores were inspected with X-rays and the directions of the oblique bedding planes measured. Of selected parts thin-sections were cut and the grain orientation was measured under a microscope. The directional features of foreset dips and fabric anisotropy both pointed towards transport from mainly northern directions. Also the grain-size and shape-sorting studies revealed a N-S trend. This trend, however, was not continuous but showed a repetition south of the rivers Rhine and Meuse. The coversands showed strong receiving shape characteristics and the coarser grains are of low sphericity. Although the influence of local sources is probable, the impression was gained that the main source of the Dutch coversands must be looked for in the region north and northwest to Holland, in the present North Sea. This fits well with the former observation of the pronounced sphericity of the sands in this area, which is explained as a lag characteristic obtained during the blowing out of the coversands.</p>	Directional trends in Dutch coversands
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VOLUME 50 NO 3 559	1971	50	3	559	576	Weber, K.J.	One of the most conspicuous geological features of the Niger Delta is its growth fault pattern. Almost all the oil reserves are contained in rollover structures which are associated with growth faults. These structural features are thought to have been formed by the force of gravity acting on a thick body of sediments supplied mainly by the Niger River. These sediments form a typical deltaic offlap sequence consisting of a wedge of continental sands grading downwards into marine clayey sediments which, at a greater depth, are in a state of undercompaction. Stratigraphically most of the known oil accumulations occur in the paratic sequence, i.e. the transition zone between the continental and fully marine sediments. The paratic sequence consists of a large number of sedimentary offlap cycles, each cycle starting with a marine clay, generally less than 150 feet thick and changing upwards progressively into proximal fluviomarine interlaminated silt, sand and clay which are usually followed by various types of more sandy barrier-bar and coastal-plain deposits. The cycles are terminated by transgressions which erode away part of the offlap sequence and which are generally represented by a thin, very fossiliferous gravelly sand. In this paper the relationship between sedimentation and growth faults is discussed. Examples are given of depositional cycles and of the associated types of reservoir rock. Attention is given to the influence of the depositional environment on the petrophysical properties of the rock, reservoir continuity and reservoir inhomogeneities.	Sedimentological aspects of oil fields in the Niger Delta
VOLUME 50 NO 3 577	1971	50	3	577	588			Boekbesprekingen
VOLUME 50 NO 3 589	1971	50	3	589	604			Geologisch en mijnbouwkundig nieuws
VOLUME 50 NO 4 605	1971	50	4	605	617	Stikker, D.U.		De huidige problematiek omtrent investering door of met het buitenlands bedrijfsleven in mijnbouwkundige objecten in ontwikkelingslanden
VOLUME 50 NO 4 619	1971	50	4	619	624	Priem, H.N.A.; Boelrijk, N.A.I.M.; Hebeda, E.H.; Verdurmen, E.A.T.; Verschure, R.H.	Rb-Sr measurements point to an Eburnian age (around 2150 million years) for the granites and tourmaline pegmatites in the Kamativi area, southern Rhodesia. From Rb-Sr and K-Ar mineral dates it is evident that a tectonothermal event affected the area in Kibaran time, about 970 million years ago; the emplacement of the tin-bearing pegmatites was probably connected with this event	Isotopic dating in the Kamativi Tin Belt, Southern Rhodesia
VOLUME 50 NO 4 625	1971	50	4	625	625	Vanderzee, T.J.		Eustatic drop of two meters since babylonian times?
VOLUME 50 NO 4 627	1971	50	4	627	638			Boekbesprekingen
VOLUME 50 NO 4 639	1971	50	4	639	648			Geologisch en mijnbouwkundig nieuws
VOLUME 50 NO 4 649	1971	50	4	649	666			KNGMG Jaarverlag 1970
VOLUME 50 NO 5 667	1971	50	5	667	670	Amerom, H.W.J. van; Boersma, M.	The ichnofossil <i>Phagophytichnus ekowskii</i> Van Amerom, known to occur in the Upper Carboniferous of Spain and in the Permo-Carboniferous of South Africa, is described for the first time from the Westphalian C of Northern France	A new find of the ichnofossil Phagophytichnus Ekowskii van Amerom

VOLUME 50 NO 5 671	1971	50	5	671	678	Collinson, J.D.	As water stage falls over a bedform covered sediment surface, local flow directions are increasingly controlled by the topography and if the bed material is still mobile, smaller surface features will reflect the control. Dispersion will increase as water stage falls. A bank in the bed of the Tana River, Norway, is used to illustrate this. Pebble features record high stage directions while sand features reflect falling stage modifications in direction of flow. Consideration of this effect might be important in using palaeocurrent distributions to specify channel type in fluvial sandstones.	Current vector dispersion in a river of fluctuating discharge
VOLUME 50 NO 5 679	1971	50	5	679	686	Dingle, R.V.	A series of deep, steep-sided, probably linear erosion hollows is described from the East Bank area on the northwestern side of the Dogger Bank, off the Northumberland coast of England. These hollows are infilled with bedded sediments and the whole sequence overlain by thick surface sediments with large linear banks. It is concluded, after a comparison with similar features from the western North Sea, that the East Bank hollows are buried tunnel valleys, which were excavated by sub-glacial streams near the edge of the Weichsel ice sheet, which deposited the Dogger Bank terminal moraine.	Buried tunnel valleys off the Northumberland coast, Western North Sea
VOLUME 50 NO 5 687	1971	50	5	687	690	Haile, N.S.; Bignell, J.D.	K/Ar determination on two adamellites from the Tambelan and Bunguran Islands, on the Sunda Shelf between the Malay Peninsula and Borneo, indicate that these are pre-Tertiary, probably Late Cretaceous' Rb-Sr determinations on the rock from Bunguran Island' and a third granitic rock from Tambelan Island, are not definitive, but are consistent with a Late Cretaceous age for the intrusion of the granitic rocks. These determinations, the first age indications from the Tambelan and Bunguran Islands, throw doubt on the supposed "pre-Upper Triassic" age of the acid batholiths in the Anambas Zone of the Sunda Shelf and its extension into West Borneo.	Late Cretaceous age based on K/Ar dates of granitic rock from the Tambelan and Bunguran islands, Sunda Shelf, Indonesia
VOLUME 50 NO 5 691	1971	50	5	691	697	Hartvelt, J.J.A.	Limestones bounding the Marimaña granodiorite, in the Central Pyrenees, which have until recently been correlated with the Cambro-Ordovician 'Calcaire métallifère' or "Calcaire de Bentaillou", have been proved to be of Devonian age. Conglomerates occurring at some distance below should be correlated with the main conglomerate level of the Cambro- Ordovician of the Pyrenees.	Stratigraphic position of the limestones and conglomerates around the Marimana granodiorite, Central Pyrenees, Spain
VOLUME 50 NO 5 699	1971	50	5	699	702	Mörner, N.A.		The Holocene eustatic sea level problem

VOLUME 50 NO 5 703	1971	50	5	703	718	Ward, W.T.	Four postglacial high sea levels, separated by intervals of low water, are recognized at 7.5 ft, 4.5 ft, 3.0 ft and 1 ft above present mean sea level in East Gippsland, Victoria, Australia. Direct estimation of shoreline age is made impracticable by an absence of datable material in the stranded beach sediments, but a few dates are available for lagoonal beds. These dates, and correlations with New Zealand made possible by the common occurrence of similar sequences of coastal dunes resulting from changes in postglacial climate, suggest that the four stages of high sea level occurred about 4,700, 3,000, 1,500 and 750 calendar years ago. In particular the East Gippsland shoreline sequence is similar to that observed in the Firth of Thames, New Zealand. The stranded shorelines are believed to result from combination of long-term land uplift with real changes in sea level. This conclusion follows comparison of the Firth of Thames data with observations reported for 15 other localities in New Zealand, western Europe, North America, Africa and Oceania. Contradictory theses concerning postglacial sea-level changes in these localities are reconciled if it is assumed that each locality has been affected by earth movements. Such movements are already recognized in some areas affected by isostatic rebound or by mountain-building, and are presumed in other where shorelines appear excessively high or excessively low. To facilitate comparison, two simple models that relate shoreline elevation to implied rate of uplift are used. These models are based on the supposition that the earth movements actually experienced were continuous, or can be reasonably represented as small fluctuations about a regular long-term trend. It is not yet possible to decide whether any of the	Postglacial changes in level of land and sea
VOLUME 50 NO 5 719	1971	50	5	719	723			Genootschapszaken

VOLUME 50 NO 6 725	1971	50	6	725	732	Nederlof, M.H.; Weber, K.J.	Means of dipmeter readings derived by a three dimensional vector method have proven to be useful in deriving structural dip and azimuth from a collection of widely scattered dips. A computer program to calculate 3-D vector means and related statistics has been developed. Dip distributions are comparable to the spherical normal distribution so that for practical purposes a measure of reliability of the vector means can be calculated. The 95% confidence cone around the vector mean is chosen as the most convenient yardstick. Confidence angles for the mean dip angle and mean azimuth are derived separately from this confidence cone. Preferably, study and correlation of well logs should precede the averaging procedure. This enables the selection of intervals, which contain readings more or less conforming to the structural dip and azimuth. The calculated average dips can be displayed on a tadpole plot, or other plots against depth. The average dips are much easier to interpret than the original data, especially when using a condensed depth scale. The difference between successive vector means is a measure of the rate of change of dip with depth and can reveal the presence of discontinuities, such as faults and unconformities which might otherwise remain undetected in the "raw" data. The approach is applicable to both 3-arm dipmeter logs and the more modern 4-arm dipmeter logs for which the digitized curves are correlated by the computer.	A three dimensional vector method as an aid to continuous-dipmeter interpretation
VOLUME 50 NO 6 733	1971	50	6	733	741	Valeton, I.	This paper presents a description of the possible plant fossils and burrows in the bauxite belt which extends through Surinam and Guyana. The possible plant fossils are defined as roots, tree trunks, and branches forming horizontal layers of roots in the underlying sediments and the basal part of the bauxites. The plant fossils show external textures, and internal structures which may be taken to be cuticulae. Within the bauxites burrows of various diameters may be seen. Internally, they either show the typical "Stopfgefüge" or lack structure entirely. The presence of plant roots and burrows proves that a large proportion of the bauxite in the bauxite belts of Surinam and Guyana originates from sediments formed in either a mangrove environment, a fresh-water marsh environment, or a brackish swamp environment.	Tubular fossils in the bauxites and the underlying sediments of Surinam and Guyana

VOLUME 50 NO 6 743	1971	50	6	743	748	Greensmith, J.T.; Tucker, E.V.	Soil mechanics parameters, such as apparent cohesion, natural moisture content and liquid limit, are useful additional factors in determining depositional and erosional events within non- and partially-lithified sedimentary successions. Overconsolidated beds, caused by desiccation, occur in the marine Quaternary succession of the Essex coast and they indicate at least two important periods of prolonged desiccation during lowered sea levels. The older phase reflects, in part, the late- Devensian - Holocene (Flandrian) interlude of depressed base-level and extended over at least 10,000 years. The younger and shorter phase is intra-Holocene c. 4,500 B.P.	Overconsolidation in some fine-grained sediments; its nature, genesis and value in interpreting the history of certain English Quaternary deposits
VOLUME 50 NO 6 749	1971	50	6	749	750	Vogel, D.E.; Abdel-Monem, A.A.		Radiometric evidence for a Precambrian metamorphic event in N.W. Spain
VOLUME 50 NO 6 751	1971	50	6	751	754	Bos, R.H.G.; Jungerius, P.D.; Wiggers, A.J.	The erosional history of the ice-pushed ridges of Uelsen is reflected in correlative slope deposits. Würmian processes lowered the gravelly summits of the hills and produced the characteristically unsorted solifluction deposits. These include remnants of an Eemian (?) soil. In contrast, Holocene erosion only affected the fine-grained soils on the flanks of the hills. It acted so slowly that well-developed humus podzols could be preserved on the eroded slopes, as well as on sites of colluvial deposition. The colluvium is strongly sorted because many small mineral grains were transported in humic aggregates of modal size.	Solifluction and colluviation on the ice-pushed ridges of Uelsen, Kreis Grafschaft Bentheim, Germany
VOLUME 50 NO 6 755	1971	50	6	755	755	Botman, A.C.		Brief account of the symposium on geochemical exploration in Delft - March 5th, 1971
VOLUME 50 NO 6 756	1971	50	6	756	757	Webb, J.S.		Present status and future prospects in exploration geochemistry
VOLUME 50 NO 6 758	1971	50	6	758	759	Oosterom, M.G.; Schuiling, R.D.		Global distribution of tin abundances
VOLUME 50 NO 6 760	1971	50	6	760	762	Dijkstra, S.		The regional geochemical landscape of the Moresnet metallogenic district
VOLUME 50 NO 6 763	1971	50	6	763	764	Kleyn, P.H. van der		Geochemical patterns and structural alignments in relation to antimony-mercury-tungsten mineralisations in the Nidge area, Turkey
VOLUME 50 NO 6 765	1971	50	6	765	767	Friedrich, G.		Use of mercury in geochemical exploration
VOLUME 50 NO 6 768	1971	50	6	768	770	Bosman, E.R.; Eckhart, D.; Kubik, K.		Application of automatic data processing to problems of exploration geochemistry
VOLUME 50 NO 6 771	1971	50	6	771	773	Cole, M.M.		Geobotanical exploration
VOLUME 50 NO 6 774	1971	50	6	774	776	Tooms, J.S.		Marine geochemical exploration
VOLUME 50 NO 6 777	1971	50	6	777	780	Uytenbogaardt, W.		Indrukken van het IMA-IAGOD congres, Tokio-Kyoto 1970
VOLUME 50 NO 6 781	1971	50	6	781	789			Boekbesprekingen
VOLUME 50 NO 6 791	1971	50	6	791	801			Geologisch en mijnbouwkundig nieuws
VOLUME 50 NO 6 803	1971	50	6	803	808			Genootschapszaken

VOLUME 51 NO 1 1	1972	51	1	1	5	Romijn, E.	Geohydrological activities in The Netherlands have undergone some remarkable developments since World War II. Besides the Government Institute for Water Supply many other agencies and institutes have contributed to this progress. Scientific achievements in geohydrology have largely run parallel with the rapid social and economic development of the Netherlands since the war.	Review of geohydrological activities in the Netherlands since World War II, in particular of the government institute for water supply
VOLUME 51 NO 1 7	1972	51	1	7	9	Jelgersma, S.; Visser, W.A.	Two hydrogeological maps, in scale 1 : 1,500,000, have been compiled, based on the principles laid down for the International Hydrogeological Map of Europe. Map I is representative for shallow conditions; map II is representative for the sequence of sediments ranging from Pliocene to Holocene.	Hydrogeological maps of the Netherlands
VOLUME 51 NO 1 7	1972	51	1	7	9	Jelgersma, S.; Visser, W.A.	Large Enclosure	Hydrogeological maps of the Netherlands
VOLUME 51 NO 1 11	1972	51	1	11	33	Damme, J.M.G. van	With the intention to give an impression of the usually applied geohydrological procedures for the foundation of a pumping station in the Netherlands, the investigations for the well field at Beerschoten (provincie of Utrecht, The Netherlands) are reviewed. The area concerned is located on the western slope of ice pushed hills forming the Utrecht Ridge. The subsoil consists predominantly of Pleistocene sandy deposits of fluvial origin, with local loam layers. The groundwater has a suitable quality for the preparation of drinking water and requires only a simple treatment. From a pumping test it appeared that the studied area is situated in the transition zone between a recharge and a discharge area and that loam layers delay the propagation of drawdowns from the pumped aquifer to the phreatic surface. The transmissivity of the aquifer from which the water will be withdrawn amounts to 3500 m ² /day. On the base of subsequent studies carried out by means of a mathematical method and electrical model tests a prediction of the consequences of the withdrawal for the groundwater table has been given. Several relatively simple statistical methods are described, from which it appears that in spite of a certain lack of appropriate data. The prediction given was reasonably reliable and also that after adjustments for several external influences the actual consequences of the withdrawal could be very well determined. As in many other cases, the practical sustained yield in this area depends merely on the drawdowns due to the withdrawal and on the decrease of underground flow to ditches. From the point of view of water resources management the survey forms an example of a case where a series of multi-purpose investigations should serve to arrive	Geohydrological investigations with a view to groundwater catchment, a case history

VOLUME 51 NO 1 35	1972	51	1	35	44	Roebert, A.J.	In the Amsterdam dune-water catchment area, a freshwater lens of some 40 to 90 m thickness is resting on salt water in the lower aquifer, located at a depth of 20 m to 160 m - O.D. Water extraction from the lower aquifer has disturbed the fresh-water/salt-water interface, extending it into a zone of dispersed, brackish water. For many years, the extraction area has been overdrawn. This article will discuss salinity conditions in the Amsterdam catchment area, and draw up a comparison between its current stock of fresh water and the original volume present before the start of waterwinning in the area. With the introduction, in 1957, of artificial recharge through infiltration of Rhine-water into the upper aquifer above 15 m - O.D., water extraction from the lower aquifer, which had been hampered by increasing salt-water contamination of the wells owing to the upconing of brackish water, was virtually stopped. The lower aquifer, however, still holds a vast stock of fresh water, which, if developed by a system of intermittent extraction, could substantially contribute to the water supply of the greater Amsterdam area.	Fresh water winning and salt water encroachment in the Amsterdam dune water catchment area
VOLUME 51 NO 1 35	1972	51	1	35	44	Roebert, A.J.	Large Enclosure	Fresh water winning and salt water encroachment in the Amsterdam dune water catchment area
VOLUME 51 NO 1 45	1972	51	1	45	52	Vries, J.J. de; Rees Vellinga, E. van	In the eastern part of the province of Gelderland, two buried valley systems have been traced. One system is filled with fluvioglacial deposits dating from the Saalian Ice Age, the other with preglacial fluvial sediments which are remarkable rich in volcanic minerals. Both systems have a course which is almost perpendicular to the present drainage system. This change in stream direction is explained by postglacial replacement of the main drainage channel in the area, tectonic movement perpendicular to the old channels, and postglacial filling of the old channels with wind blown sand.	Buried channel aquifers and present open drainage system of East Gelderland, the Netherlands
VOLUME 51 NO 1 53	1972	51	1	53	62	Weber, K.J.; Eijpe, R.; Leijnse, D.; Moens, C.	In order to understand and predict the production performance of a reservoir it may be important to know its permeability distribution in detail. The internal structure of layered sand bodies, such as those that result from the deposition of sands in channels, could for instance cause an overall permeability anisotropy. We have developed a method of deriving the permeability distribution in such a sand body from measurements on core samples. This method has been checked by comparing the permeability distribution deduced from measurements on samples from an actual channel-fill with that derived from flow tests in the same sand body. Our experimental data on unconsolidated distributary channel-fills show that permeability anisotropy is negligible in such sand bodies.	Permeability distribution in a holocene distributary channel-fill near Leerdam, (The Netherlands)

VOLUME 51 NO 1 63	1972	51	1	63	70	Löhnert, E.P.	Moderately saline groundwaters, which are still usable for drinking and industrial purposes, occur in Northern Germany until depths of approximately 500 meters below the surface. Apart from local saline water intrusions along the North Sea coast and rivers, the saline components of groundwater are derived from deep groundwaters, which can be related to salt bodies mainly of Zechstein age. Sulfate waters are found in the immediate vicinity of salt domes. In contrast chloride salt waters and brines are also found further away from the salt bodies, and show indications of reduction and base-exchange. The relationships of the groundwater types toward each other should be clarified by means of isotope research. A chemical classification of groundwater has been proposed, which bears in mind the absolute as well as the relative contents of main ions (fig. 2).	Contribution to the geochemistry of groundwater in Northern Germany
VOLUME 51 NO 1 71	1972	51	1	71	83	Wesseling, J.; Colenbrander, H.J.	For the study of water management problems in agriculture often the same hydrologic parameters and calculation techniques are applicable as for civil engineering studies (e.g. foundations) and drinkwater supply studies (e.g. extraction and recharge of water). Therefore, arbitrary subdivision of hydrology as agro-hydrology, geohydrology etc. does not always make much sense. In this paper the use of some hydrologic calculation techniques in solving water management problems in agriculture is elucidated.	The use of geohydrology in solving water management problems in agriculture
VOLUME 51 NO 1 85	1972	51	1	85	109	Ouwerkerk, J.H. van; Zeilmaker, D.A.	The application of models in geohydrological investigations is closely related to the use of quantitative methods in groundwater hydrology. To help determine which type of model should be chosen an analysis of the following aspects is required: nature of the problems, structure of the hydrological system, types of models and general conditions. The large number of factors involved in this analysis, and the small number of results of alternative methods of investigations, preclude the formulation of a generally applicable rule of selecting a model.	Application of models in geohydrological investigations

VOLUME 51 NO 1 111	1972	51	1	111	120	Ridder, N.A. de	There is an urgent need for a new approach and the application of modern techniques in solving the problems of future water supply. More than is the case at present, proper planning must relate the physical, environmental, economical and social factors involved. But integration of the various elements encounters some major difficulties of which insufficient data and lack of an exact and comprehensive methodology are the most serious. In the last few years there have been a series of important developments in, total water resources management methods and water supply optimization techniques. Basic to these developments in total water resources management methods disciplines as Operations-Research and Systems Analysis, and the availability of high-speed electronic computers. Planning techniques based on the computer's ability to process vast amounts of information enables the engineer to check a certain solution by arbitrary variation of the given or assumed parameters of his model. The water demands of an area can be met either by delivering surface water, or groundwater, or by an almost infinite number of possible combinations of these two resources. But water should be supplied economically without causing harmful effects within the area or its surroundings. To achieve this objective the technique of linear programming can be applied, as it allows to find for each plan an optimum solution of water supply under the given constraints. Then, using a digital computer model of the groundwater basin, which is capable of simulating the extraction and replenishment flows, the consequences of future water engineering works can be determined. The unique feature of these two models is that the output of the linear programming model can be used	The use of computers in water resources development and water supply planning
VOLUME 51 NO 1 121	1972	51	1	121	129	Walter, F.	Well logging methods and physical borehole investigations have come into use for geohydrological reconnaissance in The Netherlands in recent years. In open uncased boreholes the following features are logged: spontaneous potential, resistivity, natural gamma radiation and diameter; interpretation methods are given in short. Reference is made to investigation methods in observation and discharging wells. Permanent electrode systems can be used for monitoring ground-water salinity.	Recent developments of physical investigations in boreholes and wells
VOLUME 51 NO 1 131	1972	51	1	131	136	Mook, W.G.	¹⁸ O, deuterium and tritium may serve as tracers and be used to determine the origin of groundwater. The radioactive isotopes ¹⁴ C and T can be used to date water. Deuterium and ¹³ C may give information about evaporation and processes in the unsaturated zone	Application of natural isotopes in ground water hydrology
VOLUME 51 NO 1 137	1972	51	1	137	141	Rijn, W.P. van	A simple, robust, electronic groundwater-level detector has been constructed which measures the water level in piezometers with an accuracy of better than ± 1mm. A series of these instruments can be connected to an automatic digital recording system. Measurements can be performed according to a selected programme of measuring times. The reference level at each level-detector location is indicated by gauging glasses attached to a system of interconnected liquid-filled tubes.	An electronic groundwater-level detector with automatic output registration

VOLUME 51 NO 1 143	1972	51	1	143	153			Boekbesprekingen
VOLUME 51 NO 1 154	1972	51	1	154	156			KNGMG Ledenvergadering 1971
VOLUME 51 NO 1 0(1)	1972	51	1	0(1)	0	Krol, G.L.		Aan de leden
VOLUME 51 NO 1 0(2)	1972	51	1	0(2)	0	Smoor, P.B.		Preface Special Issue "Geohydrology - Hydrology"
VOLUME 51 NO 2 158	1972	51	2	158	158	Krol, G.L.		Aan de leden
VOLUME 51 NO 2 159	1972	51	2	159	216	Brueren, J.W.R.		Zestig jaren KNGMG
VOLUME 51 NO 2 217	1972	51	2	217	227	Helleman, G.		Complete lijst van de verhandelingen van het Koninklijk Nederlands Geologisch Mijnbouwkundig genootschap
VOLUME 51 NO 2 230	1972	51	2	230	234			Boekbesprekingen
VOLUME 51 NO 2 235	1972	51	2	235	241			Geologisch en mijnbouwkundig nieuws
VOLUME 51 NO 2 242	1972	51	2	242	246			Genootschapszaken
VOLUME 51 NO 3 248	1972	51	3	248	248	Mulaisho, D.C.		Preface special issue "Zambia"
VOLUME 51 NO 3 249	1972	51	3	249	249	Vletter, D.R. de; Dijkstra, S.; Bruggen, J.W. ter		Introduction Special Issue "Zambia"
VOLUME 51 NO 3 251	1972	51	3	251	263	Vletter, D.R. de	Tonnages and values of the chief minerals at present mined in Zambia are included in a survey which also touches on other mineral resources, e.g. nickel. Zambia's position amongst other major copper producers is described in terms of production, average grades mined, ore reserves and costs. Estimates of copper production for the next few years are given and some events affecting the copper industry in the past decade considered, especially as they relate to the position of the developing vis à vis the developed countries. The extent to which copper dominates Zambia's economy is noted and its contribution to the Gross Domestic Product, to exports, Government revenues and employment is compared with that of its sister industries in the CIPEC countries (namely Chile, Peru and Zaire). The corporate structure of Zambia's copper mining industry is described and the terms of the agreement by which the Government of Zambia acquired a 51 per cent interest in the industry in 1970 are set out. Important implications of recent mining legislation including the Mineral Tax Act 1970 and the Income Tax (Amendment) Act, 1970, are also considered.	Zambia's mineral industry and its position amongst world's major copper producers
VOLUME 51 NO 3 265	1972	51	3	265	275	Drysdall, A.R.; Johnson, R.L.; Moore, T.A.; Thieme, J.G.	The structural-stratigraphic provinces of Zambia are described with special reference to recent work by the Geological Survey. The Tumbide and Irumide deformations are redefined as episodes of the Kibaran Orogeny, and attention is drawn to Kibaran foreland folding within the Bangweulu Block. The Lufilian Arc is shown to be a polyphase structure, and is contrasted with the Mozambique Belt which is believed to be polyorogenic. The continental Karoo sediments preserved in the partly fault-bounded, riftlike structures of the mid-Zambezi, Luangwa and Kafue troughs are briefly described. The presence of Cretaceous beds in Western Zambia and a marine horizon beneath the continental succession are noted.	Outline of the geology of Zambia
VOLUME 51 NO 3 265	1972	51	3	265	275	Drysdall, A.R.; Johnson, R.L.; Moore, T.A.; Thieme, J.G.	Large Enclosure	Outline of the geology of Zambia

VOLUME 51 NO 3 277	1972	51	3	277	298	Garlick, W.G.	<p>Superseding of the hydrothermal origin by syngeneses subsequent to 1928 is recorded historically. Granites claimed to be intrusive were in 1940 found to be overlain unconformably by Katanga sediments. The bulging intrusive granites became bulging paleo-hills, avoided by copper mineralization. Discovery that ore grade in the deformed and shattered orebeds of a dragfold was no richer than in the unfolded sections, proved that the mineralization was pre-folding. Two decades later dolomitic facies over some granite bulges proved to be algal bioherms. By the syngenetic theory the zonal sequence, from copper-rich to iron-rich sulphide, was interpreted as representing depth zones parallel to shoreline controlled by the activity of anaerobic bacteria. Recognition of anhydrite explained mysterious cavities in veins, conditions of sedimentation, and the source of the sulphur to form the sulphides and, by its solubility, explained the high porosity of the Katanga sediments to depths of 600 m. Features of the ore shale deposits such as dissemination instead of selective replacement, mineral zoning, association with basins flanking paleo-hills, barren gaps over bioherms, apply also to mineralization in arenites. Pyritic disseminations in sediments over granite hills and sulphide concretions are confined to orebodies in arenite, explainable by its greater original permeability. Evidence for syngeneses derives from interpretation of the depositional environment, although many of the processes are still being elucidated. Prior to formation of the major ore deposits, in marine waters, evaporation of playa lakes gave high concentrations of sulphates, borates, and, under anoxic conditions, sulphide precipitation. Drying out of such lakes exposed mud flats on which</p>	Sedimentary environment of Zambian copper deposition
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VOLUME 51 NO 3 299	1972	51	3	299	308	Voet, H.W.; Freeman, P.V.	Lenticular copper concentrations in basal arenaceous and rudaceous members of the Katanga System occur in basins in Basement gneiss and schist in an area of rugged palaeotopography at the Chingola Open Pit sector of Nchanga Mine on the Zambian Copperbelt. The gneisses and schists, as well as the unconformably overlying Katanga meta-sediments with their stratiform orebodies, have been folded into-overturned to recumbent structures in which the westerly to northwesterly trend of anticlinal and synclinal axes is closely controlled by the old ridges and valleys, respectively. The overfolding is in turn the result of the incompetent behavior of the gneisses and schists which rode over the rigid buttress formed by the massive Nchanga Granite during orogenesis. Secondary redistribution of copper is believed to have taken place during the folding at one of the orebodies, which is located in the most intensely deformed area. Otherwise the present copper concentrations are still in their original stratigraphic positions. The close spatial relationship between the palaeoridges, the meta-sediments and the associated copper concentrations, suggests a common origin of both sediment and copper from the old ridges. Pre-existing copper lodes in the Basement gneiss and schist are invoked as the source of the copper, which was reconcentrated, either by detrital or chemical means or a combination of these processes, into the sediments at no great distance from the original lodes some of which are still preserved directly under the cupriferous sediments.	Copper orebodies in the basal lower Roan meta-sediments of the Chingola open pit area Zambian Copperbelt
VOLUME 51 NO 3 309	1972	51	3	309	313	Vink, B.W.	This paper describes the sulphide mineral zoning through the stratigraphic column in the Baluba copper-cobalt mine in the Zambian Copperbelt. This zoning is explained by changing Eh and pH conditions with time, due to fresh river and rain waters, entering a saline basin.	Sulphide mineral zoning in the Baluba ore body, Zambia
VOLUME 51 NO 3 315	1972	51	3	315	319	Binda, P.L.	This is the first record of microfossils found in palynological preparations of Precambrian metasediments from the Zambian Copperbelt. Argillites and carbonates of the Lower Roan contain clusters of spherical forms, chains of cells, and filaments of algal affinity, which are similar to Precambrian microfossils reported from Australia and Europe. The Mwashia and the Kundelungu groups contain mainly isolated Sphaeromorphida.	Preliminary observations on the palynology of the Precambrian Katanga Sequence, Zambia

VOLUME 51 NO 3 321	1972	51	3	321	328	Eden, J.G. van; Binda, P.L.	It is speculated that the Katanga Sequence of the Zambian Copperbelt may have been deposited in a large basin which extended to the southwest into South West Africa. This concept calls for improved regional correlation, particularly since many economic strata-bound deposits in these areas are found in identical stratigraphic sequences of similar age. The Great Conglomerate, partially glacial in origin, can be considered a deposit of the widespread Late Precambrian glaciation and can, therefore, provide a much needed time-stratigraphic marker. The association of the Copperbelt orebodies to particular sedimentary facies may help to delineate trends of mineralization on a local as well as on a more regional scale. The lowermost part of the Katanga Sequence is interpreted as deposited during a regional transgression of the sea which created similar environments along a northwest-southeast belt. Though much of the Copperbelt ore is considered syn-sedimentary in origin, some occurrences are better explained by secondary processes.	Scope of stratigraphic and sedimentologic analysis of the Katanga Sequence, Zambia
VOLUME 51 NO 3 329	1972	51	3	329	335	Jolly, J.L.W.	Short abstracts are given of some recently completed investigations bearing on the geochemistry of Copperbelt ore deposits. Three detailed investigations were carried out on veins and altered barren zones in the ore-bearing argillites and footwall quartzites at Chambishi, Luanshya and Muliashi. At all three places, hot fluids have locally altered the host rock, formed veins, leached and remobilized sulphides, and in one case, formed breccia. Comparison of samples from selected parts of the orebody and barren rock at Chambishi has shown interesting mineral and chemical trends that may have important bearing on the origin of the ore. An investigation into the use of mercury in prospecting was also undertaken with some positive results	Recent contributions to copperbelt geochemistry
VOLUME 51 NO 3 337	1972	51	3	337	345	Notebaart, C.W.; Vink, B.W.	In this paper, major and minor copper and cobalt ore minerals, presently known to occur in Copperbelt ores, are described briefly.	Ore minerals of the Zambian copperbelt
VOLUME 51 NO 3 347	1972	51	3	347	356	Kortman, C.R.	The Zambia Broken Hill ore deposits occur within a belt of dolomitic rocks of Katanga age (Upper Precambrian), which strikes NW and is flanked by shale and phyllite. The main pipe-like orebodies, striking WSW, and plunging to the ENE, have a massive sulphide core, consisting of sphalerite, galena and pyrite, surrounded by an oxidised zone containing willemite, smithsonite and cerrussite. An antipathetic relationship exists between lead and iron in the sulphide ore. The wall rock, a pure massive dolomite, was brecciated during oxidation. The breccia matrix consists of jasper-like lithified mud with erratic fragments of oxidised ore. A similar lithified mud is common along the outer margins of the oxidised ore, where it was emplaced through late infilling of cavities.	The geology of the Zambia Broken Hill mine, Kabwe
VOLUME 51 NO 3 357	1972	51	3	357	359	Ellis, M.W.		Summary - Geophysics in the Zambian environment

VOLUME 51 NO 3 361	1972	51	3	361	370	Bruggen, J.W. ter	This article gives a general review of technical practices in use at the Zambian copper industry from mining to refining. Some statistics concerning ore reserves and production for 1970 are included.	Introduction into mining and metallurgy on the Zambian Copperbelt
VOLUME 51 NO 3 371	1972	51	3	371	380	Pronk van Hoogeveen, L.A.J.	Computer techniques have become increasingly important in planning open pit mines. This article describes a computer system for the design of open pits to mine stratiform orebodies. The system incorporates a modified version of the Open Pit Design Program developed by Rio Tinto Zinc Consultants Ltd. The particular requirements of such a system, for example, the accuracy of representation of geological detail and the ability to follow footwalls, are described in this paper together with the methods that have been adopted to satisfy them. A description of how the computer design program was used to develop the medium and long term mining plans for the Nchanga Open Pit is included.	Open pit planning with the aid of a computer design system
VOLUME 51 NO 3 381	1972	51	3	381	397	Collinson, B.M.	A brief description of the ore deposits at RCM's two large underground mines at Luanshya and Mufulira is followed by details of the main mining methods used immediately prior to mechanisation and at the present time. The objectives of mechanisation are listed together with additional benefits that have accrued. Experience with various types of mechanized mining equipment, loaders, trucks, drill rigs and raiseborers is described as are the steps taken to speed up ground support. The article concludes with a description of ventilation, underground maintenance, tyre usage and training.	Underground mining mechanisation at roan consolidated mines since 1965

VOLUME 51 NO 3 399	1972	51	3	399	408	Rijken, J.H.A.; Clutten, J.M.	Nchanga Consolidated Copper Mines Limited, Konkola Division (formerly Bancroft Mines Limited) is the wettest mine on the Zambian Copperbelt and probably the second wettest in the world. The stratigraphic position of the orebody, between the Hangingwall and Footwall Aquifers, results in large quantities of controllable and uncontrollable water flowing into the workings during mining operations. In 1970 an average of 340 000 cubic metres (75 million gallons) per day were pumped to surface, equivalent to 64 tonnes of water per tonne of ore hoisted. Sufficient pumping capacity has to be installed to lower the water table in the various aquifers in time to meet production commitments. The sustained capacity for 1972 will be in the region of 600 000 cubic metres (130 million gallons) per day. The mining method of sub-level open stoping requires dewatering of the Footwall Aquifer during development operations and dewatering of the Hangingwall Aquifers prior to stoping. Water is, therefore, a major consideration in mine planning. A clear understanding of the geological features of the Konkola mining area is essential to develop a successful and efficient dewatering scheme. Dewatering of the various aquifers is achieved by drilling boreholes and by driving mining headings into the aquifers. The problem of recharge is not yet solved and research in this field is in progress, including colour and infrared aerial photographic surveys, chemical and neutron activation analyses of waters, regional water balance studies, and age determinations of waters by natural isotope analysis.	The water problem in relation to mining at Konkola Division, Nchanga Consolidated Copper Mines Limited
VOLUME 51 NO 3 409	1972	51	3	409	418	Bosse, P.J.W.		New developments at the leach plant at Nchanga Consolidated Copper Mines Limited Chingola Division
VOLUME 51 NO 3 419	1972	51	3	419	421	Tumilty, J.A.J.; Timmers, J.		Summary - The research and development department of Nchanga Consolidated Copper Mines Limited
VOLUME 51 NO 3 423	1972	51	3	423	448	Barlin, B.	A detailed description is given of the metallurgical complex comprising a concentrator, electrolytic zinc plant, sinter plant, Imperial Smelting Furnace and lead refinery used to produce refined lead and two grades of zinc at the Broken Hill mine in Kabwe, Zambia. Flow sheets and 1970 production details are included.	Metallurgical practice at the Broken Hill Division of Nchanga Consolidated Copper Mines Limited
VOLUME 51 NO 3 449	1972	51	3	449	462			Geologisch en mijnbouwkundig nieuws
VOLUME 51 NO 3 463	1972	51	3	463	467			Genootschapszaken
VOLUME 51 NO 4 469	1972	51	4	469	471	Arps, J.J.		The evolution of petroleum engineering in the last 40 years
VOLUME 51 NO 4 473	1972	51	4	473	486	Theurkauf, E.		Stufenweise Durchführung von Lagerstättenuntersuchungen unter dem Gesichtspunkt der Wirtschaftlichkeit am Beispiel der Eisenerzlagstätte Mano River, Liberia, Westafrika
VOLUME 51 NO 4 487	1972	51	4	487	490	Erdbrink, D.P.	Description of a mandibular fragment of the right side of a Cave Hyaena, found in 1971 near Deventer as the seventh recorded find of this species in the Netherlands, probably from an Eemian deposit.	A new find of a cave hyaena from the Netherlands

VOLUME 51 NO 4 491	1972	51	4	491	495	Amerom, H.W.J. van	A revision of the samples from the borehole Wanneperveen I, The Netherlands, leads to the following conclusions: a) <i>Taeniopteris parva</i> Jongmans nov. sp., published and figured in Jongmans&VanderHeide (1953) can be identified as single pinnules of <i>Neuralethopteris schlehani</i> forma <i>rectinervis</i> (Kidston). b) The non-marine shell described as " <i>Carbonicola carbonaria</i> " in the same above mentioned publication, is now determined as <i>Carbonicola cf. circinata</i> Pastiels 1960. Consequently the age of the fossil bearing sediments in the borehole Wanneperveen I must be lowered from the Autunian to the Westfalian A.	Das Karbonische alter der Tiefbohrung Wanneperveen I, eine revision
VOLUME 51 NO 4 497	1972	51	4	497	498	Wagner, R.H.		Letter to the editor
VOLUME 51 NO 4 499	1972	51	4	499	500			Samenvattingen van de lezingen symposium "Enkele nieuwe aspecten van Delfstoffen in Nederland"
VOLUME 51 NO 4 501	1972	51	4	501	508			Boekbesprekingen
VOLUME 51 NO 4 509	1972	51	4	509	514			Geologisch en mijnbouwkundig nieuws
VOLUME 51 NO 4 515	1972	51	4	515	537			KNGMG Jaarverslag 1971
VOLUME 51 NO 5 540	1972	51	5	540	540	Ritsema, L.		The Tyrrhenian sea - an introduction
VOLUME 51 NO 5 541	1972	51	5	541	545	Ritsema, A.R.		Deep earthquakes of the Tyrrhenian sea
VOLUME 51 NO 5 546	1972	51	5	546	547	Schuiling, R.D.		Oceanization - geothermal models
VOLUME 51 NO 5 548	1972	51	5	548	573	Bemmelen, R.W. van	A critical review of newer data on the Tyrrhenian area (marine geology, land geology, paleomagnetism and seismicity) leads to a formulation of some general aspects of its evolution in Cenozoic time. A solution is suggested for the geodynamic puzzle of Corsica and Sardinia, based on a relativistic structural analysis of the apparent rotations and translations of these islands with respect to a deforming continental frame. During the Cenozoic the central Tyrrhenian area was subjected to pulses of doming and intervening periods of subsidence. The youngest uplift occurred in Mid-Pliocene time and thereafter it collapsed to bathyal depths at a rate of 1 mm/yr. This diastrophic evolution was accompanied by a geochemical transformation of the original continental type of crust (formed during the Hercynian orogeny) into an intermediary type of sialic crust (about 11 to 12 km thick). Meanwhile an orogenic crustal wave migrated radially outward from the Tyrrhenian centre of diastrophism, accompanied by radially outward directed overthrusts, imbrications, and other compressive tectonic features. The driving forces of this orogeny are evidently acting from the concave side of the orogenic arc. The expectations of three geodynamic models of interpretation, advanced for the Tyrrhenian test-case, are compared with the observed aspects of its evolution. These models are (I) plate tectonics, (II) radiogenic heating by the continental crust, and (III) active mantle diapirism. It appears that only the third model provides an explanation which is consistent with the available geonomic evidence.	Driving forces of Mediterranean orogeny
VOLUME 51 NO 5 574	1972	51	5	574	575	Boekschoten, G.J.		Über einige molluskenfunde im Wellenkalk von Winterswijk (Niederlande)
VOLUME 51 NO 5 576	1972	51	5	576	576	Lingen, G.J. van der		Nieuw Zeeland en "Plate tectonics"

VOLUME 51 NO 5 577	1972	51	5	577	577	Jong, L.N.J. de		Enkele aspecten van (geo)mechanische modellenbouw
VOLUME 51 NO 5 578	1972	51	5	578	579			International soil museum
VOLUME 51 NO 5 580	1972	51	5	580	586			Boekbesprekingen
VOLUME 51 NO 5 587	1972	51	5	587	590			Genootschapszaken
VOLUME 51 NO 6 591	1972	51	6	591	607	Nossin, J.J.	The Crati basin is flanked on either side by crystalline metamorphic rocks that have been subjected to intensive folding, shearing and crushing, and have hence lost much of their resistance. The basin is filled with Neogene alternations of sand, clay and conglomerates, in a (sub)horizontal position. It is a tectonic depression separated from the metamorphic surroundings by major faults. Post-Calabrian uplift of around 1000 metres, with differential movements superposed, accounts for rapid erosive incision that undercuts the slopes at the foot. Slopes have a further reduced stability on account of the loss of coherence in the metamorphics, of frequent faulting and of exposure of water in the slope face, often trapped by Tertiary clay layers and exposed after erosive incision. The main fault-scarp zones separating the basin from the surrounding metamorphics are zones of increased weakness. All this accounts for an accumulated potential slope instability. Unstable slope zones are identified on air photos, whether they are presently moving or not. Zones in actual movement invariably make part of such larger zones of instability. This movement is mostly triggered off by cutting in the slope for purposes of road construction, frequent in this area under rapid development. Nine characteristic landslides are discussed. The recognition at an early stage in the planning phase, of potentially unstable slope zones from air photos - followed by field verification - allows the foreseeing of difficulties of construction and maintainance of communication lines. This may thus contribute to prevent disasters.	Landsliding in the Crati basin, Calabria, Italy
VOLUME 51 NO 6 609	1972	51	6	609	617	Voo, R. van der; Klootwijk, C.T.	For a preliminary paleomagnetic investigation of the Flamanville granite (Normandy, France), ten samples were studied. The granite samples had a weak remanent magnetization and a high magnetic susceptibility. The direction of the characteristic remanent magnetization was consistent with other Carboniferous paleomagnetic results from Stable Europe. The high magnetic susceptibility was distinctly anisotropic. The shape and orientation of the susceptibility ellipsoids were determined with the Utrecht astatic magnetometers, according to the method of As (1967). This method has been extended and its practical use is discussed. The orientation of the susceptibility ellipsoids could be interpreted in terms of the mode of emplacement of the granite.	Paleomagnetic reconnaissance study of the Flamanville Granite, with special reference to the anisotropy of its susceptibility

VOLUME 51 NO 6 619	1972	51	6	619	626	Vanderzee, T.J.	Static models of the lower mantle do not easily accommodate a cooling of the core on a terrestrial time scale. Moreover, merely shallow flows do not readily explain the present distribution of sial. Therefore, a still active, overall and occasionally reversing mantle convection is proposed that is consistent with the spasmodic character of orogenesis. This convection is compatible with modern estimates of pertinent parameters in a hydrodynamic theory of convection within spherical shells. It bears on the geomagnetic dynamo and helps to explain a correlation that has been suggested between changes in earthquake activity and in the earth's rotation. Apart from tidal dissipation within the mantle, a cooling of a radio-inactive core, on the order of 600°C during the last two and a half to three billion years, seems to be required to complete about a dozen successive mantle overturns.	Post-Archeozoic large-scale convection in the earth's mantle
VOLUME 51 NO 6 627	1972	51	6	627	639	Voorthuysen, J.H. van; Toering, K.; Zagwijn, W.H.	A revision is given for the definition of the Plio-Pleistocene boundary in marine beds of the North Sea Basin. It has appeared that <i>Elphidium oregonense</i> Cushman & Grant (an arctic species at present living in the Bering Street) characterizes a narrow faunal zone, which falls into the lower part of the first glacial stage of the Pleistocene, the Praetiglian, as defined by means of pollen-analysis. The <i>Elphidium oregonense</i> -zone is presently considered to mark the Plio-Pleistocene boundary. Beds hitherto assumed to belong to the Pleistocene i.e. Merksem beds, "Amstelian", are classified now within the Upper Pliocene.	The Plio-Pleistocene boundary in the North Sea Basin revision of its position in the marine beds
VOLUME 51 NO 6 641	1972	51	6	641	643	Hammen, T. van der		Changes in vegetation and climate in the Amazon basin and surrounding areas during the Pleistocene
VOLUME 51 NO 6 645	1972	51	6	645	650	Haseldonckx, P.	Some new evidences for the autochthony of <i>Nypa</i> palms were found during a palynological study of Eocene sediments in the Spanish Pyrenees. percentages of <i>Spinizonocolpites</i> Muller 1968 of nearly 40 per cent, a possible phylogenetic relationship between <i>Spinizonocolpites baculatus</i> and <i>Spinizonocolpites echinatus</i> and the appearance of fossil pollen and fruits of <i>Nypa</i> , restricted to the Eocene, make it unlikely that <i>Nypa</i> should be transported along the shores of the Tethys Sea.	The presence of <i>Nypa</i> palms in Europe: a solved problem
VOLUME 51 NO 6 651	1972	51	6	651	655			Geologisch en mijnbouwkundig nieuws
VOLUME 51 NO 6 656	1972	51	6	656	666			Boekbesprekingen

VOLUME 52 NO 1 1	1973	52	1	1	12	Andrews, J.T.; King, C.A.M.; Stuiver, M.	Radiocarbon dates on materials from storm-eroded coastal sections plus other dates from peats and wood now below current high tide level are used to construct a preliminary history of relative sea level movement and to derive isostatic and eustatic components of the sea-level changes. Sea-level rose 22 m, relative to the land between 9,200 and 6,000 BP. No information is available for sea level between 6,000 and 3,600 BP but it was probably slightly higher than present. The main Postglacial Beach along this stretch of coast, and the highest evidence of marine action, is ca 5m above average high spring tide level. Shells in this beach date from 2,300±BP which suggests that at least storm waves were reaching these elevations 3,000 years or so after the usually accepted age for the feature. Relative sea-level changes after 3,600 BP were complex and there is at least one soil forming interval recorded. The high coastal sand dunes backing this stretch of coast date from between 1.200 and 1.500 BP. The estimated glacio-isostatic recovery is ca. 18m over the last 13,000 years. Computed eustatic curves indicate fluctuations in world sea-level in the last 5,000 years but these fluctuations could be caused by variations in storminess.	Holocene Sea Level changes, Cumberland Coast, Northwest England: Eustatic and glacio-isostatic movements
VOLUME 52 NO 1 13	1973	52	1	13	19	Milsom, J.	Large gravity anomalies on the Papuan Peninsula (the eastern part of the island of New Guinea) are associated with the Papuan Ultramafic Belt, an overthrust ophiolitic complex which may once have formed the frontal zone of an island arc. Very low fields occur over outcrop of the underthrust sialic metamorphics. The extreme east of the peninsula is built up of basaltic lava over which moderately high gravity fields are observed; the structure of this latter area is most simply explained in terms of Recent extensional movements	The gravity field of the Papuan Peninsula

VOLUME 52 NO 1 21	1973	52	1	21	30	Tjia, H.D.	Detailed field studies seven important strike-slip faults in East and West Malaysia, West Sumatra, Java, and Central Sulawesi, used reliable, minor fault-plane markings (bruised step riser, spall, crescentic gouge, lunate fracture, chatter mark, pluck mark, slickenside prod mark) to determine the sense of displacement. The sense of movement on about ten other major transcurrent faults in the region was derived from the literature. A common direction of horizontal compression for each of three tectonic domains that subdivide the region between the Asian and Australian continents is indicated by consistent displacements along the wrench faults. For two of the currently active tectonic domains the directions of regional compression are 10°-190° (for Sumatra and Java) and approximately east-west (for the Philippines and the Indonesian islands east of Strait Makassar). These directions of regional compressions are parallel to compressive stress directions computed from sea-floor spreading rates by Le Pichon (1968) and to earthquake-slip vectors interpreted by Isacks et al. (1968) for the margins of the region under discussion.	Displacement patterns of strike-slip faults in Malaysia-Indonesia-Philippines
VOLUME 52 NO 1 31	1973	52	1	31	32	Raedts, C.E.P.M.		De stichting van een mijnmuseum, een urgente zaak
VOLUME 52 NO 1 33	1973	52	1	33	34	Sarma, A.V.N.		Evidences of Post-Pleistocene desiccation in South West Ecuador and Northern Peru
VOLUME 52 NO 1 35	1973	52	1	35	35	Lieth, R.M.A.		Verslag contactgroep kristalgroei
VOLUME 52 NO 1 37	1973	52	1	37	37	Schoorl, R.		Mineralogical analysis of the "Brown Rain" of February 7th, 1972
VOLUME 52 NO 1 38	1973	52	1	38	46			Boekbesprekingen
VOLUME 52 NO 1 47	1973	52	1	47	50			Geologisch en mijnbouwkundig nieuws
VOLUME 52 NO 1 51	1973	52	1	51	58			Genootschapszaken
VOLUME 52 NO 2 63	1973	52	2	63	67	Bosence, D.W.J.	The sedimentology and burrow associations of a lower Tertiary (Lutetian and Cuisian) section in south-east England are described and compared with bedding types described from the Wadden Sea and Rhine estuary. In the lower part two facies are distinguished representing channel and bank deposits. Their relationship, bed forms, fauna and general lack of bioturbation suggest deposition in an inshore tidally influenced region. The sequence is truncated by bioturbated glauconitic sediments of the transgressive Bracklesham Beds.	Facies relationships in a tidally influenced environment: A study from the Eocene of the London Basin

VOLUME 52 NO 2 69	1973	52	2	69	77	Terwindt, J.H.J.	<p>This paper deals with the resultant sand movement over the offshore underwater delta along the tidal inlets of the S.W. part of the Dutch coast and with the sediment exchange between the North Sea and the underwater delta. It appears that a complicated circulation of sediments occurs in the whole channel system in the area, mostly directed perpendicular to the general coastline. On the shoals the sand transports by currents are almost negligible. The picture of sand movement by waves suggests a net northeastern sand transport over the shoals. Also the data derived from sediment balances and grain-size differences point to a net northeastern movement of fine sand over the underwater delta. The direction of the sand transport by currents and grain-size data reveal that there is an appreciable sediment exchange between the underwater delta and the North Sea in the Haringvliet area and apparently also along the southwestern part of the underwater delta.</p>	Sand movement in the in- and offshore tidal area of the S.W. part of the Netherlands
VOLUME 52 NO 2 79	1973	52	2	79	91	Aleva, G.J.J.	<p>After a short summary of the geology of the region, mainly based on observations on the tin islands, the original exploration concept is explained: the off-shore area is the drowned continuation of the land area, as studied and explored on the islands, only covered by a relatively thin layer of Recent to Holocene marine mud. The formation of cassiterite placers mainly depends on four genetic factors: primary tin occurrences in the basement rocks, chemical weathering of these primary occurrences, elutriation or washing out, and the presence of traps. Submarine acoustic profiling has greatly helped in identifying the depositional and erosional sequences, which would not have been possible with the aid of drilling samples only. Contrary to the situation on land, there are at least three sedimentation cycles and one erosion cycle (with a total sediment thickness of up to at least 60 m), covering the Permian basement. In the last chapter the new stratigraphical data are linked up with the principles of tin placer formation, thus leading to a new, considerably less simple, exploration concept.</p>	Aspects of the historical and physical geology of the Sunda Shelf essential to the exploration of submarine tin placers

VOLUME 52 NO 2 93	1973	52	2	93	99	Schettler, H.	Continuous gasometric determination of carbonate in cuttings has been successfully used by the Mobil Oil AG in the Weser-Ems area since 1954. It is used to check changes in rock composition (facies development) during drilling and to compare the results with those of adjacent drillings. Cuttings are taken at intervals of 1 to 2 m at the site of drilling; they are washed, dried, and ground. The amount of CO ₂ is determined with the "Scheibler- asometer" (described in Müllet,1967) by treating 1/2 gr of the sample with HCl. Absolute carbonate content and the approximate calcite/dolomite ratio can be estimated if the first reading is taken after 30 seconds, the second after 1 minute (sometimes after 5 minutes) and the final reading after the gas development is completed (to 21 minutes). The resulting "carbonate-log" can be compared with those of adjacent drill holes during drilling operation. Such logs are very useful for exploring carbonate reservoirs and for stratigraphic correlation of sections strongly influenced by tectonics and of rocks lacking fossils.	New results from continuous gasometric determinations of carbonate in cuttings and cores from drill holes
VOLUME 52 NO 2 93	1973	52	2	93	99	Schettler, H.	Large Enclosure	New results from continuous gasometric determinations of carbonate in cuttings and cores from drill holes
VOLUME 52 NO 2 101	1973	52	2	101	105			Boekbesprekingen
VOLUME 52 NO 2 107	1973	52	2	107	113			Geologisch en mijnbouwkundig nieuws
VOLUME 52 NO 3 115	1973	52	3	115	124	Reijers, T.J.A.	The chronostratigraphy of the Middle-Upper Devonian Portilla Limestone Formation is discussed in three stratigraphic sections. Deposition of limestones occurred in a diachronous way. A discussion in four sections, of the sedimentology of the Huergas Formation, the Portilla Limestone Formation and the Nocedo Formation leads to a palaeogeographic picture of two shallow platforms in the west and in the east, resp., on which open marine subtidal to intertidal limestone sediments were deposited. The platforms were separated by a slightly deeper depositional environment into which a delta protruded, eventually filling up the basin. This delta was covered with limestones, similar to those present on the platforms but patchy, irregularly distributed and in smaller thicknesses. The limestone deposition ended with a new, strong pulse of siliciclastic sediments, presumably coming from the NE and spreading out gradually over the whole area. In these sediments, Lower Devonian ferruginous San Pedro pebbles are present, indicating a deep erosion in the Northern Leonides	Stratigraphy, sedimentology and palaeogeography of Eifelian, Givetian and Frasnian strata between the river Porma and the Embalse de la Luna, Cantabrian Mountains, Spain

VOLUME 52 NO 3 125	1973	52	3	125	131	Horne, R.R.; Gardiner, P.R.R.	Previously unrecorded radially symmetrical, apparently cylindrical or downward tapering structures in red, non-marine siltstones and sandstones of Devonian to early Carboniferous age are described from south-west County Wexford and the Dingle Peninsula, County Kerry, Ireland. These structures are interpreted as biogenic trace fossils rather than inorganic features. They are most probably dwelling burrows, possibly of a fresh-water coelenterate. The most comparable known forms are <i>Laevicyclus</i> Quenstedt, 1879, <i>Kulindrichnus</i> Hallam, 1960 and <i>Bergaueria</i> Prantl, 1946.	A new trace fossil from non-marine upper Palaeozoic red beds in county Wexford and county Kerry, Ireland
VOLUME 52 NO 3 133	1973	52	3	133	140	Vries, W.C.P. de	Sedimentary structures in the Waterberg System comprise transverse current ripple marks, linguoid ripple marks, cross-bedding, ripple marks on foresets of cross bedding, normal type of convolute structures and so-called convolute lump structures which occur on the upper bedding plane of a convoluted bed.	Sedimentary structures in the Southern and Central portions of the waterberg area, Northwestern transvaal
VOLUME 52 NO 3 141	1973	52	3	141	146	Gorsel, J.T. van	In his description of the type Campanian Coquand mentioned two localities in which his Campanian unit occurs. Later investigations showed that the two sections are not exact time equivalents. As a result controversies arose whether the one or the other unit should be the type Campanian. The simplest solution is to consider both units as Campanian stratotypes, one representative for the lower part and the other for the upper part, the more so as this agrees quite well with usage outside France. Between the top of the upper Campanian type section and the base of the Maastrichtian type section a time gap exists. In this time gap the boundary between the geochronologic units Campanian and Maastrichtian has to be drawn. It is suggested to adopt the boundary of Seitz (1952) because this boundary is commonly used and because its use is in accordance with the priority principle	The type Campanian and the Campanian-Maastrichtian Boundary in Europe
VOLUME 52 NO 3 147	1973	52	3	147	155	Higgins, G.M.; Ahmad, M.; Brinkman, R.	Landforms and depositional history of the semi-arid and arid Thal desert and the adjoining Indus floodplain in Pakistan are described and discussed. Climate and sand relief are controlled by three wind regimes: southern monsoon from the Arabian Sea and eastern monsoon from the Bay of Bengal in summer, and northern winds in winter. Present vegetation ranges from wooded steppe to (arid) desert steppe. The sands deposited by the Pleistocene Indus river were reworked into longitudinal and transverse ridges, alveolar (honeycomb-pattern) sands and locally barchan dunes, depending upon wind directions and forces. Abandoned Pleistocene Indus channels containing narrow clayey strips occur in this area, the eastern ones mostly obscured by wind resorting. The Holocene Indus floodplain shows four depositional stages: the sandy base of a braided river system; two stages of a thin finetextured cover; and recent moderately coarse sediments	The Thal interfluvium, Pakistan. Geomorphology and depositional history
VOLUME 52 NO 3 157	1973	52	3	157	160	Cant, R.V.		Jamaica's Pleistocene reef terraces

VOLUME 52 NO 3 161	1973	52	3	161	162			Highlights of Zambia's mineral industry in 1972
VOLUME 52 NO 3 163	1973	52	3	163	163			Verslag van het "international colloquium on Messinian events in the Mediterranean"
VOLUME 52 NO 3 165	1973	52	3	165	166			Genootschapszaken
VOLUME 52 NO 3 167	1973	52	3	167	170			Geologisch en mijnbouwkundig nieuws
VOLUME 52 NO 3 171	1973	52	3	171	177			Boekbesprekingen
VOLUME 52 NO 4 183	1973	52	4	183	186	Uytenbogaardt, W.		Politieke en ethische aspecten van de grondstoffenvoorziening
VOLUME 52 NO 4 187	1973	52	4	187	191	Langenberg, C.W.	Evidence is given for rotatory movements of klippen in the northern Sierra de los Filabres. Use has been made of difference in the orientation of linear structural elements in the klippen compared with that of equivalent structures in the underlying 'basal succession'. The rotations indicate gravitational gliding, probably resulting from updoming of the mountain-range in a late stage of the orogenic history.	Gravitational gliding in the Northern Sierra de Los Filabres (SE Spain)
VOLUME 52 NO 4 193	1973	52	4	193	202	Greensmith, J.T.; Tucker, E.V.	Faunal and lithological changes within the 34 m of Holocene sediments of the chenier plain suggest six episodes (I-VI) of marine transgression interspersed with five episodes of regression. Evidence presented for recognising transgressions includes chenier formation, marsh retreat and vertical changes in fauna, involving brackish water and intertidal molluscs. Regressions are interpreted chiefly from geosols and peat seams. Radiocarbon dates indicate that the transgressive episodes II, III and V first affected the region at about 7500, 4000 and 1400 B.P. respectively. The most recent one (VI) probably commenced about 300 B.P. The dates of episodes I and IV can only be conjectured. Comparison with similar events globally as well as in the Low Countries suggests that eustatic changes in sea level have played a significant role in the Holocene history of the Outer Thames estuary.	Holocene transgressions and regressions on the Essex coast outer Thames estuary

VOLUME 52 NO 4 203	1973	52	4	203	215	Tucker, M.E.	<p>Four main environments are described from tropical estuaries of the Freetown Peninsula, Sierra Leone: A) sand bars, B) channels, C) intertidal flats and D) mangrove swamps. The sand bars are predominantly well-sorted medium sands, with dunes as the main bed form. The channel sediments vary in grain size and bed form up the estuaries, but generally contain lag deposits (mostly of shell debris and laterite pebbles) coarser than the adjacent intertidal sediments. The intertidal flats are mostly muddy sands, commonly with scour pits and current lineation. The sedimentary structures are obliterated by infaunal bivalves and burrowing crustaceans. The mangroves, developed peripherally around the estuaries, are important in trapping and binding the finer grades of sediment. Sierra Leone has an extreme two-season climate, considerably affecting the estuarine sediments. During the dry season, a period of accretion, much sediment (mainly bed load) is taken into the estuaries from offshore. Crustaceans and bivalves increase in numbers and occupy a larger area of the intertidal flats. During the wet season, mud and plant debris are brought down by the rivers and some bed load is moved down or out of the estuaries. With rising sea level, the estuarine deposits are prograding landward, over fluvial sediments and soils (laterite in this case), producing a coarsening upward sequence from rootlet beds through bioturbated muddy sands to well-sorted cross-bedded medium sands.</p>	The sedimentary environments of Tropical African estuaries: Freetown Peninsula, Sierra Leone
VOLUME 52 NO 4 217	1973	52	4	217	219	Stalder, P.J.	<p>Our studies have shown that shifts in the trend of the permeability/porosity relationship for sandstones may be explained in terms of the crystallographic habit and aggregate structure of authigenic clay minerals. It is also suggested that the specific surface (surface/volume ratio) of the clay minerals (either authigenic or detrital in sandstones) could account quantitatively for the different permeability/porosity relationships and might represent a parameter that could be introduced into conventional permeability/porosity plots. It is assumed that a high specific surface of the interstitial clay minerals will induce tortuosity and therefore turbulence at higher flow rates and will also cause pore-space reduction by favouring water adsorption on the large available clay-mineral surface. The thread-like habit often observed for authigenic illite will also cause a division of pore space into a large number of tiny holes, through which fluid flow is much more difficult.</p>	Influence of crystallographic habit and aggregate structure of authigenic clay minerals on sandstone permeability

VOLUME 52 NO 4 221	1973	52	4	221	225	Boer, P.L.	Dimorphism does not exist in <i>Halysitidae</i> . The mesocorallites as defined by Buehler (1955) and the microcorallites and mesocorallites as defined by Hamada (1958) are considered filling structures; the author prefers the more descriptive term tubules for these skeletal features. The taxonomic importance of the distribution of these tubules in the corallum is questioned.	On the presumed dimorphism within halysites colonies
VOLUME 52 NO 4 227	1973	52	4	227	228	Jagadiswara Rao, R.		Use of Berek compensator made still easier
VOLUME 52 NO 4 229	1973	52	4	229	229	Carpay, F.M.A.		"Symposium kristalgroei" Noordwijkerhout Mei 1973
VOLUME 52 NO 4 231	1973	52	4	231	235			Boekbesprekingen
VOLUME 52 NO 4 236	1973	52	4	236	239			Geologisch en mijnbouwkundig nieuws
VOLUME 52 NO 4 240	1973	52	4	240	251			KNGMG Jaarverslag 1972
VOLUME 52 NO 5 253	1973	52	5	253	255	Egeler, C.G.		In memoriam - Prof. Dr. Ir. H.A. Brouwer
VOLUME 52 NO 5 257	1973	52	5	257	276	Leflef, D.	The alluvial rocks in the lower part of the uppermost Old Red Sandstone Complex show a significant relationship between their structural and textural features. In the area presently dealt with the encountered rocks are of sandstone, "intermediate", and mudstone facies which together allow a further subdivision into 7 rocktypes according to the above relationship. Each rocktype is characterized by its own association of structures and its own grainsize range. Two types of structures were found to exist: namely those which vary upon grainsize variations and those which do not. The latter category embraces horizontal lamination and low-angle cross-lamination. The category, the structures of which vary upon grainsize variations, comprises mostly high-angle cross-lamination. The distinguished rocktypes are regularly organized in vertical sequences, as well as in down-current developments, reflecting the changing flow conditions during time of deposition.	Significant relations between textural and structural features of the rocks in the Churchbay-, Templebreedy members of the uppermost Old Red Sandstone complex, South of Cork, Ireland
VOLUME 52 NO 5 277	1973	52	5	277	287	Soler, E.	Submarine volcanics were emplaced along tension faults developed along a pre-orogenic flexure zone in the southwestern Iberian peninsula. The age of these extrusions is placed between the Famennian and upper Visean. The lavas belong to the spilite-quartz klatophyre association, with the latter strongly prevailing. Investigation of these rocks indicates two different series (a very acid one and a basic one) but without gradations. This is explained through mobilization of sialic crustal material by basic injections. The primary basic magma could have been basaltic; it may have been contaminated by sialic material and, to a greater extent, by the thick sedimentary pile which still contained connate waters and which the basaltic magma had to penetrate before reaching the sea bottom. Hybridization did not occur but rather contamination	L'association spilites-quartz Keratophyres du Sud-Ouest de la Peninsule Iberique

VOLUME 52 NO 5 289	1973	52	5	289	295	Rutter, E.H.; Gibbons, M.J.	A small area exhibiting contact relationships between schists of the Sierra Nevada, rocks of the Mischungzone and rocks of the Alpujarride complex, in the Betic zone of Southern Spain, has been studied. It is shown from field observations that the rocks of the Alpujarride complex suffered at least one early deformation coeval with low grade regional metamorphism, and involving tectonic transport from south to north. This was followed by gravity sliding from north to south. Fault surfaces associated with these later movements provide the most obvious evidence of tectonic disturbance in the area. The results of a petrofabric study of twin lamellae in a Mischungzone marble are consistent with the hypothesis of a late phase of gravity induced sliding.	On the tectonics of an area near Laujar, Sierra de Gador, Spain
VOLUME 52 NO 5 297	1973	52	5	297	301	Dozy, J.J.		Lijst van lopende tijdschriften in het bezit van het genootschap, door ruilverkeer verkregen aanwezig in de bibliotheek van de afdeling mijnbouwkunde, T.H. Delft
VOLUME 52 NO 5 303	1973	52	5	303	312			Boekbesprekingen
VOLUME 52 NO 6 317	1973	52	6	317	334	Valeton, I.; Jürgens, U.; Khoo, F.	In Surinam, in the northern Guiana foreland, two sections of pre-bauxite sediments and two sections of bauxites were studied for origin and composition of the primary material and the pre-bauxite diagenesis. These sections are composed of "red sediments" of the clastic hematite-kaolinite-quartz association from pre-bauxite time; These sediments are erosion products of deeply weathered laterite and were formed in shallow water around basement plateaus. The base of the sequence indicate very turbulent sedimentation; in between we find periodic occurrence of plant roots; on top (today bauxite) there is evidence for new transgression and quiet sedimentations (burrows). The diagenesis of the underlying sediment (here pre-bauxite) is characterized by kaolinization of the lower and gibbsitization of the upper sequence. The type of these red sediments, as characterized by mainly detritic hematite and kaolinite and lack of feldspars, is very uncommon.	Pre-Bauxite red sediments and sedimentary relicts in Surinam Bauxites
VOLUME 52 NO 6 335	1973	52	6	335	350	Leflef, D.	The alluvial rocks in the upper part of the Upper Old Red Sandstone (Fennelsbay member) show a less stringent relationship between the structural and textural features than those of the lower part (Churchbay-Templebreedy members). Though this phenomenon is not readily explainable by a paleogeographical development, it is concomitant with well-known changes betraying an approach of the shoreline - such as improved sorting and maturity of sandstones, gradual disappearance of red coloured rocks, and first occurrence of heterotithic rocks – characteristics which are even more strongly in evidence in the overlying Ballinluska member which is of proven (fossils) marine character.	A change in rocktypes associated with the approaching shoreline of the Old Red continent, South of Cork, Ireland

VOLUME 52 NO 6 351	1973	52	6	351	358	Erdbrink, D.P.; Augustinus, P.G.E.F.	Description of two incomplete mandibulae of <i>Mammuthus (A.) meridionalis</i> dredged up in the Netherlands at Appeltern on the Meuse and at Lathum on the IJssel. Each belonged to a very old and probably male individual. A Cromerian age and a provenance from the Lower Rhine terraces in Germany is considered possible in each case, but heavy minerals analysis does not lead to conclusive evidence.	Two fragmentary mandibles of archidiskodont elephants from the Netherlands
VOLUME 52 NO 6 359	1973	52	6	359	360	Jansen, J.H.F.; Gaast, S. van der	Accurate alignment of an X-ray diffraction goniometer can easily be obtained if direct scanning of the X-ray beam is used to adjust both the dial of the goniometer and the specimenholder.	A simple method for accurate alignment of X-ray diffraction goniometers
VOLUME 52 NO 6 361	1973	52	6	361	368			Boekbesprekingen
VOLUME 52 NO 6 369	1973	52	6	369	372			Genootschapszaken
VOLUME 53 NO 1 1	1973	53	1	1	8	Formanek, V.	La concentration des mineraux est un sujet très vaste; c'est pourquoi je me limiterai à parler seulement de certains procédés de concentration en m'appesantissant un peu plus sur l'évolution du procédé de flottation	Quelques aspects de la concentration des mineraux et de son evolution
VOLUME 53 NO 1 9	1973	53	1	9	12	Knox, G.J.	An unusual beach rock occurs near Bilbao. The beach is aragonite-cemented and contains melilites/volcanic glass fragments for which there is no apparent source. Man-made bricks and fresh bone fragments suggest that the beach is very young	An aragonite-cemented volcanic beach rock near Bilbao, Spain
VOLUME 53 NO 1 13	1973	53	1	13	21	Reijers, T.J.A.	In the Upper Devonian succession the presence of allochthonous lithological elements and replaced fossils, a regular vertical alternation of layers of coral rubble and biostromes, and abundant indications of erosion and subareal exposure can be explained by application of a regional epeirogenetic model. Epeirogenetic movements governed sedimentation and led to a regressive and a transgressive depositional phase. The Portilla Limestone Formation and the Nocedo Formation have been mainly deposited during the regressive phase; the deposits of the Ermita Formation reflect the transgressive phase.	Hinge movements influencing deposition during the Upper Devonian in the Esla area of the Cantabrian Mountains, Spain
VOLUME 53 NO 1 23	1973	53	1	23	23	Bär, C.B.		Analysis of geological information on computer files
VOLUME 53 NO 1 24	1973	53	1	24	24	Mentink, H.G.		Storage and retrieval of geological data
VOLUME 53 NO 1 25	1973	53	1	25	26	Schuiling, R.D.	The possibility of using geothermal energy in non-volcanic, normal areas is discussed. An attempt is made to apply this concept to the Netherlands, where the geothermal gradient is in general above the world's average. If geothermal heat production from non-volcanic areas will ever be feasible, technologically or economically, is still very uncertain.	A future for induced geothermal energy?
VOLUME 53 NO 1 27	1973	53	1	27	29			Boekbesprekingen
VOLUME 53 NO 1 31	1973	53	1	31	36			Geologisch en mijnbouwkundig nieuws
VOLUME 53 NO 2 41	1974	53	2	41	42	Nota, D.J.G.; Plas, L. van der		In memoriam - Prof. Dr. D.J. Doeglas

VOLUME 53 NO 2 43	1974	53	2	43	50	NAM; Heybroek, P.	Three structural contour maps and three geological maps at different levels covering the Netherlands are presented and discussed. The levels depicted are the top Carboniferous, the base Cretaceous-Upper Jurassic and the base Tertiary. The maps are discussed in relation to the tectonic history of the Netherlands. The deformation is classed as intracratonic, epeirogenetic. Three successive patterns of movement are recognized: the Permo-Triassic, the Jurassic-Lower Cretaceous, and the Cenozoic. They are basically different from each other but relatively constant in themselves. The Jurassic-Lower Cretaceous pattern and its inversion in the Upper Cretaceous receives special attention.	Explanation to tectonic maps of the Netherlands
VOLUME 53 NO 2 43	1974	53	2	43	50	NAM; Heybroek, P.	Large Enclosure 1	Explanation to tectonic maps of the Netherlands
VOLUME 53 NO 2 43	1974	53	2	43	50	NAM; Heybroek, P.	Large Enclosure 2	Explanation to tectonic maps of the Netherlands
VOLUME 53 NO 2 51	1974	53	2	51	64	Lagerwey, A.A.F.	In this article a recently developed method for optical spectroscopic analysis of crystallized substances is introduced. The practical method proposed is non-destructive, and the apparatus required is relatively simple and inexpensive. Principles of optical spectroscopy for the analysis of trace elements in complex crystals are reviewed; essential aspects of this method and other routine methods are compared. Next, the nature, scope, and limitations of the new practical method are discussed, and the information, which can be obtained, is summed up. In essence, the procedure consists of the sequential registration of absorption- and luminescence spectra of the substance to be examined, and the subsequent analysis of both spectra. Details of the apparatus required, and of the analysis procedure are treated in the following section; different methods for obtaining good quality absorption- and luminescence spectrograms are reviewed here. An important feature of the method is the excitation of luminescence with blue radiation; the advantages of its use are critically discussed. Facultative refinements of apparatus and method, making possible polarisation spectrography and topographical spectrography of macrocrystals, are indicated. Requirements for preparations for the purpose of calibration are mentioned. The practical value of the new method is demonstrated by results, obtained in the process of determination of some definite typochemical varieties of the crystallized minerals scheelite, apatite, zircon, spinel and topaz; these varieties are described. Finally, possible applications in the fields of mineralogy, gemmology and geochemistry, chemistry and physics, and even in industry, are reviewed. It is expected, that the proposed method will develop into	A practical method for optical spectroscopy of crystals
VOLUME 53 NO 2 65	1974	53	2	65	69	Weehuizen, J.M.		Reactivering van de Nederlandse steenkolenmijnbouw bij de huidige oliecrisis?

VOLUME 53 NO 2 71	1974	53	2	71	73	Shepard, F.P.	The sea-level curve by Greensmith and Tucker, based on coastal work in southeastern England, is said to conform with other worldwide evidence of Holocene sea-level changes, notably that of Fairbridge and Mörner. However, the curve shows little relation to that of any previous investigators, and contrasts greatly with that of Fairbridge because it shows a lack of appreciable sea level higher than that of the present day.	Holocene sea-level changes: a discussion
VOLUME 53 NO 2 75	1974	53	2	75	75	Greensmith, J.T.; Tucker, E.V.		Holocene sea-level changes: a reply
VOLUME 53 NO 2 77	1974	53	2	77	79			Boekbesprekingen
VOLUME 53 NO 2 80	1974	53	2	80	82			Genootschapszaken
VOLUME 53 NO 3 85	1974	53	3	85	98	Allaart, J.H.; Escher, A.; Kalsbeek, F.	The Archaean gneiss block of West Greenland is made up of gneisses, amphibolites and anorthositic rocks and contains the oldest crustal rocks yet known on earth. The Archaean block is bordered to the south by the Ketilidian mobile belt, largely consisting of younger granitic intrusions and to the north by the Naggugtoqidian mobile belt which mainly consists of reworked Archaean rocks.	Outline of the Precambrian geology of Southern West Greenland
VOLUME 53 NO 3 99	1974	53	3	99	107	Kramer, G.M.	Several aspects of the definition of iron ore, as presented in the "Survey of World Iron Ore Resources" of the United Nations, are reviewed. Due to the variety of iron ore formations no general cut-off grade can be indicated. Some outside factors can be of decisive importance for an ironbearing formation reaching the "ore" status.	Some aspects of the definition of iron ore
VOLUME 53 NO 3 109	1974	53	3	109	122	Riezebos, P.A.	The cementation that has led to the local formation of slightly indurated layers in the white Miocene sand deposits, is due to authigenic quartz growth. Scanning electron microscopical information reveals that the secondary quartz is not only found at the grain contacts. A rather unexpected finding is its presence all around very small as well as large grains. The former ones show the most advanced idiomorphic habit and seem to play an actual part in the cementation. Presolved surfaces could not be found, so that the used silica does not appear to be produced by pressure solution. It is concluded that the grain surfaces must have been clean and highly disturbed before cementation started. This is, because only such surfaces seem to provide numerous suitable sites for nucleation, which may result in a comparatively rapid and full-scale overgrowing. However, since silica under certain conditions also dissolves very readily from disturbed surfaces, it is still possible that a part of the crystallized silica has come from the deposit itself. This particular type of early stage of cementation suggests strongly that the nature of the detrital quartz grain surfaces may be a very important factor in the kind of silica cement being formed. It is suggested that the origin of these weakly indurated layers must have been associated with seasonally rising and falling silica-bearing groundwater	Scanning electron microscopical observations on weakly cemented Miocene sands

VOLUME 53 NO 3 123	1974	53	3	123	123	Abbott, B.M.		A discussion of new results from continuous gasometric determinations of carbonate in cuttings and cores from drill holes, by Schettler, Vol. 52(2) p. 93-99
VOLUME 53 NO 3 125	1974	53	3	125	125	Quakernaat, J.		"Swlling clay minerals in sediment-petrographical analysis"
VOLUME 53 NO 3 127	1974	53	3	127	130			Boekbesprekingen
VOLUME 53 NO 4 133	1974	53	4	133	139	Priem, H.N.A.		in de greep van tijd
VOLUME 53 NO 4 141	1974	53	4	141	144			Van Waterschoot van der Gracht penning
VOLUME 53 NO 4 145	1974	53	4	145	145			Spoorelementen in het grondwater
VOLUME 53 NO 4 147	1974	53	4	147	147	Engelen, G.B.		Trace elements in the waters of the dune water catchment area with artificial recharge of Amsterdam
VOLUME 53 NO 4 149	1974	53	4	149	155	Matthess, G.	The natural and man-made concentrations of heavy metals are discussed concerning their abundance, geochemical mobility and their physiological effects on man. The many gaps of geochemical information concerning abundance and behaviour of heavy elements in the ground should be filled especially for those elements which are important to human health.	Heavy metals as trace constituents in natural groundwaters and polluted
VOLUME 53 NO 4 157	1974	53	4	157	161	Brinkmann, F.J.	An investigation of the Dutch groundwaters as for trace elements has been started. A sampling method has been developed. The results of the first measurements are given. They concern groundwaters from the East of the country as well as from the dune region. The investigation is handicapped by the fact that observation pits may be contaminated by rests of drilling fluid. Contrary to the first intention, production pits are also sampled now. The measurements will be extended to a complete sampling network.	Inventory of trace elements in groundwaters of the Netherlands
VOLUME 53 NO 4 163	1974	53	4	163	170	Frissel, M.J.; Poelstra, P.; Klucht, N.	As a result of his history the average dutchman knows the various soil types in his country quite well, the chemical structure is usually unknown. The paper describes the typical aspects of the soil constituents as there arc clay minerals, sands and organic materials, Specially the properties, which control the adsorption of traces of heavy metals and pesticides got attention. An important part of the paper is devoted to the behaviour of mercury in dutch and other western european soils. Because part of the drinking water companies in the western part of Holland produce their drinking water from the River Rhine by filtration through dunes, the migration of mercury in soils got serious attention. Most mercury compounds (Hg, HgCl ₂ , HgClCH ₃) do not migrate in soil, the volatile Hg (CH ₃) ₂ migtates fast. The contamination of soils is partly caused by agricultural measures' partly by flooding with water from the Rhine. An analysis of the available data indicated, however, that the main mercury source stems from the wash out of the atmosphere. The contamination of soils in areas with a high population density and much industry is considerably higher than in other areas. A similation model was developed to describe the mercury fall out drain rate.	The contamination of Dutch soils with mercury and a few other heavy metals

VOLUME 53 NO 4 171	1974	53	4	171	175	Mesu, E.J.	In the following paper is stated that groundwater-pollution caused by waste-tips is of very little significance. That is when is taken that the waste is never dumped in open surface-water nor below the groundwater-table and that the subsoil does not contain gravel-layers nor bear ('karst'-phenomena or open fissures. Besides it appears that the leachate from a tip contains most pollution during the first years after tipping and that after two or these years this pollution diminishes gradually. The microbial breakdown of the waste and the herewith formed products play a big role in the purification-processes in the soil. Organic material is needed for the development of this microflora. This induces to the opinion to combine the tipping of certain types anorganic (chemical) waste with urban waste (high organic content) rather than to tip it separately.	Reflections on groundwaterpollution by tipping of solid wastes
VOLUME 53 NO 4 177	1974	53	4	177	187	Tamboezer, R.G.	This paper covers the evolution of government-revenues per barrel of exported crude oil in the OPEC-countries from 1957, when the major oil-companies lowered their posted prices and thus the government revenues, through September 1973, when the relation between the oil-companies and the governments had so drastically changed that the recent enormous posted-price-increases could virtually be decreed by the OPEC-governments without any recognizable influence from the company-side. Also an indication will be given of the evolution of the realized prices of crude oil over that period. In appendices, tables and figures government revenues per barrel of exported crude, volumes of exported crude and total government revenues will be given for three representative OPEC-countries (Saudi Arabia, Libya and Venezuela) and for the total Middle-East, both in current dollars and in constant dollars (1957 \$).	Government revenues per barrel in the OPEC-countries 1957-1973
VOLUME 53 NO 4 189	1974	53	4	189	192	Atherton, M.P.; Atkin, B.P.; Naggar, M.H.	Kyanite and garnet have been found in some metamorphosed rocks of the so-called low-pressure Oporto-Viseu belt of the Older Hercynian granites, Portugal. Reassessment of the nature of the metamorphism is therefore necessary, as well as its relation to the higher pressure, Barovian metamorphic belt to the west (Oliveira de Azemeis).	Kyanite in the Hercynian metamorphic rocks of the Oporto-Viseu belt, North Portugal
VOLUME 53 NO 4 193	1974	53	4	193	194	Oen, I.S.	In north portugal a lower pressure metamorphism occurring in belts associated with Older Hercynian Granites includes low and intermediate pressure facies types. A higher pressure metamorphism occurring in belts outside the main granite area includes intermediate to high pressure facies types.	A note on lower pressure and higher pressure metamorphic belts in North Portugal
VOLUME 53 NO 4 195	1974	53	4	195	197	Schuiling, R.D.		De natuurlijke erosie als basisniveau voor het transport van elementen
VOLUME 53 NO 4 199	1974	53	4	199	199	Duinker, J.C.; Eck, G.T.M. van; Nolting, R.F.		Koper en zink in de Waddenzee
VOLUME 53 NO 4 201	1974	53	4	201	203	Driel, W. van; Groot, A.J. de		Zware metalen in riviersedimenten

VOLUME 53 NO 4 205	1974	53	4	205	206	Golterman, H.L.		Natuurlijke en versnelde mobiliteit van fosfaat
VOLUME 53 NO 4 207	1974	53	4	207	208	Aronds, C.A.		De mobiliteit van fluor op mondiale schaal
VOLUME 53 NO 4 209	1974	53	4	209	210	Weyden, C.H. van der		Verblijfstijden van Zn en Cd
VOLUME 53 NO 4 211	1974	53	4	211	225			KNGMG Jaarverslag 1973
VOLUME 53 NO 4 227	1974	53	4	227	232			Geologisch en mijnbouwkundig nieuws
VOLUME 53 NO 4 233	1974	53	4	233	236			Boekbesprekingen
VOLUME 53 NO 5 241	1974	53	5	241	243	Hammen, T. van der		In memoriam - Prof. dr. I.M. van der Vlerk
VOLUME 53 NO 5 245	1974	53	5	245	247	Roep, T.B.	Arguments for and against a hercynian diastrophism in the Betic of Málaga (especially of the Vélez Rubio region) are briefly discussed. It is concluded that the transition in facies, from Paleozoic turbidites to a Permo-Triassic alluvial fan, and the contrast in detritus of the Paleozoic and Permo-Triassic sediments favour the hypothesis of a hercynian diastrophism.	The hercynian diastrophism in the Betic of Málaga, SE Spain: a discussion
VOLUME 53 NO 5 249	1974	53	5	249	256	Visser, W.A.	Underground waste management, environmental implications and artificial recharge were the subjects discussed in two symposia, respectively in Houston, Texas, in 1971 and in New Orleans, Louisiana, in 1973. In the present paper the author summarizes aspects of the injection of liquid wastes into reservoir rocks by deep wells in the U.S.A. These aspects concern legislation and policy, statistics and actual conditions in some regionally important disposal Zones. Attention is given to the protection of useful subsurface waters Ground waters, i.e. those waters that take part in the present hydrologic cycle, and formation waters, i.e. those that are isolated from the present cycle, are distinguished. Disposal in the former constitutes a potential hazard to the environment, in the latter under certain precautions disposal may be considered safe. In The Netherlands conditions are such, that aquifers that are properly isolated from the present hydrologic cycle occur at depths greater than between approximately 500 and 1000 m. Below these depths disposal prospects are present in sandstone/ claystone alternations of upper Palaeozoic to Tertiary age and possibly in upper Cretaceous limestones. In the northern and eastern parts of the country solid or liquid (including radioactive) wastes could be disposed of in artificial caverns in rock-salt deposits.	Waste disposal and underground waters

VOLUME 53 NO 5 257	1974	53	5	257	265	Geertman, G.H.M.; Steeman, J.W.M.; Wetzels, F.J.	<p>First a review is given of the existing techniques and current development in the application of coal as an energy carrier, when the disadvantages attached to the use of coal is avoided. This technical part deals mainly with the process technology of manufacturing SNG and/or crude from coal and the generation of electricity from coal respectively. Secondly, the (future) commercial proposition of these techniques is valued by determining the unit costs of the product (depending on conversion costs and the upset-price for the coal) and comparing this with the price development of alternative energy. For USA conditions it is expected that, in spite of the relatively high costs of conversion, a competitive SNG market price can be realised, being the result of a low cost price for coal ex mine. A competitive SNG price on the basis of European coal does not seem attainable. However, in Europe a competitive production of SNG may be achieved, provided that the price of imported coal does not appreciably exceed the technical cost price. If on the other hand the price of imported coal is based on a calorific equivalence with heavy fuel oil, SNG prices do not seem competitive with natural gas prices, unless this SNG will be used for 'heavy' premium markets (non-industrial public use). Conversion of coal into liquid fractions is much more expensive than conversion into SNG and therefore probably will not be initiated very soon under the existing European conditions. For, SNG may serve as a substitute for heavy oil fractions and middle distillates (e.g. in industrial and domestic applications); the latter in their turn may be converted into light fractions via "cracking" at relatively low conversion costs.</p>	Enige technieken en markteconomische aspecten met betrekking tot de fabrieksmatige verwerking van steenkool tot gasvormige of vloeibare energiedragers
VOLUME 53 NO 5 267	1974	53	5	267	271	Stuffken, J.; Wetzels, F.J.	<p>Underground gasification on an industrial basis seems not applicable to European coalreserves. This conclusion is based on considerations of a technical, environmental and - especially – commercial nature. The main technical problems for European conditions are described: combustion process control, roof control, joining boreholes, control and elimination of leakage (incl. short circuit and leakage of combustion gas to the banking level), water influx into the gasification area, geological features, etc. Past experiments are very disappointing and indicate that no solution whatsoever was found for the numerous and complex technical problems. From an environmental point of view, a number of drawbacks are presented. In commercial respect underground gasification of European coal is not competitive at all because the calorific cost price of the gas produced is quite at variance with current and future prices for energy. This price discrepancy is of such a magnitude that there is serious doubt about the commercial viability of this energy source even on the very long range. Finally, no serious argument can be put forward from a strategic point of view, because of the minute share in European energy supply even in case of a large scale underground gasification program.</p>	De problematiek van de ondergrondse vergassing van steenkolen

VOLUME 53 NO 5 273	1974	53	5	273	277	Egeler, C.G.	The relationships between Alpine overthrusting, folding and regional metamorphism in the eastern and central Betic Zone are discussed, in the light of recent studies. It is substantiated that two major episodes of metamorphism had occurred, related to distinct stages of the orogenic evolution. In this there is a marked analogy with the evolutionary trend of the internal zone of the Alps. The conspicuous difference between the two belts lies in the time relationship between the final emplacement of the nappes and the 'main' episode of crystallization. In the Betic Zone it is the early episode that has determined the overall 'picture' of the metamorphism.	On the evolution of structure and metamorphism during the alpine orogeny in the eastern and central Betic Zone (Betic Cordilleras, Spain)
VOLUME 53 NO 5 279	1974	53	5	279	285			Boekbesprekingen
VOLUME 53 NO 5 287	1974	53	5	287	291			Genootschapszaken
VOLUME 53 NO 6 295	1974	53	6	295	328	Wijhe, D.H. van; Bless, M.J.M.; Dijkstra, S.	The Westphalian in The Netherlands can be subdivided into six biostratigraphical miospore zones. Each zone is distinguished by an assemblage of several characteristic species, which individually are not restricted to a particular zone with the exception of <i>Radiizonates aligerens</i> . Top and base of each zone are characterized by the first or last (regular) occurrence of a particular diagnostic species. In the Upper Westphalian A and Lower Westphalian C a distinct correlation exists between the microfloral and major lithological changes, which suggests that the Westphalian floras have been at least partly influenced by paleoecological factors.	The Westphalian of the Netherlands with special reference to microspore assemblages
VOLUME 53 NO 6 329	1974	53	6	329	341	Clement-Westerhof, J.A.; Eem, J.G.L.A. van der; Erve, A.W. van; Klasen, J.J.; Schuurman, W.M.L.; Visscher, H.	A palynological research project in the Permian, Triassic and Lower Jurassic of western Europe is briefly outlined. The project is aimed at the development and promotion of palynology as a primary tool in regional stratigraphical classification and correlation. A number of examples of specific topics currently under investigation are briefly discussed, viz. (1) a Cordaitina-assemblage from the Permian Collio Formation of northern Italy, (2) Late Permian megaspores from the Vicentinian Alps, Italy, (3) palynological assemblages from the Muschelkalk and Lettenkohle of Luxemburg, (4) a palynological reconnaissance study in the Keuper of Spain, (5) palynological assemblages from the uppermost Rhaetian of the Northern Limestone Alps in Germany, and (6) palynological assemblages from the Lower Jurassic of the Vicentinian Alps, Italy. It is emphasized that regional palynological studies should be integrated in international multidisciplinary stratigraphical projects.	Aspects of Permian, Triassic and Early Jurassic palynology of Western Europe - A research project

VOLUME 53 NO 6 343	1974	53	6	343	368	Herngreen, G.F.W.; Boer, K.F. de	Rhaetian, Liassic and Dogger sediments have been examined palynologically from boreholes, mainly located in the Achterhoek area, eastern Netherlands. The results are presented in seven pollen diagrams and a distribution chart; seven pollen zones have been recognized and illustrated (6 photoplates). A range chart of selected palynomorph types has been designated, covering the uppermost Triassic-Dogger strata. Some concluding remarks concerning Liassic tectonic movements are made.	Palynology of Rhaetian, Liassic and Dogger strata in the Eastern Netherlands
VOLUME 53 NO 6 369	1974	53	6	369	385	Zagwijn, W.H.	An outline of the palaeogeographic evolution of the quaternary sedimentary basin of The Netherlands is given, based on a discussion of 12 maps, figured in the enclosure. In the second part of the paper a documentation of the sources used is given.	The palaeogeographic evolution of the Netherlands during the Quaternary
VOLUME 53 NO 6 369	1974	53	6	369	385	Zagwijn, W.H.	Large Enclosure	The palaeogeographic evolution of the Netherlands during the Quaternary
VOLUME 53 NO 6 386	1974	53	6	386	392	Wijmstra, T.A.; Hammen, T. van der	An attempt is made to evaluate the state of affairs of correlation of deep sea curves, long palynological sequences in terrestrial deposits and the stratigraphical sequence in NW Europe. There seems to be little doubt about the correlation within the reach of normal ¹⁴ C dating (approximately covering the last 50,000 years), corresponding with oxygen isotope stages 1, 2 and, at least partly, with 3. If the indirect dating of the temperature minimum of stage 4 as approx. 70,000 B.P. is correct, a correlation with the Lower Pleniglacial becomes less probable and a correlation with one of the cold phases in the Early Weichselian much more likely. In that case, at least as the Macedonian region is concerned, a correlation of stage 4 with the dry phase between the Drama and Elevation intervals seems to be the most probable.	The last interglacial-glacial cycle: state of affairs of correlation between data obtained from the land and from the ocean
VOLUME 53 NO 6 393	1974	53	6	393	400	Teunissen, D.; Teunissen van Oorschot, H.	An interstadial peat layer near Nijmegen (The Netherlands) and the meaning of this layer for the explanation of the surrounding landscape morphology. The Geological Map of The Netherlands (1935,1947) defines the sandy plain west of the glacial push moraine of Nijmegen as a fluvio-glacial drift plain. Pons (1957) has noticed, that this plain is divided into two steps. These steps are separated by a low landscarp. We suggest that the Würm glacial dry valleys of the upper step terminate at the landscarp and that the lower step does not consist of Riss glacial sandr material as was thought previously, but that it is composed of the laterally fused, very flat alluvial cones of the dry valleys of the upper step. We base this opinion mainly on the presence of a moershoofd-interstadial (ca.45.000 years old) peat layer in the sediments of the lower step.	Eine Interstadiale Torfschicht bei Nijmegen (Niederlande) und deren Bedeutung für die Erklärung der dortigen landschaftsmorphology

VOLUME 53 NO 6 401	1974	53	6	401	405	Bottema, S.	A pollen diagram from the shelf of the Adriatic is presented and compared with diagrams from the adjoining mainland and with pollen spectra from Mediterranean deep sea samples. This comparison may give information on local pollen production on the mainland as well as on the influence of secondary pollen in deep sea sediments. Next to palynological dating, volcanic ash layers may provide more precise dates. It seems that for palynological investigations cores from shallow water are preferable to those from deeper water.	Implications of a pollen diagram from the Adriatic Sea
VOLUME 53 NO 6 406	1974	53	6	406	414	Janssen, C.R.; Kalis, A.J.; Tamboer van den Heuvel, G.; Valk, E.J. de	In order to reconstruct the Late- and Post-glacial vegetation development of a west-eastern belt in the Vosges (France) palynological and paleo-ecological investigations were made. One map and five simplified diagrams are shown and will be discussed. The map shows the area in study. On basis of differences in geology and relief the area has been divided into five regions. In this paper the central region receives most interest. A diagram of surface samples taken on a mountain summit, shows the local and/or regional deposition of several pollentypes. These results are used for the interpretation of pollendiagrams and it is possible to base a zonation on regional pollentypes as far as late Post-glacial pollendiagrams are concerned. In two diagrams the trends in the curves of some regional pollentypes have been correlated to historical events and it also seems possible to reconstruct fluctuations of the upper forest limit. Figure 6 shows differences in pollen percentages in profiles of two bogs, which may be due to the existence of a vegetation zonation in the older Post-glacial.	Palynological and paleoecological investigations in the Vosges (France): a research project
VOLUME 53 NO 6 406	1974	53	6	406	414	Janssen, C.R.; Kalis, A.J.; Tamboer van den Heuvel, G.; Valk, E.J. de	Large Enclosure	Palynological and paleoecological investigations in the Vosges (France): a research project

VOLUME 53 NO 6 415	1974	53	6	415	428	Zeist, W. van; Casparie, W.A.	In 1962 and 1963, excavations were carried out in the Neolithic lake shore settlement of Niederwil, in northeastern Switzerland. The site, which is dated from ca. 3700 to ca.3625 B.C. (bristlecone pine calibrated ¹⁴ C dates), was founded on gyttja and overgrown by peat. In the settlement remains the conditions were favourable for the preservation of organic material. Information on the vegetation in the vicinity of Neolithic Niederwil is based upon the results of the examination of plant macrofossils, mainly wood, seeds, and fruits, recovered from the site, and upon the palynological study of sediment cores from outside the settlement. At the time the natural vegetation of the uplands consisted of Carpinion betuli forests, in which, in addition to oak and beech, various other trees and a larger number of shrubs were found (table 1). In the river valleys Alno-Padion forests with poplar, ash and elm would have been present. In consequence of cutting and grazing, open vegetations came into existence (table 2), while Prunetalia shrub vegetations expanded considerably along forest edges. The main crop plants of the Niederwil farmers were bread wheat (<i>Triticum aestivum</i>), naked barley (<i>Hordeum vulgare</i> var. <i>nudum</i>), flax (<i>Linum usitatissimum</i>), and opium poppy (<i>Papaver somniferum</i>). Further, wild plants would have played a more or less important part in the diet of the Neolithic inhabitants.	Niederwil, a palaeobotanical study of a swiss neolithic lake shore settlement
VOLUME 53 NO 6 429	1974	53	6	429	435	Voorrips, A.; Jansma, M.J.	A pollen- and diatom analysis of a shore section of the former Lake Wervershoof was carried out to investigate the history of occupation and vegetation in the region. The section is dated to between 1800 BC and 850 AD; a dating near the end of this period is probable. The presence of human occupation near the lake shore is shown. At this time the lake contained fresh water. The occupation changed its agricultural emphasis from the growing of wheat and barley to the growing of rye. The occupation is ended by a marine transgression. During a break in this transgression there is a renewed inhabitation.	Pollen and diatom analysis of a shore section of the former lake Wervershoof
VOLUME 53 NO 6 429	1974	53	6	429	435	Voorrips, A.; Jansma, M.J.	Large Enclosure	Pollen and diatom analysis of a shore section of the former lake Wervershoof

VOLUME 53 NO 6 436	1974	53	6	436	448	Riezebos, P.A.; Slotboom, R.T.	It is pointed out that in measuring current geomorphological processes, which in general act either extremely slowly or, if more catastrophic in nature, at long intervals, knowledge of the recent geomorphological history is essential. This is particularly necessary, if the outcome of the measurements have to serve as a basis for prognosis, because an extrapolation of measurements alone is subject to a high degree of uncertainty. In the area near Bavigne (Luxembourg), where present day displacements of slope material are measured, loamy materials covering the slopes appear often to contain pollen in appreciable amounts. Pollen diagrams constructed from this sort of material show a considerable agreement with the corresponding sections of reference diagrams prepared from alluvial deposits. The disturbance of the pollen stratification by the decay of included contemporaneous pollen combined with a supply of younger pollen, which is considered to be common in sandy soils, apparently has been equally effective in the alluvial fills and in the soils developed in the slope-covering materials. Hence, the disturbance must have been of a similar order of magnitude in the alluvial as well as in the slope materials. The present authors therefore consider the palynological analysis under certain circumstances as an appropriate technique for collecting the necessary information in regolithic materials. The data obtained suggest that pollen analysis of these materials, in conjunction with lithological and pedological field evidence, not only may be used to date events, to which slope materials have been subjected in the recent past, but also to contribute to their reconstruction.	Palynology in the study of present-day hillslope development
VOLUME 53 NO 6 436	1974	53	6	436	448	Riezebos, P.A.; Slotboom, R.T.	Large Enclosure	Palynology in the study of present-day hillslope development
VOLUME 53 NO 6 449	1974	53	6	449	453	Havinga, A.J.	The theories of pollen homogenization and of differential decay of <i>Quercus</i> pollen in Pleistocene cover sand soils now showing a podzol profile, adduced in earlier papers, are disputed by some palynologists. In the present article they are supported by various palynological, ecological, pedological and experimental arguments. Two examples from published evidence, relating to a loess and a cover sand soil respectively, are given to demonstrate that pollen analysis of mineral deposits with a minute pollen concentration may easily lead to the wrong conclusions.	Problems in the interpretation of pollen diagrams of mineral soils
VOLUME 53 NO 6 454	1974	53	6	454	457	Gemeraad, J.H.	The present state of the palynological data bank at Leiden is described, the problems, as yet partly unsolved, are explained and suggestions are given to improve the input procedure.	The data bank of palynological species descriptions at Leiden
VOLUME 53 NO 6 458	1974	53	6	458	459	Janssen, C.R.; Punt, W.; Reitsma, T.J.		The Northwest European pollen flora, a new project
VOLUME 53 NO 6 460	1974	53	6	460	461			Committee "Geoscience and man"
VOLUME 53 NO 6 463	1974	53	6	463	467			Genootschapszaken

VOLUME 54 NO 1-2 1	1975	54	1-2	1	14	Ente, P.J.; Zagwijn, W.H.; Mook, W.G.	Based upon lithologic data and radiocarbon datings the lithostratigraphy of the Calais IV phase and existing subphases A and B is discussed. A subdivision of the Calais IV A subphase into two subunits 1 and, 2 is introduced. The new subdivision solves the incompatibility between statements of various previous authors on the subject. The data obtained are utilized to elucidate the genesis of northern North Holland.	The Calais deposits in the vicinity of Wieringen and the geogenesis of Northern North Holland
VOLUME 54 NO 1-2 15	1975	54	1-2	15	22	Kuijpers, E.P.	A description is given of an Old Red Sandstone sequence of Upper Devonian age occurring along the south coast of Ireland. This sequence shows a gradual transition from continental deposits to overlying tidal marine sediments via a transition zone. The most characteristic changes occurring upward in the transition-zone between the underlying continental (interior alluvial plain) deposits and the marine tidal sediments are: 1) The increasing mineralogical maturity of the sandstones. 2) The appearance of "heterolithic beds". 3) The increasing frequency of occurrence of thick fluvial sandstones. 4) The change in rock colours from reddish via greenish to greyish hues.	Continental and coastal plain deposits of the uppermost Old Red Sandstone complex of Southern Ireland
VOLUME 54 NO 1-2 23	1975	54	1-2	23	35	Schermerhorn, L.J.G.	The Devonian-Lower Carboniferous eugeosynclinal succession of the Iberian Pyrite Belt was deformed and regionally metamorphosed during the Hercynian orogeny. Metamorphic grade decreases from lower greenschist facies in the north to pumpellyite facies in the south. The volcanics comprise a felsic and a mafic-intermediate suite, the latter including spilite lavas and tuffs with intrusive diabases. Spilites precede, follow, and are contemporaneous with felsic eruptions. The parent magma of the spilites and albite diabases was not altered notably by contamination and assimilation. The felsic volcanics are sodic to potassic quartz keratophyres, mostly tuffs. Rio Tinto stratigraphy is reviewed. The possibility that the compositional bimodality of the volcanics might be related to subduction seems remote.	Spilites, regional metamorphism and subduction in the Iberian Pyrite Belt: some comments
VOLUME 54 NO 1-2 36	1975	54	1-2	36	42	Buurman, P.; Boekschoten, G.J.; Koster, Y.	Silicon-alumina concretions with about equal amounts of both components and ranging in crystallinity between allophane and initial crystallization toward halloysite or gibbsite were found in and on Upper Cretaceous limestones. These concretions were probably the result of accumulation of Late Tertiary and Early Pleistocene weathering products, accumulated by stagnation of percolating waters. Crystallization might have been inhibited by the electrolyte concentrations in the limestone pore waters. pure allophane material was much like the allophane originally described in 1816.	Allophane and its initial crystallization products as concretions in the south Limburg Chalk
VOLUME 54 NO 1-2 43	1975	54	1-2	43	54	Engelen, G.B.		De Nederlandse Aardwetenschappen in de spiegel van oraties en openbare lessen

VOLUME 54 NO 1-2 55	1975	54	1-2	55	60	Kloosterman, J.B.	On the western and central parts of the Guiana Shield, South America, tabular sedimentary sequences are found, consisting of sandstones, shales and conglomerates and of tuffs, tuffites and graywackes. In Venezuela, Guyana, Roraima and Surinam they have been designated the Roraima Formation; on the southern margin of the Guiana Shield in Brazil they are called the Uatumã Formation. The writer argues that they are similar in origin and probably are roughly coeval in the several parts of the Shield. Summaries and a selection of quotations are presented, in part taken from not easily available papers, and in part translated for the benefit of students who read English but not Portuguese.	Roraima, Tabelberg and Uatumã Formations of the Guiana Shield: a correlation
VOLUME 54 NO 1-2 61	1975	54	1-2	61	70	Priem, H.N.A.; Boelrijk, N.A.I.M.; Bon, E.H.; Hebeda, E.H.; Verdurmen, E.A.T.; Verschure, R.H.	Granitic rocks on Belitung (Billiton), Bangka and the Tuju islands (Pulau Tudjuh) have a Rb-Sr isochron age of 217 ± 5 Ma with initial $^{87}\text{Sr}/^{86}\text{Sr} = 0.7152 \pm 0.0029$ (15 whole-rocks and 4 biotites). K-Ar ages of four hornblendes and two biotites average 214 ± 4 Ma. The granitic complex on Karimata has a Rb-Sr isochron age of 74 ± 2 Ma with initial $^{87}\text{Sr}/^{86}\text{Sr} = 0.7101 \pm 0.0025$ (8 whole-rocks), while an associated amphibolite has a K-Ar age of 78 ± 5 Ma. (Rb-Sr ages based upon $d = 1.39 \times 10^{-11}/a$; errors at 95% confidence level.) The granites have intruded into flysch-type sediments containing Norian fossils, while the regional stratigraphic and tectonic relationships strongly suggest that they are overlain by fossiliferous sediments of probably Rhaetian age. The age of 217 ± 5 Ma can thus be taken as the minimum age of the Norian, probably as representing the Norian/Rhaetian boundary. Cassiterite mineralisation is associated with both Upper Cretaceous and Upper Triassic granitic masses, but major tin deposits are related only to Upper Triassic plutons.	Isotope geochronology in the Indonesian Tin Belt
VOLUME 54 NO 1-2 71	1975	54	1-2	71	81	Bemmelen, R.W. van	For an all-round interpretation of the Earth's history geodynamic as well as geochemical processes should be taken into account. The anthropomorphic character of the jargon used by plate-tectonicists is an impediment to achieve this aim. The driving forces of the geodynamic evolution as viewed by the current model of plate tectonics are too much restricted to mechanical processes, whereas their intertwining with physico-chemical processes should also be realized.	Kritik zur plattentektonik
VOLUME 54 NO 1-2 82	1975	54	1-2	82	84	Verbraeck, A.		Ice-pushed ridges in the Eastern part on the Netherlands river area

VOLUME 54 NO 1-2 85	1975	54	1-2	85	100	Ealey, P.J.; Knox, G.J.	The pre-Tertiary rocks of SW Cyprus consist of an autochthonous unit, composed of Campanian sediments, and an allochthonous assemblage containing igneous and sedimentary rocks of Triassic to Lower Cretaceous age, and some undated metamorphic rocks. The complex rests on a basement of Cenomanian to Campanian basic pillow lavas, which form the youngest unit of the Troodos Igneous Complex. The basal autochthonous sediments (Perapedhi Formation) consist of thin (less than 10 m) iron-rich shales (umbers), locally associated with cherts and manganese nodules. The overlying autochthonous sediments (Kannaviou Formation) comprise 500 m or more of abyssal mudstones and marls intercalated with tuffaceous sandstones containing also lithoclasts similar in lithology to the large allochthonous rock units that are now referred to as "Mamonia Allochthonous Complex" The volcanic elements in the Kannaviou Formation have been derived from an andesitic-dacitic source, extraneous to Troodos, and probably reflect the crustal instability that culminated in the emplacement of the Mamonia Allochthonous Complex. During this time the Troodos Massif was probably a submarine high, undergoing submarine weathering and local brecciation. The Mamonia Allochthonous Complex comprises Triassic alkali lavas associated with reef and pelagic limestones, metamorphic schists, serpentinites, peridotites, gabbros, Triassic turbiditic sandstones and packstones intercalated with shales, Jurassic cherts, shales and packstones, and Lower Cretaceous quartz sandstones intercalated in shales. The total sedimentary thickness is not more than a few hundred metres. The association is interpreted to be of deep-marine origin in general, but including also shallower,	The Pre-Tertiary rocks of SW Cyprus
VOLUME 54 NO 1-2 101	1975	54	1-2	101	105	Buurman, P.	Fine grained natural pyrite concretions oxidize spontaneously under laboratory conditions. A solution of oxidation products in distilled water yields the following crystallization products upon evaporation (in order of formation): melanterite, rozenite, szomolnokite, rhomboclase, coquimbite, roemerite, a slightly basic ferric sulphate, and voltaite. The crystallization sequence is comparable to that found in natural environments where pyrite ores are oxidizing.	in vitro weathering products of pyrite
VOLUME 54 NO 1-2 107	1975	54	1-2	107	115			Boekbesprekingen
VOLUME 54 NO 3-4 121	1975	54	3-4	121	122	Reynders, J.J.; Mouthaan, W.L.P.J.		In memoriam prof. Dr. Ir.F.A. van Baren
VOLUME 54 NO 3-4 123	1975	54	3-4	123	129	Eek, W.N. van		Jaarrede

VOLUME 54 NO 3-4 130	1975	54	3-4	130	145	Weering, T.C.E. van	In the Skagerrak several sedimentary units are present that were found previously in the Norwegian Channel. The thickness and distribution of late-postglacial sediments is measured and mapped. The origin of the sediments are discussed and a model for the late-Quaternary sedimentary history of the area is suggested. The occurrence of shadow zones is related to gasbubbles or coarse materials in the subsoil. Sedimentary structures such as large scale foresets and giant sand waves are found along the southern border of the Skagerrak. The sand waves are considered as relict structures. The bottom relief in the Skagerrak is closely related to the sedimentary history; along the southern border ice grounding has probably played an important role.	Late Quaternary history of the Skagerrak; an interpretation of acoustical profiles
VOLUME 54 NO 3-4 146	1975	54	3-4	146	147	Angus, R.B.	An account is given of fossil from two organic layers in Weischelian deposits at Voorthuizen, The Netherlands. On radiocarbon and stratigraphic evidence these beds apparently date from between the Brorup and Upton Warren interstadials. Although the samples analysed were small and gave meagre fossil assemblages, the lower bed clearly represents tundra conditions, with average July temperatures below 10°C. The upper bed gave a climatically nondescript fauna from which no firm inferences can be made. However, it is considered that had this bed been deposited under conditions as cold as those represented by the lower bed, the fossils would have given some indication of this, and it therefore seems likely that it reflects somewhat warmer conditions, with average July temperatures of about 10°C	Fossil coleoptera from Weichselian deposits at Voorthuizen, the Netherlands
VOLUME 54 NO 3-4 148	1975	54	3-4	148	156	Stalder, P.J.	Huge masses of coarse clastics were deposited and cemented during and shortly after the last uplift phases of the Oman Mountains; the environment was fluvial and the climate was alternatively humid and semi-arid. The cement includes mainly calcite, high-magnesium calcite and dolomite; their genesis and relation to the area of water run off are discussed. The cement textures indicate both vadose and phreatic cementation. The absence of cement cathode-luminescence seems to be characteristic of this fresh-water environment of cementation.	Cementation of pliocene-Quaternary fluvial clastic deposits in and along the Oman mountains

VOLUME 54 NO 3-4 157	1975	54	3-4	157	168	Hutchison, C.S.	The active volcanic arc of Indonesia extends almost continuously over 6000 km from north Sumatra to the Molucca Sea. Chemical analyses of 196 rocks from 33 volcanoes have been processed to give molecular norms and multiple linear correlation analyses between various chemical parameters and silicon content or differentiation index (D.I.) and vertical depth of the underlying Benioff Zone, which ranges from 140 to 300 km. The great majority of the volcanic products is of augite-hypersthene andesite or basalt, sometimes with olivine and hornblende, and occasionally with biotite, quartz and tridymite. Leucite occurs in volcanoes overlying the deepest seismic contours. Most rocks are quartz-normative, but many are olivine- and even nepheline-normative where the volcanoes overlie the greatest seismic depths. Significant relationships exist between each of potassium %, alkalis % and the ratio of potassium to alkalis and both silicon content (or D.I.) and depth to the underlying Benioff Zone. The relationship with silicon or D.I. is petrologically controlled and the relationship with Benioff Zone depth may suggest that the magmas are produced at and rise from the Benioff Zone and that some of the chemical variation is controlled by the depth of magma production. However the best correlation obtained cannot explain more than 50 to 60% of the chemical variation in terms of depth of magma production. Future refinement of the measurement of the seismic contours and improvement of the chemical analyses may lead to a closer correlation, but on the basis of the present data it is necessary to conclude that, in addition to seismic depth, other unknown factors play an important role in controlling the chemical variation of the	Correlation of Indonesian active volcanic geochemistry with Benioff Zone Depth
VOLUME 54 NO 3-4 169	1975	54	3-4	169	176	Coo, J.C.M. de; Smit, O.E.	The Triassic Koding Limestone Formation is formally described as a new lithostratigraphic unit in the Malay Peninsula. The thickness of the stratotype measured is more than 125 m. The carbonate sediments, consisting of algal stromatolites, intraformational breccias, limestone conglomerates with sedimentary slumps, black mudstones with radiolarian chert, and limestone turbidites, were deposited in a shelf, slope, and basinal environment. The paleoslope was dipping to the east.	The Triassic Koding limestone formation in Kedah, W. Malaysia
VOLUME 54 NO 3-4 177	1975	54	3-4	177	183	Engen, H. van	Temperature surveys have been carried out by NAM in gas wells in and around the Groningen field, From these surveys subsurface temperatures at datum level (= 2,875 m S.S.) between 88 and 1 14° C have been obtained, which have been used to construct a subsurface temperature map. This map is used for volumetric gas in place calculations and the prediction of producing wellhead temperatures. On the map a number of areas with low datum depth temperatures can be seen, which appear to correspond with overlying salt domes and ridges. In these areas the heat flow rate to the surface is found to be above average.	An interpretation of Groningen subsurface temperature data

VOLUME 54 NO 3-4 184	1975	54	3-4	184	194	Sadée, C.P.M.	Staatsmijnen in Limburg (now named Naamloze Vennootschap DSM at Heerlen) has conducted temperature measurements in the Carboniferous rocks of the South-Limburg coalmining area. From the measuring results the temperature gradients for both the overburden and the Carboniferous are derived. The temperature gradient of the Carboniferous averages $\delta_c = 3.0$ °C/100 m, whilst, that of the overburden, depending on the composition and the water content, appears to range between $\delta d = 5.5$ and $\delta d = 2,4$ °C/100 m, according to 5 separate regional groups of measurements in the South-Limburg mining area. With the aid of the data obtained a map has been compiled of subsurface temperature at datum level, (-749 m. Amsterdam Zero Level), which chart is to serve in making predictions regarding climatic conditions in underground workings.	An interpretation of South-Limburg subsurface temperature data
VOLUME 54 NO 3-4 195	1975	54	3-4	195	198	Haak, R.; Postuma, J.A.	A correlation between the tropical planktonic foraminiferal zonation and the Tertiary Far East Letter Classification is presented. Their relationships with world-wide time stratigraphical units and classic European stages are tabulated. The datum planes of the most important planktonic and larger Foraminifera are also shown.	The relation between the tropical planktonic foraminiferal zoantion and the Tertiary far East letter classification
VOLUME 54 NO 3-4 199	1975	54	3-4	199	204	Boorder, H. de	Geological observations during a mineral exploration programme in the western part of the Troodos Igneous Complex, Cyprus, have led to the formulation of a hypothesis concerning the origin of the Sheeted Intrusive Complex in connection with the development of the Troodos dome. The hypothesis suggests an originally horizontal attitude of the "Diabase" sheets in a large part of the Sheeted Complex. Some related aspects of sulphide mineralisation are discussed.	The sheeted intrusive complex of Troodos, Cyprus
VOLUME 54 NO 3-4 205	1975	54	3-4	205	207	Priem, H.N.A.; Boelrijk, N.A.I.M.; Hebeda, E.H.; Romein, B.J.; Verdurmen, E.A.T.; Verschure, R.H.	K-Ar dates of seven glauconites from Campanian and Maastrichtian horizons in Netherlands and Belgian Limburg are ionsistent with their stratigraphical position.	Isotopic dating of glauconites from the Upper Cretaceous in the Netherlands and Belgian Limburg, 1

VOLUME 54 NO 3-4 208	1975	54	3-4	208	221	Mulder, C.J.; Lehner, P.; Allen, D.C.K.	This paper attempts to describe the Neogene evaporite basins in the Eastern Mediterranean and the Red Sea Rift in the context of the regional tectonic framework and the regional tectonic phases of the Alpine-Mediterranean region. It is mainly based on airgun seismic surveys in the Mediterranean and Red Sea carried out in the time span between 1971 and 1973. The Neogene basins of the Eastern Mediterranean as well as the Red Sea began to form after the main Oligocene - Lower Miocene Alpine orogenic phase. The morphological conditions for evaporite deposition in the Mediterranean basins, during a short period of time were provided by late Miocene - early Pliocene tectonic movements in the basin peripheries, which caused a temporary restricted connection with the open sea. It was followed by open marine conditions during the Pliocene. Graben subsidence in the Red Sea Rift began during Oligocene - early Miocene. Initial terrestrial sedimentation was followed by widespread evaporite deposition, which lasted throughout a considerable part of the Miocene period. The late Miocene - early Pliocene tectonic phase caused a final disruption of the connection with the Mediterranean. Open marine conditions were established in the Pliocene through a connection with the Indian Ocean. Regional doming of the Arabian-Nubian shield and axial collapse, first of the main graben and later of the axial trough, is thought to represent the dominant mechanism for the origin of the Red Sea Rift.	Structural evolution of the Neogene salt basins in the Eastern Mediterranean and the Red Sea
VOLUME 54 NO 3-4 222	1975	54	3-4	222	230	Ruiter, G. de	Pollen analysis of a 20 m long core of peat, sand and silt deposits near Apeldoorn, the Netherlands shows that these sediments were laid down in the Late Eemian, the Early Weichselian and the Middle Weichselian. Only the most upper Eemian is present- In the Early Weichselian one zone with interstadial character and represented by a peat layer is particularly well developed, showing successive maxima in the pollen values of Alnus, Picea and Pinus. Pollen of Betula however remains dominant. The Middle Weichselian is strongly glacial in character. It includes an oscillation with Salix, Potamogeton, Pediastrum and Selaginella selaginoides pointing to more favourable conditions.	A pollendiagram from the Weichselian deposits near Apeldoorn, the Netherlands
VOLUME 54 NO 3-4 222	1975	54	3-4	222	230	Ruiter, G. de	Large Enclosure	A pollendiagram from the Weichselian deposits near Apeldoorn, the Netherlands
VOLUME 54 NO 3-4 231	1975	54	3-4	231	239			Boekbesprekingen
VOLUME 55 NO 1-2 1	1976	55	1-2	1	2			In memoriam William van Leckwijck (1902-1975)
VOLUME 55 NO 1-2 3	1976	55	1-2	3	5	Odin, G.S.		Commentaires sur la datation des glauconies du Cretace superieur du Limbourg
VOLUME 55 NO 1-2 6	1976	55	1-2	6	6	Priem, H.N.A.; Boelrijk, N.A.I.M.; Hebeda, E.H.; Romein, B.J.; Verdurmen, E.A.T.; Verschure, R.H.		Isotopic dating of glauconites from the Upper Cretaceous in the Netherlands and Belgian Limburg, 1: reply to the comments by G.S. Odin.

VOLUME 55 NO 1-2 7	1976	55	1-2	7	17	Berckel, F.L. van	It is suggested that the origin of submarine canyons depends on two factors: 1. a drop of the ocean level below the shelf/slope rim as a consequence of the formation of enormous ice masses during a glaciation. 2. the presence of powerful streams, created by the melting of ice masses; these streams carried large amounts of glacial debris across the shelf and deposited them on the continental slope. Continuous overloading of these debris piles resulted in debris avalanches downslope, which excavated canyons and ultimately formed large submarine fans.	On the origin of submarine canyons
VOLUME 55 NO 1-2 18	1976	55	1-2	18	40	Swie-Djin, N.	The genetic relation between the onset of a marine transgression and the consequent upbuilding of three ancient sandwave complexes is discussed and illustrated. These are: a. The Lower Tertiary Roda sandwave complex of the southern Pyrenean basin. b. The Lower Greensand sandwave complex of the Isle of Wight. c. The Miocene sandwave complex of the swiss Molasse. Based on these examples, a model for the formation of a sandwave complex in relation to a marine transgression and tidal action is developed. Finally, based on geological arguments derived from the sequential and structural analysis of these ancient sandwave complexes, the genesis of the modern sandwaves of the North Sea is related to the Holocene transgression.	Marine transgressions as a factor in the formation of sandwave complexes
VOLUME 55 NO 1-2 41	1976	55	1-2	41	45	Borradaile, G.J.	The distribution of metamorphic zones in the SW Scottish Highlands may have been influenced by the bulk thermal anisotropy of the regional structure	Thermal anisotropy - a factor contributing to the distribution of Caledonian metamorphic zones in the SW Scottish Highlands?
VOLUME 55 NO 1-2 46	1976	55	1-2	46	50	Wijs, H.J. de	Although mineral resources are non-renewable, mineral reserves can be created by new discoveries and from already identified sub-economic resources. A probabilistic model is presented to adjust reserve estimates to changes in minimum workable grade. This model is based upon a rational frequency distribution for the dependence of tonnage on cut-off and average grade. For this purpose the straight lognormal transformation is rejected, and replaced by a logarithmic, three-parameter transformation of wider applicability, including negatively skewed distributions of iron, bauxite, and phosphate deposits. The estimation of ore reserves occasionally serves the restricted purpose of the commercial evaluation of mining property. Yet, more often such estimates have a wider scope: up to forecasts of the adequacy to supply the future needs of a country or the world.	Models for the estimation of world ore reserves

VOLUME 55 NO 1-2 51	1976	55	1-2	51	60	Winkelmolen, A.M.	A new design is presented of an infinite flume. This flume has been specially developed to study equilibrium processes during transport and deposition of sand and the influence of time on these processes. The flume-plan is oblong rectangular, the channel is 60 cm deep and 45 cm wide. In each corner reflexion blades are mounted, which are specially shaped to compensate for the increase in width in the bends. The water drive is performed by means of paddles, hanging from two parallel chains which run over cog-wheels. The paddles move in a vertical position through the water. Due to a downcurrent inclination of the chains, the paddles are gradually lifted out of the water and are free of the surface whilst flipping round the cog-wheels, thus producing no extra turbulence. Flow characteristic are shown for different discharge rates and peculiarities of the flume are discussed	An inexpensive infinite flume
VOLUME 55 NO 1-2 61	1976	55	1-2	61	67	Sesören, A.	A lineament map from ERTS (Landsat) images of The Netherlands is presented. The directions of these lineaments have been compared to fault patterns in the Carboniferous, the base of the Cretaceous and the uppermost Tertiary and Quaternary. The known fault patterns are essentially similar to the Landsat lineament patterns	Lineament analysis from ERTS (Landsat) images of the Netherlands
VOLUME 55 NO 1-2 68	1976	55	1-2	68	72	Whalley, W.B.; Chartres, C.J.	The type of orthoquartzite known as sarsen stone is found over wide areas above the Chalk of south-east England. Scanning electron microscope and thin section studies indicate that sarsens are composed of quartz grains with syntaxial overgrowths of secondary quartz. They contain relatively little inter-particle siliceous cement. Their strength appears to be derived from the interlocking structure of the quartz grains produced by the syntaxial overgrowths.	Preliminary observations on the origin and sedimentological nature of sarsen stones
VOLUME 55 NO 1-2 73	1976	55	1-2	73	82	Clemmensen, L.B.	Eolian flats are often encountered along modern shorelines in association with wash-over fans, storm inlets and swamps. A possible ancient analogy to this environmental situation has been confronted in the Miocene sediments in the Garsdorf Quarry, Western Germany. These sediments consist of several facies associations, the uppermost of which is notable due to the occurrence of sandy lignite. The sandy lignite displays several sedimentary structures of presumably eolian origin and is interpreted as an eolian sediment formed during humid conditions on eolian flats. Deposits associated with the sandy lignite include stratified channel-sand, most probably representing storm inlets filled by eolian and ephemeral stream deposits, sheets of faintly laminated sand of wash-over fan origin, and lignite formed in coastal swamps.	Eolian "sandy lignite" and associated sediments from the Miocene of the Lower Rhine Basin Western Germany

VOLUME 55 NO 1-2 83	1976	55	1-2	83	86	Bartenstein, H.	Presentation of a new zonation chart with benthonic foraminifera, valid for the worldwide Lower Cretaceous, Berriasian to Albian, in the temperate and tethyan facies realms. Divisions, sections and zones comprise 22 foraminifera columns with 36 species of different stratigraphic value.	Practical applicability of a zonation with benthonic foraminifera in the worldwide Lower Cretaceous
VOLUME 55 NO 1-2 87	1976	55	1-2	87	104	Veenstra, H.J.; Winkelmolen, A.M.	The sand movement on and around two barrier islands flanking the tidal flat area north of The Netherlands is studied by means of size, shape and density sorting. Since there is mainly fine sand in the area, the competency of the transporting media is seldom reached and selection mainly occurs on shape and density. In the deeper offshore, a coarse grain-population shows inherited characteristics from a higher energy early transgressive phase, whereas a finer population is consistent with the present-day hydrodynamic situation. Tidal channels in between the islands form outer tidal deltas. These deltas protect the islands against the waves produced by N-W gales and they form a "shadow" for the W-E longshore currents. The coastline of the islands is still retreating. The removal of sand mainly occurs during storm surges. The eroded material is redeposited in sorted zones parallel to the coast. Only the susceptible material, that is deposited farthest from the beach, can be transported by the longshore currents. The coarsest, most spherical and densest grains remain closest to the beach and can re-enter the beach as prograding bars during more quiet conditions. This process gives rise to a stepwise diminishing grain-size from island to island towards the east. The eastern island is situated on top of older river and/or tidal channel deposits, which are easy to erode. This gives the tidal inlet, and hence the tidal delta, a great lateral mobility. The eastern island is therefore very mobile. The western island is bordered by a deep tidal channel, which cuts into more resistant glacial deposits. This keeps the channel and hence its outer tidal delta in the same site. The western island therefore did not change longitude and constantly retired over its own deposits.	Size, shape and density sorting around two barrier islands along the north coast of Holland
VOLUME 55 NO 1-2 105	1976	55	1-2	105	109	Dijkstra, S.	The paper presents an elementary introduction into the theory of random functions and demonstrates the usefulness of covariograms in the analysis of geological data. Most examples refer to experiences in exploration geochemistry.	Simple uses of covariograms in geology
VOLUME 55 NO 1-2 110	1976	55	1-2	110	116	Stel, J.H.	Faults, tension-rupture, slumplike- and load-and-flamelike structures in thin carbonate intercalations in the Upper La Vid (Lower Emsian) shales NW of Colle are described. They are argued to have been caused or accentuated by clay diapirism. The paleoslope probably had no influence on this deformation process.	Clay diapirism in the Lower Emsian La Vid shales near Colle, Cantabrian mountains, NW-Spain
VOLUME 55 NO 1-2 117	1976	55	1-2	117	129			Boekbesprekingen

VOLUME 55 NO 3-4 131	1976	55	3-4	131	146	Greensmith, J.T.; Tucker, E.V.	The 36 m thick succession rests discordantly on sub-aerially weathered Pleistocene and older strata and comprises 3 major marine transgressive cycles. The lower 2 are confined to the vicinity of deep Pleistocene channels whereas the 3rd, possibly initiated c. 7500 B.P. extends across the whole coastal zone. Each cycle consists of a lower division of clays and silts with thin coarser deposits towards the base and an upper division of sands and sandy gravels. The contact between the two divisions is often erosional or sharp. Landward displacement of the plain lithofacies is most pronounced during episodes of relatively rapid rise in sea level, as in the U.S.A. and Holland. At certain levels reached by the rising sea extensive bodies of relict Pleistocene sediment became available for marine reworking. The persistence of lagoon, marsh, beach, chenier, barrier, tidal flat and channel lithotopes through the succession in conjunction with 12 radiocarbon dates allow general palaeogeographic deductions to be drawn, more especially for c. 7500, c.4000 and c. 1350 B.P.	Major Flandrian transgressive cycles, sedimentation and palaeogeography in the coastal zone of Essex, England
VOLUME 55 NO 3-4 147	1976	55	3-4	147	158	Kiam Fui, H.	The morphogenetic trend of <i>Lepidocyclus</i> in Miocene sediments from Sarawak, East Malaysia, has been studied. A correlation has been established between the degree of curvature of <i>Lepidocyclus</i> and the planktonic foraminiferal zonation in the area. The results prove that this evolutionary trend of <i>Lepidocyclus</i> is a practical tool for chronostratigraphy.	Morphogenetic trend of <i>Lepidocyclus</i> and its application in time stratigraphy
VOLUME 55 NO 3-4 159	1976	55	3-4	159	162	Jungerius, P.D.; Riezebos, P.A.	Volcanic grain percentages in heavy-mineral concentrates of local colluvial deposits in Luxembourg and surrounding areas have been used to trace the dispersal of an ash deposit of Allerød age characterized by an association of brown amphibole, pyroxene and sphene. Remnants of the ash fall were detected at distances of more than 300 km southwest of the Laacher See eruption centre. As Allerød ashes previously have been found at similar distances east of this centre, it is evident that the dominant wind direction during this geological interstade cannot be reconstructed from the distribution of ashes produced by short-lived eruptions.	The distribution of Laacher See ash west of the Eifel region

VOLUME 55 NO 3-4 163	1976	55	3-4	163	174	Stel, J.H.; Oekentorp, K.	Serial sections of <i>Paleofavosites</i> specimen presents proof to the contention that <i>Desmidopora</i> = <i>Multisolenia</i> is only a growth habit of <i>Paleofavosites</i> . The so-called solenia are funnel-shaped parts of the paleofavosited wall around quite ordinary corner pores. The former are arranged in dumb-bell pairs among any four adjoining corallites. Such dumb-bells are arranged crosslike, when seen in the direction of growth of the corallites. This growth habit is found in the type species of <i>Paleofavosites</i> as well as in other undisputed members of that genus. The present authors accordingly consider <i>Priscosolenia</i> as a junior synonym of <i>Paleofavosites</i> . <i>Desmidopora</i> (= <i>Multisolenia</i> + <i>Mesosolenia</i>) could serve as a subgeneric heading for <i>paleofavositids</i> with this peculiar growth habit.	On the solenid growth habit of <i>Paleofavosites</i>
VOLUME 55 NO 3-4 175	1976	55	3-4	175	178	Milsom, J.; Richardson, A.	Recent gravity measurements in eastern Timor have shown that steep gradients occur in the northern part of the island, and that the maximum Bouguer Anomaly values attained are greater than those on the inner volcanic arc immediately to the north. The observations can be explained only by supposing that the dense source rocks rise very close to the surface, and analogies can be drawn with the large anomalies associated with ophiolitic thrusts in New Guinea and New Caledonia. The pattern of volcanic activity north of Timor also resembles that of eastern New Guinea, suggesting, again by analogy, that a thrust slice is wedged in the subduction zone south of the inner Banda arc. If correct, this hypothesis provides some support for the concept of Timor as built up of a series of thrust slices resting ultimately on continental basement.	Implications of the occurrence of large gravity gradients in Northern Timor
VOLUME 55 NO 3-4 179	1976	55	3-4	179	184	Schlanger, S.O.; Jenkyns, H.C.	Organic carbon-rich sediments are globally developed in pelagic sedimentary sequences of Aptian-Albian and Cenomanian-Turonian age. They formed in a variety of paleo-bathymetric settings including oceanic plateaus and basins, continental margins and shelf seas. The widespread nature of these deposits suggests that they were not strictly controlled by local basin geometry but were a product of "Oceanic Anoxic Events". We interpret these events as the result of the interplay of two major geologic and climatic factors: firstly the Late Cretaceous transgression which increased the area and volume of shallow epicontinental and marginal seas and was accompanied by an increase in the production of organic carbon; and secondly the existence of an equable global climate which reduced the supply of cold oxygenated bottom water to the world ocean. This combination of climatic and hypsographic conditions favoured the formation of an expanded oxygen-minimum layer and where this intersected the sediment-water interface, organic carbon-rich deposits could be formed, these being records of "Oceanic Anoxic Events".	Cretaceous oceanic anoxic events: causes and consequences

VOLUME 55 NO 3-4 185	1976	55	3-4	185	194	Brinck, J.W.	<p>From the mining history of different mineral commodities it is indicated that the average annual growth of production can be used as an indicator for their economic and industrial maturity. Calculations show the growth rate to be determined by the size of the remaining reserves as function of the annual production. Its value at all times tends to remain directly proportional to the number of times that a mineral industry could double its annual production before depleting its remaining reserves. The observations indicate logistic growth of mineral production toward a moving ceiling which is determined by both natural- (Clarke and specific mineralisability) and technico-economic- (price and current state of mining technology) parameters. If confirmed, this will enable the prediction of ultimate production levels and possible rates of substitution of scarce commodities by more abundant ones.</p> <p>Furthermore, it would increase the physical base for the viability of our technological society by a factor greater than 10; increasing its predictable lifetime from less than a century to well over a thousand years. Using this relation to predict the size of the inferred reserves of a metal from its current annual production and average growth rate, close confirmation of independent estimates with the Mimic model is obtained for the major metals iron, aluminum, copper, gold, zinc and lead, each with a value of annual production in excess of one billion US\$. Somewhat less convincing results are obtained for the almost equally well established industries of nickel, tin, mercury and antimony. They show lower growth rates than allowed by the theory. Still lower rates are found for the metals chromium, manganese and tungsten. The nonconforming metals all are</p>	Critical parameters for the production depletion and substitution of mineral resources
VOLUME 55 NO 3-4 195	1976	55	3-4	195	203	Sykes, R.M.; Brand, R.P.	<p>The Hartz Fjeld Formation (Middle Volgian - Ryazanian) is interpreted as a synorogenic fan-delta complex. The lower part of the formation is characterised by coarsening upwards fan-delta sequences with marine delta destructive units. A thick lagoonal unit separates these sequences from the upper part of the formation in which fan-delta deposition resumed in a lateral position and fan plain sands are intercalated within bay muds. A distinction is made between fan-delta deposition, dominated by sheetflood and streamflood processes, and short-headed stream delta deposition in which flow is confined in stable channels.</p>	Fan-delta sedimentation: An example from the Late Jurassic - Early Cretaceous of Milne land, Central East Greenland
VOLUME 55 NO 3-4 205	1976	55	3-4	205	210	Schermerhorn, L.J.G.		Volcanism and metallogenesis
VOLUME 55 NO 3-4 211	1976	55	3-4	211	212	Amerom, H.W.J. van; Boersma, M.; Riehl-Herwirsch, G.	<p>In 1961 during fieldwork plant remains were found at the "Christophberg" near St. Filippen (Carinthia, Austria). The flora was believed to be indicative of a Westphalian age. However, during the summers of 1974 and 1975 additional material has been collected, among which <i>Callipteris conferta</i> could be determined. Due to the discovery this flora at the base of the postvariscian transgression series at the Christophberg is at present considered to be of Rotliegend age.</p>	Zum alter des "Karbons vom Christophberg", Kärnten, Österreich

VOLUME 55 NO 3-4 213	1976	55	3-4	213	217	Brouwer, A.	Lyell's main work, The principles of geology (1830-1833), left a deep impression on Darwin. This is not only evident from the three geological books Darwin published after his return from the voyage of the Beagle, but also from his main work, The origin of species (1859). The latter can be considered as an application of Lyell's principle of uniformitarianism to the history of the living world. Lyell on the other hand never became a fully convinced Darwinian. It is suggested that this was mainly due to a fundamental difference between Lyell's steady-state model of the Earth's history, and Darwin's view of the history of life as a progressive process. Increased knowledge of the Earth's early Cryptozoic history shows that progressive changes also occurred in the history of the Earth. This, however, does not invalidate the general applicability of the principle of uniformitarianism throughout the whole of geological time.	Charles Lyell and Charles Darwin
VOLUME 55 NO 3-4 218	1976	55	3-4	218	226	Amerom, H.W.J. van; Boersma, M.; Niedermayr, G.	During fieldwork near Kötschach in Carinthia (Austria) in the summer of 1975 plant remains in the "Werfener Schichten" (Trias) were discovered for the first time, <i>Pleuromeia cf. sternbergii</i> (Muenster) Corda, <i>Voltzia</i> sp., "roots", "seeds" and some leave fragments of uncertain identity could be recognized. The plant-bearing beds are situated in between a series of red and gray coloured, mainly coarse-grained clastics, from which important indications could be obtained on the lithological development of the triassic basal layers in the western Drauzug.	Notes on the sedimentology and paleobotany of the Werfener schichten in the Western Gailtaler Alps near Kötschach (Carinthia, Austria)
VOLUME 55 NO 3-4 227	1976	55	3-4	227	228	Brouwer, A.	It is questioned whether the complete system of lithostratigraphic terms introduced in the explanation of a (beautiful) new geological map of the Netherlands, scale 1:600000 (Zagwijn & van Staaldunen, 1975) serves a useful purpose. Some definitions seem to be in defiance of the recommendations by the International subcommission on stratigraphic classification, some terms seem to be superfluous.	Inflatie in de stratigrafie?
VOLUME 55 NO 3-4 229	1976	55	3-4	229	241			Boekbesprekingen
VOLUME 56 NO 1 1	1977	56	1	1	3	Straaten, L.M.J.U. van		In memoriam Ph.H. Kuenen
VOLUME 56 NO 1 5	1977	56	1	5	24	Ruegg, G.H.J.	The sandur deposits discussed below appear to be much similar to alluvial fan deposits. Only minor differences may occur which are related to the nature of the source area (slopes, availability of non-consolidated material) and to climatic conditions. In the introduction a synopsis is given concerning river types and their deposits in general, represented in the deposits of this part of the North Sea Basin; subsequently, Neogene and Quaternary fluvial deposits (including sandur deposits) in The Netherlands are classified based on the type of deposition.	Features of Middle Pleistocene sandur deposits in the Netherlands
VOLUME 56 NO 1 25	1977	56	1	25	30	Brouwer, J.	A continuously cored marine Oligocene Rupel Clay of the N.A.M. well Grashoek-1 (Peel region, the Netherlands) yielded a benthonic foraminiferal fauna indicative of a bathyal environment with a seadepth below 300-500 m.	Depositional environment of the Oligocene Rupel Clay in well Grashoek-1, Peel region, The Netherlands.

VOLUME 56 NO 1 25	1977	56	1	25	30	Brouwer, J.	Large Enclosure	Depositional environment of the Oligocene Rupel Clay in well Grashoek-I, Peel region, The Netherlands.
VOLUME 56 NO 1 31	1977	56	1	31	36	Prins, S.	A volumetric calculation of the amount of gas in a rock reservoir requires in practice numerical integration of a volume integral. The distributions of porosity- and gassaturation values throughout the reservoir have then to be known: Since in all practical cases these distributions are only partially known, the calculation of the amount of gas in the reservoir can only be made using a model of the reservoir from which the overall distributions are derived. The model is based on premises that have to be specified separately. The problem of finding suitable distributions is most urgent for a newly discovered reservoir. Therefore an example of such a case has been picked out and general geological and physical considerations have been used as the principal premises in order to arrive at a starting model, named the Continuous Conformal Model (CCM). The construction and computational procedures are illustrated by a numerical example.	A volumetric model to estimate the amount of gas in a newly discovered rock reservoir.
VOLUME 56 NO 1 37	1977	56	1	37	65	Sissingh, W.	The stratigraphical distribution of selected species of calcareous nannoplankton from sections of Cretaceous deposits in Tunisia, France, The Netherlands, West Germany, Great Britain, Denmark, Turkey, Oman and New Jersey was studied. A number of Late Cretaceous lineages was recognised, on which a proposal for a revised zonation is based. Twenty-six zones are distinguished for the Cretaceous interval. First-order correlations between zones and Cretaceous stage-stratotypes are discussed briefly. The Upper Cretaceous part of the proposed zonation has also been correlated with planktonic foraminiferal zones. One new genus and two new species are described.	Biostratigraphy of Cretaceous calcareous nannoplankton
VOLUME 56 NO 1 37	1977	56	1	37	65	Sissingh, W.	Large Enclosure	Biostratigraphy of Cretaceous calcareous nannoplankton

VOLUME 56 NO 1 66	1977	56	1	66	82	Cleintuar, M.R.; Knox, G.J.; Ealey, P.J.	New datings and sedimentological observations seem to confirm the Cretaceous age and submarine origin of the Troodos igneous complex in central Cyprus. Troodos rocks, of marked calc-alkali character, form the basement to an Upper Maastrichtian-Tertiary sequence, 500-1800m thick, of bathyal-shallow abyssal marls and chinks. In N Cyprus these relatively undisturbed sediments are in contact with southward thrust flysch deposits (2000-3000 m) of prevailing Miocene age, indicating a tectonic weld of major order. Allochthonous Permian-Lower Cretaceous shelf limestones are exposed in what seems to be the core (Kyrenia Range) of the N Cyprus thrust belt. In SW and S Cyprus a thin, exotic rock complex (Mamonia) wedges in between the Upper Maastrichtian-Tertiary sediments and Troodos basement. The Mamonia comprises a Triassic- Lower Cretaceous allochthonous, mainly deep marine assemblage that rests on Campanian dated andesitic pyroclastics. The geological evolution of Cyprus is conceived by the authors as follows: The Troodos igneous complex formed part of an ocean rise in a Cretaceous sea bordered by continental margins. In about Campanian time Troodos was underthrust by the southern (Afro-Arabian) margin. Some of the continental margin rocks (the allochthonous Mamonia), preceded by pyroclastic slope deposits, came to rest on the leading edge of Troodos. The andesitic source of the pyroclastics was probably in the former margin. Quartz sandstone blocks of Lower cretaceous age, included in the allochthonous assemblage, are possibly Nubian sandstones derived from the southern continent. Continued underthrusting forced Troodos to rise without disturbing its sedimentary cover. Eventually,	The geology of Cyprus and its place in the East-Mediterranean framework
VOLUME 56 NO 1 83	1977	56	1	83	84	Priem, H.N.A.; Boelrijk, N.A.I.M.; Hebeda, E.H.; Verdurmen, E.A.T.; Verschure, R.H.		A note on the isotopic age of Beryl pegmatites near Rama, Suriname
	1977	56	2	85	102	Kolstrup, E.; Wijmstra, T.A.	A palynological study has been made of some organic deposits from The Netherlands dated between ca. 50,000 and 30,000 B.P. From the recent ecology and distribution of plants found as fossils in the Moershoofd Interstadial complex, the Hengelo Interstadial and the Denekamp Interstadial, it was concluded that the average July temperatures were 13°, 13-15° and 10°C, respectively. Furthermore a decrease of at least 5°C was found within a time span of 1,500 years during the Moershoofd Interstadial complex.	A palynological investigation of the Moershoofd, Hengelo, and Denekamp interstadials in the Netherlands
VOLUME 56 NO 2 85	1977	56	2	85	102	Kolstrup, E.; Wijmstra, T.A.	Large Enclosure E1	A palynological investigation of the Moershoofd, Hengelo, and Denekamp interstadials in the Netherlands
VOLUME 56 NO 2 85	1977	56	2	85	102	Kolstrup, E.; Wijmstra, T.A.	Large Enclosure E2	A palynological investigation of the Moershoofd, Hengelo, and Denekamp interstadials in the Netherlands
VOLUME 56 NO 2 85	1977	56	2	85	102	Kolstrup, E.; Wijmstra, T.A.	Large Enclosure E3	A palynological investigation of the Moershoofd, Hengelo, and Denekamp interstadials in the Netherlands
VOLUME 56 NO 2 85	1977	56	2	85	102	Kolstrup, E.; Wijmstra, T.A.	Large Enclosure E4	A palynological investigation of the Moershoofd, Hengelo, and Denekamp interstadials in the Netherlands

VOLUME 56 NO 2 85	1977	56	2	85	102	Kolstrup, E.; Wijmstra, T.A.	Large Enclosure E5	A palynological investigation of the Moershoofd, Hengelo, and Denekamp interstadials in the Netherlands
VOLUME 56 NO 2 85	1977	56	2	85	102	Kolstrup, E.; Wijmstra, T.A.	Large Enclosure E6	A palynological investigation of the Moershoofd, Hengelo, and Denekamp interstadials in the Netherlands
VOLUME 56 NO 2 103	1977	56	2	103	122	Vries, J.J. de	The stream network in the higher, Pleistocene part of The Netherlands is genetically coupled with groundwater discharge systems of various extents. Streams of a given order can be described as the outcrops of groundwater flow systems of a corresponding order. The drainage system is controlled by the precipitation surplus (climate), by the resistance of the subsurface to groundwater flow (geology) and by the previous relief and the depth of incision (topography). This concept is defined as the Groundwater Outcrop-Erosion Model (GOEM). On the basis of this model stream nets can be synthesized theoretically. In this context use is made of data on geology, geomorphology and climate applying groundwater flow formulae and Horton's law of stream order versus stream density. Comparison of the actual and "synthetic" stream-net characteristics shows reasonable agreement.	The stream network in the Netherlands as a groundwater discharge phenomenon
VOLUME 56 NO 2 123	1977	56	2	123	128	Vandenberghe, J.; Gullentops, F.	Earlier stratigraphical studies of the upper Quaternary in N.W. Belgium have been supplemented with some recently obtained dates, which allowed to make a new approach to construct a more detailed stratigraphical table of the Weichsel Pleniglacial in this region. Between a series of "laminated sands and silts" (undermost part) and a series of "coversands", (uppermost part) an important peat bed was found (Assebroek peat). The pollen spectrum indicates relative warm conditions. A ¹⁴ C-date of 30,700 BP was obtained and therefore the peat is correlated with the Arcy-Kesselt interstadial. The overlying "coversands" are characterized by three levels of ice wedges and frost cracks and by one pebble string. The formation of the lowermost level of large deep ice wedges is dated between 26,220 BP and 24,760 BP. It is shown that the severest climatic conditions during the Weichselian started very soon after the Arcy-Kesselt interstadial.	Contribution to the stratigraphy of the Weichsel Pleniglacial in the Belgian Coversand area

VOLUME 56 NO 2 129	1977	56	2	129	139	Mabesoone, J.M.; Rolim, J.L.; Castro, C. de	The late Cretaceous-Cenozoic history of northeastern Brazil is characterized by relief development, correlative sediments and paleosoil profiles. Between Albian and Miocene the so-called Sulamericana Surface developed on a slowly epirogenetic doming area, with the formation of kaolinic and arenaceous soils. During the Miocene the uplift became stronger with consequent deposition of the correlative Serra do Martins Formation and basaltic volcanism. During the more quiet Pliocene a lateritic soil developed on these sediments (Cuité Soil). The early Quaternary glaciations again caused rupture of the equilibrium, resulting in the removal of most of the sedimentary cover of the region, depositing the detritus along the coast. Erosion halted on the reappearing Jurassic planation surface elaborated in crystalline basement rocks (Sertaneja and Tabuleiros Surface). During the interglacial periods soil formation took place on the correlative deposits (Guararapes Formation, Riacho Morno Soil). The last two glaciations which apparently were of stronger intensity, caused the formation of pediments with bornhardts, and river and coastel terraces (polyphase Paraguaçu Cycle). Correlative deposits were laid down in grabens caused by tectonic reactivation (Macaiba Formation). The covering Potengi Soil was formed during the last interglacials. Recent deposition of white sands suggests a new rupture of climatic equilibrium. Paleontological evidence of this history is scarce.	Late Cretaceous and Cenozoic history of Northeastern Brazil
VOLUME 56 NO 2 140	1977	56	2	140	144	Lisle, R.J.	By considering computer models representing suites of passive elliptical markers subjected to homogeneous deformation, the relationship between the strain ellipse shape ($R_s = 1+e_1/1+e_2$) and mean final axial-ratio of the markers is investigated. Random and uniform models in terms of the choice of pre-tectonic initial axial-ratios (R_i) and marker-orientation are considered. The arithmetic mean (R), geometric mean (G) and harmonic mean (H) of the final axial-ratios ($R_f = \text{long/short axis}$) are calculated and it is found that R departs the most from R_s . The closest of the means to the value of R_s is given by H . Using H as an estimate of R_s always gives rise to an error when the markers had a non-circular original shape. However this error diminishes relatively with increase in R_s and decrease in R_i . For the initial clast shapes present in coarse-grained detrital sedimentary rocks and R_s equal or greater than 2.5, H allows an estimation of R_s within 10% error.	Estimation of the tectonic strain ratio from the mean shape of deformed elliptical markers

VOLUME 56 NO 2 145	1977	56	2	145	154	Langenberg, C.W.; Rondeel, H.E.; Charlesworth, H.A.K.	A 50 km ² area in the eastern part of the Hercynian Dinant synclinorium of the Belgian Ardennes containing sandstones, carbonates and shales is macroscopically folded and cut by several faults. Using numerical procedures the area was divided into five domains within which the folding is statistically cylindrical. The domains were examined with the aid of structural cross-sections. Each section was constructed using a computer-plot showing the positions of outcrops projected parallel to the fold-axis onto the plane of section, together with the traces of bedding. A composite plot was obtained for all five domains by first rotating four domains separately so that their fold-axes became parallel to the fold-axis in the fifth domain. Such rotations, which affect the coordinates of outcrops as well as the direction cosines of bedding-poles, can be accomplished by matrix multiplication. Sections constructed in this way, particularly the composite section, display the structure to considerable depths. The competent rock-units within the map area have been deformed into rounded parallel folds. The intervening incompetent units appear to be zones of disharmony especially in the south. Several southdipping listric thrust-faults can be discerned in the sections.	A structural study in the Belgian Ardennes with sections constructed using computer based methods
VOLUME 56 NO 2 155	1977	56	2	155	160	Priem, H.N.A.; Boelrijk, N.A.I.M.; Hebeda, E.H.; Kroonenberg, S.B.; Verdurmen, E.A.T.; Verschure, R.H.	Six whole-rock samples from the high-grade metamorphic Coeroeni Group in southwestern Suriname define a Rb-Sr isochron age of 2042 ± 97 Ma with initial $^{87}\text{Sr}/^{86}\text{Sr} = 0.7027 \pm 0.0039$ ($\lambda^{87}\text{Rb} = 1.39 \times 10^{-11} \text{ a}^{-1}$; errors at 95% confidence level). This isochron relationship dates the event of high-grade metamorphism during the Trans-Amazonian Orogenic Cycle. The initial $^{87}\text{Sr}/^{86}\text{Sr}$ value does not record a substantial pre-metamorphic crustal history. K-Ar and Rb-Sr analyses of separated minerals (4 hornblendes, 2 muscovites and 6 biotites) yield a highly discordant age pattern, ranging from about 2000 to 1200 Ma (omitting one hornblende containing excess radiogenic argon). This pattern is interpreted as reflecting various degrees of resetting of Trans-Amazonian ages due to a low-grade metamorphic event 1200 ± 100 Ma ago (the Nickerie Metamorphic Episode). The order of mineral dates fits into the common order of radiogenic nuclide retentivities, corresponding to a temperature of about 350°C during the low-grade metamorphism.	Isotopic ages in the high-grade metamorphic Coeroeni group, Southwestern Suriname

VOLUME 56 NO 2 161	1977	56	2	161	167	Price, D.G.	Engineering geology forms the bridge between geology and engineering. It is taught and practised throughout the world and fulfills all the criteria that serve to identify a separate discipline. Its strength lies in the wide range of earth sciences it encompasses while remaining firmly rooted in geology, but its diversity of interest gives rise to uncertainty over its purpose and limitations. The author briefly traces the development of the subject, attempts to define its present state relative to purpose, scope, training and practice and speculates as to further developments.	Engineering geology - past, present and future
VOLUME 56 NO 2 168	1977	56	2	168	180	Groot, R.A. de	Boring sponges of the genus <i>Cliona</i> were sampled by SCUBA-diving in the Adriatic Sea near Rovinj, Yugoslavia. Boulders of limestone and shells of molluscs, infested by clionids were collected. The sponges were identified and polyester casts were made of their bore-holes. A description is presented of the spiculae of the sponges as well as their bore-holes. It appears that sponges with different spiculae excavate different borings. The borings in limestone are larger than those in shells.	Boring sponges (Clionidae) and their trace fossils from the coast near Rovinj (Yugoslavia)
VOLUME 56 NO 2 181	1977	56	2	181	184			Boekbesprekingen
VOLUME 56 NO 3 185	1977	56	3	185	202	Berg, J.H. van den	The two studied beaches both form part of the coastal barrier system which extends along the eastern margin of the southern North Sea. One of them (at Schouwen) is bordered by the coalescing ebb deltas of two major tidal inlets; the other one (at Zandvoort) lies beyond the influence of inlets. The ridge and runnel beach environment is divided into areas lying relatively sheltered from wave action behind ridge or berm crests and seaward dipping surfaces exposed to the influence of swash and backwash during the tidal cycle. Both of the areas are characterized by a set of sedimentary bedforms and structures, which produce distinctive associations in preserved sediments. Comparison of data on sampled structures from buried sediment layers with information from repeated measurement of beach variation, permitted reconstruction of the location of these associations as preserved during the last few years in sections perpendicular to the coastline. Major differences in the morphodynamics of the two beaches as well as in the location of associated sedimentary structures preserved in these sections, are related to the degree to which the beaches are sheltered from storm waves and to rates of progradation.	Morphodynamic development and preservation of physical sedimentary structures in two prograding recent ridge and runnel beaches along the Dutch coast

VOLUME 56 NO 3 203	1977	56	3	203	210	Terwindt, J.H.J.	Mud is transported to the Dutch delta area from the Rhine, Waal, Maas and Scheldt rivers (resp. 0,6; 2,5; 0,7 and 0,7 million tons/year). Above, in the Rotterdam Waterway about 3,5 million tons of mud per year are brought in from the sea. The mud of the underwater delta comes from the Channel, the Haringvliet, from biological formation, from erosion of older clay and mud deposits and from mud that is dumped in this area from the Rotterdam harbours. In recent years the last mentioned quantities amount to approximately 4 million tons per year. The mud content in the water varies greatly over the area, as illustrated in figure 2.	Mud in the Dutch Delta Area
VOLUME 56 NO 3 211	1977	56	3	211	218	Faas, R.W.; Wartel, S.	Sediments in the anoxic reaches of the Veerse Meer, a tideless basin in the southwest Netherlands, possess certain physical properties which are directly dependent upon the geochemical environment in which they are accumulating. High values of water content and correspondingly low values of bulk density (unit weight) and shear strength were observed in sediments deposited in low oxygen to anoxic waters (-12 m to -20 m depth). Plasticity increased regularly with depth with highest plasticity found in the most highly reduced sediments at -20 m. One-dimensional consolidation analyses showed rapid consolidation and almost complete lack of rebound. Stress-strain diagrams show little or no reloading curves and are typical of underconsolidated or remolded sediments in which interparticle bonding is minimal. Gas generation and bubble ebullition with swelling is believed to retard normal gravitational consolidation and inhibit fabric development through continual agitation and physical manipulation of sediment particles. Both conditions (i.e., underconsolidation and remolding) exist as a direct result of methanogenesis.	The effect of gas bubble formation on the physical and engineering properties of recently deposited fine-grained sediments
VOLUME 56 NO 3 219	1977	56	3	219	233	Wartel, S.	The grain-size characteristics (grain-size distribution, comparison of one percent value (C) of a given grain-size distribution with the median value (M) in so-called CM-patterns, silt/clay ratio's) of the Schelde estuary are distributed in relation to the existence of a turbidity maximum. Fine sand, silt and clay are deposited, while fluid mud occurs. Towards the North Sea, as well as in an upstream direction, the sediments become much coarser. Silt, clay and part of the sand are derived from the river drainage basin. Sands are also brought into the estuary from the North Sea. Flocculation is important as a depositional agent. However, deflocculation in a seawards direction, favouring seawards transport of silt and clay particles, is assumed. Movement of fluid mud deposits in relation to river discharge has not been observed. This can be explained by narrowing of the channel and the corresponding increase in stream power, where the river crosses the Boom clay (Oligocene).	Composition, transport and origin of sediments in the Schelde estuary

VOLUME 56 NO 3 234	1977	56	3	234	242	Cleveringa, P.; Gans, W. de; Kolstrup, E.; Paris, F.P.	A lithological and palynological investigation has been made of the Late Glacial and early Holocene filling of a pingo remnant in Drente (The Netherlands). It was found that the deposition of aeolian sands, although of varying nature, was uninterrupted from the beginning of the Late Glacial until the end of the Boreal. From the pollen records a vegetational development was reconstructed and its dependance on temperatures, moisture conditions, and soil development is discussed. It was concluded that the mean July temperatures were at least 10° C - possibly 13° C - in the Bølling, probably 12° - 13° C in the Earlier Dryas, around 14°C at the beginning of the Allerød, and at least 12° C in the Late Dryas time.	Vegetational and climatic developments during the Late Glacial and the Early Holocene and aeolian sedimentation as recorded in the Uteringsveen (Drente, The Netherlands)
VOLUME 56 NO 3 234	1977	56	3	234	242	Cleveringa, P.; Gans, W. de; Kolstrup, E.; Paris, F.P.	Large Enclosure 1	Vegetational and climatic developments during the Late Glacial and the Early Holocene and aeolian sedimentation as recorded in the Uteringsveen (Drente, The Netherlands)
VOLUME 56 NO 3 234	1977	56	3	234	242	Cleveringa, P.; Gans, W. de; Kolstrup, E.; Paris, F.P.	Large Enclosure 2	Vegetational and climatic developments during the Late Glacial and the Early Holocene and aeolian sedimentation as recorded in the Uteringsveen (Drente, The Netherlands)
VOLUME 56 NO 3 243	1977	56	3	243	252	Ramos, V.A.	The mineral potentials of basement cratonic areas are evaluated on the basis of mechanical analyses of their tectonic framework, obtained from LANDSAT imagery, Tensional release targets are selected through the application of different deformational models and the identification of the stage and type of deformation. Correlation between tensional release zones and epigenetic hypogenic mineralization in different cratonic areas of South America has been successful in several mining exploration programmes.	Basement tectonics from LANDSAT imagery in mining exploration
VOLUME 56 NO 3 253	1977	56	3	253	258	Boer, R.B. de; Lagrand, J.	Maastrichtian Carbonate Sand collected from the Pietersberg near Maastricht (Netherlands) was compressed at room temperature, in order to detect pressure-solution phenomena. Compaction took place at slowly rising loads (10 atm/day) as well as under constant loading. The maximum loads to which the different samples were subjected varied from 15 to 280 atmospheres. The influence of the following factors on the compaction behaviour of the sand was studied: 1. presence or absence of pore water; 2. partial CO ₂ -pressure of pore water; 3. inhibition of calcite precipitation; 4. saturation of pore water with respect to calcite; 5. circulation of pore water. At room temperature applied microscopically detectable pressure-solution phenomena were not produced. The influence of the presence of pore water on compaction was clearly demonstrated, but the pore-water composition appeared not to be a dominant factor.	The influence of pore water on the compaction behaviour of carbonate sand

VOLUME 56 NO 3 259	1977	56	3	259	262	Berg, J.H. van den	An inexpensive, simple and efficient method has been developed for sampling sedimentary structures, down to 1.1 m. below the sediment surface, in unconsolidated wet sands. The method can be used on land and in quiet water to a depth of at least 4 metres. The procedure makes possible the study of sedimentary structures in the form of lacquer peels measuring 1.1 m. high and 0.1 m. wide within one hour after coring has been started.	A fast procedure for sampling sedimentary structures down to 1,1m in unconsolidated wet sands
VOLUME 56 NO 3 263	1977	56	3	263	269	Bemmelen, R.W. van		The undation theory
VOLUME 56 NO 3 270	1977	56	3	270	271			Boekbesprekingen
VOLUME 56 NO 4 273	1977	56	4	273	274	Frost, R.T.C.; Dijkers, A.J.		Preface - Fault tectonics in N.W. Europe
VOLUME 56 NO 4 275	1977	56	4	275	285	Dijkers, A.J.	Regional linear fracture zones, or "lineaments", are known to be elements of fundamental importance in the structure of the Variscan (Hercynian) and older basement in NW Europe. Several lineaments have shown periodic tectonic activity until very recent times; movements in different directions at different times are common. Based on data from various sources - especially aeromagnetics and Landsat images the existence of several lineaments in the North Sea area is postulated. The known and the postulated lineaments can be loosely grouped into three recognisable, but not sharply defined, directional sets: around NW-SE, NE-SW, N-S. The effect of the lineaments on the structure of the Permian and younger cover is well expressed in the segmentation of the Mesozoic-Tertiary graben systems, in particular the Central Graben-Viking Graben.	Sketch of a possible lineament pattern in Northwest Europe
VOLUME 56 NO 4 275	1977	56	4	275	285	Dijkers, A.J.	Large Enclosure	Sketch of a possible lineament pattern in Northwest Europe
VOLUME 56 NO 4 287	1977	56	4	287	294	Johnson, M.R.W.; Frost, R.T.C.	This paper discusses the mapped faults and photolineaments (observed on Landsat images) in part of the Scottish Caledonides. The prominent NNE-SSW to NE-SW trending wrench faults, including the Great Glen Fault, were active in the Upper Palaeozoic. In addition, recent studies have suggested Mesozoic/Tertiary activity along the Great Glen Fault. The Highland Boundary Fault, which forms the southeastern margin of the metamorphic Caledonides was an active reverse fault in Devonian times, and later transcurrent movements along it have been postulated. Another conspicuous fault set trends NW-SE; some of these faults were active in Mesozoic/Tertiary times. A minority of the faults trend roughly N-S or E-W. A map of lineaments from Landsat images has been constructed. The lineament pattern is shown to correspond closely to the fault pattern. Although by no means all mapped faults were observed on the satellite imagery, it is considered that some previously undescribed fractures and extensions to known faults were detected.	Fault and lineament patterns in the southern highlands of Scotland
VOLUME 56 NO 4 287	1977	56	4	287	294	Johnson, M.R.W.; Frost, R.T.C.	Large Enclosure 1	Fault and lineament patterns in the southern highlands of Scotland
VOLUME 56 NO 4 287	1977	56	4	287	294	Johnson, M.R.W.; Frost, R.T.C.	Large Enclosure 2	Fault and lineament patterns in the southern highlands of Scotland

VOLUME 56 NO 4 295	1977	56	4	295	310	Ramberg, I.B.; Gabrielsen, R.H.; Larsen, B.T.; Solli, A.	Linear features (believed to represent fractures of some kind) seen on Landsat satellite images, topographic maps and geological maps have been mapped for the area of southern Norway (roughly the region south of the 65° parallel). Special attention is given to the area of the Oslo Graben. The results of the analysis are related to the main geological and geophysical features of the region, of which a brief description is given. A system of NW-SE and NE-SW sets of lineaments is present over most of the region and predominates in the Precambrian area; it is thought to be the oldest structural element. In the Caledonian belt the NE-SW set is predominant, in accordance with the general strike. A roughly N-S trending set is obviously associated with the Oslo Graben but extends well to the north of the latter; a similar pattern is also present near the west coast. An E-W set is locally associated with Devonian movements. The coastlines of southern Norway conform closely to the directions of the dominant fracture pattern in the vicinity.	Analysis of fracture patterns in southern Norway
VOLUME 56 NO 4 295	1977	56	4	295	310	Ramberg, I.B.; Gabrielsen, R.H.; Larsen, B.T.; Solli, A.	Large Enclosure 1	Analysis of fracture patterns in southern Norway
VOLUME 56 NO 4 295	1977	56	4	295	310	Ramberg, I.B.; Gabrielsen, R.H.; Larsen, B.T.; Solli, A.	Large Enclosure 2	Analysis of fracture patterns in southern Norway
VOLUME 56 NO 4 295	1977	56	4	295	310	Ramberg, I.B.; Gabrielsen, R.H.; Larsen, B.T.; Solli, A.	Large Enclosure 3	Analysis of fracture patterns in southern Norway
VOLUME 56 NO 4 295	1977	56	4	295	310	Ramberg, I.B.; Gabrielsen, R.H.; Larsen, B.T.; Solli, A.	Large Enclosure 4	Analysis of fracture patterns in southern Norway
VOLUME 56 NO 4 295	1977	56	4	295	310	Ramberg, I.B.; Gabrielsen, R.H.; Larsen, B.T.; Solli, A.	Large Enclosure 5	Analysis of fracture patterns in southern Norway
VOLUME 56 NO 4 295	1977	56	4	295	310	Ramberg, I.B.; Gabrielsen, R.H.; Larsen, B.T.; Solli, A.	Large Enclosure 6	Analysis of fracture patterns in southern Norway

VOLUME 56 NO 4 311	1977	56	4	311	327	Surlyk, F.	Mesozoic faulting in the East Greenland Basin is interpreted as the result of graben formation extending from a postulated "trilete junction" south of Scoresby Sund. Faults appear slightly curved in plan, but can be divided into straight sections 2 - 10 km long (up to 20° between adjacent segments). They are normal types only, dipping 60° - 80°, with throws up to 4 km partly resulting from block rotation. Although this rotation implies faults curved in section, they can usually be assumed flat with such large radii of curvature. Major faults are often complex zones (0.5 - 4 km wide) of narrow blocks and slivers. Faulting was partly synsedimentary. Comparisons of pre-Mesozoic and Mesozoic fault directions show fairly similar dominant trends (335°, 355°, 015° - 025°, 035° - 050° & 085° - 090°) in all areas, indicating that pre-existing basement anisotropies controlled directions of Mesozoic-Cenozoic faulting. Basin formation was accomplished by roughly N-S boundary faults in east and west and major NW-SE faults, which together defined a series of fault blocks (subsiding successively from south to north). In Volgian- Valanginian times, the basin was further split into N-S trending antithetic blocks by faults 10 - 30 km apart (crustal extension about 6%).	Mesozoic faulting in East Greenland
VOLUME 56 NO 4 311	1977	56	4	311	327	Surlyk, F.	Large Enclosure	Mesozoic faulting in East Greenland
VOLUME 56 NO 4 329	1977	56	4	329	350	Illies, J.H.	The Rhinegraben is part of a western European rift system. Although of different ages and trend, these rifts are situated on pre-existing basement weakness zones. Signs of Rhinegraben subsidence occur in mid-Jurassic, but true rifting began in mid-Eocene. Boundary faults are complex systems of normal faults, dipping about 65°, perhaps flattening with depth. "Horizontal stylolite" orientations indicate an Eocene palaeostress field (related to Alpine plate collision) with its minimum component normal to the graben, i.e. ideal for rifting on the basement weakness zone. Rifting continued until Lower Miocene, but the depocentre shifted north with continued development of a mantle bulge in the south. Then, although crustal upwarping and volcanism continued, graben formation ceased - the stress field was no longer appropriately oriented. Graben activity restarted in Upper Pliocene and continues today. In-situ stress measurements indicate a sinistral shear component parallel to the graben, producing different tectonic reactions in the three slightly differently oriented graben segments. This shear motion is ascribed to continuing Alpine uplift and extension pushing northwestward the block east of the graben. The Rhinegraben and Lower Rhine Embayment are connected by a continuous seismotectonic belt where rifting is controlled by pre-existent basement fractures and regional stress,	Ancient and recent rifting in the Rhinegraben

VOLUME 56 NO 4 351	1977	56	4	351	362	Frost, R.T.C.	Lineament maps of the Danish region have been produced from three different data sources: magnetic anomaly maps, surface data (Landsat satellite images and bathymetric maps) and Bouguer gravity maps. The directional patterns produced, represented by rose diagrams, show several prominent and statistically significant directions. Three directions (WNW-ESE to NW-SE, NNE-SSW and NE-SW to ENE-WSW) are well defined by all three data sources, and are parallel to the principal structural trends in older exposed rocks framing the region studied; however, the other less prominent directions may also be of import. The close correspondence between patterns produced by surface data and by magnetic data (presumably mainly representative of the basement) is regarded as strong evidence that these patterns are tectonically significant and are probably present throughout the sedimentary cover. Systematic pattern differences are observed between three sub-areas of the region; these may reflect variations in the basement, different tectonic histories and/or different thicknesses of sediment.	Tectonic patterns in the Danish region (as deduced from a comparative analysis of magnetic, landsat, bathymetric and gravity lineaments)
VOLUME 56 NO 4 363	1977	56	4	363	370	Horsfield, W.T.	To assist in the interpretation of fault structures in the North Sea, a programme of scaled-model experiments was run in a specially-built sandbox. Faults were produced in the sand overburden in response to normal displacement along faults in the underlying basement. Variations in overburden fault geometry were studied in relation to the attitude of basement faults and variations in sand properties. A stereoscopic method was used to analyse successive stages of development. In the experiments, two stages were observed. Initially, curved precursor faults formed, particularly over high-angle basement faults. These were followed by planar normal faults. Over low-angle basement faults, antithetic as well as synthetic normal faults were prominent.	An experimental approach to basement-controlled faulting
VOLUME 56 NO 4 371	1977	56	4	371	371			Boekbesprekingen

VOLUME 57 NO 1 1	1978	57	1	1	10	Visser, W.A.	The earliest known subsurface temperatures were obtained in 1879 in a borehole (to in the a depth of 365 m) centre of the city of Utrecht. During the years 1912 - 1914 temperatures were measured to depths as great as 1400 m in a number of wells in structurally high areas in Tertiary, Senonian, Triassic, Upper Permian and Carboniferous rocks. In 1952 additional data were obtained (Peel horst), followed in 1956 by a few measurements in the South Limburg mining district. The various thermometers used are briefly described. The temperatures are related to lithology and stratigraphy and to the salinities of the interstitial waters. very low geothermal gradients are present in Quaternary to uppermost Tertiary due to percolating waters of meteoric origin. In the post-carboniferous overburden and, where shallow, in the higher parts of the Westphalian the waters are either fresh, or, if saline, do not reach sea-water concentrations. In such areas the geothermal gradients are lower than 3°C/100 m. In the Carboniferous, due to the low thermal conductivity of coal, gradients tend to be high: over 4, and reaching 5.2 to 5.6°C/100 m. In contrast, the high conductivities of anhydrite and rock salt cause low gradients (2.5 in the Buntsandstein and Zechstein formations).	Early subsurface temperature measurements in the Netherlands
VOLUME 57 NO 1 11	1978	57	1	11	18	Thiadens, A.A.	This paper deals with geological thinking and mapping in The Netherlands before and during the life of W.C.H. Staring (1808-1877). During the last two centuries there have been two centres of geological activity, viz. Groningen and Haarlem. Some outstanding pre-staring geological achievements are mentioned. As typical items, which may give an idea of the geological thinking in The Netherlands in the past, special attention is paid to theories about the origin of peat, the provenance of erratic boulders, and the mapping of Quaternary The first geological map of the Netherlands (scale 1:200,000) was made by Staring, who is considered the father of Netherlands geology.	Geological thinking and mapping in the Netherlands before and during Staring's lifetime
VOLUME 57 NO 1 19	1978	57	1	19	24	Bartenstein, H.	Ten stratigraphically important phylogenetic sequences of benthic index foraminifera in the Lower Cretaceous are described. Their distribution is examined in North West Germany, which belongs to the north temperate facies realm, and they are also found to be, in part, of stratigraphic importance in the Lower Cretaceous throughout the world, including the tethyan facies realm. The development and importance of such phylogenetic sequences for biostratigraphic determinations is emphasized; the paper concludes with a supplementary note about the validity of statistical analyses as applied to phylogenetic lineages.	Phylogenetic sequences of Lower Cretaceous benthic foraminifera and their use in biostratigraphy

VOLUME 57 NO 1 25	1978	57	1	25	32	Gelder, A. van; Clayton, G.	The sedimentology and stratigraphy of the Dinantian (Lower Carboniferous) Kinsale Formation are described from ten major coastal sections in south Cork, Republic of Ireland. Palynological correlations between the sections are outlined, and subdivision of the Kinsale Formation into three members is proposed. Members 1 and 3 are dominated by mudrocks, and are separated by the more sandy member 2. Sediments assigned to member 1 were deposited in a deep-water, marine environment below wave base, whereas members 2 and 3 were deposited on a shallow marine, muddy platform, where sandy shoals built up. The latter are especially well developed in member 2.	New data on Early Dinantian (Early Carboniferous) stratigraphy and sedimentation in South Cork, Ireland
VOLUME 57 NO 1 33	1978	57	1	33	43	Geys, J.F.	Grain-size analyses show that the Kempenland deposits (Lower Quaternary, N. Belgium) were deposited in an environment of rather quiet water with a low flow energy and no tidal influence. Electron microscopical investigations indicate that the water contained few salts. The sedimentary structures are the result of an unidirectional current towards the northwest, in a river with a mainly meandering character. No evidence could be found for a marine, littoral or perimarine genesis. Most probably the Kempenland deposits can be placed within the Kedichem and Tegelen Formations of Dutch authors.	The palaeoenvironment of the Kempenland clay deposits (Lower Quaternary, N. Belgium)
VOLUME 57 NO 1 45	1978	57	1	45	54	Oele, E.	Various factors which influence the economic feasibility of offshore mining are discussed. The mined sands and gravels are used for constructional purposes. Therefore, some specifications of the grainsize distribution of the exploitable product are mentioned. A gravel exploration by the Netherlands Geological Survey in an area off the Norfolk coast is mentioned. Some special samplers, used for this purpose, are described. Sand and gravel on the shelves have been transported and supplied by rivers, glaciers, wind and locally by longshore currents. Marine erosion may contribute as well. The North Sea and English Channel are good examples of an aggregate-bearing shelf, since shells, sands and gravels are all present. The availability is at least as important as the transporting agents. Controlling include a.o. climate, tectonic instability and distance from the source area. Even in the Pleistocene the weathering processes in the tropical zones resulted in only small amounts of sand and gravel reaching the present-day shelf areas. In the subtropical zone the humidity and tectonic instability are a prerequisite for their presence) whereas in the temperate zones various mechanisms have led to mineable deposits. From a combination of prospective areas and densely populated regions it follows that only very restricted parts of the shelf are of interest as far as mining is concerned.	Sand and gravel from shallow seas

VOLUME 57 NO 1 55	1978	57	1	55	58	Hossain, K.M.	Equations are derived which describe the stress condition in the matrix around a rigid circular inclusion subjected to uniaxial stress. The values of the principal stresses and their orientations are obtained using a computer. The orientation of potential fractures around an inclusion is determined from the stress trajectories and the development of pressure shadows and pressure fringes are predicted by assuming that mineral migration occurs in response to gradients in the mean stress. The type of structures (whether pressure shadows or pressure fringes) that develop in the low mean stress zone adjacent to the inclusions is controlled by the magnitude of applied stress.	Theoretical stress conditions in the matrix around a rigid circular inclusion and their geological implications
VOLUME 57 NO 1 59	1978	57	1	59	63	Bhattacharyya, D.S.	A prominent shear zone runs E-W across Singhbhum. Structural analysis indicates three phases of folding, all with E-W axial planes dipping northerly or subvertically to the north of the shear zone. South of this shear zone there are two phases of folding consisting of earlier folds with NNE striking axial planes, overprinted by later E-W folds. This marked structural contrast, along with other contrasting characteristics, indicates a large horizontal displacement that juxtaposed the two separate orogenic belts. Kinematic patterns indicate that such a large horizontal displacement could have been brought about by a sinistral transcurrent shear during the second phase of deformation seen in the north. The changes in kinematic patterns from N-S compression to transcurrent movement to N-S compression again during the same Singhbhum orogeny are of great interest.	Contrasts across the shear zone in the Precambrian rocks of Western Singhbhum

VOLUME 57 NO 1 65	1978	57	1	65	76	Gietelink, G.	The diagenetic and metamorphic evolutions of the Cambro-Ordovician siliclastic sediments of the Luna area, which formed part of the Lower Palaeozoic stable shelf, and of the Sil area, which was situated in the adjacent geosyncline, were determined and compared. The overburden in the Luna area reached 2500-3500 m, based on stratigraphic evidence. This is in agreement with the mineral association occurring in the sediments (authigenic illite with minor amounts of detrital kaolinite and authigenic muscovite and chlorite), indicating a depth of burial of 2000-3000 m. The sediments were subject to diagenetic changes, which occurred shortly after deposition before lithification (syndiagenetic phase), in the lithified rocks (anadiagenetic phase) and after uplifting and erosion of the area (epidiagenetic phase). Based on stratigraphic evidence, the overburden of the sediments studied in the Sil area ranged from 5000 to 14000 m. The mineral associations observed in the sediments (illite-muscovite-chlorite in the upper part and muscovite-chlorite-biotite in the lower part of the succession) are not in agreement with the estimated depth of burial. The sediments of the Sil area underwent diagenetic alterations similar to those of the sediments in the Luna area, but the effects are obscured by metamorphic recrystallization, which occurred during the Hercynian orogeny. During this period the area was affected by regional metamorphism.	Diagenetic and metamorphic evolution of Cambro-Ordovician siliclastic sediments in Northwestern Spain
VOLUME 57 NO 1 77	1978	57	1	77	86	Elbassyony, A.A.	The structural studies of the northeastern plateau concern two fold axes trending NE-SW. The first fold axis runs through the ElHarra and ElGedida areas. The second fold axis runs through the Gebel Ghorabi and Dumbell's Hill areas. Between these two fold axes lies the plunge of the northeast anticline (Ghorabi anticline) of the Bahariya high. Two periods of deformation have affected the investigated area. The first one is considered to be a part of the Syrian arc system (of the Laramide cycle) that extends in post-cenomanian - pre-Campanian time from Bahariya to Abu Rawash near Cairo. The second one is considered to be a part of the Alpine cycle. It affects the Eocene and Oligocene sediments. Faulting accompanied both periods of deformation. The fault systems: NE-SW (aualitic), E-W (Tethyan) and NW-SE (African) are recognized.	Structure of the Northeastern plateau of the Bahariya oasis, Western desert, Egypt
VOLUME 57 NO 1 87	1978	57	1	87	89	Geel, B. van; Kolstrup, E.		Tentative explanation of the late glacial and Early Holocene climatic changes in North-Western Europe
VOLUME 57 NO 1 91	1978	57	1	91	92	Dissanayake, C.B.; Riel, B.J. van		A recently discovered nickeliferous serpentinite from Uda Walawe, Sri Lanka
VOLUME 57 NO 1 93	1978	57	1	93	96			Book reviews
VOLUME 57 NO 2 98	1978	57	2	98	98	Gillavry, H.J.M.; Beets, D.J.		Preface THE 8th CARIBBEAN GEOLOGICAL CONFERENCE (WILLEMSTAD, 1977)

VOLUME 57 NO 2 99	1978	57	2	99	104	Beck, C.M.	<p>The southern -non metamorphic- belt of the Western Caribbean Chain is composed of the superposition of several tectonic units with an upper Cretaceous-Palaeocene content. The whole –called 'Piemontine Nappe'- was detached from an Albian and pre-Albian substratum and suffered two major compressive tectonic phases with southward displacements. The first phase Lower Middle Eocene produced the allochthony of the previously tectonized Villa de Cura Nappe, which was strongly shortened. During the Oligocene (?) - Miocene period, a wide subsiding furrow appeared along the southern margin of the palaeorelief formed before in relation with a NNW-SSE distension. The second tangential phase -Middle-Upper Miocene- produced a partial overthrusting of the Piemontine Nappe on the Miocene terrains and a new shortening of the latter. An earlier phase may have affected the northern part of the Piemontine dominion in the lower Senonian. This hypothesis and the preceding conclusions are in opposition with the theory -generally held- of a displacement of the Villa de Cura Nappe as due to a continuous sliding occurring during Maastrichtian and Palaeocene time and followed by a continuous sliding of the Piemontine Nappe from Upper Eocene to Miocene time. The hypothesis of tectonisation by gravity sliding is discussed and discarded.</p>	Polyphasic Tertiary Tectonics of the interior range in the Central Part of the Western Caribbean chain, Guarico state, Northern Venezuela.
VOLUME 57 NO 2 105	1978	57	2	105	116	Biju-Duval, B.; Mascle, A.; Montadert, L.; Wanneson, J.	<p>The geological setting of five sites for future IPOD drilling in the Caribbean is described. These sites were surveyed in 1976 by IFN-CNEXO with 2800 km of multichannel seismic records. The first two sites straddle the lesser Antilles island arc where the oceanic Atlantic plate is subducted westwards under the Caribbean plate. The main objectives of these sites are to investigate the frontal overthrust of the Barbados Ridge (accretionary prism) on the Barracuda abyssal plain, and the age and nature of sediments and crust of the back arc basin, e.g. the Grenada Basin. The three other sites are located in the Venezuela and Colombia Basins in order to understand their composite structure better and to compare their geological history with the geological evolution of their surrounding margins.</p>	Seismic investigations in the Colombia, Venezuela and Grenada Basins, and on the Barbados ridge for future IPOD drilling

VOLUME 57 NO 2 117	1978	57	2	117	122	Bonini, W.E.	A new Bouguer gravity anomaly map is presented for the southern Caribbean borderland and northern South America. Major features are; the Lake Maracaibo-Venezuela Andes minimum (-160 mgal); gravity maxima in the Venezuelan offshore area and on the Netherland Antilles; a steep gradient (- 4.7 mgal/km) south across the Western Caribbean Mountains; the termination on Margarita ultra-mafic rocks of the minimum trend of the Lesser Antilles; and the broad gravity minimum (-200 mgal) to the east and anomalous maxima (+10 mgal) to the west associated with the Eastern Venezuela Basin. Gravity models have been calculated for two sections over this basin. The broad gravity minimum in the east can be explained by up to 15 km of sediment and crustal downwarping to a depth of 47 km. The maxima suggest an anomalous crust, possibly caused by a higher-density basement, a crustal upwarp, or both. The trend of the gravity maxima parallels those of the Eastern Venezuela Basin minimum and the Antillean trends as they enter Venezuela. In addition they are parallel to the ENE structural trends of the Precambrian south of the Orinoco River. Thus, the anomalous sub-sediment rocks could be related to Mesozoic tectonics, or Precambrian basement features.	Anomalous crust in the Eastern Venezuela Basin and the Bouguer gravity anomaly field of northern Venezuela and the Caribbean borderland.
VOLUME 57 NO 2 123	1978	57	2	123	133	Brezsnysanszky, K.; Iturralde-Vinent, M.A.	The changes in the tectono-sedimentary regimen between the volcanic arc stage and the platformlike stage in eastern Cuba are studied. During the Palaeocene and Lower Eocene volcano-sedimentary deposits predominated in the territory, derived from volcanic centres in the present Sierra Maestra. Transgressive carbonate sedimentation in the Middle Eocene succeeded the extinction of the volcanic activity. In the Upper Eocene a new tectono-sedimentary regimen started. Terrigenous and carbonate-terrigenous deposits played the fundamental role, and a regression started, which continued into the Middle Oligocene. At that time two islands, separated by a mediterranean channel, developed between the Golfo de Guacanayabo and the Bahía de Nipe. During the Upper Oligocene a new marine transgression started, which reached its maximum development in the Lower Miocene. The change from a volcanic arc regimen to the platform-like stage was marked by a great relief inversion. The Nipe-Guacanayabo fault need not have been a sinistral transcurrent fault; if it is, then it did not have a great displacement in the Palaeogene. The territory of eastern Cuba during the Palaeogene can be divided into a northern more stable part, and a southern unstable part. The characteristics are related to a progressive continentalization from Cretaceous to Palaeogene, and from north to south.	Paleogeografía del Paleógeno de Cuba oriental

VOLUME 57 NO 2 135	1978	57	2	135	138	Carby, B.E.	The Hope Mine lead-zinc deposit is located near the western margin of the Wagwater Belt, Jamaica. The galena-sphalerite mineralisation is associated with an andesite body of (?) Eocene age and was deposited from hydrothermal emanations. The dispersion patterns of Na, K, Ca and Mg in two adits of the mine are briefly described and the results are presented. The ratios MgO/CaO and K ₂ O/Na ₂ O are calculated. It is found that this ratio might be useful in locating ore bodies of this type.	The dispersion of Na, K, Ca and Mg along the footwall of a Pb-Zn ore body, Hope Mine, Jamaica.
VOLUME 57 NO 2 139	1978	57	2	139	142	Boorder, H. de	Changes in the attitude of sheet-like bodies of mafic rocks ('diabase') are discussed in relation to changes in the attitude of the bedding of intercalated and otherwise associated sedimentary rocks. Examples are presented in photographs of outcrops along the main road between Buga and Buenaventura, W. Colombia. The mafic sheets of the Colombian Western Cordillera and their mode of emplacement are compared with the sheets of the Sheeted Intrusive Complex of Cyprus, with reference to the sheet swarms of Iceland. Horizontal emplacement of sheets, never questioned in the Western Cordillera of Colombia, is considered as an alternative to vertical emplacement of sheets, previously suggested for the Sheeted Intrusive Complex of Cyprus. The subject matter is thought to be of importance in the (geophysical) study of the framework of the ocean floors. Further field investigation of the volcanic-sedimentary complex of the Western Cordillera of Colombia should be encouraged.	Aspects of the attitude of mafic sheets in the Western Cordillera of Colombia
VOLUME 57 NO 2 143	1978	57	2	143	150	Torre, A. de la; Jakus, P.; Albear, J.F. de	A review of the most important publications about the rudist assemblages in Cuba is offered. A faunal assemblage from the eastern part, belonging to the Maastrichtian (Titanosarcolites fauna), is studied. It includes both Titanosarcolites and Barrettia. Four faunal assemblages are recognized in the Cuban Upper Cretaceous: (1) Tepeyacia fauna, probably Cenomanian-Turonian age; (2) Durania fauna, probably of a Santonian or Coniacian age; (3) Barrettia fauna; and (4) Titanosarcolites fauna. The last two are of a (probably Upper) Maastrichtian age and are corresponding to either two different stratigraphic horizons or two different facies in that age. The relationship between these two assemblages must, however, still be investigated, although the Barrettia fauna probably is somewhat older than the Titanosarcolites fauna, according to the work of Chubb (1956, 1961). Some evidence about the occasional association of Titanosarcolites and Barrettia at some Cuban and West Indian localities is mentioned.	New data on rudist assemblages in Cuba

VOLUME 57 NO 2 151	1978	57	2	151	162	Donnelly, T.W.; Rogers, J.J.W.	New analytical determinations for more than one hundred igneous samples enable us to place several circum-Caribbean igneous series into a tentative tectonic perspective. We consider that the basaltic rocks from Curaçao, Aruba, Tiara (Venezuela), and the mafic intrusives of the Paraguaná Peninsula (Venezuela) belong to a MORB association of possible early Late Cretaceous age, which is correlative with basinal basalts from the Caribbean, and which has been tectonically emplaced after eruption on to the continental border. Some stratigraphically early volcanic complexes from Jamaica, Dominican Republic, Désirade, Tobago, and Bonaire are placed in the primitive group, along with the early volcanics of Puerto Rico and the Virgin Islands. Plutonic rocks from Haiti and the Pedro Bank are somewhat high in K but not broadly different from those of Puerto Rico. The young volcanics of the central Dominican Republic are of the shoshonite (high-K) group. The plutonics of the southern Caribbean continental borderland are probably all calcalkaline, including those of Tobago. Several are notably high in cobalt, which further demonstrates that the southern Aves Ridge plutonics belong here and are not part of some other series.	The distribution of igneous rock suites throughout the Caribbean
VOLUME 57 NO 2 163	1978	57	2	163	171	Focke, J.W.; Gebelein, C.D.	At a depth of 50 meters the fore-reef slope at the northern margin of the Bermuda platform consists of solid reef rock interspersed with sand patches and channels. Coralline algae are the predominant framebuilders, the only common coral being <i>Montastrea cavernosa</i> . On the rippled sand abundant red algal nodules (rhodolites) occur with diameters up to 12 cm. Both reef and rhodolites show various stages of alteration and lithification by repetitive boring, secondary framebuilding, internal sedimentation and cementation. All processes are marine. Aragonite cement occurs only within the in situ deposited primary framework, and is probably a very early, post mortem precipitate. Magnesian calcite is the only common cement on all other substrates. Practically all porosity and permeability is destroyed within approximately 1500 years. Net accretion rates in the rhodolites are in the order of 0.05 mm/year. With local current patterns providing a suitable pumping mechanism, the very slow accretion rates are thought to be the main reason for the pervasive nature of diagenetic alteration on this fore-reef locality. Rhodolites of this type may be useful palaeo- environmental indicators for deep (more than 50 m) tropical waters.	Marine lithification of reef rock and rhodolites at a fore-reef slope locality (-50m) off Bermuda

VOLUME 57 NO 2 173	1978	57	2	173	176	Franco, G.L.; Nagy, E.; Radocz, G.	Coral formations of eastern Cuba occur around two anticlinoria in zones progressively further from the axis and nearer to the present coast. A lagoonal facies prevails. The oldest fauna, found in the Guantánamo Basin, is of Oligo-miocene age; it correlates with faunas of Antigua and the Panama Canal Zone. The fauna is of Indopacific type and grew on a gravel bottom in quiet water (Corallinacea-Lepidocyclus community). The temperature favoured true reefal growth. An abrupt change occurred at the boundary Early/Middle Miocene, possibly because of an interoceanic influx of cooler water. The development is mostly biostromic. More favourable conditions reappear in the Upper Pliocene. Pleistocene coral zonation resembles that of the Netherlands Antilles, but is less well outlined. Fifty percent of the fossil species listed occurs in Recent reefs and lagoons.	Development of the coral facies from the Oligocene to the Recent in Eastern Cuba).
VOLUME 57 NO 2 177	1978	57	2	177	187	Herweijer, J.P.; Focke, J.W.	A sequence of subaerial denudation benches, which are recognized as remnants of planation surfaces, has been found in the drainage basins of Aruba, Bonaire and Curaçao. The benches were formed during periods of relatively stable sea-level. This denudational sequence has been correlated with the late Pleistocene marine limestones of the islands. These limestone deposits represent eustatic sea-level maxima. The correlation led to a revised stratigraphy of the marine strata. At least ten units, each representing an individual sealevel event, have been recognized. One of the units (presently + 10 m above sea-level) is correlated with the 125,000 B.P. highstand. The rate of tectonic uplift is estimated to be in the order of 0.05 m/1000 year.	Late Pleistocene depositional and denudational history of Aruba, Bonaire and Curaçao (Netherlands Antilles)
VOLUME 57 NO 2 189	1978	57	2	189	192	Hunter, V.F.	Micropalaeontological evidence is presented for a further refinement of the Tertiary stratigraphy of Margarita Island, Venezuela. The writer supports Bermudez & Gamez (1966) and Butterlin (1970) in determining the uppermost beds of the Punta Mosquito Formation as no younger than the Truncorotaloides rohri zone of the Middle Eocene. Caudri's (1974) evidence for possible deposition of Upper Eocene sediments is challenged. Micropalaeontological studies and field observations indicate the La Guica Formation to be a middle clay member of the Mio-Pliocene Cubagua Formation. Rich planktonic foraminiferal faunas from this horizon are identified as representing the Late Miocene Neoglobobadrina dutertrei zone of Boji & Bermudez (1965). The Los Bagres limestone is interpreted as allochthonous blocks of Paleocene or Early Eocene age within the conglomeratic facies of the Lower Eocene Las Bermudez Formation. The time gap represented by the Miocene-Eocene unconformity on the island can be demonstrated to extend through Late Eocene to Late Miocene time.	Notes on the Tertiary stratigraphy of Margarita Island

VOLUME 57 NO 2 193	1978	57	2	193	203	Hunter, V.F.	Correlations of conspicuous Tertiary mollusc horizons described from the southern Caribbean area are attempted on associated micropalaeontological evidence. By this method the rich mollusk horizons characteristic of the Springvale Formation of Trinidad, the Punta Gavilán Formation of Venezuela, and the Tubará Formation of Colombia are considered time-correlatable at the Early Pliocene level. The Cantaure mollusc horizon of the Paraguaná Peninsula of northern Venezuela contains an Early Miocene (Burdigalian) microfauna and is correlatable with that of the basal part of the Castilletes Formation of the Guajira Peninsula of northern Colombia and the Quiroz horizon of the La Rosa Formation of the Maracaibo Basin. The 'Raetomya Shales' of the Jarillal Formation of western Venezuela correlate with similar macrofaunas found in the Caus Formation and other transitional facies units associated with the contact of the Middle Eocene Misoa and Pauji Formations of the Maracaibo Basin, and those of the Ceru Mainsji Formation of the island of Curaçao. These horizons can be clearly calibrated with the Truncorotaloides rohri and Orbulinoides beckmanni zones of Bolli's (1966) planktonic foraminiferal zonation. There is also micropalaeontological evidence to suggest that the Hannatoma horizon of western Venezuela can be associated with the final regressive depositional phase of the Middle Eocene throughout northwestern South America.	Foraminiferal correlation of Tertiary mollusc horizons of the southern Caribbean area
VOLUME 57 NO 2 205	1978	57	2	205	212	Iturralde-Vinent, M.A.	The geological development of Cuba has been of the platform type since the Late Eocene. A mosaic of blocks was formed, comprising five grabens, six horsts and four semigrabens, delimited by faults and flexures. The platform as a whole oscillated with a median period and amplitude. The blocks themselves oscillated with three superimposed waves: (1) oscillations with a period of the order of hundreds of millions of years and an amplitude of thousands of metres; (2) oscillations of a million to tens of millions of years, and amplitudes of hundreds to thousands of metres; and (3) oscillations of short periods of thousands of years and an amplitude of tens of metres. These movements are conditioned by a tensional regime and the external manifestations of processes in the subcrustal mantle.	Tectonic movements during the oscillating development of the Cuban platform

VOLUME 57 NO 2 213	1978	57	2	213	220	Jackson, T.A.; Smith, T.E.	<p>The Wagwater Belt represents part of a former inter-arc basin in which approximately 5,000 m of Tertiary sediments and volcanics accumulated. The volcanics are made up of minor amounts of submarine mafic flows and their sedimentary derivatives, and extensive silicic flows, volcanic breccia, conglomerates and tuffs. The mafic flows have been identified as basalts and spilites, and the silicics as dacites and quartz keratophyres. The stable-element geochemistry of the spilites is similar to that of the basalts. Ti, Zr and Y indicate that these mafic rocks were erupted in an intra-plate tectonic setting and are comparable to plateau-type tholeiitic basalts. The levels of concentration of the stable elements in the quartz keratophyres are comparable to those of the dacites. The rare-earth elements of these silicic rocks confirm that they belong to the calc-alkaline series. Mineralogical, textural and geochemical data support the view that most of the basalts and dacites in the Wagwater Belt were metasomatized to spilites and quartz keratophyres respectively.</p>	Metasomatism in the Tertiary volcanics of the Wagwater Belt, Jamaica, W.I.
VOLUME 57 NO 2 221	1978	57	2	221	225	Kloos, D.; Gillavry, H.J.M.	<p>A sample of megalospheric <i>Sorites orbiculus</i> from lagoon Awa di Oostpunt, Curaçao, contains a surprisingly large percentage of adults with brood in the reproduction chambers. Measurements of the initial chambers of a parent do not differ significantly from those of the offspring. This suggests a paratrimorphic life cycle. Two specimens contain undeveloped embryos consisting of protoconch only or of protoconch with incipient flexostyle. It is concluded that protoconch and flexostyle are separate chambers, and that brood formation proceeds with considerable but not perfect synchronism. These protoconchs have thin walls and are perfectly circular in outline; they will be somewhat deformed by the formation of the flexostyle around them after which the wall will be thickened. The question is raised whether Leutenegger's two plurinucleate specimens with micronuclei could not be diploid megalospheric schizont/gamonts in which case the haploid generation would be reduced to the micronuclei and gametes. The diploidy of such a parent can be tested if the gametes produced by it can fuse inter se into viable zygotes.</p>	Reproduction and life cycle of <i>Sorites orbiculus</i> (Forskål), Foraminifer

VOLUME 57 NO 2 227	1978	57	2	227	232	Krushensky, R.D.	A major unconformity between rocks of Late Cretaceous and Eocene age in central-western Puerto Rico was previously reported. Recent work suggests that the evidence cited is invalid: (1) because sediments which were interpreted as a basal conglomerate appear to be a fault breccia related (in all areas but one) to gravity sliding; (2) because more extensive mapping has shown that the lithologically distinct Anón Formation, known locally to contain fossils of early Tertiary age, interfingers conformably with formations which contain fossils of Late Cretaceous age. The evidence indicates that deposition in central-western Puerto Rico has been continuous from Late Cretaceous to at least Middle Eocene.	Unconformity between Cretaceous and Eocene rocks in Central-Western Puerto Rico: A concept rejected
VOLUME 57 NO 2 233	1978	57	2	233	242	Krijnen, J.P.	Pseudorbitoides curacaoensis and P. israelkyi are described from two localities near Parguera, SW Puerto Rico, and P. trechmanni trechmanni and P. ?rutteni rutteni from respectively the Back Rio Grande and Rio Grande (Blue Mountain inlier, Jamaica). The evolutionary pattern of the pseudorbitoids is discussed on the basis of the present material and of samples described previously from Curaçao and from western Jamaica.	Pseudorbitoids from the Parguera Limestone, Puerto Rico, and from the Back Rio Grande Limestone, Jamaica, with remarks on the pseudorbitoidal evolutionary pattern
VOLUME 57 NO 2 243	1978	57	2	243	250	Krijnen, J.P.; Lee Chin, A.C.	An interpretation of successive geological events is proposed, based on lithological and palaeontological evidence encountered in the northern, central and south-eastern Blue Mountains, Jamaica. A provisional geological map of the entire inlier is given. An interpretation of a number of structural features includes some remarks regarding a plate tectonic model of the northern Caribbean plate margin.	Geology of the northern, central and south-eastern Blue Mountains, Jamaica, with a provisional compilation map of the entire inlier
VOLUME 57 NO 2 251	1978	57	2	251	253	Kulhánek, O.; Bâth, M.	A method is developed for the calculation of earthquake insurance coefficients, defined as annual premiums normalized by the value of the insured property, taking account of the extent of damage, time element and building type. The method is applied to the seismic histories of capital areas in South and Central America.	Seismic risk and earthquake insurance in south and Central Amerika

VOLUME 57 NO 2 255	1978	57	2	255	260	Ladd, J.W.; Watkins, J.S.	Seismic reflection records from the north slope (landward slope) of the Muertos Trench south of Hispaniola reveal features similar to those seen on reflection records from Pacific active margins. Tectonically rotated sediment ponds characterize the slope; landward-dipping reflection horizons within the wedge of sediments underlying the slope suggest possible fault planes. Oceanic crust can be traced landward of the trench axis for tens of kilometers beneath the sediment wedge. Seismic refraction velocities are similar to velocity profiles found in Pacific inner trench slopes. The above similarities between the Muertos Trench inner slope and the inner slopes of Pacific trenches suggest similarities in tectonic origins. Although the Muertos Trench, unlike Pacific trenches, is not associated with a belt of active volcanism or a well-defined Benioff zone, models that explain the structure of Pacific trench inner slopes in terms of imbricate thrusting may also apply to the north slope of the Muertos Trench	Active margin structures within the North slope of the Muertos trench
VOLUME 57 NO 2 255	1978	57	2	255	260	Ladd, J.W.; Watkins, J.S.	Large Enclosure	Active margin structures within the North slope of the Muertos trench
VOLUME 57 NO 2 261	1978	57	2	261	266	Muessig, K.W.	Basaltic igneous rocks crop out in a 50 km belt within Oligocene sedimentary rocks in the central Falcon Basin of northwestern Venezuela. Outcrop patterns, structural orientations, chilled margins, baked contacts, sedimentary inclusions, igneous breccias and uniformly alkaline compositions suggest these bodies are shallow intrusives and extrusives. Potassium-Argon determinations on a sill yield a 22.9 ± 0.9 Ma age which is 5 Ma younger than paleontologic ages of surrounding sedimentary rocks. A span of igneous activity from 28 to 23 Ma is inferred from stratigraphic constraints. Locally, normal NNW-SSE growth faults are present in Oligocene units. Features of similar regional trend and evidence of growth faulting offshore imply a tensional tectonic regime during Oligocene-Miocene time. The tensional regime, silica undersaturated, alkaline nature of the igneous rocks, and rapid basin subsidence rates suggest a pull-apart basin model for the Falcon Basin – Bonaire Trough area. This resulted from commencement of Caribbean - South American transform motion over a wide zone of offset transform faults.	The central Falcon igneous suite, Venezuela: alkaline basaltic intrusions of oligocene-Miocene age

VOLUME 57 NO 2 267	1978	57	2	267	270	Nagle, F.; Erlich, R.N.; Canovi, C.J.	The locations of 400 dredge hauls from the Caribbean have been compiled from published and unpublished sources. The following information on them is listed: location, depth, rock types recovered and age, and a literature reference or institution to contact for further information. The rocks recovered provide information about the Caribbean crust along the northern border of the Caribbean from Central America to Guadeloupe; and under the Beata and Aves Ridges. They also provide evidence for extensive vertical motion (up to several thousand meters) in the Neogene throughout the northern and eastern Caribbean. Many of the dredge hauls already collected have been examined in a selective fashion only. We could significantly increase our knowledge of the Caribbean crust and Neotectonics through more systematic team investigations. There are no dredge hauls from the southern and southwestern Caribbean margins. Suggestions for five localities are made.	Caribbean dredge haul compilation: Summary and implications
VOLUME 57 NO 2 271	1978	57	2	271	276	Newcomb, W.E.	An areally extensive quartz-monzonitic gneiss, characterized by a variety of cataclastic textures, has been mapped as the structurally lowest member of the Chuacus Group in east-central Guatemala. This apparent orthogneiss is separated from overlying Chuacus Group metasediments (phyllite and marble) by a south-dipping, low-angle thrust. The appearances of the gneiss is variable, ranging in texture from ultramylonite to blastomylonite gneiss. Retrograde mineral assemblages characteristic of the upper-greenschist facies (quartz-microclineoligoclase-biotite-chlorite) developed in response to cataclastic deformation adjacent to the Motagua fault zone, and do not represent regional metamorphism in the classic sense. The areal extent of the gneiss suggests that it may be a fundamental basement unit north of the Motagua fault zone in Guatemala's Cordillera Central. It has not been recognized south of the fault zone.	Retrograde cataclastic gneiss north of Motagua fault zone, East Central Guatemala
VOLUME 57 NO 2 277	1978	57	2	277	285	Persad, K.M.	It is now recognized that deltaic and associated sands, together with porous marine limestones, form the vast majority of the reservoirs in the major accumulations of hydrocarbons throughout the world. The source of the hydrocarbons is now thought to be kerogen which is generated from the organic content of principally marine shales which are formed in or near the continental shelves. The Trinidad area contains several sedimentary sub-basins, most of which consist largely of deltaic and associated sediments. These sediments, like most of the ancient deltas of the world, contain major reserves of oil and gas. Other less important reserves should occur in sporadic (time-wise) porous limestones. The total proven and probable reserves of the Trinidad area are around 5 billion barrels of oil, of which 1.6 billion barrels have already been produced, and over 47 trillion cubic feet of gas	Hydrocarbon potential of the Trinidad area - 1977

VOLUME 57 NO 2 287	1978	57	2	287	292	Pons, J.C.; Julius, C.; Klingebiel, A.; Pujos, M.	The oceanic cruise called 'GUYANTE' was aimed at the shelf of Martinique Island. It has been possible to re-establish and to state precisely the structural dissymmetry which opposes the Caribbean slope to the Atlantic. The four large sedimentary areas developed here are also different because of structural features.	Morphology and sediments of the shelf around Martinique Island
VOLUME 57 NO 2 293	1978	57	2	293	296	Priem, H.N.A.; Beets, D.J.; Boelrijk, N.A.I.M.; Hebeda, E.H.; Verdurmen, E.A.T.; Verschure, R.H.	Rb-Sr investigations revealed an age of 85.1 ± 0.5 Ma (Coniacian-Santonian) for the northwestern part of the tonalitic batholith on Aruba, and an age of 70.4 ± 2.0 Ma (Maastrichtian) for the remaining part. The dates are interpreted in terms of an episodic intrusion of the batholith. It is discussed that the two episodes of tonalitic magmatism belong to two different tectonic-magmatic phases in the geologic evolution of the Caribbean region.	Rb-Sr evidence for episodic intrusion of the late Cretaceous tonalitic batholith of Aruba, Netherlands Antilles
VOLUME 57 NO 2 297	1978	57	2	297	300	Robinson, E.	Preliminary examinations of two Holocene coastal peat deposits in Jamaica have indicated more than 150 million wet tons of peat, exceeding 10 m depth in places. Most of the peat is of the sedge marsh type, bordered on the seaward side by mangrove peats. It overlies clays, resting in turn on faulted Tertiary limestone blocks. Although ash contents are comparatively high (usually more than 10%, dry weight basis), peats of this type could be attractive as sources of energy in developing countries, such as Jamaica, which have no indigenous supplies of fossil fuel. Deposits similar to those in Jamaica are probably widespread, but few studies appear to have been carried out on peats for fuel in tropical areas.	Possible use of tropical peats as fuel: an example from Jamaica
VOLUME 57 NO 2 301	1978	57	2	301	304	Rodriguez, S.E.	The geothermic zone of Sucre Central, which extends from Cariaco to El Pilar, lies in a strongly tectonized area, in which the El Pilar fault is an important feature. These faults of supracontinental character form one of the southern boundaries of the Caribbean Plate. As a result of this tectonic setting, the northern part of the country (and specially Sucre Central) shows much evidence of geothermal activity, abnormal heat flows, constant seismic activity, and a continuous rejuvenation of the local structures. The presence in Sucre Central of Tertiary dacites, which affect strongly tectonized metamorphic sequences, and which are situated in a zone with enrichment of Pb and Zn, indicates the presence of deep-seated heat chambers which are associated with the deep plate tectonics of northern South America.	Relationship between plate tectonics and geothermal heat flows in Sucre Central, Venezuela

VOLUME 57 NO 2 305	1978	57	2	305	308	Rodriguez, S.E.	Along the northern coast of Venezuela a metallogenic zone has been discovered, which is characterized by masses of barite in metamorphic volcanics and sediments of the Villa de Cura Group. This zone is situated at 25 km SE of the city of Villa de Cura, in the industrial centre of the country. The minerals occur in lenses and masses within a sequence of strongly tectonized phyllites and meta-andesites of the El Chino Formation. Most probably these deposits are associated with the numerous occurrences of metals along the Villa de Cura complex in the states of Guárico and Aragua.	Baritization in the Villa de Cura complex, state of Aragua, northern Venezuela
VOLUME 57 NO 2 309	1978	57	2	309	313	Roper, P.J.	The Chuacús Group is a complex of metamorphic rocks in an east-west belt along the Central America Cordillera between the Chixoy-Philochic fault zone to the north and the Motagua fault zone to the south. Newcomb (1975) proposed a stratigraphy for the middle and eastern portions of the Sierra de las Minas range. This investigation attempts to extend that stratigraphy to the western end of the range. To achieve this, some of the formations proposed by Newcomb must be modified, and at least one new formation is introduced. Newcomb's San Agustín Formation is the lowest unit of the Chuacús Group and has not been recognized in the western end of the Sierra de las Minas range. In El Progreso quadrangle several major modifications are needed for the overlying Jones Formation. The mafic composition of this unit may in part be due to metasomatism during Mesozoic to Tertiary serpentinite emplacement. A hornblende gneiss occurs in the lower part of this sequence.	Stratigraphy of the Chuacús group on the south side of the Sierra de las Minas range, Guatemala
VOLUME 57 NO 2 315	1978	57	2	315	318	Rowley, K.C.; Roobol, J.M.	The island of Tobago, situated at the SE corner of the Caribbean plate, is made up of groups of volcanic, plutonic and metamorphic rocks. The volcanics are mainly calc-alkaline island-arc rocks which range from basalts to rhyolacites. They have been affected by metamorphism of the lower zeolite zone facies. The plutonic rocks, which intrude the volcanics range from high-Al gabbros to biotite granodiorites, are much fresher. The metamorphics arc of the greenschist facies and are overlain by the volcanics. All these rocks were hitherto believed to be of Cretaceous age, but new K-Ar dates from the freshest available samples, including a mineral determination, show a Lower Cretaceous age for the pluton. It therefore indicates that the overlying volcanics are at least of Lower Cretaceous age. Upper Cretaceous ages obtained for the volcanics appear to be artificially young due to the effects of metasomatic alterations on these rocks. It also appears that the Tobago metamorphic rocks may be of a Jurassic age, similar to that of equivalent rocks in neighbouring Trinidad.	Geochemistry and age of the Tobago igneous rocks

VOLUME 57 NO 2 319	1978	57	2	319	324	Schell, B.A.; Tarr, A.C.	<p>Previous geologic literature and the results of the Puerto Rico Seismic Network are synthesized into a plate tectonic model of the northeastern Caribbean Sea region. The Puerto Rico Seismic Network has detected earthquakes which form a well defined zone of seismicity dipping 45 to 50 degrees from the Puerto Rico Trench to a depth of about 150 km under Puerto Rico. This inclined zone of seismicity is interpreted to represent a lithospheric plate. However, focal mechanism solutions have shown that plate motion along the Puerto Rico Trench is directed in an east-to-west sense similar to that expected in a transform fault zone. A plate tectonic model is developed which shows that a portion of the North American plate, originally subducted under the northern Lesser Antilles, underrides the northern edge of the Caribbean plate. When this underriding plate reaches the Hispaniola subduction zone it sinks deeper taking on a plow-shaped configuration. The Puerto Rico type of 'transform' trench is not unique to the Caribbean, but also occurs in the western Aleutian Trench, Puysegur Trench, northern Sunda Trench, and possibly the Scotia Sea region.</p>	Plate tectonics of the Northeastern Caribbean sea region
VOLUME 57 NO 2 325	1978	57	2	325	332	Schubert, C.; Szabo, B.J.	<p>Sequences of 3, resp. 5 Pleistocene limestone terraces crop out on La Blanquilla and Curaçao. All represent Pleistocene reefs which have been uplifted. Diagenesis of the corals shows a sequence of increasing alteration with elevation (or age) of the terraces. Samples of corals in growth position were collected for dating of the Lower and Middle Terraces of Curaçao, and of the Limestone Terraces 1 and 2 of La Blanquilla. ²³⁰Th age determinations indicate that the Lower Terrace of Curaçao (10 m above sea level) and the Limestone Terrace 1 at La Blanquilla (7-10 m above sea level) formed contemporaneously at about 130,000 years ago, and are time-equivalent to Terrace III of Barbados and to the main limestone terrace of La Orchila island, all deposited during the last interglacial. No equivalents of Barbados I and II Terraces were found; they are probably below sea level, indicating that the Netherlands Leeward Islands and La Blanquilla were less uplifted than Barbados. The age of the higher terraces of Curaçao and La Blanquilla is uncertain because of diagenetic changes, but may be estimated as about 325,000 years for the Limestone Terrace 2 of La Blanquilla and about 570,000 years for the Middle Terrace of Curaçao.</p>	Uranium-series ages of Pleistocene marine deposits on the Islands of Curaçao and La Blanquilla, Caribbean Sea

VOLUME 57 NO 2 333	1978	57	2	333	337	Sonnenfeld, P.; Hudec, P.P.	A meromictic lake on the island of Gran Roque, Venezuela, is both thermally and chemically stratified. The density stratification is largely chlorine-controlled, but concentration of major cations is more variable. A statistical evaluation of chemical analyses serves to indicate that differences in concentration between a central depression and a seaward one suggest seepage of seawater into the latter. Additional cations are supplied by drainage, albeit small, from nearby hills composed of basic intrusives.	Geochemistry of a meromictic brine lake
VOLUME 57 NO 2 339	1978	57	2	339	346	Wal, R.J.F. van der	Specimens of Titanosarcolithes from St. James' Parish, NW Jamaica, are described. It is shown that in Titanosarcolithes new tubes are formed by a process of subdivision of older tubes. The presence of the ligament in the right valve of Titanosarcolithes giganteus is established. The internal structures of Titanosarcolithes alatus (Chubb, 1967,1971) are described; the species may be intermediate between Antillocaprina and Titanosarcolithes giganteus. The genus Titanosarcolithes was already known from the Baretia Limestone of Sunderland.	On two species of Titanosarcolithes (Rudistids) from St. James' Parish, NW Jamaica
VOLUME 57 NO 2 347	1978	57	2	347	352	Wadge, G.; Draper, G.	The structural geology of over 100 km of Cretaceous rocks in the southeastern Blue Mountains is described for the first time. Full stratigraphic details have yet to be resolved, but it is apparent that the structural evolution was controlled by different responses to deformation of the two dominant rock types. These are a thick massive unit of basaltic volcanics and a thinly bedded sandstone/siltstone/ mudstone sequence, separated by thin limestones. Synsedimentary deformation is recognized at the boundary of well-bedded argillaceous and thick arenaceous units. Tectonic folds have a dominant NW-SE trend, but variations exist within a mosaic of structural domains. Three fault trends are recognized with modes at 040°, 100° and 155°.	Structural geology of the southeastern blue mountains, Jamaica

VOLUME 57 NO 2 353	1978	57	2	353	359	Wells, J.T.; Coleman, J.M.	Time series measurements of waves and wave/mud interactions along the Surinam coast indicate that waves may play a greater role than previously thought in the suspension and transport of fine-grained sediment on the northeastern coast of South America. Accumulations of fluid mud or sludgemud that occur on western flanks of migrating mudbanks affect incoming swell by changing their form from sinusoidal to solitary-like and by preventing wave breaking except for occasional spilling. As solitary like waves propagate over the soft-mud bottom, fluid mud is suspended, resulting in surface suspensate concentrations that exceed $3 \cdot 10^3$ mg/l. The presence of solitary waves, high suspended-sediment concentrations, and a relatively uniform angle of wave approach throughout the year may lead to extraordinarily high sediment transport rates. If waves are assumed to have a net drift as given by solitary wave theory, then, in taking angle of wave approach and actual measured concentration of sediment in suspension, enough sediment can be transported by waves alone to explain the propagation of mudbanks by fluidmud transport. On the basis of reasonable wave and sediment conditions, it is estimated that up to $70 \cdot 10^6$ m ³ of mud can be transported alongshore each year.	Longshore transport of mud by waves: Northeastern coast of South America
VOLUME 57 NO 2 361	1978	57	2	361	364	Wiedmann, J.	Ammonites have been discovered for the first time in some thin pelagic intercalations in the Curaçao Lava Formation. Since this is the oldest rock unit which occurs on the island, its dating is of extreme interest. The rather poorly preserved and partly baked ammonites can be attributed to the genera Beudanticeras, Cleoniceras (Grycia), Gastroplites, ?Dipoloceras, Hysterocheras and ?Pervinquieria. The Curaçao Lava Formation is, thus, of upper Middle Albian age. This is consistent with the available equivalent K/Ar-data of 118 ± 10 and 126 ± 12 M.A.b.p. (Santamaria & Schubert, 1974), since submarine extruded basalts dated by this method generally give ages somewhat too high. Paleobiogeographic relationships point to the Western Interior and Pacific faunal provinces of North America, and, to a minor degree, to the European Tethys. Moreover, this is exactly the time when Northern and Southern Atlantic became connected for the first time (WIEDMANN & NEUGEBAUER, 1978).	Ammonites from the Curaçao lava formation, Curaçao, Caribbean

VOLUME 57 NO 2 365	1978	57	2	365	368	Wong, T.E.; Lissa, R.V. van	As a result of the recently commenced exploration programme of the Geological and Mining Service of Surinam, gold was discovered in gravels of the Tertiary Coesewijne Formation near Jorka Kreek and Loksie Hatti. These gravels form the base of isolated plateaus along the southern margin of the Coesewijne Formation in the vicinity of major rivers. The gravels were deposited in braided river and alluvial fan systems under semi-arid conditions. It is assumed that at Jorka Kreek both gold and rounded clasts were derived from the Precambrian Rosebel Formation, whereas at Loksie Hatti the gold is derived from local quartz veins. Further evaluation of these placers, now in progress, should reveal whether or not they are economically exploitable.	Preliminary report on the occurrence of Tertiary gold-bearing gravels in Surinam
VOLUME 57 NO 2 369	1978	57	2	369	372	Zonneveld, J.I.S.	During the year 1972 H.Ms. "Luymes" of the Royal Netherlands Navy made a hydrographical survey in a part of the N. E. Caribbean. The resulting echograms and maps allowed a more detailed impression of the topography of the sea bottom in this area to be made. In this paper the relief of the shelf of St. Eustatius, with its submarine terraces and ridges, is discussed.	Some notes on the geomorphology of the shelf of St. Eustatius (Netherlands Antilles)
VOLUME 57 NO 2 373	1978	57	2	373	384			Supplement to the volume of abstracts 8th Caribbean Conference Willemstad
VOLUME 57 NO 3 385	1978	57	3	385	394	Gillavry, H.J.M.	Directional changes are distinguished from yes-or-no changes. The latter lack the quality of direction; in the evolution of larger foraminifera they manifest themselves at first at a late ontogenetic stage as individual monstrosities, but lead, by the deuterogenetic mode, to new genera or families. Further evolution within a lineage is characterized by the directional gradualism of neptonic reduction. Various hypotheses why this complex evolution could have been of selective advantage are reviewed; complicating factors are discussed; there is still a large unexplained residue. Gradualism is considered to be rare and to be associated with faunas of low diversity, consisting of related but genetically isolated subunits which react to extra-group factors as one population, but which may evolve through intra-group competition; hence the frequent coexistence of related lineages. Still unexplained is the following of the same evolutionary pathway by forms of no near relationship. This may be due to severe structural limitation of possibilities; one pathway is followed by forms derived from planispiral ancestors, another by forms derived from trochoid ancestors. Three appendices give details on the phylomorphogenesis of Cycloclypeus, notes on Indonesian larger foraminifera, and notes on the stratigraphy of South Sumatra.	Foraminifera and parallel evolution - How ofrwhy?
VOLUME 57 NO 3 395	1978	57	3	395	400	Brouwer, A.		Rocks, life and time - an international guide through the stratigraphical labyrinth

VOLUME 57 NO 3 401	1978	57	3	401	406	Urban, B.	Palynological investigations of earliest Pleistocene deposits at Frechen, some ten kilometers west of Cologne permit the dating of these sediments in terms of the Dutch biostratigraphic scale. Of special interest is a newly discovered interglacial period, termed the 'Frechen I Interglacial', which indicates a more complicated development of vegetation during the early Tiglian than was hitherto thought.	The interglacial of Frechen I/Rheinland - A section of the Tiglian A-type
VOLUME 57 NO 3 401	1978	57	3	401	406	Urban, B.	Large Enclosure	The interglacial of Frechen I/Rheinland - A section of the Tiglian A-type
VOLUME 57 NO 3 407	1978	57	3	407	416	Bisdorn, E.B.A.; Gerlofsma, A.; Poelman, J.N.B.; Riezebos, P.A.	The varying content of composite grains in heavy-mineral concentrates was used for the differentiation of surface sediments in a geomorphologically and pedologically complicate landscape at the confluence of the Maas (Meuse) and the Roer (Rur). West of the Maas valley, these deposits contain quantities of minor importance (<10%), while to the east surface sediments with percentages ranging from 4 to 59 occur. In this latter area a decrease in an easterly direction is suggested from the data. The characteristic high composite content is also found in sediments from the present flood plain of the Maas as well as in an old fluvial deposit of this river (Caberg terrace). It is suggested that the flood plain of the Maas is the source of the surface deposits being found to the east, and that similar deposits west of the Maas valley come from another source area. Finally the possible use of composites as provenance indicators is discussed briefly.	Composite grains in heavy-mineral concentrates and their significance in the differentiation of surface deposits at the confluence of the Maas (Meuse) and Roer (Rur) rivers.
VOLUME 57 NO 3 417	1978	57	3	417	431	Riezebos, P.A.; Bisdorn, E.B.A.; Boersma, O.	The opaque mineralogy of composite grains in acid-treated heavy-mineral concentrates from sediments of the river Maas (Meuse) was studied in reflected light and by SEM-EDXRA analysis. Secondary rutile, secondary ilmenite and hematite constitute the subtranslucent to opaque matter in these composites, which principally represent actual rock fragments. This suggests that the sediments investigated contain products of rather freshly disintegrated rocks. The opaque components enable two important groups of rock fragments to be distinguished: a major group characterized by secondary rutile, secondary ilmenite and their intergrowths; and a minor group with exclusively hematite.	Composite grains in Maas (Meuse) sediments: a survey and a discussion of their opaque components

VOLUME 57 NO 3 433	1978	57	3	433	440	Sissingh, W.	Correlation of the most recent Cretaceous zonations based on calcareous nannoplankton, planktonic foraminifera and calpionellids allows more precise determination of the relative position of some Cretaceous stage-stratotypes in the standard chronostratigraphical scale. In particular, those of the Santonian, Campanian and Maastrichtian stratotypes seem to be very limited in time-span. It is possible to overcome these limitations and to some extent also the problems concerning their recognition and traceability by a pragmatic extension of the type-sections and by the introduction of auxiliary hypostratotypes in the type areas. However, it is concluded that designation of one or more independent reference sections for Upper Cretaceous stages is a preferable alternative which should receive more attention. In this way also a more useful section could be proposed for the Cenomanian, Turonian and Coniacian stages.	Microfossil biostratigraphy and stage-stratotypes of the Cretaceous
VOLUME 57 NO 3 441	1978	57	3	441	443	Priem, H.N.A.; Andriessen, P.A.M.; Boelrijk, N.A.I.M.; Hebeda, E.H.; Hutchison, C.S.; Verdurmen, E.A.T.; Verschure, R.H.	Rb-Sr dating of the pair whole-rock/biotite from the cordierite-bearing granite on Ambon (Moluccas, E. Indonesia) yields an age of 3.3 ± 0.1 Ma with initial $^{87}\text{Sr}/^{86}\text{Sr} = 0.7221$. The K-Ar age of the biotite is 3.8 ± 0.2 Ma (ages based upon the constants recommended by Steiger & Jäger, 1977). A Middle to Late Pliocene age can thus be assigned to the granitic magmatism	Isotopic evidence for a Middle to Late Pliocene age of the cordierite granite on Ambon, Indonesia
VOLUME 57 NO 3 445	1978	57	3	445	450	Kroonenberg, S.B.	A red transition zone with granitic fragments between the Roraima sandstones and the underlying granite at Kappelsavanna, Tafelberg and Emma Range is argued to represent a pre-Roraima palaeosol. The mineralogical and micromorphological characteristics of the palaeosol indicate an origin in an arid or semi-arid climate.	Precambrian palaeosols at the base of the Roraima formation in Surinam

VOLUME 57 NO 3 451	1978	57	3	451	464	Fortuin, A.R.	An interpretation is given of the structural setting and the sedimentary history of the Middle Miocene - Quaternary deposits in eastern Crete (Ierapetra region). The present tectonic structure, characterized by normal faults in W-E and NE-SW directions, is dominated by a central NE-SW graben, which seems to mark a dislocation in the curvature of the Aegean Arc. In Late Serravallian – Early Tortonian times deposition drastically changed from terrestrial to open marine, with turbidites, filling in a graben that extended over the southern half of the region. The sources of sediment supply then shifted from east to west and slices of sediments (in part of pre-Neogene age) slid from the uplifted blocks in the north to the central parts of the region, where a submarine valley was formed. A seismic reflection profile south of Crete may show analogous gravity sliding in the Neogene. From the Late Tortonian till the Pliocene carbonate sedimentation took place. A gradual shallowing followed, which ended with deposition of the well known Messinian facies. Unstable tectonic conditions controlled the sedimentation until the Early Pliocene, when quiet open marine sedimentation returned. In the early Late Pliocene tectonic uplift started to separate Crete as a horst from the surrounding seas. Although strong, this general uplift was periodically interrupted.	Late Cenozoic history of Eastern Crete and implications for the geology and geodynamics of the southern Aegean area
VOLUME 57 NO 3 465	1978	57	3	465	478	Pers, J.N.C. van der	The boring activities of <i>Polydora</i> BOSCH, 1802, are an important agent in bioerosion. Trace fossils attributed to this worm are very common. From data collected on Recent representatives of <i>Polydora ciliata</i> JOHNSTON 1838, it is evident that the boring mechanism of this worm is to be interpreted as a combination of mechanical and chemical processes. <i>Dodecaceria</i> , another genus of polychaete worms, is considered to be able to bore chemically in lime-rich substrata.	Bioerosion by polydora (Polychaeta, sedentaria, vermes) off Helgoland, Germany
VOLUME 57 NO 3 479	1978	57	3	479	480			Book reviews
VOLUME 57 NO 4 481	1978	57	4	481	481	Loon, A.J. van		Preface - Key-notes of the MEGS-II
VOLUME 57 NO 4 483	1978	57	4	483	485	Tieleman, W.H.J.		Opening adress

VOLUME 57 NO 4 487	1978	57	4	487	502	Coelewij, P.A.J.; Haug, G.M.W.; Kuijk, H. van	Magnesium-bearing salts occur in the Zechstein Basin in the northeastern Netherlands at a depth of 1500 to 2500 m. Exploration has resulted in the discovery of significant amounts of this salt which will be exploited by solution mining for the production of refractory grade magnesiumoxide. Of the four main evaporite cycles, Zechstein III (the ore-bearing cycle) is fully developed and contains the magnesium salts carnallite ($MgCl_2 \cdot KCl \cdot 6H_2O$), bischofite ($MgCl_2 \cdot 6H_2O$) and kieserite ($MgSO_4 \cdot H_2O$). The salt sequence has been affected by halokinesis, resulting in salt domes and other structures. The magnesium-bearing layers were thickened towards the top of the structures, thus forming prime targets for exploration. Exploration techniques comprise seismic surveys and rotary drilling. Conventional seismic methods adequately define depth and structural configuration, whilst high-resolution seismic wavelet processing is used for the identification of the magnesium-salt layers on the seismic section and determination of thickness. Seismic sections are converted into acoustic impedance sections which are calibrated from acoustic impedance logs. These in turn are derived from velocity and density measurements in bore holes. The mineral composition, ore grade, and thickness can be accurately determined by petrophysical well-logging: in particular formation density, gamma ray, and sonic logs. Results are calibrated by chemical analysis of drillcores.	Magnesium-salt exploration in the northeastern Netherlands
VOLUME 57 NO 4 503	1978	57	4	503	516	Colter, V.S.	Exploration for gas between the Isle of Man and the mainland has confirmed the presence of a Permo-Triassic basin, with sediment thicknesses in excess of 3,000 m. The section can be correlated with the onshore succession and consists of the following: 'Keuper' Marl + Saliferous series (eroded), 'Keuper' Waterstones, 'Keuper' Sandstone, St. Bees Sandstone Manchester Marl and equivalent halite Collyhurst Sandstone and equivalent shales. Drilling and seismic work have shown abrupt thickness changes across some faults, which may show reversals of throw at different times. Sonic velocities in shales at the base of the 'Keuper' Marl suggest depths of burial of more than 4000 m, pointing to the possibility that a thick younger Mesozoic section was once present. Diagenesis of the sandstones includes calcite and quartz cementation and the development of platy illite. Gas has been found by Hydrocarbons Great Britain Limited, a subsidiary of British Gas Corporation, in sandstones of the 'Keuper' Waterstones, 'Keuper' sandstone and top part of the St. Bees Sandstone.	Exploration for gas in the Irish area
VOLUME 57 NO 4 503	1978	57	4	503	516	Colter, V.S.	Large Enclosure	Exploration for gas in the Irish area

VOLUME 57 NO 4 517	1978	57	4	517	525	Gliese, J.	The Tertiary brown coal resources in the Lower Rhine Embayment amount to 55,000 million tons. The open-cast mining operations under way or at the planning stage ensure an annual production of 115-120 million tons over a period of the next 75 years. The brown coal mainly serves to generate electrical energy. At present about 150-250 m of overburden have to be removed to get at the brown coal. In future this may increase up to 500 m. The maximum thickness of the brown coal is about 100 m. The brown coal beds provide data about: - a basin-shaped subsidence of the embayment during the Miocene. No major block faulting occurred during the main period of peat accumulation. - peat compaction. 100 m of brown coal (under an overburden of 500 m) might correspond to 250 m of peat. - a Pre-Rhine river system during the main period of peat accumulation. - the perennial effectiveness of some Palaeozoic structural elements.	On brown coal resources in the Lower Rhine embayment (West Germany)
VOLUME 57 NO 4 527	1978	57	4	527	532	Lüttig, G.	Without support by the geosciences it will not be possible to develop regulations for the future of mankind which provide good chances for survival. This is due to the fact that the environmental potential is being steadily restricted, as is obvious from the growing scarcity of mineral resources, energy sources, groundwater, and farming land. Thus, the author has pointed out in several publications that part of our geoscientific research capability needs to be reoriented towards the future. This includes a transformation and translation of our geocartographic material into maps that can be easily understood by the planner. The Geoscientific Map of the Natural Environment Potential (GMNEP) meets the requirements mentioned above. The individual maps are presented here and explained in detail. At the same time, the reader is informed about the plans agreed upon by the IUGS Commission on the International Geological Map. All colleagues interested in this important task are invited to cooperate with the subcommission in charge, the Subcommission on Maps of Environmental Geology (SC-MEG).	Geoscientific maps of the environment as an essential tool in planning

VOLUME 57 NO 4 533	1978	57	4	533	543	Pomerol, C.	The Paris Basin was born in a late Proterozoic palaeorift, obliterated in the Brioverian by detritic sediments and in the Carboniferous by granitic batholiths. After the Variscan orogenesis and the Permo-Triassic peneplanation, the Paris Basin became, during the Jurassic and Cretaceous, the intersection of three seas where the influences of the Mesogean, the North Sea, and the Protoatlantic met. Subsidence persisted in the Palaeogene where the mobility of the palaeogeography is a structural detector of the Pyrenean and Alpine tectonic phases. At the same time, a north-south undulation developed, 200 meters in amplitude and 200 kilometers in wave length, which displaced the pole of negative epirogenesis from the region of Compiègne to south of Orleans. After the stabilization at the end of the Miocene and the strong positive Plio-Pleistocene epirogenesis, some neotectonic indications are the first signs of a Holocene reactivation of the subsidence in the center of the basin.	Évolution paléogéographique et structurale du bassin de Paris, de Précambrien à l'actuel, en relation avec les régions avoisinantes
VOLUME 57 NO 4 545	1978	57	4	545	557	Požaryski, W.; Brochwicz-Lewiński, W.	The Polish trough represents the main part of a huge synsedimentary structure stretching from the Carpathians to the North Sea, mainly in a zone of weakness at the contact of the East-European Precambrian and Palaeozoic platforms. It was active from the Early Permian to the Early Cretaceous as a graben, and in the Late Cretaceous as a downwarp. A SW corner of the Baltic Shield acted as the threshold responsible for the division of the structure into Danish and Polish parts and limiting the zone of inversion. A connection with the Carpathian geosyncline is traced.	On the Polish Trough
VOLUME 57 NO 4 559	1978	57	4	559	576	Ricci Lucchi, F.	Deposition in a typical 'flysch trough' (Marnoso-arenacea or Inner Basin of 'the Periadriatic Apenninès) was interpreted in terms of the depositional system (slope-deep-sea fan-deep-sea plain)' The basin fill is wedge-shaped and shows vertical and lateral grading; in its proximal portion, it forms a progradational turbidite 'suite' with upward increase in grain size, sand content and bed thickness indicating a transition from deep-sea plain via outer-fan to inner-fan environment. The outcropping part of the plain is 175 km long. Detailed studies of lateral variations of single beds show that: (1) sandy lobes from outer fans prograded into the plain over a distance of 25-50 km; (2) 30-40% of basin plain turbidites are more than 40 cm thick, and 15 out of 100 can be correlated axially over a distance of more than 125 km; (3) these single, huge turbidites (called Contessa-like beds) were introduced from different, lateral and axial sources but their dominant dispersal was axial.	Turbidite dispersal in a Miocene Deep-sea plain: The Marnoso-Arenacea of the Northern Apennines

VOLUME 57 NO 4 577	1978	57	4	577	588	Zagwijn, W.H.; Doppert, J.W.C.	An outline is presented of Neogene and Quaternary biozonation and lithostratigraphy of the southern North Sea Basin. The maps showing the thickness distribution of the Upper Miocene deposits and the depth contours of the base of the Quaternary depict the basin evolution. The pattern of basin development in the Quaternary differs distinctly from that in Neogene times; resemblance with the pattern in Mesozoic times is ascribed to reactivated downwarping in areas of much earlier, namely Mesozoic, basin development. Considerably greater amounts of sediments were accumulated per time unit in the southern North Sea Basin during the Quaternary as compared to the Neogene.	Upper Cenozoic of the Southern North Sea Basin: Palaeoclimatic and palaeogeographic evolution
VOLUME 57 NO 4 589	1978	57	4	589	626	Ziegler, P.A.	This paper discusses the geologic evolution of North-Western Europe from Late Silurian to Cainozoic times on the base of 13 palaeogeographic and 6 palaeotectonic maps. Furthermore a pre-Permian and a pre-Tertiary subcrop map as well as an isopach map of Upper Permian to Cainozoic sediments is presented. This synthesis is based to a large extent on geophysical and subsurface data acquired by the oil industry during its exploration efforts in the various on-shore and offshore sedimentary basins of North-Western Europe. A more comprehensive summary is given at the end of the paper.	North-Western Europe: Tectonics and basin development
VOLUME 57 NO 4 589	1978	57	4	589	626	Ziegler, P.A.	Large Enclosure 1	North-Western Europe: Tectonics and basin development
VOLUME 57 NO 4 589	1978	57	4	589	626	Ziegler, P.A.	Large Enclosure 2	North-Western Europe: Tectonics and basin development
VOLUME 57 NO 4 589	1978	57	4	589	626	Ziegler, P.A.	Large Enclosure 3	North-Western Europe: Tectonics and basin development
VOLUME 57 NO 4 589	1978	57	4	589	626	Ziegler, P.A.	Large Enclosure 4	North-Western Europe: Tectonics and basin development

VOLUME 57 NO 4 627	1978	57	4	627	654	Zwart, H.J.; Dornsiepen, U.F.	The complexity of the structure of Central and Western Europe is for a large part due to the rapid succession of four important orogenic events each belonging to a major orogenic period: the Cadomian, Caledonian, Variscan and Alpine orogenies. The four successive mountain chains have partly occupied the same space, resulting in an intricate pattern of rocks formed or deformed during each orogeny. Due to this multiple orogenesis the presence of older Precambrian rocks is difficult to demonstrate. Low grade Proterozoic sediments and volcanics are known from the Armorican and Bohemian Massifs and from the Iberian peninsula. Crystalline basement rocks predating these supracrustals have been reported only from the Armorican and Bohemian Massifs. Other signs of Precambrian events are zircon ages of more than 2000 Ma. The Cadomian orogeny has been demonstrated in England, the Armorican Massif, the Bohemian Massif, the Pyrenees and in the Iberian peninsula either by the unconformity of Cambrian on folded basement, or by geochronological methods. The folding is accompanied by regional metamorphism of varying grade up to granulite facies. Postorogenic Cadomian granitic magmatism occurs in the Armorican and Bohemian Massifs. The Caledonian orogeny occurs besides the main belt in Scandinavia, Scotland, Ireland and Wales, in the Ardennes and a zone from northern Germany towards Poland and Rumania. South of this zone no Caledonian folding based on geological evidence as unconformities can be ascertained, although numerous radiometric dates on metamorphic and igneous rocks indicate a thermal event during the period corresponding to the Caledonian orogeny. The Variscan orogeny is much better	The tectonic framework of Central and Western Europe
VOLUME 57 NO 4 655	1978	57	4	655	656			Book reviews

VOLUME 58 NO 1 1	1979	58	1	1	20	Batchelor, B.C.	A Late Cainozoic global eustatic sea-level rise, of greater magnitude and opposite trend to previous schemes, is indicated, with important consequences on climates, sedimentation, pedogenesis, oceanographic features and biological distributions, especially for Sundaland and other equatorial regions. An abrupt sealevel depression during the late Middle Miocene to around 1000 m below present, is correlated with an emergent Sundaland continent. Increased land/sea area ratio resulted in more seasonal semi-arid climates facilitating savanna expansion and laterite development. A major Miocene discontinuity in Sundaland is paralleled worldwide by contemporaneous unconformities or facies changes on continental terraces, reduced oceanic sedimentation and truncation and pedogenesis on Pacific reefs. Sea levels have since risen discontinuously at around 10 cm/10 ³ a with maximum transgression in the late Quaternary. Sea-level curves are constructed assuming that eustasy is mainly due to superposition of glacio-eustatic fluctuations on a linear tectono-eustatic trend, adjusted to fit Sundaland data. Before the Middle Pleistocene Sundaland coastlines changed very little. Once since then did seas rise above the shelf-break causing major coastline shifts, dramatically affecting sedimentation climates' and Extinctions of savanna-adapted mammals resulted from their geographical isolation and unsuitability of increasingly homogeneous rain-forest habitats. Intervening glacials temporarily restored former continental environments.	Discontinuously rising Late Cainozoic eustatic reference to Sundaland, Southeast Asia
VOLUME 58 NO 1 21	1979	58	1	21	28	Roeleveld, W.; Loon, A.J. van	A new series of 19 radiocarbon dates from the Holocene picture Young coastal plain in Suriname fits into the of a rapid sea-level rise in this area until about 6000 B.P. From 6000 B.P. onward the sealevel remained essentially at its present position. Indications for a higher position of the sea-level at about 6500 B.P. are inconclusive. From about 6500 B.P. onward the marine influence in the interior part of the young coastal plain diminished, but some marine oscillations were registered. The available evidence is too limited to permit pertinent conclusions about the regional occurrence of marine fluctuations. From an analysis of the younger Holocene development in the Hertentits area it is concluded that a new subdivision has to be established for understanding of these marine oscillations.	The Holocene development of the young coastal plain of Suriname

VOLUME 58 NO 1 29	1979	58	1	29	32	Geer, G. van de; Colhoun, E.A.; Bowden, A.	The paper outlines the distribution, height and origin of extensive pre-Holocene marine deposits from various localities in Tasmania. The marine deposits occur up to 20-30 m above present sea-level. The stratigraphic relationships of the deposits are discussed in relation to associated glacial, freshwater, Aeolian and slope deposits. ¹⁴ C dating of some of these deposits strongly suggests that most of the marine deposits are of Last Interglacial age. other Australian studies suggest that the maximum sea level attained in southeastern Australia during the Last Interglacial was 5-10m. The higher marine levels in Tasmania, inferred to be of Last Interglacial age, suggest that differential tectonic and hydroisostatic deformation may have occurred during the late Quaternary.	Evidence and problems of interglacial marine deposits in Tasmania
VOLUME 58 NO 1 33	1979	58	1	33	38	Paris, F.P.; Cleveringa, P.; Gans, W. de	This paper describes the results of geological and palynological investigations of a pingo remnant in Friesland. The remnant is situated in a small, former tributary valley of the Boorne river. As contrasted with other pingo remnants in The Netherlands, the Stokersdobbe is at its base filled with sand and gravel overlaid by a loam deposit of Bølling age. The decay of the pingo could be dated between 13,000 (Bølling) and 18,000 radiocarbon years B.P. The period of growth of the pingo is correlated with the Brandenburger Phase and the Upper Pleniglacial level of ice wedge casts. An attempt is made to correlate the Friesland and Rammelbeek phases at the transition of Weichselian to Holocene with local changes in the hydrological situation.	The Stokersdobbe: Geology and palynology of a deep pingo remnant in Friesland (the Netherlands)
VOLUME 58 NO 1 33	1979	58	1	33	38	Paris, F.P.; Cleveringa, P.; Gans, W. de	Large Enclosure 1	The Stokersdobbe: Geology and palynology of a deep pingo remnant in Friesland (the Netherlands)
VOLUME 58 NO 1 33	1979	58	1	33	38	Paris, F.P.; Cleveringa, P.; Gans, W. de	Large Enclosure 2	The Stokersdobbe: Geology and palynology of a deep pingo remnant in Friesland (the Netherlands)
VOLUME 58 NO 1 33	1979	58	1	33	38	Paris, F.P.; Cleveringa, P.; Gans, W. de	Large Enclosure 3	The Stokersdobbe: Geology and palynology of a deep pingo remnant in Friesland (the Netherlands)

VOLUME 58 NO 1 39	1979	58	1	39	48	Maccarthy, I.A.J.	<p>The Early Carboniferous Kinsale Formation contains a distinctive sand dominant unit in western County Waterford known as the Crows Point Member. This is built up by epsilon cross-stratified grey sandstones with minor thin claystone and heterolithic intercalations. Six rhythmically diminishing lithofacies, organised-into four sequential facies associations, are distinguished. Facies analysis shows it to be the record of high-energy pulses of fluvial sediment influx via distributary channels from the ESE. These were modelled by fluctuations in river stage; an overall allocyclic mechanism may have been responsible for the interpreted progressive shallowing of the distributaries. through time, accompanied by an increased tidal influence in response to a north-easterly regional transgression. The member provides additional support for a positive source area lying off the southeastern margin of the Munster Basin during the Early carboniferous. This together with its relationship to adjacent facies, indicates a NE-SW axial drainage pattern within-this basin at this time.</p>	<p>An early carboniferous river-dominated regressive facies in southern Ireland</p>
VOLUME 58 NO 1 49	1979	58	1	49	56	Linthout, K.; Vissers, R.L.M.	<p>A layer of calcareous cataclasites, formerly considered to be interstratified in permo-Mesozoic rocks in the lowest Nevado-Filabride tectonic unit - the Nevado-Lubrín unit - locally contains fragments of pre-Permian black schist. It is argued that the cataclasite represents a fault-rock formed in association with an important overthrust. This leads to a revision of the lithostratigraphy of the Nevado-Lubrín unit, with the cataclasitic forming the uppermost rock-body. The cataclasite is tectonically overlain by the Secano unit (composed of pre-Permian black schist and quartzite) and - where this unit is absent - by the Umbria de las Cantèras unit (consisting of a sequence of marble and calcschist). This latter thrust-mass was hitherto misinterpreted as the stratigraphic upper part of the Nevado-Lubrín unit. which led to a seemingly enigmatic position of the Secano-unit within the Nevado-Filabride rock-pile. The present interpretation solves this 'Secano-problem', as thrusting of the Umbria de las Canteras unit over the Secano unit is recognized.</p>	<p>On the classification of tectonic units in the Nevado-Filabride complex of the Northern Sierra de los Filabres, Betic Cordilleras, SE Spain.</p>

VOLUME 58 NO 1 57	1979	58	1	57	64	Bartenstein, H.	The palaeogeographic knowledge of the European Palaeozoic (Lower Permian, Carboniferous and Devonian) is closely connected with the search for hydrocarbon deposits, because the biggest deposits of natural gas have been found so far in the Rotliegendes (Lower Permian). An extension of these reservoirs into geologically older formations, especially into Upper Carboniferous and uppermost Devonian is expected and systematic exploration investigations are being proposed. An important tool for this is the research on coalification, which has already resulted internationally in much success and is now used intensively in the European palaeozoic. this regional-geologic survey points out the current state of knowledge in the palaeogeographic as well as geochemical and coal-petrographic studies.	Essay on the coalification and hydrocarbon potential of the northwest European palaeozoic
VOLUME 58 NO 1 65	1979	58	1	65	70	Keasberry, E.J.	A gravity survey of the peripheral belt of the Ordenes complex in Galicia (NW Spain) has been combined with a little used, although known, interpretation method. From the results of the survey and geological evidence, support was found for the hypothesis that the peripheral belt could be subdivided into separate units of shallow buried, but deep-reaching bodies of high-grade ultramafic material, which appear to have their-origin in diapiric movements of upper-mantle material into a crystalline lower crust of continental type. The depth of the western body, projected underneath the high-grade metamorphic complex of Santiago de Compostela, is computed at a depth of 780 metres, while the bodies of the complexes of Sobrado-Teijeiro and Mellid are computed at a depth of 550 metres and 150 metres, respectively. The semi-circular outline of all three Bouguer anomalies suggested diapiric structures comparative to salt-domes, which have been interpreted using a three-dimensional method.	An interpretation model of semi-circular Bouguer anomalies found over the peripheral belt of the Ordenes complex (NW Spain)
VOLUME 58 NO 1 71	1979	58	1	71	83	Maurasse, F.; Husler, J.; Georges, G.; Schmitt, R.; Damond, P.	The Dumisseau Formation, is described-as a complex of intercalated mafic and pelagic rocks of Cretaceous age exposed at the southern Peninsula of Haiti. This formation includes a lower member of possibly Early cretaceous age, and the St. Dominique Member of Late cretaceous age. Their thickness exceeds 1,5 km, and the igneous rocks show geochemical affinities for abyssal and island arc tholeiites, which accumulated in a deep eupelagic environment. The formation is here equated to an ophiolite complex described earlier by Miyashiro, and to crustal layers (2A and 2B) described by Houtz & Ewing. Correlations between the Dumisseau Formation and geophysical data concerning the crustal structure and composition of both the Caribbean crust and oceanic crust provide corroborative evidence to suggest that the analog of crustal materials below acoustic reflector B". The Dumisseau Formation thus represents a portion of the Caribbean crust uplifted through block faulting tectonism much similar to the adjacent Beata Ridge.	Upraised Caribbean sea floor below acoustic reflector B" at the southern peninsula of Haiti

VOLUME 58 NO 1 85	1979	58	1	85	88	Nwajide, C.S.; Hoque, M.	The Eocene Nanka Formation of the Anambra Basin of southeastern Nigeria is a thick, abundantly cross-stratified, flaser and lenticular bedded unfossiliferous unit; it is composed dominantly of medium to coarse grained quartz sand with shale and claystone at several horizons. Various kinds of burrows, confined to the sand beds, are the only evidence of past organic activity within the otherwise unfossiliferous formation. These burrows have been identified to be of the ichnogenera Ophiomorpha and Skolithos. The former occurs as both isolated and randomly oriented tubes and as dichotomously branching burrows possessing tuberculate ornamentation. The latter is seen as short and narrow vertical to steeply inclined straight to curvilinear burrows. A third unidentified burrow type occurs as horizontally oriented, unlined tubes probably constructed by sediment ingesting worms. Trace fossils have proved to be reliable environmental indicators. Both Ophiomorpha and Skolithos have been known to occur mainly in a marginal marine environment. Their presence in the Nanka Formation is, therefore, indicative of the deposition of Nanka sands in an intertidal to shallow sublittoral zone. This interpretation, based on trace fossil study, finds support on other evidences independently obtained from the lithostratigraphic and sedimentologic features of the formation. It appears then that the presence of trace fossils in otherwise unfossiliferous strata could provide a reliable basis for environmental diagnosis.	Trace fossils from the Nanka Formation, Southeastern Nigeria
VOLUME 58 NO 1 89	1979	58	1	89	93			Exchange of publications
VOLUME 58 NO 1 94	1979	58	1	94	96			Book reviews
VOLUME 58 NO 2 99	1979	58	2	99	100	Linden, W.J.M. van der		Preface FIXISM, MOBILISM OR RELATIVISM: VAN BEMMELEN'S SEARCH FOR HARMONY
VOLUME 58 NO 2 101	1979	58	2	101	106	Bemmelen, R.W. van		Crustal convergence or diverge in the Banda Sea region of Indonesia
VOLUME 58 NO 2 107	1979	58	2	107	116	Katili, J.A.; Hartono, H.M.S.	The undation theory launched more than half a century ago in Indonesia by Van Bemmelen had a tremendous impact on the development of earth sciences. An attempt is made to trace Van Bemmelen's scientific activities prior to the birth of the undation theory. First envisaged as a fixistic concept, the theory was later developed into a mobilistic one which accommodates continental drift and sea-floor spreading hypothesis. However, instead of accepting the theory of extensive rigid plates it utilised a rheological approach in dealing with island arcs. A geotectonic evolution of Indonesia is presented in this paper. Recent marine geophysical findings which appear to contradict the results of prior geological investigations are also discussed. Problems and present status of geoscientific research in Indonesia are also discussed such as active collision processes, mechanism of ophiolite emplacement, geometry of subducted lithosphere etc.	Van Bemmelen's contributions to the growth of geotectonics and the present state of earth-science research in Indonesia

VOLUME 58 NO 2 117	1979	58	2	117	126	Brunn, J.H.; Burolet, P.F.	It is attempted to reconsider the problem of orogeny through a review of three arcuated systems: Tyrrhenian, Aegean, and Ceram. The Tyrrhenian Sea is inherited from a sheaf of Alpine ridges and furrows located between the Corso-Sardinian block to the west and the African-Adriatic platform to the south and east. The abyssal plain represents the tearing apart of these zones following the gradual curving of the Calabro-Lucanian arc. The Aegean Arc is part of the Hellenic-Tauric ranges. Its folding and thrusting is not due to the northward movement of a 'Tethysian plate', but to an active, outward thrust over its foreland. The Aegean bulge results from the westward movement of Anatolia, being barred to the west by the eastward thrusting Calabro-Sicilian Arc. The frontal trenches rising towards the south to the so-called Mediterranean Ridge should be compared to the mollassic furrows that surround all arcuated folded ranges. The Banda Sea may correspond to a longitudinal extension similar to that of the Tyrrhenian Sea: it would be due to a compressional effect related to the north-westward movement of Australia. Transcurrent faults play an important role with two main directions, both being left-lateral: NNW or NW and E-W.	Island arcs and the origin of folded ranges
VOLUME 58 NO 2 127	1979	58	2	127	134	Ritsema, A.R.	The comprehensive list of earthquakes with focal depth > 50 km in the subduction zone of the Calabrian Arc is presented. The seismic zone dips towards the NW and strikes from SW-NE in the upper part to S-N at the deeper levels down to 490 km. The main activity occurs between depths of 220 and 350 km; relative minima are found above and below. The focal mechanisms of the earthquakes show a common feature in the position of one of the possible fault planes, and are indicative of a common stress pattern for the whole zone below 200 km. Subduction in the mantle is of the passive kind and seems to be determined by gravity only. This is not yet clear for the horizontal movements which in the first place generated the zone of subduction.	Active or passive subduction at the Calabrian arc
VOLUME 58 NO 2 135	1979	58	2	135	138	Zacher, W.	A geologically mapped and investigated transect through NE Corsica is subdivided into its main tectonic units. The zone of the 'schistes lustrés' s.s. is overlain by two ophiolite units: the upper one shows no or weak metamorphism and has an eastern origin; it has overthrust the metamorphic lower ophiolite unit and the 'schistes lustrés' zone s.s. in a westerly direction. Blueschist metamorphism is confined to the overridden 'schistes lustrés' zone, the lower ophiolite unit and small parts of the Hercynian basement.	The geological evolution of NE Corsica

VOLUME 58 NO 2 139	1979	58	2	139	144	Leonardi, P.	Some authors maintain that a good part of the carbonate assemblages of the Dolomites do not correspond to true 'reefs' in an ecological sense. In contrast, they suggest that these rocks belong to masses of lime mud that are part of the indented edge of a broad, shallow-water platform, the formation of which was only scarcely influenced by corals and other reef-building organisms. This hypothesis is probably correct for several carbonate bodies (i.e. Marmolada, Latemar) in which these organisms are either absent or rare. But this is not the case in other bodies where corals are abundant and are often found in growth position. It is clear that, in some cases at least, the carbonate bodies of the Dolomites correspond to true 'reefs', even in an ecological sense. This is true, above all, for the dolomitic reefs of post-Ladinian age (San Cassian and perhaps lower Raiblian). It has not been demonstrated that volcanic activity in the Dolomites ceased before the San Cassian period, since a lava bank in the most elevated part of Mount Sciliar (Schlern) is included in the Rosetta dolomite, which can be referred precisely to the lower Carnian (San Cassian). According to the author the Pachycardia Formation is synchronous with the upper part of the St. Cassian Formation.	Sedimentological-stratigraphic considerations regarding the Triassic 'reefs' of the dolomites (Italy)
VOLUME 58 NO 2 145	1979	58	2	145	152	Haaf, E. ten; Wamel, W.A. van	The structure of the Romagna Apennines is less simple than has been supposed. Between the Ligurid allochthon and the true autochthon of the Romagna there are several superposed thrust sheets. each with a distinctive stratigraphy. Their emplacement in the Romagnan flysch basin was a submarine and syndimentary process, driven by gravity.	Nappes of the Alta Romagna
VOLUME 58 NO 2 153	1979	58	2	153	160	Vandenberg, J.	Based on seafloor data and palaeomagnetic results, reconstructions are given for the Western Mediterranean area, for the period of 165 Myr. to 10 Myr. ago. Reconstructions for 13 episodes provide a framework that can be used to unravel the history of Alpine orogeny. Of crucial importance in these reconstructions is the Adriatic continental block, the movements of which determined to a large extent the location of Alpine foldbelts in the Western Mediterranean.	Reconstructions of the Western Mediterranean area for the Mesozoic and Tertiary timespan
VOLUME 58 NO 2 161	1979	58	2	161	174	Vandenberg, J.	A review is given of palaeomagnetic data that have become available during the last years. The accent of this review is on the palaeomagnetic results from the Italian peninsula, since most of the new data came from there. It is shown that the data from the Italian peninsula are consistent and define the movements of the Adriatic block. The Adriatic block moved together with Africa during post-Hercynian times until the Early Tertiary. In a post-Early Tertiary movement phase this block was detached from the African continent. The Tertiary rotation pole that describes this detachment is derived according to a new method for fitting apparent polar wander curves.	Paleomagnetic data from the Western Mediterranean: a review

VOLUME 58 NO 2 175	1979	58	2	175	185	Wensink, H.	For palaeomagnetic studies oriented samples were collected from several formations of different ages from various parts of Iran. Palaeomagnetic data are presented from four formations with volcanic rocks from the Central Alborz. An outline of the geology of Iran is given, and particularly that of the Alborz Mountains. The palaeomagnetic results from rocks of Late Palaeozoic age -Late Devonian to Early Carboniferous and Middle Permian- indicate that Iran, probably with West Afghanistan attached, was located at the edge of Gondwanaland not very far from Arabia's east coast. Palaeomagnetic data of Early Jurassic and Cretaceous age point to a position of Iran that practically coincides with its present location. Iran could have performed its main translation and rotation during the important tectonic phase in Middle and Late Triassic times. The Iranian block is probably bounded in the SW by the Zagros Thrust, and in the N by the Kopet Dagh-Caspian Fault.	The implications of some paleomagnetic data from Iran for its structural history
VOLUME 58 NO 2 187	1979	58	2	187	192	Zeil, W.	The Precambrian-Palaeozoic basement of the Andes consists of material from the continental crust. This basement experienced multiple and intensive orogenies and metamorphoses. The Andine tectal orogen, however, has only been slightly deformed by compression since Triassic time. The high mountain range seen at present originates from massive block-faulting since Tertiary time. Deep canyon-like depressions, filled in up to a height of 10,000 to 15,000 m, were formed concomitantly within the orogen. This geodynamic development cannot reasonably be explained by a simple model of subduction.	On the geodynamics of the Andes orogen
VOLUME 58 NO 2 193	1979	58	2	193	200	Purbo-Hadiwidjono, M.M.; Sjachrudin, M.L.; Suparka, S.	Recent investigations help elucidate the volcano-tectonic history of Mt. Maninjau, Sumatra. Three stages may be distinguished: the pre-volcanic edifice stage, the pre-caldera stage and the caldera-formation stage. During the pre-caldera stage, fissures opened in this part of Sumatra as a result of stresses, the largest presumably being vertical. In the next stage basaltic to andesitic magma ascended to the surface, building up a number of strato-volcanoes, one of which formed the N-S oriented Maninjau compound volcanic complex. The caldera-formation stage was preceded by the ejection of some 220-250 km ³ of pumiceous tuff. This was subsequently followed by the collapse of the top part of the volcano, and the radial failure of the western flank. Two eruptions of acid magma have taken place, the first yielding an unwelded and the second a welded tuff. the latter presumably ejected from the southernmost crater. Since then, obvious volcanic activity has ceased at Mt. Maninjau.	The volcano-tectonic history of the Maninjau caldera, Western Sumatra, Indonesia

VOLUME 58 NO 2 201	1979	58	2	201	208	Agterberg, F.P.	This is a brief review of alternative methods of problem-solving in geoscience. Special attention is given to applications of the theory of probability, mathematical statistics, computers and artificial intelligence. It is desirable to maintain a clear-cut distinction between reliable facts which can be stored in data banks and concepts which should be incorporated in the specifications of statistical models designed for specific purposes. Two illustrative examples deal with the probability of occurrence of mineral deposits. This probability is conditional upon the occurrences of geological features systematically quantified and processed for large regions.	Statistics applied to facts and concepts in geoscience
VOLUME 58 NO 2 209	1979	58	2	209	212	Beneš, K.	Comparative studies of the surfaces of the terrestrial planets reveal that processes of flood basalt volcanism were common to all of them, irrespective of their stages of evolution either primitive, intermediate or progressive. On the Moon manifestations of flood basalt volcanism have been recognized in basins (maria); on the planet Mars both in basins (planitiae) and in higher topographic (continental) levels. The mare-epoch of the less developed planets led to significant changes in their relief and in the crustal structure. Examples of volcanic flows from the lunar and martian surface are introduced. Some crustal uplifts on Mars can be interpreted in terms of Van Bemmelen's undations.	Flood basalt volcanism on the moon and mars
VOLUME 58 NO 2 213	1979	58	2	213	224	Hédervári, P.	In certain cases tectonic earthquakes can trigger volcanic eruptions; or outbreaks are followed by tectonic shocks within some hundred kilometres of the volcano and within some weeks or months after the beginning of the eruption. For the gradation of the cases which were analysed a space-time parameter, denoted by q , was introduced. At first altogether 47 cases are summarized in Tables I, II and III, respectively. After them almost all known eruptions of the Santorini volcano are treated. Also many eruptions of a number of Indonesian volcanoes are discussed. Finally some reasonable models are presented with the help of which one can give a rather simple geophysical explanation for the relationship in the case of both phreatic-phreatomagmatic and true magmatic eruptions. The paper is dedicated in honour of Mrs. Luus van Bemmelen and Professor Dr. Dr. h. c. Reinout Willem van Bemmelen.	The relationship between tectonic earthquakes and volcanic eruptions with particular reference to Santorini (Aegan Sea) and Indonesia
VOLUME 58 NO 2 225	1979	58	2	225	230	Rittmann, A.; Villari, L.	The use of volcanological studies in the reconstruction of geodynamic processes is discussed, pointing out that a valuable contribution only follows from a critical evaluation of all available data. Any simplistic generalization that is based on a too fragmentary knowledge of the topic under discussion, leads to completely erroneous conclusions and suggests models that hardly fit a more general geological picture. Volcanological data actually contribute to a better knowledge, if the research that aims to understand the mechanism of magma origin and ascent strictly avoids any kind of constraining dogmatic premises.	Volcanism as a tracer in geodynamic processes

VOLUME 58 NO 2 231	1979	58	2	231	240	Kröner, A.	The difference between Phanerozoic orogens and Precambrian mobile belts and granite/greenstone terrains suggests non-uniformitarian crustal evolution, probably related to changes in the asthenospheric convection system and lithospheric thickness as the earth cooled. Sea-floor spreading and modern-type plate tectonics did not operate during the Archaean and may only have begun in the upper Proterozoic as a result of increased rigidity of the crust following lithospheric thickening. Archaean and Proterozoic belts developed over primitive spreading centres where the heated lower crust was rendered ductile and reacted by laminar flow, thus leading to upper crustal grabens and deep ensialic basins. Only in rare cases did crustal rupture lead to small ocean basins. Many high-grade mobile belts were not produced during distinct orogenic periods, but represent sections of the lower continental crust which were brought to the surface through internal rotation of rigid blocks in large continents and/or through large-scale over- and underthrusting along straightening zones. Some features of the Precambrian evolution are in agreement with the undation theory, but the overall pattern seems to favour a systematic development characterized by increased rigidity and mobility of the earth's crust with time. Modern plate tectonics is the logical consequence of this evolution.	Precambrian crustal evolution in the light of plate tectonics and the undation theory.
VOLUME 58 NO 2 241	1979	58	2	241	252	Caire, A.	Large fans and sheafs of transcurrent faults, cutting off series of trenches or rifts in echelon fashion, develop in a similar orderly way in both continental and oceanic settings. They graft themselves on to the large bundles and the long faults paths of transcurrent tectogenic zones. In between these 'macro,-groves' or 'geocoulisses' lithospheric blocks or plates show a tendency to differential spiral movement and creep. Arcs and orogenic involutions develop along these macro slip zones, caused by the major transcurrent tectogenic zones. The curls and wrap-around phenomena, within the involuted, inwardly curling structures, resemble spirals, whirlpools and vortices.	Spiral geotectonics
VOLUME 58 NO 2 253	1979	58	2	253	260	Berthelsen, A.	A contorted drift sequence involving displaced pre-Quaternary and Quaternary sediments is described from the coastal cliffs of southern and eastern Møn, SE Denmark. The principles of proglacial and subglacial deformations in a permafrozen sedimentary environment are outlined, and an analysis of the structures is presented. Large-scale thrusting and stacking of permafrozen thrust slices are referred to proglacial deformations. Superimposed simple-shear deformation, recorded by large recumbent folds with boudinage structures in their stoss-side flanks and with shortened to ultimately stretched leeward flanks, is ascribed to a subglacial origin. It is stressed that the driving force for these natural small-scale models of orogenic tectonics was nothing but the force of gravity.	Recumbent folds and boudinage structures formed by subglacial shear: an example of gravity tectonics

VOLUME 58 NO 2 261	1979	58	2	261	272	Shaffer, F.R.	Ocean-spreading ridge-, basin-and-range-, graben-, young-alpine-, island-arc-, and intra-continental- geosynclinal types of terrestrial crust are indicative of 'unstable' lithosphere. Whether undergoing tensional or compressional tectogenesis, these areas have certain geological and geophysical characteristics in common. Observations and measurements include anomalously high heat flow (>1.8 HFU), shallow intermediate P-wave velocities (7.2-7.8 km/s), low Q (i.e. a high attenuation factor), attenuated S-wave velocities (<4.5 km/s), and high electrical conductivity. Most 'unstable' areas are also marked by shallow seismicity and outpourings of basaltic volcanics which testify to shallow mantle sources. The data suggest welts of raised mantle as a common denominator under all types of 'unstable' crust. Therefore, seismicity, which presently defines the plate boundaries in plate tectonic theory is only a conspicuous effect of a deeper and more fundamental global phenomenon. I propose that the concept of plate boundaries be redefined on the basis of the wider range of geological and geophysical characteristics indicative of sublithospheric perturbations.	Perturbed mantle: a unifying characteristic of plate boundaries
VOLUME 58 NO 2 273	1979	58	2	273	276	Fairbridge, R.W.	Verticalism and mobilistic philosophies in geotectonics are seen as integrally joined in modern plate tectonic theory. This theme is illustrated under two topics: lineaments and rifting (with examples from Gondwanaland); and cratonic planation-surface chronology (with an example from Western Australia).	Vertical crustal movements and the rifting of continents
VOLUME 58 NO 2 277	1979	58	2	277	288	Jong, K.A. de	Earlier tectonic interpretations indicated the presence of northward as well as southward overthrusts in the Central Bergamasc Alps. In the present study it was found that all overthrusts are southward. The extent of the overthrust sheets is much greater than previously believed. All Late Triassic and younger formations south of the Central Bergamasc Alps, previously thought to be autochthonous, have been moved a maximum of 9 km to the south. Overthrusting in the Bergamasc Alps was the result of gravity tectonics.	Overthrusts in the Central Bergamasc Alps, Italy
VOLUME 58 NO 2 277	1979	58	2	277	288	Jong, K.A. de	Large Enclosure	Overthrusts in the Central Bergamasc Alps, Italy
VOLUME 58 NO 3 289	1979	58	3	289	294	Dozy, J.J.		Obituary H.M.E. Schürmann (1891-1979)

VOLUME 58 NO 3 295	1979	58	3	295	304	Jong, S.J. de; Geirnaert, W.	The relationship between regional groundwater-flow systems and groundwater temperatures has been studied. Temperature/depth profiles were recorded in 70 observation wells. Low temperature gradients were observed in the infiltration areas. In these areas the observed temperature/depth profiles and those calculated with the theory of one-dimensional steady-state heat flow, showed significant correlation. Temperature/depth profiles in discharge areas showed lower shallow vertical temperature gradients than expected. This could be explained with a simple heat-budget equation of the regional groundwater-flow systems. In the area studied recharge of groundwater occurs at a lower temperature than discharge. Part of the geothermal conductive heat flow is used for warming up the relatively cold recharge water. This results in relatively low shallow temperature gradients in discharge areas.	The groundwater thermal regime in the Flevo polders and Gelderse Vallei (Southern IJsselmeer area, the Netherlands)
VOLUME 58 NO 3 305	1979	58	3	305	319	Schwan, J.; Loon, A.J. van	At a coastal cliff near S�nderby, SW Funen, the internal structure of a Weichselian kame terrace is well exposed. It exhibits, though in a rather deformed state, a sequence of lodgement till overlain by stratified glaciofluvial beds plus a capping of flow till. An elongated ridge, interpreted as an intraglacial crevasse-infilling, is perched right on top of the kame terrace, whereas laterally the terrace body passes into a small sandur. The kame terrace and the overlying kame ridge are interpreted to be the result of two subsequent oscillations of the Belt glacierization stage. The effect of static load diapirism is demonstrated and the presence of slump structures in a seemingly anomalous spatial attitude is explained. By combining geomorphological, sedimentological and tectonic data, the depositional and deformational history of the kame terrace and associated landforms is reconstructed.	Structural and sedimentological characteristics of a Weichselian kame terrace at S�nderby Klint, Funen, Denmark
VOLUME 58 NO 3 321	1979	58	3	321	336	Aleva, G.J.J.	The bauxite deposits and ferritic duricrusts of Suriname are arranged in four groups, based on their geology and a number of other parameters. In an appendix five examples are described in sufficient detail to illustrate the essential mutual differences and similarities. The four groups of deposits are related to the geomorphological history of Suriname, from which a genetic history for the bauxite and other duricrusts evolves. It also becomes clear that, although saprolitic weathering occurred four or five times during Tertiary and Quaternary history, in Suriname only the Late Eocene-Oligocene weathering period was of sufficient intensity to produce accumulation zones and duricrusts that could withstand later erosion, denudation and planation activities. Several of these old duricrusts are now being mined for bauxite.	Bauxitic and other duricrusts in Suriname: a review

VOLUME 58 NO 3 337	1979	58	3	337	340	Strasser-King, V.E.H.	Pleistocene sediments overlie the area around the Rokel estuary of Sierra Leone. These are part of a series of Tertiary and Quaternary sediments forming the Bullom Group. Borehole samples of the Pleistocene sediments reveal a sequence of interbedded sands and clays with horizons of lignite. Repetition of the sequence is observed and has led to the establishment of a cyclothem. It is concluded that the cyclothem results from sea-level changes in the area during the Pleistocene.	A Pleistocene cyclothem in the Rokel estuary (Sierra Leone, West Africa)
VOLUME 58 NO 3 341	1979	58	3	341	351	Olade, M.A.; Kraats, A.H. van de; Ukpong, E.E.	Pb, Cu, Zn, Mn, Fe, pH and organic matter (OM) data on 350 reconnaissance stream sediments obtained from the lead-zinc belt of Nigeria's Benue Trough around Abakaliki are examined by R-mode factor analysis, with the objective of isolating the significant factors accounting for the sample composition as derived from mineralization and environment. The orthogonal varimax solution yields a three-factor model that accounts for 72% of total data variance. Factor 1, an OM-Pb-Cu factor shows the influence of organic matter on Pb and Cu dispersion in the stream sediments. Factor 2, a Zn-Fe factor shows the chelating effect of iron oxides on Zn in an oxidizing environment. Factor 3, a pH-Mn factor is explained as depicting the effect of pH on Mn precipitation in areas with calcareous shale horizons. The results have aided in isolating effects of surficial processes on metal dispersion within a complex tropical environment. Thus in the search for polymetallic deposits in tropical terrains, the presence of organic matter and iron oxides are factors detrimental to the exploration for Pb and Zn respectively. The pH is of no importance for these two elements although it affects Mn precipitation in localized environments.	Effects of environmental parameters on metal dispersion patterns in stream sediments from the lead-zinc belt, Benue Trough, Nigeria: using factor analysis

VOLUME 58 NO 3 353	1979	58	3	353	366	Johnson, T.C.; Elkins, S.R.	Tidal currents and waves have caused some reworking and redistribution of Holocene sediments in the northern North Sea, with preferential deposition of fines in topographic depressions. This has led to a patchy distribution of sediments in terms of their textural, mineralogical and chemical composition. Nevertheless discernable relationships are found to exist between mean grain size and composition of the sediments. The relative abundance of biogenic components (primarily benthic Foraminifera) in the sand-size fraction of the sediments increases as mean grain size decreases, thus biogenic components are relatively more abundant in bathymetric lows. Coarse-grained sediments rich in detrital quartz show higher values of Si/Al than do fine-grained sediments. Smectite is concentrated in the finest-grained sediments, whereas illite is relatively more abundant in coarser deposits. Thus clay mineral segregation processes previously reported to occur near river mouths also occur in an open shelf environment. Fine-grained, smectite-rich sediments show correspondingly higher values of Fe/Al and lower values of K/Al compared to the coarser deposits enriched in illite.	Holocene deposits of the Northern North Sea: evidence for dynamic control of their mineral and chemical composition
VOLUME 58 NO 3 367	1979	58	3	367	373	Priem, H.N.A.; Andriessen, P.A.M.; Beets, D.J.; Boelrijk, N.A.I.M.; Hebeda, E.H.; Verdurmen, E.A.T.; Verschure, R.H.	K-Ar and Rb-Sr analyses were made of suites of samples from different units in the island-arc succession of the Washikemba Formation (from late Albian through Turonian/Coniacian) on western Bonaire. Whole-rock K-Ar determinations yield ages of 78 ± 2 Ma (Campanian) and 61 ± 4 Ma (Palaeocene). Both ages are younger than the time span of the magmatism and they are interpreted as reflecting two separate events of low-grade metamorphism. No conclusive ages can be calculated from the Rb-Sr data, but they seem to agree with the corresponding K-Ar ages. The initials $^{87}\text{Sr}/^{86}\text{Sr}$ ratios of two volcanic units are about 0.7039 and 0.7050, respectively, within the common range of the andesitic-dacitic associations of oceanic island arcs. Hornblendes from a tuffaceous layer indicate an age of 88 ± 2 Ma, in accordance with the biostratigraphic position (Turonian/Coniacian).	K-Ar and Rb-Sr dating in the Cretaceous island-arc succession of Bonaire, Netherlands Antilles
VOLUME 58 NO 3 375	1979	58	3	375	376	Verbeek, J.W.	Evidence is given for a much wider distribution of Early Oligocene sediments in The Netherlands than hitherto known.	Preliminary report on the distribution of the Lower Oligocene in the Netherlands
VOLUME 58 NO 3 377	1979	58	3	377	380	Kolstrup, E.	From the present July temperature demands of plant species also found as fossils in Weichselian Pleniglacial and Late-Glacial deposits in and near The Netherlands a reconstruction of the former minimum mean July temperatures is attempted and compared to a previous record. Analysis of a section near Epe suggests that there may have been a warmer interval around 14.000 years B.P. and the name of 'Epe Interstadial' is provisionally proposed for this interval in The Netherlands.	Herbs as July temperature indicators for parts of the Pleniglacial and Late-Glacial in the Netherlands

VOLUME 58 NO 3 381	1979	58	3	381	382	Woude, J.D. van der		Chronology of the perimarine fluviatile depositional phases at Molenaarsgraaf
VOLUME 58 NO 3 383	1979	58	3	383	384			Book reviews
VOLUME 58 NO 4 385	1979	58	4	385	386	Nieuwenhuis, J.D.		Preface PROCEEDINGS OF THE SYMPOSIUM ON ENGINEERING-GEOLOGICAL ASPECTS OF DELTAIC AREAS (RENESE, 1979)
VOLUME 58 NO 4 387	1979	58	4	387	396	Volker, A.	The hydrology of deltaic regions is characterized by the interaction of fluviatile and marine changes in water level, by the small gradients that may cause extensive inundations, and by the influx of saline sea water into fresh surface- and groundwater. Deltas possess a large development potential, both for agricultural and industrial purposes, provided water management and flood control is adequate. The measures taken may profoundly change the natural hydraulic environment. Several large deltas, in particular in Asia, still are in a primitive stage of hydrologic development, although they belong to the most productive and densely populated regions of the world. Hydrological water management depends on the characteristics of the river basin (variable discharge, speed of flooding) and of the ocean (astronomical tides and storm surges). Agrohydrologically, the climate in a delta region is of prime importance. Examples are provided from deltas in the temperate (Rhine), arid (Nile) and humid tropical (Ganges, Irrawaddy and Mekong) climatic zones.	Hydrology of various delta types
VOLUME 58 NO 4 397	1979	58	4	397	404	Tomlinson, M.J.	The wide variety of soil types present in deltaic deposits, the occurrence of weak compressible soils extending to considerable depths, and the unstable topography of the deltaic terrain can give rise to difficult problems in the design and construction of roadworks, airports, and the shallow foundations of buildings and engineering structures. This paper describes some of the topographic features and geotechnical characteristics of deltas, as they affect the siting, design, and construction of highways, airports and buildings. Examples are given of construction projects in each category.	Construction problems in deltaic areas: roads, airport runways and shallow foundations

VOLUME 58 NO 4 405	1979	58	4	405	416	Weele, A.F. van	A practical approach is made to analyse the stresses and deformations in the ground before, during and after installation of foundation piles of various types. This exercise leads to the following conclusions: (1) Displacement type of piles improve the stress state in the surrounding soil during installation, while non-displacement type of piles will have an adverse effect. (2) A foundation on many small diameter piles will show less deformation than an alternative foundation on a small number of large-diameter piles. When an equal deformation is aimed at, the factor of safety to be applied to the large-diameter piles, should be substantially larger. (3) Driven piles improve the stress-state in the soil around their lower ends most, but increasing pile penetration during installation deteriorate this good result progressively. (4) There seems to be room for increasing the stress [eve[around the pile section in the bearing stratum after pile installation. Such an approach would enable pile-installation techniques, which are more friendly to the pile and its environment than the techniques applied nowadays. (5) Theories for the prediction of pile capacity do not take into consideration, in a sufficient manner, the way piles are installed. (6) Pile-installation techniques do not exploit the possibilities to improve pile capacities. (7) Researchers approach the problem of pile capacities as if this is a matter of arithmetics without studying in detail what really happens with the pile and the ground. (8) The predetermination of pile capacities will require a lot more attention in the future. Using our knowledge about the geology of the underground, about the installation techniques to be applied and about the pile-shape and the pile-material needs more attention than hitherto.	Some considerations with regard to the bearing capacity of foundation piles
VOLUME 58 NO 4 417	1979	58	4	417	432	Oud, H.J.C.	Most tunnels are formed by tubes at the place where there are large traffic intersections of waterways and/or roads. Tubes are constructed at the deepest location and basin structures consisting of a floor and walls are constructed on each side. In these the road is returned to the normal level, which is either at or above ground level. Reinforced concrete is used as the building material. After completion, the road is beneath the groundwater level over practically the entire length of the works. The construction of the tube and the basin ensure that no groundwater is withdrawn from the surroundings. This is in contrast to the end phase, during the implementation of which the groundwater conditions in the tunnel surroundings are indeed affected. The cheapest building method is practically always obtained by carrying out the work in an open excavation. It is generally advisable for the civil engineer to be aware that although he may know the geological composition of his building land, he is not always in a position to complete specific projects on the basis of his own knowledge and experience. The assistance of a geologist having specific civil engineering knowledge is frequently very important so that he can help to assess a project and the steps required for its implementation.	Tunnels and excavations

VOLUME 58 NO 4 433	1979	58	4	433	448	Lubking, P	There now exists a great variety of investigation methods and measurements which can be applied in the field to derive appropriate and reliable information from the soil strata with respect to their behaviour as a foundation for civil engineering constructions. The basic principles of in situ measurements in deltaic areas and especially in The Netherlands are given and some of the most interesting and recently developed devices are described. Although every apparatus causes a certain disturbance of the soil strata, in practice the measuring results often appear to be sufficient and serviceable.	In situ soil-investigation methods for soil mechanics and foundation engineering in delta regions
VOLUME 58 NO 4 449	1979	58	4	449	458	Wakeling, T.R.M.; Jennings, R.A.J.	The Thames Barrier, now under construction, is a structure containing movable gates which will prevent extra high tides flooding London. The majority of the piers are founded in chalk and a few at the northern end of the barrier will be set in the overlying Thanet Sand. The site investigation in these strata posed problems since the samples from boreholes are only of limited quality and the strata, being mostly under water, cannot be examined in situ. The investigation was carried out by boreholes using an extensive series of standard penetration tests and borehole permeability tests, together with tube samples for visual examination and classification testing. The detailed geological structure beneath the site was inferred from a geophysical survey and from a micropalaeontological investigation and was extended by visual examination of exposures of the strata in adjacent dry land sites. The results showed that there was a series of faults in the Chalk, but their presence did not appear to affect its engineering properties.	Engineering geology and the Thames barrier project
VOLUME 58 NO 4 459	1979	58	4	459	462	Rijkswaterstaat deltdienst		The storm-surge barrier in the Oosterschelde
VOLUME 58 NO 4 463	1979	58	4	463	470	Boon, T.J.		Foundation aspects of the eastern Scheldt storm-surge barrier
VOLUME 58 NO 4 471	1979	58	4	471	476	Mulder, E.F.J. de		Engineering-geological investigations in the mouth of the Eastern Scheldt (SW Netherlands)
VOLUME 58 NO 4 477	1979	58	4	477	477	Borm, G.		Geophysical methods and monitoring
VOLUME 58 NO 4 479	1979	58	4	479	479	Elliott, T.		Modern river deltas
VOLUME 59 NO 1 1	1980	59	1	1	1	Hellemans, A.		Ter herdenking van Ir. G.J. de Vooy

VOLUME 59 NO 1 3	1980	59	1	3	24	Wijhe, D.H. van; Lutz, M.; Kaasschieter, J.P.H.	The Rotliegend in the Dutch part of the Mid-European Basin contains recoverable gas reserves of at least $2.1 \times 10^{12} \text{ m}^3$. A combination of the following favourable conditions is the cause of these prolific accumulations: (1) up to 2500 m of Late Carboniferous coal-bearing strata form excellent source rocks for gas; (2) burial of these source rocks to depths of 4000-6000 m has led to generation of methane over a wide area; (3) excellent reservoirs in aeolian and alluvial Rotliegend sandstone are present, often not adversely affected by diagenesis; (4) favourable sealing qualities are offered by Zechstein evaporites; (5) abundant structural traps occur, often formed before the main gas-generation periods.	The Rotliegend in the Netherlands and its gas accumulations
VOLUME 59 NO 1 25	1980	59	1	25	32	Dypvik, H.; Vollset, J.	In the Norwegian-Danish Basin, several minor Middle to Late Jurassic deltas (Haldager Formation) were built out from the different highs, which acted as local sediment source areas. The cores studied from well 8/3-1 most probably represent the Middle Jurassic Haldager Formation, while wire-line logs and mineralogical composition indicate that the 17/4-1 core may represent the Late Triassic/Early Jurassic Gassum Formation. The analysed sediments of wells 8/3-1 and 17/4-1 were deposited in delta-front environments, probably as distributary mouth bars. While the 17/4-1 delta had the Utsira High as a major sediment source area, the 8/3-1 delta material was mainly derived from the Sele High. The composition of the Oxfordian marginal-marine deposits of 16/9-1 indicates both the Utsira and Sele Highs as important source areas, reflecting derivation of sediments by reworking of underlying formations. The studied Oxfordian sandstones of well 16/9-1. may represent sandy equivalents to the Egersund Member of the Bream Formation.	Deltaic sedimentation during the Jurassic in the Norwegian-Danish Basin (North Sea)
VOLUME 59 NO 1 33	1980	59	1	33	42	Jüch, P.J.W.; Boekschoten, G.J.	Fossil grazing traces of molluscs are regularly encountered but have not yet been studied in detail. This paper presents data on the grazing traces produced by a periwinkle (<i>Littorina littorea</i>) and by a chiton (<i>Lepidochitona cinereus</i>) both under laboratory conditions and in the Dutch Wadden Sea. It is found that the traces are different for both species, but that the traces made by one particular species are not necessarily uniform.	Trace fossils and grazing traces produced by <i>Littorina</i> and <i>Lepidochitona</i> , Dutch Wadden Sea

VOLUME 59 NO 1 43	1980	59	1	43	48	Ryckborst, H.; Leusink, A.	Spectral decomposition of groundwater-table profiles from the extremely wet year 1965 shows that the wavelength of 1710 m is the most significant for fluctuations in Pleistocene till and aeolian coversands in The Netherlands. Consequently, the optimum well sampling distance of groundwater levels in till and coversands is 855 m, whereas the average distance in the national groundwater network (12,000 wells) is 1600 m. The distance of 855 m corresponds to half the average distance between soil classes, mapped on the 1:25,000 soil maps. The design of an optimum groundwater well network will thus benefit from 1:25,000/1:50,000 soil maps and land use maps.	Optimum well sampling distance of groundwater levels in till and coversands.
VOLUME 59 NO 1 49	1980	59	1	49	60	Vandenberg, J.	The results of a palaeomagnetic investigation of Mesozoic sediments from the Betic Cordillera, the Iberic Chain and Cantabria in general confirm earlier conclusions about the rotation of the Iberian peninsula. The start of the rotational movement could be specified as post-Barremian/Aptian. Palaeomagnetic results from the Bilbao synclinorium show that the Iberia-Europe plate boundary has to be situated south of the synclinorium. Along the coast of Cantabria near Gijon Mesozoic European-like poles have been found probably indicating a complicated fault system along which the rotational movement of the Iberian peninsula was achieved. A model for the development of the Iberia-Europe plate boundary in its final stage is presented. A magneto-stratigraphic correlation of a Santonian-Campanian section from the Betic Cordillera with the Italian 'Gubbio' section is discussed.	New palaeomagnetic data from the Iberian Peninsula
VOLUME 59 NO 1 61	1980	59	1	61	64	Drury, S.A.	Garnet-hornblende gneisses from the eclogite to high-pressure granulite facies complex of Cabo Ortegal, NW Spain, show three main geochemical characteristics: (1) low K, Rb, Th and Rb/Sr ratios, and high K/Rb ratios compared with upper crustal rocks; (2) high Ca, low Sr and Ba, low Ba/Sr ratios and high Ca/Sr ratios compared with low - to intermediate - pressure granulite facies gneisses; (3) low REE and absence of positive Eu anomalies compared with granulite-facies gneisses. These geochemical peculiarities reflect the gneisses being residues of partial melting at depths in excess of 35 km, which may have been induced by rise of hot ultramafic diapirs from the underlying mantle.	The geochemistry of high-pressure gneisses from Cabo Ortegal (NW Spain): residues of deep anatexis

VOLUME 59 NO 1 65	1980	59	1	65	77	Maccarthy, I.A.J.; Gardiner, P.R.R.	The North Ringabella section, critical to an understanding of the sub-carbonate facies changes in south Co. Cork, is redescribed. Three successive formations are detailed: the alluvial West Cork Sandstone Fm. (800+ m), the shallow-marine Coomhola Fm. (96+ m) and the fault-based Kinsale Fm. (340+ m), here a pro-delta and shallow-marine sequence. This is overlain by the calcareous Courtmacsherry Fm. The Devonian/Carboniferous boundary occurs about the base of the Kinsale Fm. Comparison with adjacent sections reveals a complex transgressive-regressive interplay. Four cycles are recognised. The first, in the Late Devonian, was affected by differential subsidence and was initially localised. The second, at the base of the Carboniferous, abruptly cut across earlier deltaic depositional patterns. Further delta growth in the Cork Harbour area was terminated by the third transgression, while the fourth marked the end of deltaic activity and the formation of a low-energy platform area around Cork Harbour upon which carbonate reefs ('Carboniferous Limestone') were subsequently developed	Facies changes in the Upper Devonian and Lower Carboniferous of South Cork, Ireland - a re-assessment
VOLUME 59 NO 1 79	1980	59	1	79	86	Shaaban, M.A.	The ground water conditions and possibilities in Sana'a Basin were analysed for the purpose of locating a suitable source of water supply, and to delineate the structural set-up of the area. Resistivity vertical electrical soundings, previously performed in the area, were interpreted to construct geoelectrical sections of the subsurface along some selected profiles. Also, some parametric resistivity and conductivity measurements were undertaken at some locations for the different rock types and waters of wells encountered in the area. Correlation between the geoelectrical results and the available geological and hydrological data was made. The study ascertained the groundwater potential in the investigated area and defined the electrical properties of its different rock types. Furthermore, a reliable source of adequate quality and quantity of groundwater was revealed, at an economic depth and distance, to the north-west of Sana'a city.	A geoelectrical study of the Sana'a groundwater basin, Yemen Arab Republic

VOLUME 59 NO 1 87	1980	59	1	87	96	Reijers, T.J.A.	In the Middle-Late Devonian Santa Lucía and Portilla Formations in the Cantabrian Mountains (NW Spain), a series of facies belts parallels the palaeo-coastline. They represent from N to S a backbarrier, barrier and fore-barrier setting. Mild sea-level changes and epeirogenetic movements governed the rate and mode of carbonate production and controlled movements of these facies belts basinwards and marginwards. Carbonate masses in which such sedimentary movements are reflected can be correctly mapped regionally only if the interval is subdivided into units, each representing one movement. On a more local scale, carbonate masses reflect the same sedimentary mechanisms in the internal organization of carbonate build-ups.	Sedimentary mechanism in Spanish Devonian Carbonates
VOLUME 59 NO 2 97	1980	59	2	97	111	Winkelmolen, A.M.; Veenstra, H.J.	After a severe storm part of the sample localities have been resampled in the shallow off-shore (to about 20 m) and the beach of an area, which was previously surveyed under quiet conditions. It appeared that in the shallow off-shore: (1) the depth had not changed much, (2) half of the samples were finer after the storm, some were coarser and some had not changed much, (3) the garnet percentages as well as the mica concentrations had both decreased after the storm, (4) the post-storm sands were considerably less rollable than before and the Shape Distribution Character had changed into an upsloping type, which is characteristic for receiving deposits. The observed features are explained by erosion of the shallow sea floor with transport by undertow towards deeper water. Subsequently, deposition took place of finer material that had been eroded in the tidal flat area and taken out in front of the coast by the first post-storm ebb tide. This material was reworked and spread out later on, loosing its mica and part of the fines by winnowing. Since most of the depositional processes were due to capacitive overloading rather than to competency, the grain 'size' largely failed as a diagnostic criterion and the conclusions reached in this paper are mainly based on grain-shape and density differences.	The effect of a storm surge on near-shore sediments in Ameland-Schiermonnikoog area (N. Netherlands)

VOLUME 59 NO 2 113	1980	59	2	113	120	Meene, E.A. van de	A fossil aeolian landscape of 15 km ² has been investigated with help of drillings and study of exposures. The sands show a gently undulating surface and an average thickness between 0.8 and 1.8 m. In one place they have a low dune morphology. The sands are underlain by Late Weichselian floodplain deposits and overlain by Holocene floodplain deposits. Pollenanalytical dating limits the time of deposition to the interval Late Dryas Stadial/Atlantcum. As it is presumed that in this environment strong aeolian action is possible under periglacial circumstances only, the time of deposition must be restricted to the Late Dryas Stadial. Stratigraphically the deposit represents an aeolian phase in the predominantly fluvial Kreftenheye Formation. It is closely associated with the Late Glacial river-dune deposits that are present along the major rivers in The Netherlands.	Geology and geomorphology of a fossil aeolian landscape in the Liemers (Eastern Netherlands)
VOLUME 59 NO 2 121	1980	59	2	121	128	Ryckborst, H.	A meandering river, upon preliminary inspection, looks like a very inefficient system, in need of serious correction. That the contrary is the case is shown by geomorphological changes which occur when sets of river meanders are cut off and replaced by straight or curved channel sections. Subsequent to the meander cutting, the potentially available energy per metre of channel increases dramatically and the water velocity increases. The excess energy causes erosion of bed and banks, while eroded material is deposited in the downstream channel. Before equilibrium can be reached again, a river bed must incise deeply for considerable distance upstream. Thereupon the river will start to make a new set of meanders not unlike the old meander pattern. The one-dimensional open-channel flow equation, when applied to river erosion (triggered by meander cutting), shows that the 'half life' of such man-made disturbances ranges from hundreds to a thousand years. Consequently, man-made interference with natural rivers represents a costly capital operation, which requires a long term (50-100 years) commitment for up-keep, improvement and replacement, if not in the short run, then in the long run (next 500 years).	Geomorphological changes after river-meander surgery
VOLUME 59 NO 2 129	1980	59	2	129	138	Schwan, J.; Loon, A.J. van; Gaauw, P.G. van der; Steenbeek, R.	Weichselian deposits have been investigated in a high kamiform hill of the Vissenbjerg dead-ice landscape. The sediments were formed by the gradual infilling of an intraglacial lake underlain by a basal till. Normal deposition by a prograding delta was interrupted by the catastrophic bursting of a supraglacial lake, resulting in a boulder bed. Various facies can be distinguished, though vertical and lateral relationships often are obscured by diapiric activity of a subjacent clay. The meaning of the terms 'supraglacial' and 'intraglacial' (often used in a confusing way) is shortly discussed	The sedimentary sequence of a Weichselian intraglacial lake at Ormezhøj (Funen, Denmark)

VOLUME 59 NO 2 139	1980	59	2	139	144	Theakstone, W.H.	Micro-ripples (wavelength 0.5-2.0 cm, amplitude less than 0.2 cm) form on silt-dominated beds at the margins of ephemeral stream channels in reworked glacial lake sediments as a result of unidirectional currents, oscillatory flow or both. Pulsation of flow and the presence of bed irregularities much larger than the dominant particle size result in local stress concentration, and micro-ripples may form even though the mean stress is below the theoretical threshold for the grain sizes involved. Grain shape and composition may be partly responsible for differentiation of crest and trough material. X-ray diffraction studies have confirmed that samples of sediments from micro-ripple troughs and crests at one site differ in mineralogical composition, and differences of grain size and shape are confirmed by scanning electron microscope investigations.	Micro-ripples on silt-dominated beds: observations at the glacier Austerdalsisen, Norway
VOLUME 59 NO 2 145	1980	59	2	145	153	Summerfield, M.A.; Whalley, W.B.	The petrography of sarsens (Cenozoic silcretes), which occur extensively as scattered surface deposits over southern England, is investigated through thin-section observations and scanning electron microscopy. Attention is focused on the general characteristics of the various types of sarsen fabric (GS-(grain-supported), F-(floating) and C-(conglomeratic)), and on the nature of quartz-overgrowth development. Evidence for possible host materials is considered and some provisional conclusions are drawn about the diagenesis of these sediments and the environment in which they formed.	Petrographic investigation of sarsens (Cenozoic silcretes) from southern England

VOLUME 59 NO 2 155	1980	59	2	155	168	Garcia-Hernandez, M.; Lopez-Garrido, A.C.; Rivas, P.; Sanz de Galdeano, C.; Vera, J.A.	The main events characterizing the Mesozoic palaeogeographic evolution of the External Zones of the Betic Cordillera are outlined. The Triassic sediments show a 'germanic' type facies over the entire region. ending with Late Triassic evaporites and variegated clays of Keuper facies. At the beginning of the Jurassic a transgression takes place, and a broad shallow-marine carbonate-platform environment appears. During the Carixian (180 Ma) the carbonate platform breaks down leading to the differentiation of two large palaeogeographic units: the Prebetic Zone where shallow-water environments prevailed throughout the Mesozoic, and the Subbetic Zone where the sediments are clearly pelagic. Within the Prebetic Zone, two palaeogeographic realms are differentiated: the External Prebetic showing important stratigraphic gaps in the Jurassic and Early Cretaceous sequence, and the Internal Prebetic with a thicker and more continuous stratigraphic sequence. Between the Prebetic and Subbetic Zones, a palaeogeographic realm is distinguished (Intermediate units) where turbiditic and pelagic materials were deposited. This zone corresponds approximately to a slope environment during most of Mesozoic times. In the Subbetic Zone a marked differential subsidence occurs during the Jurassic, leading to trough (Median Subbetic) and swells (External and Internal Subbetic). In the Median Subbetic, the deposits consist mainly of marls, pelagic limestones, radiolarites and calcareous turbidites, with mafic volcanic and subvolcanic rocks. During the Cretaceous pelagic marls and marly limestones were laid down. Mesozoic sedimentation took place along the southern margin of the European plate, in an Atlantic-type continental margin underlain by	Mesozoic palaeogeographic evolution of the External Zones of the Betic Cordillera
VOLUME 59 NO 2 169	1980	59	2	169	170	Schuiling, R.D.		Lithophile, calcophile, siderophile: can these terms be quantified
VOLUME 59 NO 2 171	1980	59	2	171	173	Priem, H.N.A.; Roever, E.W.F. de; Bosma, W.		A note on the age of the Paramaka metavolcanics in northeastern Suriname
VOLUME 59 NO 2 175	1980	59	2	175	178	Rondeel, H.E.		Ingredients for a first degree geological education
VOLUME 59 NO 2 179	1980	59	2	179	180	Jansen, J.H.F.	When studying superficial sediment samples of the North Sea, one should discriminate between areas with different oceanographic and sedimentary history. The demonstrated relationships between the chemical compositions and the grain-size distributions of the samples are not the same for the distinguished deposits. The variations are therefore not the result of one single hydrodynamic regime acting throughout the North Sea, but point to differences in source material. In the north-central North Sea the grain-size distributions, and consequently also the associated chemical parameters, reflect the succession from Weichselian arctic to Holocene temperate marine conditions. The abundance of planktonic Foraminifera is also due to the postglacial evolution. The ratios of illite to smectite suggest a change in source area of the clays.	Holocene deposits in the northern North Sea: evidence for dynamic control of their mineral and chemical composition? -a comment-
VOLUME 59 NO 2 181	1980	59	2	181	181	Johnson, T.C.; Elkins, S.R.		Holocene deposits in the northern North Sea: evidence for dynamic control of their mineral and chemical composition -Reply-

VOLUME 59 NO 2 183	1980	59	2	183	186	Schuilig, R.D.		In Memoriam, W. Nieuwenkamp (1903-1979)
VOLUME 59 NO 2 187	1980	59	2	187	192			Boekbesprekingen
VOLUME 59 NO 3 193	1980	59	3	193	213	Ryckborst, H.	About 5% of the giant tar sand deposits along the Athabasca River in Western Canada can presently be mined by open-pit mining methods. Under certain conditions, groundwater depressions are created by continuous pumping to keep the tar sand mines dry. Groundwater depressions for plateau-type mines are expected to expand beyond an area of 150 km ² after ten years. The volumes of groundwater flowing into a plateau-type open mine may range from 17,000-400,000 m ³ /day, depending on type of mining methods and the presence of water-tight clays. The Cretaceous tar sands are separated from underlying rock salt by a karstified Devonian limestone. Some of the groundwater flowing into an open mine consists therefore of saline waters and brines. Modern, but as yet unproven dredging methods may offer an economic alternative to 'dry' open-pit mining methods.	Geohydrology and geotechnical aspects of dewatering of open tar sand mines along the Athabasca River (Canada)
VOLUME 59 NO 3 215	1980	59	3	215	224	Houbolt, J.J.H.C.; Wells, P.R.A.	Based on published data, it is assumed that the ratio of sound velocity to thermal conductivity exhibits a linear relationship with formation temperature for most sedimentary rocks. Combination of this assumption with Fourier's heat-flow law yields $q^* = \ln(T_L + c/T_U + c) \cdot (1/A(t_L - t_U))$ where T_L and T_U are the subsurface temperatures at the top and the bottom of an interval, respectively, t_L and t_U the sound travel times, and q^* is the heat flow. This relation has been tested in the case of 10 wells, for which accurate data were available. The relation generated very satisfactory fits with the measured data for siliciclastic and carbonate rocks. The parameters a and c take respective values of 1.039 and 80.031; heat flow (q^*) is expressed relative to the heat flow in the standard well Bolderij-1 in the Groningen gasfield (Bolderij Unit, BU). A method for estimating the relative heat flow from bottom-hole temperatures as observed during logging operations, and sound-travel times from well-shoot in combination with sonic-log data, has been developed and tested in the Viking and Central grabens of the UK sector of the North Sea. In this region the mean relative heat flow using data from 120 wells is 0.601 BU, with a standard deviation of 0.055 BU. Comparisons of calculated relative heat-flow values in BU, with heat-flow values in SI-Units conventionally obtained suggests that the Bolderij unit is equivalent to about 77 mWm ⁻² .	Estimation of heat flow in oil wells based on a relation between heat conductivity and sound velocity

VOLUME 59 NO 3 225	1980	59	3	225	231	Wassmann, T.H.	A method for forecasting the vertical and horizontal movements of points at the surface caused by saltmining subsidence has been developed for the special case of the Hengelo field. All possible data of a first case of caving-in of cavities created by the solution mining of salt were collected and studied. A theory was set up to explain two striking differences from other subsiding areas, i.e. the duration in time of the subsidence and the small area influenced at the surface in relation to the depth of the cavity mined out. Special attention is paid to the behaviour of the Triassic claystone formation ('Red Beds') above the salt layer. In 1973 this theory was used to predict the rate of subsidence of a second case over a 10 year period. This second area of subsidence was situated just under a new brine purification and vacuum plant. For each part of the installation within this area the movement with time was calculated. With these figures it was possible to arrange a long-term planning for preventive maintenance and by doing so to keep the complete plant operating.	Mining subsidence in Twente, East Netherlands
VOLUME 59 NO 3 233	1980	59	3	233	240	Wartel, S.	The subbottom stratigraphy of the Schelde estuary near Antwerpen was studied using an O.R.E. subbottom profiler. The estuary valley is incised in Tertiary and Quaternary deposits, still eroded at several places. In the Boom Clay (Oligocene) uparching and diapirs occur. They result from an unloading of the clay after one or more erosion periods. The top of the Boom Clay consists of an undulating erosion surface, dipping roughly NNE and covered unconformably by Miocene (Edegem Sands) and Pliocene (Kattendijk Sands) deposits. The contact between Miocene and Pliocene has not been observed. The lowermost Quaternary deposit consists of a gravel and shell layer irregular in thickness and unconformable with the older deposits. The recent sediment cover, where present, is less than 1m thick.	The Tertiary and Quaternary subbottom of the Schelde estuary near Antwerpen (Belgium)
VOLUME 59 NO 3 241	1980	59	3	241	250	Schwan, J.; Loon, A.J. van; Steenbeek, R.; Gaauw, P. van der	A kamiform hill in the Vissenbjerg dead-ice landscape consists of a basal till, overlain by various glaciolacustrine sediments. Within these sediments diapiric phenomena can be observed; the source is a clay layer, probably occurring just beneath the lodgement till. Pressure gradients between the intraglacial lake and the surrounding dead-ice blocks induced diapiric strain in the clay. Both intrusive behaviour and subaqueous (partly possibly subaerial) extrusive spreading were the result. Deformational structures, caused by this plastic flow, are described, depicted and interpreted.	Intraformational clay diapirism and extrusion in Weichselian sediments at Ormehøj (Funen, Denmark)

VOLUME 59 NO 3 251	1980	59	3	251	272	Brodzikowski, K.; Loon, A.J. van	Three quarries near the village of Wlostów show a sequence of 16 m of glaciolimnic deposits, dating from the Odra (= Drenthe) and Warta stadials of the Saalian glaciation. Eighteen units can be distinguished, many of them with deformational structures: diapiric folding, breccias, load casts, fault structures and cryogenic disturbances. An analysis of the deformations shows that some of them must be considered to be syn- or metasedimentary; others are formed by early diagenetic processes. The sediments are also deformed in a postsedimentary stage, viz. by cryogenic and diapiric (glacitectonic) activity. The nature of these deformations is explained and examples are depicted. A scheme with spatial and genetic relationships between the various sediments in a glacial environment is presented, in order to facilitate the environmental interpretation of the eighteen units exposed.	Sedimentary deformations in Saalian Glaciolimnic deposits near Wlostów (Żary area, Western Poland)
VOLUME 59 NO 3 273	1980	59	3	273	281	Barr, S.M.; Areias, L.	Granitic intrusions in the Viana do Castelo map-area in northern Portugal are part of the Hercynian plutonic belt of the Iberian peninsula. They consist predominantly of muscovite-biotite granite of varied textures with minor granodiorite and quartz monzonite. Chemically they exhibit typical calcalkalic differentiation trends and appear to represent a co-magmatic suite. They are peraluminous and show typical characteristics of S-type granites. An age of 316 ± 4 Ma was obtained from a Rb-Sr whole-rock isochron.	petrology and geochemistry of granitic intrusions in the Viana do Castelo area, northern Portugal
VOLUME 59 NO 3 283	1980	59	3	283	285			Book reviews
VOLUME 59 NO 4 289	1980	59	4	289	299	Gruppig, A.W.; Pieterse, R.	In deep underground coal gasification the all-important parameter is the volume of coal that can be gasified between two boreholes. This volume depends to a large extent on the maximum attainable linking distance. Spectacular advances in recent years in deviated drilling techniques suggest that the linking of deep boreholes can more easily be achieved by drilling than by conventional methods such as fracturing. Gasification methods could then be developed in dipping coal seams in which the combustion front is, from time to time, driven updip by backward filling of the cavity with a filler such as sand. The results of filling tests in a scaled model are described. It is shown that dipping underground cavities can be completely filled by a process of sedimentation, with the exception of an updip channel along the coal face. Through this channel combustion can be re-initiated after removing the excess water with high-pressure gas. In this way a number of roughly parallel strips of coal could be gasified between two boreholes; serious subsidence at the surface would then be avoided. The tests also show that localized caving-in of the roof of the cavity does not seriously disturb the filling process or the development of the updip channel.	Underground gasification of coal: The filling of dipping underground cavities

VOLUME 59 NO 4 301	1980	59	4	301	312	Bos, C.F.M.	This paper covers the evolution of government revenues per barrel of exported crude oil in the OPEC countries as from 1973, when the first oil crisis triggered a radical change in the power balance between oil companies and oil-importing countries on the one hand, and oil-exporting countries on the other hand, through 1979. The background of price-increasing decisions is given in the light of common and clashing interests within OPEC and the mutual dependence of oil-importing and -exporting countries. In figures the government revenues per barrel of exported crude, volumes of exported crude, and total government revenues are given for four representative OPEC countries (Saudi Arabia, Libya, Venezuela and Indonesia) and for the total OPEC, both in current and in constant 1973 dollars. Furthermore, an overall picture of oil prices, pricing systems and government revenues is presented	Oil-pricing policy and government revenues per barrel of exports in the OPEC countries (1973-1979)
VOLUME 59 NO 4 313	1980	59	4	313	325	Velzeboer, P.T.		The future of Dutch coal: possibilities and impossibilities, a personal view
VOLUME 59 NO 4 327	1980	59	4	327	331	Daams, R.; Weerd, A. van de	An association consisting of <i>Muscardinus</i> sp., <i>Kowalskia</i> sp., <i>Apodemus</i> aff. <i>dominans</i> , Petauristinae gen. et sp. indet. (Rodentia) and <i>Prolagus ct. michauxi</i> (Lagomorpha) is described. The faunule is of Early Pliocene age and points to a forest biotope. The small but diverse faunule suggests that Karpathos was connected to Anatolia during the Early Pliocene.	Early Pliocene small mammals from the Aegean islands of Karpathos (Greece) and their Palaeogeographic significance
VOLUME 59 NO 4 333	1980	59	4	333	341	Tuuk, L.A. van der	Upper Maastrichtian rhyncholites (cephalopod mandibles) from the province of Limburg, The Netherlands, were described by Binckhorst as early as 1861. Recently discovered material makes a revision possible. A survey is given of the available material, which was identified as <i>Rhyncholites minimus</i> Binckhorst, from the Late Cretaceous deposits of various localities of the Maastrichtian type area.	Note on some Late Maastrichtian rhyncholites from Limburg, the Netherlands
VOLUME 59 NO 4 343	1980	59	4	343	351	Plassche, O. van de	Published time-depth data from peat-covered slopes of early Holocene river dunes in the Rhine-Meuse delta are reviewed in the light of a new sea-level graph by Jelgersma. It is argued that the irregular convergence of the river-dune data on this curve with time can be explained in terms of a gradually decreasing gradient of the (tidal) rivers and a variable reduction - both in time and space - of the tidal range behind the coastline. A curve is constructed for the Brandwijk-Hazendonk area and shows the decrease of the raising effect of the river gradient on the local mean high-water level or groundwater level with time. For each time-depth point from the Brandwijk-Hazendonk area this gradient-effect reduction curve allows an estimate of the extent to which the decrease in tidal amplitude behind the coastline has compensated the gradient effect.	Holocene water level changes in the Rhine-Meuse delta as a function of changes in relative sea level, local tidal range, and river gradient

VOLUME 59 NO 4 353	1980	59	4	353	362	Gans, W. de	An outline is given of the geomorphology and Late Quaternary history of the Drentsche Aa valley. The valley sediments are subdivided in fluvial, slope and aeolian sediments on lithological arguments. The vertical succession of the river valley sediments demonstrates a decreasing fluvial activity during the Weichselian. Tentatively four erosion phases are distinguished in the valley system	Outlines of the Late Quaternary history of the Drentsche AA valley (Drente, the Netherlands)
VOLUME 59 NO 4 363	1980	59	4	363	374	Akkerman, J.H.; Maier, G.; Simon, O.J.	The Alpujarride complex in the western sierra de las Estancias comprises a pelite-psammite Sequence and an overlying carbonate sequence. A Ladinian to Late Triassic age seems most likely for the carbonate sequence, while a Middle Triassic and possibly older age is inferred for the remaining part of the section. The tectono-metamorphic evolution took place during the Alpine orogeny. No indications have been found for pre-Alpine metamorphism and deformation. The rock sequences have been affected by plurifacial metamorphism during three metamorphic events! The first event (M1) involved an increase in temperature under low to intermediate pressure, resulting in a prograde metamorphism up to amphibolite facies. M1 seems related to the intrusion of hot ultramafic masses. This event was followed by retrograde metamorphism (M2). Renewed increase of temperature, without a change of the existing low-pressure conditions, locally caused a third metamorphic event (M3). The plurifacial metamorphism was accompanied by polyphase deformation. The first phase (D1) resulted in mainly isoclinal, similar folds. During the second phase (D2) important translations gave rise to the superposition of at least three major overthrust masses. Associated folds have a vergence to the north, indicating a northerly direction of transport. Subsequently the rock sequences have been deformed into S to SE vergent folds, N to NW dipping reverse faults, E-W trending subvertical faults and into NNW trending wrench faults.	On the geology of the Alpujarride complex in the Western Sierra de las Estancias (Betic Cordilleras, SE Spain)
VOLUME 59 NO 4 375	1980	59	4	375	383	Kloos, D.P.	The exclusively epiphytic and sedentary living foraminifer <i>Sorites orbiculus</i> (FORSKÅL) has been found in several lagoons and bays on Curaçao (Netherlands Antilles). Only megalospheric specimens were found. Living <i>S. orbiculus</i> , attached to their favourite substratum, the marine phanerogam <i>Thalassia</i> , were kept in aquaria for three weeks. Positive phototaxis was observed. Symbiotic algae colour the protoplasm and show its irregular distribution within the test; they also provide a criterion for recognition of living specimens. Most <i>S. orbiculus</i> specimens are enveloped in a pellicle and are encircled by a rim of sediment which is probably a feeding-cyst; both are left behind when the specimen moves away.	Studies on the foraminifer <i>Sorites orbiculus</i>

VOLUME 59 NO 4 385	1980	59	4	385	396	Orsini, J.B.; Coulon, C.; Cocozza, T.	Drifting in a southeastern direction of Corsica and Sardinia was the major feature during the recent evolution of the northwestern Mediterranean basin. The reality of this phenomenon is demonstrated by geological and geophysical data. Furthermore, values of palaeomagnetic declinations, ocean continent limits and linear geological markers, lead to a reconstruction of the pre-drifting Cenozoic position of the two islands with respect to the European margin. Finally, the age and kinetic system of drifting are defined with the help of the significance, age and palaeomagnetic characteristics of calc-alkaline Cenozoic volcanism of Sardinia.	Dérive Cénozoïque de la Corse et de la Sardaigne et ses marqueurs géologiques
VOLUME 59 NO 4 397	1980	59	4	397	403	Burgers, W.F.J.	The growing interest for engineering-geological maps in The Netherlands has led in recent years to a search for possible sources of engineering-geological information. The object of this paper is to show where the necessary information for the construction of this type of maps is available. The data in this paper were obtained through interviews and by means of an inquiry. The results indicate that the large governmental and semi-official organisations and the geotechnical bureaus are the principal sources of engineering-geological information in The Netherlands.	Sources of information for the preparation of engineering-geological maps in the Netherlands
VOLUME 59 NO 4 405	1980	59	4	405	408	Veen, P.M. van; Zwan, C.J. van der	From the Green Sandstone Formation (Devonian), outcropping in the McGillicuddy's Reeks (Co. Kerry, Ireland), a palynological assemblage is recorded, indicating a late Givetian-early Frasnian age. The importance of this assemblage with regard to the establishment of a realistic chronostratigraphical framework for the Devonian of Southwest Ireland is briefly discussed	Palynological evidence concerning the Middle/Late Devonian age of the Green Sandstone Formation, McGillicuddy's Reeks, Southwest Ireland
VOLUME 59 NO 4 409	1980	59	4	409	410	Meys, E.P.M.		A short note on the presence of the elville-tuff layer in the surroundings of Maastricht
VOLUME 59 NO 4 411	1980	59	4	411	413			Book reviews
VOLUME 60 NO 1 1	1981	60	1	1	2	Zwart, H.J.; Dornsiepen, U.F.		Preface Special Issue The Variscan Orogeny in Europe

VOLUME 60 NO 1 3	1981	60	1	3	5	Savage, J.F.	The Variscan Orogen in this central part of northern Spain is made up of a practically unmetamorphosed sedimentary succession detached from the underlying crust. The kinematics of the suprastructural elements had an essentially centripetal pattern which, moving separately, formed the Knee of Asturias. It is postulated that gravity powered the formation of these structures in their present general form. The crust is considered to have been most likely cratonised during the whole of the Phanerozoic over most or the whole of the region. This craton must have been fractured into blocks capable of limited relative movements, both vertical and horizontal. Crustal events leading to the deformation were probably much more intense outside the limits of the orogen considered; for example the Hesperian Massif along the western edge of the Iberian Peninsula. The reconstructions made rule out the possibility of a subsurface connection between the Variscan infrastructures of the Hesperian and Pyrenean orogenes.	Geotectonic cross sections through the Cantabrian Mountains, Northern Spain
VOLUME 60 NO 1 3	1981	60	1	3	5	Savage, J.F.	Large Enclosure 1	Geotectonic cross sections through the Cantabrian Mountains, Northern Spain
VOLUME 60 NO 1 3	1981	60	1	3	5	Savage, J.F.	Large Enclosure 2	Geotectonic cross sections through the Cantabrian Mountains, Northern Spain
VOLUME 60 NO 1 3	1981	60	1	3	5	Savage, J.F.	Large Enclosure 3	Geotectonic cross sections through the Cantabrian Mountains, Northern Spain
VOLUME 60 NO 1 7	1981	60	1	7	16	Jantsky, B.	Five pre-permian megatectonic units can be distinguished in Hungary: a high-grade Precambrian crystalline complex, two Variscan greenschist-facies complexes, the amphibolite-facies complex of the Sopron massif,-and the unmetamorphosed Palaeozoic. These five units are described. The Variscan orogeny has reactivated the older basement, which forms part of a number of median massifs. These can be traced towards Greece and Turkey.	Geological characterization of the Variscan and Pre-Variscan in Hungary

VOLUME 60 NO 1 17	1981	60	1	17	31	Perekalina, T.V.	The type of volcanism in Central and Western Europe clearly reflects the tectonic conditions of the time of its manifestation. Two main types of Variscan volcanism can be distinguished: (1) spilitokeratophyre (pre-orogenic); and (2) postorogenic calc-alkaline. The spilito-keratophyre associations are widespread in space and time and form belts related to regional faults, intraplate rifts and grabens. This reflects a tectonic regime of tension. Spilito-keratophyre sequences are connected with the initial stages of the individualisation of new basins (Devonian, Carboniferous). They can appear several times in one region. It seems possible that the spilitic belts mark the boundaries of small plates or blocks. The source of magma was the upper mantle. The tectonic conditions during the time of eruption of postorogenic volcanics is quite different. They are characterised by folding, vertical movements, compression and anatexis melting in the sialic crust. Two associations can be distinguished: (1) a late-orogenic one of monotonous acid (rhyolites, dacite) composition, forming magmatic structures of the central type related to cauldron subsidence; and 2) a postorogenic or final one of bimodal composition on (trachybasalts- rhyolites) marking the beginning of a new period of tension related to the uplift of the region.	Variscan volcanism of Central and Western Europe
VOLUME 60 NO 1 17	1981	60	1	17	31	Perekalina, T.V.	Large Enclosure 1	Variscan volcanism of Central and Western Europe
VOLUME 60 NO 1 17	1981	60	1	17	31	Perekalina, T.V.	Large Enclosure 2	Variscan volcanism of Central and Western Europe
VOLUME 60 NO 1 33	1981	60	1	33	40	Tex, E. den	A section across the axial zone of the northern Hesperian massif in Galicia is presented. It is extrapolated to a depth of 5 km on the basis of gravity data obtained over key areas near Mellid and Santiago de Compostela. Several lithotectonic units are distinguished in this part of the massif. Lower Palaeozoic supracrustals, closely associated with late Palaeozoic migmatites, granitic and metamorphic rocks constitute the regional tectonic framework. Infracrustal rock complexes occur in subcircular to elongate outcrops. Those representing the higher basement levels are of mesozonal metamorphic grade and contain abundant amphibolites and calcalkaline as well as peralkaline granite gneisses. Others, representing the lower basement levels, are predominantly catazonal and have prominent constituents of the continental upper mantle. Some of the latter are associated with dismembered metaophiolites of Palaeozoic age. For the evolution of the northern Hesperian Massif a mantle-plume/rift-system model is preferred. An outline of this model is provided.	A geological section across the Hesperian Massif in Western and central Galicia.
VOLUME 60 NO 1 33	1981	60	1	33	40	Tex, E. den	Large Enclosure	A geological section across the Hesperian Massif in Western and central Galicia.

VOLUME 60 NO 1 41	1981	60	1	41	44	Ribeiro, A.	A geotraverse through the Variscan Fold Belt in Portugal is described. The main geometric and chronologic features of the different deformation phases are drawn for each palaeogeographic and tectonic zone (Middle Galician - Trás-os-Montes Subzone; Centro-Iberian, Ossa-Morena and South Portuguese Zones). The problem of the tectonic position of the Bragança and Morais Massifs is referred to. The pattern of vergences and the mechanical origin of the Ibero-Armorican arc are briefly discussed.	A geotraverse through the Variscan Fold Belt in Portugal
VOLUME 60 NO 1 41	1981	60	1	41	44	Ribeiro, A.	Large Enclosures	A geotraverse through the Variscan Fold Belt in Portugal
VOLUME 60 NO 1 45	1981	60	1	45	48	Geukens, F.	Two profiles through the Belgian Ardennes are described and depicted. The Cambrian to Silurian rocks, folded during the Caledonian orogeny, show a weak metamorphism. The cover, consisting of Devonian and Carboniferous, thickens towards the south and is thrown into a number of major folds during the Variscan orogeny. This was accompanied by a second stage of low-grade metamorphism.	Cross-sections through the Belgian Variscan Massif
VOLUME 60 NO 1 45	1981	60	1	45	48	Geukens, F.	Large enclosure 1	Cross-sections through the Belgian Variscan Massif
VOLUME 60 NO 1 45	1981	60	1	45	48	Geukens, F.	Large enclosure 2	Cross-sections through the Belgian Variscan Massif
VOLUME 60 NO 1 49	1981	60	1	49	66	Naylor, D.; Sevastopulo, G.D.; Sleeman, A.G.; Reilly, T.A.	The major geological features of Ireland south of Latitude 52°30' are described. Palaeofacies and isopachyte maps, combined with stratigraphic cross-sections, are used to trace the Late Palaeozoic development of the region. A thick red-bed sequence of Middle-Late Devonian age accumulated within an east-west trough, the Munster Basin, which was fault-controlled at its northern margin. The northward marine incursion across the region in late Devonian - early Carboniferous times is described. South of the Cork-Kenmare line (in the South Munster Basin) the dominantly Cork Beds sequence was developed and reflected a gradually deepening marine facies through Early Carboniferous time. Isopachyte data show the influence of an important intra-basinal positive element, the Glandre High, which effectively separated east and west depositional sub-basins. North of the Cork-Kenmare line the shelf area was dominated by carbonate deposition until the end of Early Carboniferous time. Turbidite deposition was a feature of Namurian deposition across the region, whilst evidence of the Westphalian is limited to the coal-bearing measures of Westphalian A in the small Kanturk Coalfield. The considerable control of structural styles exercised by bulk lithologies is demonstrated with the aid of structural cross-sections. Basement controls on both structural style and sedimentation are discussed, with particular reference to the Glandore High and the northern margin of the Munster Basin. Finally, the concept of a clearly-defined northern thrust front to the Variscan fold belt is examined and the conclusion reached that the supposed 'front' is better considered as a complex zone within which the northward diminution of tectonic intensity is affected by	The Variscan fold belt in Ireland

VOLUME 60 NO 1 67	1981	60	1	67	80	Raumer, J.F. von	Relics of the pre-Permian history are preserved in the five crystalline basement complexes of the External or Helvetic realm. Their evolution can be compared with the Variscan regional evolution in Central Europe. Precambrian to Palaeozoic sediments interlayered with acid and basic magmatic rocks suffered an early regional anatexis with contemporaneous formation of granitoid rocks. This event (5-6 kb/700 °C) supposed to be at least of Caledonian age is followed by the formation of blastomylonite zones probably contemporaneous to large scale B ₃ -folds. A second regional anatexis (of probably early Variscan age, 650-700 °C/4 kb) is characterized by the regional occurrence of cordierite-bearing granitoids, accompanied or followed by a regional growth of biotite and plagioclase. The later history is dominated by the intrusion of distinct granite bodies. Although Variscan events are of importance for the structural evolution, the main metamorphic history is of pre-Variscan age. No considerable break could be seen in the rather continuous history of evolution from Caledonian until Variscan time.	Variscan events in the Alpine region
VOLUME 60 NO 1 81	1981	60	1	81	88	Hancock, P.L.; Dunne, W.M.; Tringham, M.E.	Palaeozoic rocks in the Variscan domain of SW Dyfed, Wales, were deformed under anchimetamorphic conditions during the late Carboniferous. Within the Pembrokeshire Coalfield a 1 km wide zone of conjugate folds and thrusts, external to the northern limit of slaty cleavage, is used to define the Variscan orogenic front. South of the front there is a progressive increase in the average amplitude of macrofolds across three further structural zones. Folding about a WNW axial trend was single phase except within a few narrow belts of refolded folds. Wrench and normal faults which developed during and after folding resulted in the axial elongation and clockwise rotation of the region. Structures in the paratectonic Caledonides controlled the locations of four WSW trending Disturbance Belts of Variscan age to the north of the front. In the Druidston Haven Horst, the westernmost of these Disturbances, Caledonian folds and cleavage were refolded approximately coaxially during the Variscan. The Variscan fold belt is cut by several, laterally impersistent, major strike faults which cannot be regarded as separating allochthonous blocks. Although displacements were dominantly reverse or normal the evolution of the faults during folding probably involved some scissor motion. On the Johnston Thrust northward overthrusting was followed by dextral strikeslip.	Variscan structures in Southwest Wales.
VOLUME 60 NO 1 81	1981	60	1	81	88	Hancock, P.L.; Dunne, W.M.; Tringham, M.E.	Large Enclosure 1	Variscan structures in Southwest Wales.
VOLUME 60 NO 1 81	1981	60	1	81	88	Hancock, P.L.; Dunne, W.M.; Tringham, M.E.	Large Enclosure 2	Variscan structures in Southwest Wales.

VOLUME 60 NO 1 89	1981	60	1	89	96	Walliser, O.H.	The Palaeogeographical distribution and evolution of facies in the Rheinische Schiefergebirge reflect the geosynclinal development of the Mid-European part of the Rheohercynian zone of the Variscan geosyncline. The geosynclinal development of the Rheinische Schiefergebirge was strongly influenced by the Mid-German Crystalline Rise in the south and by the Old Red Continent in the north. From late Precambrian up to Early Ordovician, the Mid-German Crystalline Rise has been a zone of rapid accumulation of sediments and volcanics, thus indicating an early tensional phase and the beginning of fracturing and mobilization of the European crust. With that the Variscan geosyncline proves to belong to a Proterozoic-Palaeozoic, resp. Caledonian-Variscan megacycle. The tension of the crust did not lead to the creation of an ocean in the described area. The Mid-German Crystalline Rise delivered debris into the southern part of the Rheinische Schiefergebirge during the Early Devonian. But the main part of this episialic sea was characterized by a large deltaic spread off the Old Red Continent. The delivered material accumulated in rapidly subsiding shelf troughs which followed asymmetrical graben-like structures and which retreated episodically northward. Tension at this time is also proved by an important volcanic activity. Outside of the shelf areas relatively thin pelagic sediments were deposited in a relatively stable basin of no great depth. The Givetian transgression caused a maximum of reef development. After the suppression of reefs by another global event in the late Frasnian, the further development led to an equalization of relief and facies. The pre-flysch phase in the Dinantian is characterized by another tensional episode with basic	The geosynclinal development of the Rheinische Schiefergebirge (Rheohercynian Zone of the Variscides; Germany)
VOLUME 60 NO 1 97	1981	60	1	97	105	Zwart, H.J.	The Palaeozoic stratigraphic sequence of the Pyrenees, folded in Late Carboniferous time during the Variscan orogeny, consists of Cambro-Ordovician phyllites and quartzophyllites, Silurian carbonaceous shales, Devonian limestones, calcslates and slates with local sandstones, and Early Carboniferous shales. Igneous rocks consist of a pre-Variscan granite and late- to posttectonic granodiorites. Several generations of folds were formed during the Variscan orogenic period, of which the first two are responsible for most of the major structures. A large part of the folds shown on the profiles date from the second fold generation, usually called the main phase. These structures are accompanied by an axial-plane cleavage in low-grade rocks. In these rocks in the axial zone the cleavage forms half of a fan, which was formed by a late phase of tilting. In the high-grade infrastructure axial planes of folds and foliations are usually gently dipping. These structures were formed later and at the expense of earlier steep structures. Yet later fold generations have in general only resulted in small-scale structures.	Three profiles through the Central Pyrenees
VOLUME 60 NO 1 97	1981	60	1	97	105	Zwart, H.J.	Large Enclosure 1	Three profiles through the Central Pyrenees
VOLUME 60 NO 1 97	1981	60	1	97	105	Zwart, H.J.	Large Enclosure 2	Three profiles through the Central Pyrenees
VOLUME 60 NO 1 97	1981	60	1	97	105	Zwart, H.J.	Large Enclosure 3	Three profiles through the Central Pyrenees

VOLUME 60 NO 1 107	1981	60	1	107	128	Julivert, M.	The Iberian Massif forms the western extremity of the Variscan Fold Belt in Europe, which from the Armorican Massif describes a sharp bend (the Ibero-Armorican arc) to cross the Iberian Peninsula from northwest to southeast. A cross-section through the massif shows the existence in the belt of two branches with an opposite polarity, which gives a certain mirror-image symmetry to the structure of the belt. An east-west section parallel to the Cantabrian coast provides the best cross-section of the northern branch of the Iberian Massif. This section shows the typical zonation of linear fold belts. It consists of an 'external' part (Cantabrian zone) formed by carbonaceous and terrigenous rocks in a varied platform facies (at least the pre-Carboniferous rocks) and with thin-skinned tectonics, and an 'internal' part with a more monotonous, pelitic facies, and in general with cleavage, metamorphism and plutonism. The facing of the main structures is towards the 'external' part of the belt. During pre-Carboniferous Palaeozoic time, the geological evolution can be explained as the result of tension resulting in normal faulting, synsedimentary volcanism and intrusion of peralkaline and calcalkaline granitoids. The source of terrigenous supply was near the core of the arc, where an uplift tendency existed. Coinciding with the Devonian-Carboniferous boundary there was a break in the geological history and the subsequent geological evolution has been controlled by compressional orogenic events. This break is shown by a change in terrigenous supply now derived from the rising chain, by the development of foredeeps in the frontal part of the chain, and by the change from anorogenic to orogenic conditions with folding, metamorphism and plutonic intrusion.	A cross-section through the northern part of the Iberian Massif
VOLUME 60 NO 1 107	1981	60	1	107	128	Julivert, M.	Large Enclosure	A cross-section through the northern part of the Iberian Massif
VOLUME 60 NO 1 129	1981	60	1	129	135	Schwab, M.; Mathé, G.	Two cross sections of the Variscides in the territory of the GDR are described. The section of the Saxothuringian Zone (Eastern Erzgebirge, Central Saxonian Lineament, Granulite Complex) includes deeper tectonic levels with metamorphic rocks of Barrow type (Erzgebirge) and granulite facies (Granulitgebirge). In shear zones in the Central Saxonian Lineament low-grade, high-pressure rocks with a tendency to glaucophanitic facies occur. Intercalated mafic and ultramafic rocks are considered to be tectonically displaced relics of the upper mantle. The cross-section of the Rheno-Hercynian Zone (Harz Mountains) demonstrates a higher tectonic level with tectonic structures and rocks typical of slate regions and a low to very low grade of metamorphism. Whilst in the Saxothuringian Zone the vertical component is stronger, horizontal movements directed towards the margin of the orogeny dominate in the internal Rheno-Hercynian zone. Therefore in the Harz a strong NW-vergence and gravitational sliding is exhibited (i.e. olistostromes and downsliding nappes).	A geological cross section through the Variscides in the German Democratic Republic (Eastern Erzgebirge, Central Saxonian Lineament, Saxonian Granulite Complex, Harz Mountains).

VOLUME 60 NO 1 129	1981	60	1	129	135	Schwab, M.; Mathé, G.	Large Enclosure	A geological cross section through the Variscides in the German Democratic Republic (Eastern Erzgebirge, Central Saxonian Lineament, Saxonian Granulite Complex, Harz Mountains).
VOLUME 60 NO 1 137	1981	60	1	137	143	Maass, D.R.	In the Black Forest three large gneiss regions, consisting of paragneiss with several intercalations of other rocks, are present. Low-grade metamorphics have probably an Early Palaeozoic sedimentary age. Dated Upper Devonian and Carboniferous up to Westphalian is strongly folded. Stephanian and Permian occur as an unconformable cover. Two different structural regions can be distinguished, a northern one with NE trending folds, and a southern one with basin structures and more variable fold trends. Four major faults occur: the northern two underthrust towards the south; the other two in the south have a reverse movement direction. In the two structural regions there are indications for a different metamorphic evolution.	The Variscan Black Forest
VOLUME 60 NO 1 137	1981	60	1	137	143	Maass, D.R.	Large Enclosure 1	The Variscan Black Forest
VOLUME 60 NO 1 137	1981	60	1	137	143	Maass, D.R.	Large Enclosure 2	The Variscan Black Forest
VOLUME 60 NO 1 145	1981	60	1	145	148	Matthews, S.C.	The stratigraphy of the Devonian-Carboniferous of SW England resembles that of the Rheinische Schiefergebirge. The structures are different in that flat-lying folds and cleavages are common in SW England. Folds have vergences to the north or to the south. The Lizard Complex is regarded as a basement high and not as a Variscan plate margin. The structural history including the emplacement of the granite batholith is discussed.	A cross section through southwest England

VOLUME 60 NO 1 149	1981	60	1	149	159	Weber, K.	The structural framework of the Rheinische Schiefergebirge is characterized by NW-facing folds with a more or less strongly developed slaty cleavage and by listric overthrusts. The listric overthrusts of the Subvariscan Foredeep often are folded. Nappe displacements are assumed for the southeastern Rheinische Schiefergebirge. Based on their tectonic movement pictures two different types of listric overthrusts can be distinguished in the Rheinische Schiefergebirge: (1) Listric overthrusts forming simultaneously with folding. As the upward decreasing displacement may be compensated by folding, the overthrusts may die out at higher tectonic levels. During folding and thrusting fold-axial planes and thrust planes are rotated to NW. As a result of uplift and rotation to NW, both being related to folding and thrusting, secondary structures occur: low dipping NW-facing overthrusts and, locally, a SE-dipping post-crystalline crenulation cleavage. (2) Listric overthrusts which cut pre-existing NW-facing fold structures. This gives rise to an antithetic rotation of the overthrust block and thus to a steepening of the originally NW-facing folds and cleavage planes. This rotation is intensified by further tectonic shortening and finally results in NW-dipping axial planes and cleavage planes. As a consequence of the SE-directed rotation of the overthrust blocks a cleavage fan develops, which becomes overprinted by a predominantly flat-lying post-crystalline second cleavage. The youngest tectonic fabrics are kink bands. They occur in areas of late tectonic uplift and must be interpreted as extension structures. The character of metamorphism in the Rheinische Schiefergebirge is of a low pressure and high temperature with metamorphic temperatures	The structural development of the Rheinische Schiefergebirge
VOLUME 60 NO 1 161	1981	60	1	161	168	Suk, M.; Weiss, J.	The construction of sections through the Variscan Orogen in the Bohemian Massif is discussed to solve the following problems: the age of the Moldanubicum and the relationship between the Moldanubicum and the Proterozoic of the Barrandian region, the Precambrian/Palaeozoic boundaries, the differentiation of the effects of the Variscan and Cadomian orogenies, the delimitation of the Variscan units in the Bohemian Massif, and the zonal structure of the Variscan orogen in central Europe. The development of the Variscan orogen in time and space is also discussed from the viewpoint of the influence of the supracrustal structure and the secular tendencies of the development of the earth's crust in the central European region.	Geological sections through the Variscan Orogen in the Bohemian Massif
VOLUME 60 NO 1 161	1981	60	1	161	168	Suk, M.; Weiss, J.	Large Enclosure	Geological sections through the Variscan Orogen in the Bohemian Massif

VOLUME 60 NO 1 169	1981	60	1	169	170	Ebner, F.; Fenninger, A.; Schönlaub, H.P.	In the last years several comprehensive reviews of the Variscan in Austria have been published. The fundamental data to this subject have previously been summarized by FLUGEL (1970,1978),TOLLMANN (1977) and SCHÖNLAUB (1979); they also mentioned the relevant literature. With regard to the attempt to present the pre-Alpine history of the Austrian Palaeozoic within the framework of the IGCP project no. 5 (pre-Variscan and Variscan events of the Alpine Mediterranean mountain belts), it seems not very useful to anticipate to that report in the present paper. Moreover, the above-mentioned publications document the state of knowledge up to about 1979; a correlation table compiled by SCHÖNLAUB (1979) gives additional information (Encl. I). It might be useful, however, to provide the most recent information to current investigators; for that reason a bibliography is presented with additional data.	The Variscan in Austria
VOLUME 60 NO 1 169	1981	60	1	169	170	Ebner, F.; Fenninger, A.; Schönlaub, H.P.	Large Enclosure	The Variscan in Austria
VOLUME 60 NO 1 171	1981	60	1	171	181	Carmignani, L.; Cocozza, T.; Minzoni, N.; Pertusati, P.C.	In the Variscan orogen of Sardinia it is possible to distinguish: (1) A Southwestern zone (foreland), restricted to the SW of the Cenozoic graben of Campidano, with slight metamorphism and minor folding without important overthrusts. (2) A central zone that runs across the entire island from Nurra to Sarrabus, characterized by important overthrusts and a rather uniform metamorphism never exceeding the greenschist facies. The metamorphism grades towards the NE into the higher-metamorphic area. (3) The Northeastern zone (granitized root zone) that includes the northern tip of the island and is characterized by the superimposition of several metamorphic episodes and by tectonic events that have intensively remobilized the pre-Variscan basement. A conventional boundary between the two last belts may be drawn along the NW-SE line joining Stintino and Dorgali. Furthermore, there seems to be a parallelism between post-Cambrian palaeogeographic domains and Variscan tectono-metamorphic zones. The absence of ophiolite associations, the Ordovician magmatism, the Silurian one with continental alkaline affinity and the Variscan metamorphism of low or intermediate pressure suggest that the Variscan orogenic cycle in Sardinia had an ensialic evolution. The structural style of the different zones, the asymmetry of the belt, the division into metamorphic zones and the relationship between crystallization and deformation suggest also that the northeastern Sardinian Variscan belt represents the portion of the crust deeply subducted along intracontinental shear zones dipping towards the NE.	Structural and palaeogeographic lineaments of the Variscan cycle in Sardinia
VOLUME 60 NO 1 183	1981	60	1	183	184	Zwart, H.J.		In memoriam L.U. de Sitter
VOLUME 60 NO 1 185	1981	60	1	185	186			Boekbesprekingen

VOLUME 60 NO 2 193	1981	60	2	193	202	Gans, W. de	A survey is given of the Eemian and early Weichselian erosional and depositional fluvial history of the Drentsche Aa valley. In between these fluvial deposits four mor-like organic levels are dated on stratigraphical and palynological criteria. The lowest three levels are dated as late Eemian and the Brørup and Odderade Interstadials of the early Weichselian respectively. The fourth mor-like level is dated as middle Weichselian and tentatively called the Papenvoort pollen zone. The fluvial deposits intercalated with mor-like levels are reckoned to be the lower Aa deposits.	Stratigraphy, palynology and radio carbon data of Eemian and Early Weichselian fluvial deposits in the Drentsche Aa valley system (Drente, the Netherlands)
VOLUME 60 NO 2 203	1981	60	2	203	208	Mäkel, G.H.	A description is given of the tectonic evolution of rock sequences of the Malaguide and Alpujarride complexes in the Espuña area. Two phases of folding and thrusting, the first accompanied by metamorphism, affected the Alpujarride sequences. Subsequently Malaguide rocks were folded and thrust over the Alpujarride rocks and Malaguide tectonic units were formed. Afterwards folding and thrusting to the south affected the pile of units. Subsequent Tortonian and younger faulting took place along E-W and N-S trending, subvertical faults. In the Espuña area there exists, besides marked differences in stratigraphy and degree of metamorphism, a clear distinction between the tectonic evolution of the Malaguide and Alpujarride sequences. Therefore it is concluded that intermediate tectonic units do not exist in the Espuña area where they were originally defined. As a consequence of these data, arguments in support of a close palaeogeographic relation between the Malaguide and Alpujarride complexes cannot be founded on the existence of intermediate units.	Differences in tectonic evolution of superposed malaguide and Alpujarride tectonic units in the Espuña area (Betic Cordilleras, Spain)
VOLUME 60 NO 2 209	1981	60	2	209	214	Nobel, F.A.; Andriessen, P.A.M.; Hebeda, E.H.; Priem, H.N.A.; Rondeel, H.E.	The post-Alpine lamproitic volcanism in the Prebetic of the External Zone of the Betic Cordilleras of southern Spain is dated at 7.6-7.2 Ma by the K-Ar data from two richterites, two sanidines, a phlogopite and a whole-rock, and the fission-track analysis of an apatite. Biotite from a lava of the rhyolitic-dacitic suite in the post-orogenic Vera basin of the Internal Zone produces the same age. Phlogopite from a lamproitic (veritic) subvolcanic body in the Vera basin yields an age of about 8.6 Ma; as lavas belonging to the veritic suite reportedly overlie Late Messinian sediments, pointing to an age of less than about 5 Ma, this type of volcanism in the Vera basin must have been active over several million years	Isotopic dating of the post-alpine Neogene volcanism in the Betic Cordilleras, Southern Spain

VOLUME 60 NO 2 215	1981	60	2	215	223	Ryckborst, H.	<p>A serious effort to restore Canadian oil sufficiency would require the offset of oil imports at a rate of 600,000 barrels per day plus the balancing of a 15% annual decline in present light-oil production. Oil sufficiency may require significant developments of offshore frontier oil, but also the phased construction of one to six world-scale heavy-oil production and upgrading units. In onshore Western Canada heavy oil has been found in abundance in Western Canadian areas where water deficiency prevails. World-scale heavy-oil plants require the implementation of large-scale diversions of fresh river water ranging from 2-22 m³/s. Additional off-line storage reservoirs sized from 5-170 million m³ would also be necessary to provide security of water supply from the North Saskatchewan River during the low-flow winter months and to avoid high-flow sedimentation problems. Super-large on-line water-storage schemes, considered 15 years ago, would reduce the need for off-line water storage, but would encompass construction of some eight large dams and diversion canals at a cost of 14 billion dollars. Development of economic water-recycling technology appears essential and realistic in the overcoming of water supply constraints to Canadian oil sufficiency.</p>	<p>Water-supply constraints on oil sufficiency through heavy-oil development by western Canadian oil industry</p>
VOLUME 60 NO 2 225	1981	60	2	225	236	Herber, M.A.; Runia, D.J.; Helbig, K.	<p>High-resolution seismic profiling requires special instrumentation and special acquisition techniques, with a high-frequency source being the key factor. In a feasibility study on the Roggenplaat, a tidal flat in the mouth of the Oosterschelde (SW Netherlands), the CDP-method was applied using standard recording equipment together with a specially developed weight-drop unit. On areas with a high clay content results were obtained which were, in principle, good enough for a detailed investigation of the upper 120 m. However, due to the lack of well control in the area of investigation, only two major interfaces could be identified with some confidence. The registration techniques used can be easily improved by using digital enhancement seismographs with digital recording on magnetic tape. However, the resolution obtained (about 2-3 m) can be repeated only in areas where the surface conditions are comparable to those of the survey area on the Roggenplaat: no weathered layer, high clay content, and a nearly complete water saturation.</p>	<p>The shallow structure of the Roggenplaat (The Netherlands) as deduced from High-resolution multi-channel seismic profiling</p>

VOLUME 60 NO 2 237	1981	60	2	237	245	Schaap, W.	<p>For a large-scale mine and concentrator, working a low-grade orebody by open-pit methods, the mill-dump cutoff grade decision is of crucial economic importance. Lane has provided a sound theoretical basis for this decision-making. His approach to the problem is extended to allow for the effect of taxation, and to include deliberate decisions concerning the concentrator operations that must be taken in conjunction with the cutoff grade selection for optimal overall results. The cutoff grade decision is thus seen as a compound decision upon which the government is able to exert influence through its tax formula. It is assumed that a grade distribution is available for selective mining units, as well as mathematical expressions that describe the processes of comminution, liberation of valuable mineral from gangue, and mineral recovery by separation from gangue. Typically, the operation may be thought of as the mining and processing of the massive chalcopyrite-bornite zone of a porphyry orebody. Apart from its operational use, the theory enables the identification of taxation schemes that enhance overall mineral recovery and government revenue, without affecting the economic feasibility point of the operator. Two simple tax formulae that achieve this are discussed.</p>	A theory of compound decisions on mill-dump cutoff grades
VOLUME 60 NO 2 247	1981	60	2	247	256	Hawkins, T.R.W.; Hindle, D.; Strugnell, R.	<p>Recently drilled deep water wells have provided new information of the succession and structure of Southern Dhofar. A small segment of the Pan-African Shield, composed of acid gneisses, granites, pegmatites, aplites and a basic dyke swarm underlies the Mirbat Plain. Furthermore, two windows of bedded basement rocks occur in south-west Dhofar. A restricted development of post-basement Palaeozoic clastics occurs as the Mirbat Formation, which may equate with the Ordovician to Permian Haima Formation elsewhere in Oman. The Cretaceous sequence (Mahra Group) is similar to that found in eastern South Yemen, except that a newly defined mixed clastic and carbonate Qamar Formation is recognized. The Kenozoic succession broadly resembles that of South Yemen and much of Saudi Arabia and the Gulf area. Structures in the post-basement rocks are: east-northeast trending folds which commenced in middle Eocene times, north-south open folds and arcuate normal faults subparallel to the coastline, associated with the Gulf of Aden Rift.</p>	Outlines of the stratigraphy and structural framework of Southern Dhofar (Sultanate of Oman)

VOLUME 60 NO 2 257	1981	60	2	257	266	Linden, W.J.M. van der	Magnetic anomalies over the Cape Verde Basin and the continental margin off Senegal and The Gambia help define the boundary between oceanic crust and attenuated continental crust. Development of the Atlantic continental margin in the region through continental fragmentation, rifting, attenuation and subsidence began presumably in Early Mesozoic, or possibly in Palaeozoic time. Sea-floor spreading and formation of oceanic crust started in the Middle Jurassic. Later, during the Middle Tertiary, after initial uplift, the oceanic and transitional lithosphere off West Africa cracked into a set of fissures through which deep seated magmas intruded abundantly into overlying Mesozoic and Tertiary sediments and in places threw up substantial volcanic mounts. It is suggested that the origin of the Cape Verde Rise and Cape Verde Islands is also due to this process, which is probably related to African and Eurasian plate collision.	The crustal structure and evolution of the continental margin off Senegal and the Gambia, from total-intensity magnetic anomalies
VOLUME 60 NO 2 267	1981	60	2	267	272	Maijer, C.; Andriessen, P.A.M.; Hebeda, E.H.; Jansen, J.B.H.; Verschure, R.H.	In SW Norway mineral assemblages in metapelites indicate three stages of Precambrian high-grade metamorphism, M-1, M-2 and M-3. An osumilite-in isograd is recognized in the higher-grade part of the M-2 high-temperature granulite-facies aureole surrounding the Bjerkreim-Sokndal lopolith. Osumilite separated from a metapelite yields K-Ar and Rb-Sr cooling ages of 987 ± 30 Ma and 952 ± 25 Ma, respectively, indicating that it may be a suitable mineral for isotopic dating with a closure temperature to Rb-Sr and K-Ar similar to or slightly higher than that of hornblende to K-Ar.	Osumilite, an approximately 970 Ma old high-temperature index mineral of the granulite-facies metamorphism in Rogaland, SW Norway
VOLUME 60 NO 2 273	1981	60	2	273	276	Meer, J.J.M. van der; Semeijn, J.		Frost cracks of the Saalian age near Lunteren (The Netherlands)
VOLUME 60 NO 2 277	1981	60	2	277	280	Arua, I.	<i>Siphonochelus nigeriensis</i> sp. nov., found in the Eocene Ameki Formation of southeastern Nigeria, is described and figured. With four smooth varices and tubes which are incorporated into it per whorl, and which are nearer to succeeding than to preceding varices, it is a typical <i>siphonochelus</i> . This is the first record of fossil typhine gasteropods from African strata and therefore seems to be of considerable interest, also from a palaeobiogeographical point of view.	First record of typhine gasteropods from the Eocene of southeastern Nigeria
VOLUME 60 NO 2 281	1981	60	2	281	284	Dreghorn, W.	Geomorphological, geological and archaeological evidence suggest that the coast of Northern Cyprus has undergone about 1 m of uplift since the Byzantine period (330-1100 A.D.). This movement forms part of the intermittent uplift that has affected the area since the Pliocene and that has produced a series of intertidal platforms and terraces.	Recent uplift in Northern Cyprus
VOLUME 60 NO 3 290	1981	60	3	290	294	Hageman, B.P.		Quaternary geology: a farewell to A.J. Wiggers - preface
VOLUME 60 NO 3 295	1981	60	3	295	296	Loon, A.J. van		Introduction

VOLUME 60 NO 3 297	1981	60	3	297	304	Jardine, W.G.	Recent studies of Holocene shorelines in Britain have included only a few investigations of the nature and positions of shorelines, but five individual categories of mappable shorelines may be recognised. Shorelines in relation to vegetation and to marine transgression and regression have been subjects of extensive study along several parts of coastal Britain. Vegetational change may denote marine transgression or regression but need not denote changes of sea level. Similarly, marine transgression and regression are changes in the position of the land/sea interface rather than events determined by changes of global sea level. About half of the recent shoreline studies in Scotland have been concerned with the gradients of tilted shorelines. A growing interest is the relationship between former shorelines and sites of early human occupation. Few investigations have been concerned primarily with the chronology of Holocene shorelines.	Holocene shorelines in Britain: recent studies
VOLUME 60 NO 3 305	1981	60	3	305	315	Synge, F.M.	In the south of Ireland the glacial succession consists of two major glacial episodes (Munsterian and Midlandian), considered to be Elsterian (or Saalian) and Weichselian respectively. These are separated from each other by two phases of high sea level along the south coast, at 72-73 m and 3-5 m above present mean sea level. Foci of local glaciation were particularly prevalent in highland areas outside the limits of the Midlandian ice sheet.	Quaternary glaciation and changes of sea level in the south Ireland
VOLUME 60 NO 3 317	1981	60	3	317	320	Königsson, L.K.	Radiocarbon dates from shells in <i>Ancylus fluviatilis</i> bearing deposits on the islands of Öland and Gotland in the Baltic are reported. The deposits are situated at a much lower altitude than the <i>Ancylus</i> limit for the two islands and have been dated at the pre-Boreal pollen zone (IV, Jessen). <i>Ancylus</i> layers in Finland have been dated at approximately the same ages. In 1927 the Early <i>Ancylus</i> Substage (A I) was defined by Thomasson for the pre-Boreal. It is suggested that the numerous deposits on the Island of Gotland with 'too low' <i>Ancylus</i> faunas should be studied for further evidence of pre-Boreal age, and to elucidate the question of whether these finds belong to the classical <i>Ancylus</i> stage or to an earlier stage separated from the classical by the <i>Yoldia</i> stage.	Were there locally two <i>ancylus</i> stages in the Baltic?

VOLUME 60 NO 3 321	1981	60	3	321	330	Paepe, R.; Baeteman, C.; Mortier, R.; Vanhoorne, R.; Centre for quaternary stratigraphy	A review of the Pleistocene marine stratigraphy of the Belgian coastal plain is given, including a critical discussion of the formerly used nomenclature. A stratigraphical revision of formations introduced in the first edition of the legend of the Geological Map of Belgium is made. Hence the Oostende Formation (type locality Oostende) stands for marine deposits of Eemian age, the Herzelee Formation (type locality Herzelee in France) stands for marine deposits of both Holsteinian and 'Cromerian' age. In the Flemish Valley as well as in the eastern part of the coastal plain both formations are found to exist generally superposed. Here the Zeebrugge Member of the Herzelee Formation is introduced to indicate marine deposits with <i>Corbicula fluminalis</i> and <i>Tapes senescens</i> var. <i>eemiensis</i> . Neither fossils are therefore considered as solely belonging to the Eemian stage.	The marine Pleistocene sediments in the Flandrian area
VOLUME 60 NO 3 331	1981	60	3	331	336	Jong, A.F.M. de; Mook, W.G.	The rise in sea level during the past 18,000 years has been studied largely by means of radiocarbon dating. The question of whether small fluctuations are superimposed on the steadily rising sea level is discussed. Support for this is the observed succession of clastic deposits and peat layers, resulting from alternating periods of transgressive and regressive activity. However, irregularities in the ¹⁴ C time scale might not only give rise to apparent steps in the relative sealevel rise, but also to clustering of ¹⁴ C dates of geological finds at certain ¹⁴ C intervals. Therefore, until there is more evidence the succession of clastic deposits and peat layers is interpreted as caused by local disasters at certain times and random regressive peat growth during quiet periods.	Natural C-14 variations and consequences for sea-level fluctuations and frequency analysis of periods of peat growth
VOLUME 60 NO 3 337	1981	60	3	337	345	Bijlsma, S.	Late Cenozoic deposits in the North-West European Basin with a typical gravel composition, called the Baltic Gravel Assemblage, have been studied from the literature and in the field. The gravel indicates a provenance from the Fennoscandian area and is characterized by a high proportion of translucent quartz and the presence of silicified palaeozoic sediments. From the available data it is concluded that one river system, called the Baltic River System, was the transporting agent of the Miocene, Pliocene and Pleistocene deposits containing the Baltic Gravel Assemblage. In the Miocene the sedimentation was to the south and west. From the Late Miocene into the Early Pleistocene the main transport was towards the west. The Baltic River system was destroyed by the inland-ice of the Menapian glacial.	Fluvial sedimentation from the Fennoscandian area into the North-West European Basin during the Late Cenozoic

VOLUME 60 NO 3 347	1981	60	3	347	352	Maarleveld, G.C.	An analysis of data from the literature, on summer thaw depths and cryoturbation in present-day cold areas, shows that the thickness of fossil cryoturbated deposits cannot be correlated to the July temperature of that time. It is suggested that the thickness of fossil cryoturbated deposits has been positively influenced by thermokarst.	Summer thaw depths in cold regions and fossil cryoturbation
VOLUME 60 NO 3 353	1981	60	3	353	361	Loon, A.J. van	Many lithostratigraphic units have been introduced in the geological literature without clear definitions. This has led to serious problems, especially in cases where various authors have used the same name with apparently different meanings. Holocene lithostratigraphy knows the same problem, but there are two more important disturbing factors: (1) many sedimentary units are still being formed, thus prohibiting a unit delineation on the basis of both the lower and the upper boundary; (2) much field work is carried out by scientists who are interested in the ecological and sedimentary development of the area or in the land-use potential rather than in its purely stratigraphic aspects. This implies that the existing definitions are often based upon a non-lithostratigraphic aspect. In order to solve these problems it is suggested that Holocene lithostratigraphic units should be defined by their lower boundary and their lithological characteristics. Some examples are mentioned to illustrate the practical and theoretical possibilities.	Problems of holocene lithostratigraphy
VOLUME 60 NO 3 363	1981	60	3	363	372	Vries, J.J. de	Historical sequences of encroaching seawater and recharge of fresh water under different geological and geomorphological conditions during the Quaternary are responsible for a rather complicated distribution of fresh and salt groundwater in the Dutch coastal area. A qualitative genetic model is proposed based on the Holocene landscape evolution.	Fresh and salt groundwater in the Dutch coastal area in relation to geomorphological evolution
VOLUME 60 NO 3 373	1981	60	3	373	384	Gans, W. de; Cleveringa, P.	A survey is given of the Middle Weichselian (Pleniglacial) and Late Weichselian (Late Glacial) deposits found in the Drentsche Aa valley system. The middle Pleniglacial succession consists of humic loam layers which are interpreted as thaw lake deposits. The upper Pleniglacial coarse fluvial sand is correlated with the lower part of the Beuningen Gravel Bed. Late Glacial aeolian and slope deposits cover these Pleniglacial deposits and relief. The tentative stratigraphic interpretation of these valley sediments is based on superposition and palynological data of pollen-bearing organic levels. However, the radiocarbon dates from the thaw lake deposits do not agree with this interpretation. Possible causes are discussed.	Stratigraphy, palynology and radiocarbon dating of middle and late Weichselian deposits in the Drentsche AA valley system (Drente, the Netherlands)

VOLUME 60 NO 3 385	1981	60	3	385	394	Schwan, J.; Loon, A.J. van	In the Rold area indications have been found for two subsequent Weichselian ice transgressions: an older one from the SE and a younger one from the N or NE. The older ice advance could be inferred from the presence of partly buried and distorted glacial sediments which are exposed in four sand and gravel pits. The steeply tilted and strongly folded beds share an almost identical NW vergence at all four sites the farthest of which are 2 km apart. Where buried the distorted glaciofluvial beds are unconformably overlain by fine-textured glaciolacustrine deposits, ill-sorted solifluction material or both. The younger glacierization phase is evidenced by both oriented surface features with roughly NW-SE trend and by scattered glaciolacustrine surface deposits. Together these two phenomena appear to form a time-correlative complex of deglacial origin. Various glacitectonic classes are discussed in order to evaluate the ice-push event associated with the older ice transgression.	Structure and genesis of a buried ice-pushed zone near Rold (Funen, Denmark)
VOLUME 60 NO 3 395	1981	60	3	395	399	Vugts, H.F.; Cannemeijer, F.	Sand transport takes place when the wind speed is higher than some critical value. When the wind speed is not too high and the sand has a monodisperse size distribution it is possible that ripples are formed. Simple relationships are derived between the wavelength of the ripples, the sand-grain motion, and the increase in drag due to sand transport. The theoretical results are in agreement with field observations.	Interaction between wind and sand surface
VOLUME 60 NO 3 401	1981	60	3	401	408	Plassche, O. van de	An analysis is made of the relative time-depth positions for published data from the base of the so-called Lower Peat in The Netherlands. Development of this peat is generally linked with the Holocene sealevel rise. Emphasis is placed on the location of samples with respect to pre-existing subsurface topography. This factor is thought to govern the moment at which peat formation commenced at a given site. However, in those cases where topographical influence has been small, it becomes apparent that other (dynamic) factors, such as seepage and local tides, in fact control the initial time-depth position of Lower Peat growth.	Sea level, groundwater, and basal peat growth - a reassessment of data from the Netherlands
VOLUME 60 NO 3 409	1981	60	3	409	416	Paris, F.P.; Cleveringa, P.; Gans, W. de	Two organic layers from the Upper Pleistocene of the northern Netherlands are investigated in detail for their pollen content. Comparison of the pollen diagrams with the standard Eemian biozones indicates that the continental peat growth and/or accumulation of organic material (mor) started during the E4/E5 phase. A hiatus in the deposits with an Eemian age is discussed.	Palynological investigations of Eemian deposits in the Drentsche AA area (Drenthe, the Netherlands)

VOLUME 60 NO 3 417	1981	60	3	417	426	Vandenberghe, J.; Krook, L.	A detailed study was carried out on a large outcrop at Alphen in the southern Netherlands. At the base fluvial, gravel-bearing sands were found with a stable heavy-mineral association. These deposits, referred to as 'Alphen Sands', are of Early or Middle Pleistocene age. They are overlain by Eemian peat and Weichselian aeolian deposits. Besides loamy coversands, the latter comprise a compact aeolian loam layer, fine dune sands and superficially reworked coversands. During two separate periods the sediments have been subject to periglacial deformations under permafrost conditions. Furthermore they show two gravel pavements. Mineralogically they are characterized by an association of both stable and unstable heavy minerals, probably indicating a mixture of allochthonous Rhine-derived sediments and more or less local deposits.	Stratigraphy and genesis of Pleistocene deposits at Alphen (southern Netherlands)
VOLUME 60 NO 3 427	1981	60	3	427	432	Hof, G.T.A.; Reiling, R.; Zilverberg, E.; Levelt, T.W.M.	For an area NW of Roermond, province of Limburg, a landscape classification has been developed on the basis of four variables: loam content of the soil, water-table class, soil type and altitude. The presented variables are more or less associated with each other. A hierarchy of the variables, which implicitly means the existence of an overall theory of landscape genesis, has not been used. The classification was performed by means of cluster analysis and reflects the association between the variables in the structure of the agglomerative legend system. For every desired number of groups the legend system gives the mapping units, which have a maximum homogeneity for the combinations of the variables. With the graphical facilities of the computer programme a map can be drawn at any desired grouping level. As an example, the grouping level 8 is discussed in the text.	An areal classification by means of cluster analysis using abiotic landscape data
VOLUME 60 NO 3 433	1981	60	3	433	445	Gonggrijp, G.P.; Boekschoten, G.J.	The first call for the conservation of geologically important sites in The Netherlands was made by Van Baren in 1908. In the decade that followed, some reserves were established, mainly through the efforts of interested individuals as no lead was given by the professional societies and only a few scientists chose to play an active role. Further, those conservation societies which were in existence and in receipt of support from numbers of professional scientists, had interests which were largely confined to biological features. It was not until 1969, when the Gea working group was inaugurated, that systematic governmental involvement in earth-science conservation began. Descriptive inventories of sites of scientific and/or educational value are produced province by province; in addition special reports dealing with individual sites threatened with destruction are also prepared. Some case histories in geological conservation are outlined in this paper.	Earth-science conservation: no science without conservation

VOLUME 60 NO 3 447	1981	60	3	447	452	Gans, W. de; Sohl, H.	Geomorphological and geological investigations on closed topographic depressions and valley systems on the Drente plateau allow correlations to be made between the location of pingo remnants on the plateau and the Weichselian drainage pattern. In general, the depth of the remnants varies between 2 and 7 m, but locally the geological structure of outcropping sediments is responsible for the development of extremely deep pingo remnants, reaching a maximum of 17 m. This figure gives a tentative estimate of the minimum depth of the permafrost then prevailing,	Weichselian pingo remnants and permafrost on the Drente plateau (the Netherlands)
VOLUME 60 NO 3 453	1981	60	3	453	459	Schoute, J.F.T.; Griede, J.W.; Mook, W.G.; Roeleveld, W.	Radiocarbon dating of vegetation horizons (fossil A ₀ /A ₁ -soil horizons occurring within the younger Holocene marine deposits) is subject to contamination by old carbon which forms part of the sedimentary matrix. Samples of recent mud from several locations in The Netherlands give apparent radiocarbon ages of up to 5900 years BP, demonstrating that a significant ageing effect may occur. Notably the age of the organic residue, left after alkali pretreatment of the sample of vegetation horizons, is affected by this contamination. A substantial part of the total amount of the organic matter in these vegetation horizons consists of humic substances. Since the larger part of these humic substances has actually been formed in situ by humification of fresh organic material. it is to be expected that radiocarbon dating of humic substances (dissolved in the alkaline extracts) gives a better indication of the true age of the vegetation horizons than the dates from the (apparently too old) residues. This hypothesis is compared to geological evidence in the coastal plains of the northern Netherlands and of Suriname.	Radiocarbon dating of vegetation horizon, illustrated by an example from the holocene coastal plain in the northern Netherlands
VOLUME 60 NO 3 461	1981	60	3	461	463			Book reviews
VOLUME 60 NO 4 465	1981	60	4	465	465			From the editors

VOLUME 60 NO 4 467	1981	60	4	467	486	Murris, R.J.	The post-Hercynian sequence of the Middle East is dominated by carbonate sedimentation on a stable platform flanked on the northeast by the Tethys ocean. Two principal types of depositional systems alternated in time: (1) ramp-type mixed carbonate-clastic units and (2) differentiated carbonate shelves. The first type was deposited during regressive conditions, when clastics were brought into the basin and resulted in 'layer-cake' formations. The second type was formed during transgressive periods and is dominated by carbonate cycles separated by lithoclines, time-transgressive submarine lithified surfaces. Differentiation is marked, with starved euxinic basins separated by high-energy margins from carbonate-evaporite platforms. The tectonic development of the Middle East can be divided into several stages. The first stage, which ended with the Turonian, was characterized by very stable platform conditions. Three types of positive elements were dominant: (1) broad regional paleohighs, (2) horsts and tilted faults blocks trending NNE-SSW, and (3) salt domes. All three influenced deposition through syndimentary growth. The subsequent stage, from Turonian to Maestrichtian, was one of orogenic activity, with the formation of a foredeep along the Tethys margin and subsequent ophiolite-radiolarite nappe emplacement. From the late Cretaceous to the Miocene the platform regained its stability, only to lose it again at the close of the Tertiary, when the last Alpine orogenic phase affected the region, creating the Zagros anticlinal traps. Source rocks were formed in the starved basins during the transgressive periods. Marginal mounds, rudist banks, oolite bars and sheets, and regressive sandstones form the main reservoirs. Supratidal	Middle East: stratigraphic evolution and oil habitat
VOLUME 60 NO 4 487	1981	60	4	487	495	Lovelock, P.E.R.; Potter, T.L.; Walsworth-Bell, E.B.; Wiemer, W.M.	Recent work in the Saih Hatat region of the Oman Mountains has established an early Ordovician age for the Amdeh Formation. This dating is based on assemblages of brachiopods, trilobites, and lamellibranchs together with microflora and trace fossils from several localities. The formation comprises a sequence of shallow marine clastic rocks at least 3400 m thick which has been measured in detail in Wadi Kahza, some 40 km southwest of Muscat. The sequence may be divided into five members and a preliminary account of the stratigraphy is given, accompanied by illustrations of some of the characteristic sedimentary structures, macrofauna, and trace fossils. The Amdeh Formation is a marine equivalent of the continental to shallow marine sediments of interior Oman and the Saq and Tabuk Formations of Saudi Arabia and southwest Jordan. It has apparently been subjected to Late Paleozoic orogenic movements tentatively related to the Hercynian Orogeny	Ordovician rocks in the Oman mountains: the Amdeh formation

VOLUME 60 NO 4 497	1981	60	4	497	507	Passchier, C.W.; Urai, J.L.; Loon, J. van; Williams, P.F.	A synthesis of the metamorphic and structural history of the Central Sesia-Lanzo Zone. (Western Alps) is proposed, based upon detailed mapping. Four lithologic units are distinguished. The metamorphic history can be divided into a pre-Alpine amphibolite facies event, an early Alpine HP-LT event and a late Alpine greenschist facies event. Five generations of folds are distinguished. F ₀ is probably of pre-Alpine age. F ₁ produced isoclinal folds, part of the regional foliation and major shear zones along which the lithologic units are brought into their present relative positions. F ₂ , F ₃ and F ₄ are subsequent phases of folding, each producing a locally developed foliation. Some F ₂ folds occur on a km scale and can be seen on the map. F ₄ might be related to a young, postulated major fold that trends NE-SW through the entire Sesia-Lanzo Zone. A detailed map and three-dimensional interpretation of the major structure in the central Sesia- Lanzo Zone are presented, including a new interpretation of the IIDK body at Mt. Nery..	Structural geology of the central Sesia Lanzo zone
VOLUME 60 NO 4 509	1981	60	4	509	516	Katsikatsos, G.; Bruijn, H. de; Meulen, A.J. van der	The Neogene sediments in the three major basins on the Island of Euboea (Evia) (the Aliveri-Kymi, the Palioura-Gides and the Limni-Istiea Basin) show roughly similar lithological successions, but differ in age. Fossil rodent associations show that sedimentation started in the Early Miocene (Early Aragonian) in the Aliveri-Kymi Basin, in the Late Miocene (Vallesian) in the Palioura-Gides Basin and in the Early Pliocene (Early Ruscinian) in the Limni-Istiea Basin. The lignite occurrences in the Aliveri-Kymi Basin are shown to be of Early Aragonian (MN3) Age, while those in the Palioura-Gides and Limni-Istiea Basins are assigned a Vallesian (MN10) and Villanyian (MN16) Age, respectively. It is concluded that lignite formation in the area depended primarily on the local circumstances of sedimentation and not on climate.	The Neogene of the island of Euboeda (Evia), a review

VOLUME 60 NO 4 517	1981	60	4	517	529	Riezebos, P.A.; Bruin, M. de; Duin, R.P.W.	Rasenerz and Bohnerz concretions from Gutland have been studied geochemically and by reflected light microscopy. The greater part of either type can be characterized by a single microscopic feature: more than 50% of the Rasenerz samples has an oolitic texture which is considered indicative of the Minette Formation; about 65% of the Bohnerz samples displays festoon development that is regarded as a sign of supergene origin. Festoons that occur in ooid-lacking Rasenerz (27%) suggest that Rasenerz also derives in part from destructed iron-bearing crusts. Common population statistics of individual trace element abundances fails to discriminate between the two types, but a statistical interpretation of 13 normalized concentrations enables their distinction. When clustered on textural grounds into oolitic Rasenerz, festoon-bearing Rasenerz, and festoonbearing Bohnerz categories, only the Na values of the first and the second category are significantly different. Especially on the basis of the rare earth chemistry, the festoon-bearing Rasenerz and Bohnerz concretions are thought to derive from different surface crusts.	Ore-textural and geochemical features of Bohnerz and Rasenerz concretions in Gutland (Luxembourg)
VOLUME 60 NO 4 531	1981	60	4	531	539	Troost, P.J.P.M.	The Dutch Schoonebeek oil field initially contained $170 \times 10^6 \text{ m}^3$ of 25° API crude. primary recovery is low mainly due to the high viscosity of the oil. It varies between 6% of stock tank oil initially in place (STOIP) in the west (solution gasdrive) to 18% in the east (waterdrive). Research on enhanced recovery began in 1950 and concentrated on thermal processes. As a result hot water injection has been applied on a large scale increasing the recovery of oil by 8% of STOIP. The performance of hot water injection projects is declining and a gradual switch is being made towards steam injection. Steam injection was applied already in 1960 in a depleted part of the field. In 1972 a pilot project was started to test the feasibility of steam injection in the much larger waterdrive part where pressures are kept at the hydrostatic level of 85 bar by aquifer water influx. This project indicated that steam injection under waterdrive conditions is a very effective recovery process and that a recovery increase of 14% of STOIP can be obtained at an extra-oil/steam ratio exceeding $0.6 \text{ m}^3 / \text{ton}$. On the basis of the pilot results a large scale project was designed, the RW-2E steam injection project. It consists of 14 steam injection wells, 43 producers and 14 water disposal wells. Steam will be injected at a total rate of about 3000 tons/day for a period of 6 years. Additional oil recovery of the RW-2E, project is estimated at $4 \times 10^6 \text{ m}^3$. The maximum additional oil production rate is estimated at $1500 \text{ m}^3 / \text{day}$. During the design and construction of the RW-2E project extreme care was taken to minimise the impact of the project on the environment. The project started in January 1991. Total project life is estimated at 15 years.	Schoonebeek oil field: the RW-2E steam injection project

VOLUME 60 NO 4 541	1981	60	4	541	544	Romein, A.J.T.; Smit, J.	The patterns displayed by the ratios of stable Carbon and Oxygen isotopes of calcareous nannofossil assemblages from the Cretaceous-Tertiary boundary interval in a section near Biarritz closely match those from the same interval in the Gredero section (SE Spain). The data give additional support to the occurrence of a catastrophic event at the end of the Cretaceous that was probably coupled with a drastic increase in temperature and a decrease in marine phytoplankton productivity.	Carbon-oxygen stable isotope stratigraphy of the Cretaceous-Tertiary boundary interval; data from the Biarritz section (SW France)
VOLUME 61 NO 1 2	1982	61	1	2	4	Nelson, C.H.; Nio, S.D.		The Northeastern Bering Shelf: New perspectives of epicontinental shelf processes and depositional products - An introduction
VOLUME 61 NO 1 5	1982	61	1	5	18	Nelson, C.H.	The distribution of late Pleistocene and Holocene surface sediments on the northern Bering Seafloor is patchy and dependent upon locations of seafloor bedrock and pre-late Pleistocene glacial debris, late Holocene river sediment influx, and modern strong bottom currents. Seafloor vibracores and high-resolution profiles record two different sedimentary environments in the northern Bering shelf: late Pleistocene-Holocene shoreline transgression (<16.000 years BP) in Chirikov Basin, and Holocene deposition from the Yukon River in Norton Sound. Lag gravels remain exposed on the margins of Chirikov Basin where the transgression of the late Pleistocene-Holocene shoreline reworked pre-Quaternary bedrock and Pleistocene glacial moraines. In central Chirikov Basin, the transgressive deposits cover Pleistocene limnic peaty mud of emergent shelf deposition. In places, a few centimeter thick basal transgressive facies of pebbly Medium or fine sand is left above which is a widespread sheet of thin (< 1m) inner-shelf fine-sand facies. Water circulation patterns have inhibited deposition of Holocene Yukon River silt over transgressive sand and lag gravels of Chirikov Basin. About 10.000 BP, a rapid marine transgression caused the deposition of a basal nearshore facies of thick storm-sand layers in marine silt over the Pleistocene freshwater peaty mud of Norton Sound. This has been covered by an offshore bioturbated silt. A younger progradation of thick storm-sand layers and Holocene brackish-water silt (up to 14 m) in southern Norton Sound has been deposited since a shift of the active Yukon Delta into its present position about 2.500 BP.	Late Pleistocene - Holocene transgressive sedimentation in deltaic and non-deltaic areas of the Northeastern Bering epicontinental shelf

VOLUME 61 NO 1 19	1982	61	1	19	27	McDougall, K.	Holocene microfauunal associations and distribution patterns define three inner-shelf (<20m) biofacies in Norton Sound, northern Bering Sea. The first biofacies is composed of typical bay faunas dominated by the species <i>Eggerella advena</i> , <i>Buccella frigida</i> , <i>Ammotium cassis</i> , and <i>Reophax dentaliformis</i> . The second biofacies contains bay to inner-shelf faunas indicative of deeper, more marine waters; such inner-shelf species as <i>Reophax arctica</i> , <i>R. fusiformis</i> , <i>Spiroplectammina biformis</i> , and <i>Textularia torquata</i> dominate. The third biofacies, common in deltaic areas with high sedimentation rates and freshwater input, is characterized by abundant <i>Elphidium orbiculare</i> and <i>E. clavatum</i> . The distribution of other microfauunal groups (diatoms, ostracods, tintinnids, and fragments of larger invertebrates and plants) corresponds to current and sedimentary patterns. These Holocene facies relations are the basis for interpreting early Holocene and late Pleistocene environmental conditions in the northeastern Bering Sea area. Within older deposits the sequence of biofacies can be used to interpret the Holocene transgressive cycle in Norton Sound. Norton Sound cores provide evidence of two marine transgressions and a varying river input.	Microfaunal analysis of the Late Quaternary deposits of the Northern Bering Sea
VOLUME 61 NO 1 29	1982	61	1	29	36	Howard, J.D.; Nelson, C.H.	Sedimentation in an epicontinental sea influenced by deltaic progradation is exemplified by the Norton Sound-Yukon Delta region. Norton Sound is a large embayment of more than 24,000 km ² with water depths of less than 25m. The Yukon Delta, on the south side, is a major North American source of sediment that enters the Sound. Progradational deposits on the seaward part of the delta are highly reworked by storm waves and currents, and serve as a model for a depositional sequence that encroaches on a shallow shelf. To describe the primary physical and biogenic sedimentary structures of the several facies in this embayment, we utilized X-ray radiographs, relief casts, and grain-size analyses of 83 box cores. Primary physical sedimentary structures are best developed in and adjacent to the Yukon Delta and include parallel- and ripple-laminated sand and silt and crossbedded sand. Biogenic sedimentary structures are found throughout Norton Sound and, in the northern part, completely obliterate physical sedimentary structures. Bioturbation close to the northern shoreline suggests that rates of sedimentation there are low. Dominance of physical structures near the delta results from (1) increased wave and current energy in this very shallow water, (2) reduced biological activity in brackish water, and (3) increased rates of deposition. As a result, the Holocene progradational sequence in Norton Sound consists of basal beds with well developed physical structures deposited during lower eustatic sea level, a thin middle interval of bioturbated mud and a thick upper section of structured beds deposited by the prograding delta.	Sedimentary structures on a delta-influenced shallow shelf, Norton Sound, Alaska

VOLUME 61 NO 1 37	1982	61	1	37	48	Nelson, C.H.; Dupré, W.R.; Field, M.; Howard, J.D.	The eastern epicontinental shelf of the Bering Sea is characterized by variations in river and glacial sediment supply, wave energy, tidal range (microtidal to mesotidal), and tidal, geostrophic, and storm-induced currents. These factors, combined with the effect of the Holocene rise in sea level, have resulted in the formation of a complex assemblage of generally linear sand bodies of similar morphology and lithology, but different origins. The sand bodies are large features > 10 km long, found from the present shoreline to tens of kilometers offshore, in water depths up to 50 m. They include modern sand bodies formed by present-day processes, relict sand bodies formed during lower stands of sea level, and palimpsest sand bodies formed under past conditions but modified by modern day processes. Linear tidal sand ridges (5-35 by 1-3 km) which form at the present time in the macrotidal, funnel-shaped Kuskokwim Bay, are oriented perpendicular to the shoreline, enclosed by tidal flat and shelf mud, and sometimes sigmoidal in shape. The modern shore parallel shoals (including barrier islands, 5-10 by 0.5-1 km) form in mesotidal environments, are the smallest of the shelf sand bodies, and typically are bounded by tidal flat mud inshore and shelf mud offshore. Delta front channels (20-30 by 2-4 km) extend seaward from the modern river distributaries and form sand bodies perpendicular to the shoreline; they are enclosed by graded overbank sandbeds and muds and are characterized by large to small-scale trough-cross lamination. Lee side shoals (25-100 by 5-25 km) form behind obstructions to unidirectional shelf currents, are the longest, possess the finest grain size, and exhibit the most consistent rhythmic flat lamination of any sand bodies encountered	Variation in sand body types of the eastern Bering sea epicontinental shelf
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VOLUME 61 NO 1 49	1982	61	1	49	62	Hunter, R.E.; Thor, D.R.; Swisher, M.L.	<p>Sonographs and bathymetric profiles from water depths less than 1-5 m in the Nome-Solomon, Port Clarence, and Yukon Delta areas of the Alaskan Bering Sea coast show features generated by waves, currents, and drifting ice. The surficial sediments in the Nome-Solomon and Port Clarence areas range in grain size from sand to boulder gravel and have many surface features visible on sonographs, whereas the sediments off the Yukon Delta are fine sands and silts that have few such features. Materials in the Nome-Solomon and Port Clarence areas have been segregated by grain size into ribbons and irregular, elongate, and lobate patches. The sand patches commonly have convex-up profiles and probably rest on gravel lag deposits that are exposed in adjacent gravel patches. Coarse sand and fine gravel patches and ribbons are characterized by symmetrical ripples, spaced 0.5 to 2 m apart, that could only have been generated by storm waves. Gravelly sand waves in the Nome-Solomon area were formed by westward shore-parallel currents. Boulder gravel ridges in this area are of unknown origin. Sand and gravel ribbons are common near the entrance to Port Clarence. Unlike ribbons elsewhere, which have been attributed to tidal or other currents, the ribbons in the port Clarence area show features suggesting generation by storm waves. These ribbons are oriented approximately normal to the associated large wave ripples, and both the ripples and ribbons vary in orientation in ways that can be explained as effects of wave refraction over a shoaling bottom. Ribbonlike features of unknown origin occur locally on the Yukon delta front. Ice-gouged furrows, though less common than in areas farther offshore, occur in all the nearshore areas studied. The</p>	Depositional and erosional features of the inner shelf, northeastern Bering Sea
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VOLUME 61 NO 1 63	1982	61	1	63	70	Dupré, W.R.	The Yukon River provides approximately 90% of the sediment presently entering the northeastern Bering Sea. Most of that sediment is initially deposited in Norton Sound, a broad, microtidal embayment typically less than 20 m deep. The shallowness of the depositional basin has allowed extensive reworking of the deltaic sediments by a variety of processes. These include waves, Tidally and wind-induced currents, and oceanic currents, as well as processes associated with the movement and deformation of sea ice. The relative importance of these processes varies systematically throughout the year. The seasonal variability is best described by the definition of an ice-dominated, river-dominated, and storm-dominated regimen, each consisting of a characteristic suite of geologic processes. The morphology of the Yukon Delta also reflects the climatic extremes of this high-latitude, epicontinental sea. The subaqueous profile of the delta differs from most previously described deltas in that the shoreline is separated from the prograding margin of the delta by a 'sub-ice platform' which is typically 2-3 m deep and extends up to 25 km offshore. The platform is crossed by a series of 'sub-ice channels' which extend up to 25 km beyond the mouths of the major distributaries. The platform and associated subaqueous channels are related to the presence of shorefast ice which fringes the delta for half of the year, and appear to be characteristic of ice-dominated deltas formed in high-latitudes.	Depositional environments of the Yukon Delta, northeastern Bering Sea
VOLUME 61 NO 1 71	1982	61	1	71	78	Cacchione, D.A.; Drake, D.E.; Wiberg, P.	We have used long-term measurements of near-bottom velocities at four heights above the sea floor in Norton Sound, Alaska, to compute hourly values of shear velocity u_* , roughness z_0 , and bottom-drag coefficient c_D . Maximum sediment resuspension and transport, predicted for periods when the computed value of u_* exceeds a critical level, occur during peak tidal currents associated with spring tides. The fortnightly variation in u_* is correlated with a distinct nepheloid layer that intensifies and thickens during spring tides and diminishes and thins during neap tides. The passage of a storm near the end of the experiment caused significantly higher u_* values than those found during fair weather. We attribute these increases in u_* to stronger bottom currents and larger surface waves	Velocity and bottom-stress measurements in the bottom boundary layer, outer Norton Sound, Alaska

VOLUME 61_NO 1_79	1982	61	1	79	89	Holmes, M.L.; Thor, D.R.	<p>Numerous zones of anomalous acoustic responses caused by gas in the subsurface sediment layers have been detected on seismic reflection records from Norton Sound and Chirikov Basin. Sound sources used range in size and power from 3.5 kHz transducers to 1326 in³ (21.71) air gun arrays. The frequency and distribution of these zones suggest that as much as 7000 km² of the northeastern Bering Sea may be underlain by gas-charged sediment. Much of the gas is of shallow biogenic origin, having been generated in buried peat deposits. Compressional velocity is about 1.5 km/s in these layers. 7 percent below the velocity in gas free areas as determined from seismic refraction studies. Seismic velocity beneath a large gas seep south of Nome decreases to about 1.2 km/s in the interval from 250 to 440 m below the seafloor. where thermogenic gases of deeper origin are migrating upward along a system of basin margin faults.</p>	Distribution of gas-charged sediment in Norton sound and Chirikov basin, northeastern Bering Sea
VOLUME 61_NO 1_91	1982	61	1	91	103	Olson, H.W.; Cluckey, E.C.; Nelson, C.H.	<p>Sediment of Holocene age derived from the Yukon River, consisting dominantly of silty fine sand and sandy silt, covers the bottom of central and western Norton Sound, which is a high energy environment involving extensive ice loading, high waves, and strong bottom currents. The sediment contains significant amounts of sand in some areas and a generally minor amount of clay-size material ranging from 0 to 20 percent. Moreover, the sediment is generally dense, although loose and weak zones occur at the surface and also at depth between relatively dense layers. These characteristics, evidence of storm sand layers and scour depressions, and the results of preliminary analytical studies indicate that this sediment is susceptible to liquefaction during major storms. Substantially finer grained, weak, and highly compressible sediment of Holocene age, derived from the Yukon River and from local rivers and streams, covers eastern Norton Sound and the Port Clarence embayment, which are low energy environments with negligible ice loading, low waves, and weak bottom currents. Transgressive deposits of late Pleistocene age that cover the bottom of Chirikov Basin include an inner-shelf fine sand underlain by a basal transgressive medium sand that is exposed on the north and east flanks of the basin. Geotechnical data in the latter, obtained in the sand waves fields near Port Clarence, show that the material is loose near the surface but becomes firm rapidly with depth and could not be penetrated more than about 3 m with the Alpine vibratory corer. Pleistocene peaty deposits underlie the Holocene and late Pleistocene deposits in both Norton Sound and Chirikov Basin and are somewhat overconsolidated, probably because of subaerial desiccation during</p>	Geotechnical characteristics of bottom sediment in the northeastern Bering Sea

VOLUME 61 NO 1 105	1982	61	1	105	114	Nio, S.D.; Nelson, C.H.	The present-day shallow marine basins can be subdivided into marginal and epicontinental shelf areas. The occurrence, geometry and formation of large sand bodies in the southern bight of the North Sea and the Chirikov Basin in the northeastern Bering Sea are discussed here. The North Sea is mainly used as an example for reconstructing a sedimentation model. The large sand bodies which occur in the two basins consist of a lower sequence of sand banks and an upper sequence of stacked sand waves. The geometry and arrangement of the different lithotypes are not only controlled by the latest sea level rise, but also by the basin geometry. Peripheral basins, such as the southern bight of the North Sea show a concentric aggradational pattern; semi-peripheral basins, such as the Chirikov Basin, show an onlap pattern. Based on data from the North Sea and partly from the Chirikov Basin a hypothetical stratigraphic cross section is constructed which can be used for interpreting ancient analogues.	The North Sea and northeastern Bering Sea: a comparative study of the occurrence and geometry of sand bodies of two shallow epicontinental shelves
VOLUME 61 NO 1 115	1982	61	1	115	116	Murris, R.J.		In memoriam - Dr. Ernst Kündig
VOLUME 61 NO 1 117	1982	61	1	117	120			Book reviews
VOLUME 61 NO 2 121	1982	61	2	121	129	Koster, E.A.	The terminology of the eolian sand deposits and related form and relief types in The Netherlands is reviewed and evaluated. Because there is as yet no consensus on the criteria for a division of eolian sediments into lithostratigraphic units, the various lithological properties of the following 'sand types' are discussed: Younger and Older Coastal Dune Deposits of the Westland Formation, (Younger and) Older River Dune Deposits of the Kreftenheye Formation, Younger and Older Cover Sand Deposits of the Twente Formation, Older Inland Dune Deposits of the Twente Formation and Younger Inland Dune Deposits of the Kootwijk Formation. Geomorphological criteria, that can facilitate in distinguishing between these seemingly homogeneous 'sand types', have been summarized. A simplified lithostratigraphic division of surficial eolian sediments into three formations is tentatively proposed.	Terminology and lithostratigraphic division of (surficial) sandy eolian deposits in the Netherlands: an evaluation
VOLUME 61 NO 2 131	1982	61	2	131	140	Goffau, A. de; Linden, P. van der	Topographical, lithological and paleo-pedological features enable the reconstruction of the Late Tertiary and Quaternary development of the Kroya coastal plain. Climatic changes and sea level fluctuations during the Pleistocene, and tectonic and volcanic activity which persisted up to the present, are the main factors that determine the current morphology of the area. The coastal plain represents a horst-graben structure, both in an east-west as well as in a north-south direction. The central part is characterized by a Pleistocene beach ridge complex which is covered by younger volcanic ashes, and which is bordered to the east, north, and west by the lagoonal-fluvial sedimentation areas of the grabens. Only to the south there is an almost uninterrupted southward extending Holocene beach ridge system.	Late Tertiary and Quaternary coastal landscape development of the Kroya Beach ridge area (South Java, Indonesia)

VOLUME 61 NO 2 141	1982	61	2	141	146	Veenstra, H.J.	Beach and dune quartz sands of the East Frisian Islands (Germany) demonstrate an irregular tendency of coarsening eastwards. The sands contain flint, feldspar and igneous fragments. The sediments of the offshore probably determine grain-size of the sands: the coarse fractions are derived from reworked Pleistocene sands at Borkum Rough and Wangerooge Ground. On each island the dune sands form one population in size and shape. By means of rollability analyses it appears that the dune sands are more angular than their source, the beach sands.	Size shape and origin of the sands of the East Frisian Islands (North Sea, Germany)
VOLUME 61 NO 2 147	1982	61	2	147	158	Gans, W. de	Cross sections of five pingo remnants in the Drentsche Aa valley area reveal that the remnants are situated on the floors of small Pleniglacial tributary valleys. Lithological and palynological data from organic levels below some ramparts of these pingo remnants suggest growth of most of the pingos in a thaw lake environment. A hydrostatic (closed-system) origin of the pingos is suggested. Radiocarbon data from the organic levels and the lithostratigraphic position of the ramparts indicate that the pingos developed between 25,000 and 19,000 BP. Transformation of the pingos into pingo remnants was not isochronous, but occurred until the middle Late Glacial (Late Weichselian).	Location, age and origin of pingo remnants in the Drentsche AA valley area (The Netherlands)
VOLUME 61 NO 2 159	1982	61	2	159	162	Beyens, L.; Denys, L.	A review of the various sources of allochthonous diatom valves in deposits is given. The importance of these problems in palaeoecological research is discussed and some simple methods for their approach in quantitative analysis are introduced.	Problems in diatom analysis of deposits: allochthonous valves and fragmentation
VOLUME 61 NO 2 163	1982	61	2	163	171	Schwan, J.; Ritzema, W.	In a 5 km long coastal cliff section in SW Funen till variation in Weichselian glacial sequences has been studied. In the central part of the exposure the presence of two till units separated by stratified sands and gravels is immediately apparent. Within each of these two units several lateral facies could be distinguished. The lower till unit is a basal till consisting of a massive and a brecciated facies. In the genetically complex upper till unit four different facies are present: two flow till facies, a supraglacial lacustrine facies and a transitional facies. The fourth type has been classified as transitional since it presumably represents a flow till which after its supraglacial deposition has been partly transformed into a subglacial till during a later glaciation phase. This interpretation is based on both the general glacial history of the cliff and specific characteristics of this facies type, primarily its gradual lateral change in sedimentary structure	Till variation in a Weichselian glacial section along the coast of southwest Funen, Denmark
VOLUME 61 NO 2 173	1982	61	2	173	178	Coninck, J. de; Smit, J.	Assemblages of marine organic-walled microfossils have been studied in four samples (SM 75 -502, -504, -505, and -506) that represent the Maastrichtian-Danian boundary layers in the Barranco del Gredero (S.E. Spain). No sharp changes can be seen in their composition and the marine organic walled microfossils give no indication here at which level the Cretaceous-Paleocene boundary has to be placed..	Marine organic-walled microfossils at the Cretaceous Tertiary boundary in the Barranco del Gredero (S.E. Spain)

VOLUME 61 NO 2 179	1982	61	2	179	182	Tuuk, L.A. van der	Conchorhynch (calcareous parts of cephalopod lower jaws) are reported for the first time from the Maastrichtian of Limburg, The Netherlands. These fossil remains are described as <i>Conchorhynchus limburgicus</i> n.sp.	A Maastrichtian Conchorhynch (<i>Conchorhynchus limburgicus</i> n. sp.; Cephalopoda) from Limburg, the Netherlands
VOLUME 61 NO 2 183	1982	61	2	183	189	Feyter, A.J. de	The structure of the Northern Umbrian Apennines is broadly comparable to the structure of the Alta Romagna to the north. Three major tectono-stratigraphic units can be distinguished. The lower two are the Umbrian parautochthon and the Nero unit. The Nero unit, comprising the Alpe della Luna sequence, can be seen as an internal, southwestern part of the parautochthon, that was thrust upon the external parautochthon to the northeast. The Nero unit was overridden from the southwest by the third tectono-stratigraphic unit, the Tuscan nappe. The structure of the area is complicated by the presence of a structural high, which seems to be related to large, north-south running dextral strike slip faults. It overprints a paleo-high, which is the consequence of the southwest-northeast directed Apenninic orogenic compression.	The structure of the Northern Umbrian Apennines, Italy
VOLUME 61 NO 2 191	1982	61	2	191	199	Heijnsens, M.H.L.G.; Tijssen, J.M.	Pollen analysis of cores from an area with a river valley that is blocked by a coversand ridge shows that the three beds of which the ridge consists were deposited respectively before the Lateglacial, during the Earlier Dryas stadial, and after the Allerød interstadial. During the first part of the Lateglacial the valley was only partly obstructed and occupied by a local Cyperaceae vegetation. Later, from the Earlier Dryas stadial onward, the valley became completely blocked and that resulted in a change in drainage pattern. The pollen diagrams show a local lacustrine environment, caused by the progressing obstruction of the valley. Wetter and drier phases are recorded in the sediments and mark the climatic development during the Lateglacial.	The influence of the development of a Weichselian coversand ridge on the drainage of a river valley in Noord Brabant (The Netherlands); A geomorphological and palynological study
VOLUME 61 NO 2 201	1982	61	2	201	205	Kloos, D.P.	After reproduction or death, the empty shells of the epiphytic foraminifer <i>Sorites orbiculus</i> , living in a lagoon on Curaçao, sink to the bottom and are there intensively bored by endolithic algae. Fragmentation of <i>S. orbiculus</i> skeletons due to boring algae contributes to the generation of the silt fraction of the sediment; part of the calcareous tests is dissolved. The proportion and composition of <i>Sorites</i> -derived grains in a sediment sample taken in August differ from one taken in February. There is no trace of micritization in or around the bored soritid grains. This suggests that the demolition of a <i>S. orbiculus</i> test by endolithic algae is completed in a few weeks, or at the most in a few months	Destruction of tests of the foraminifer <i>Sorites orbiculus</i> by endolithic microorganisms in a lagoon on Curaçao (Netherlands Antilles)

VOLUME 61 NO 2 207	1982	61	2	207	211	Vos, J. de; Sartono, S.; Hardja-Sasmita, S.; Sondaar, P.Y.	A reinvestigation of the Pleistocene mammals of Java from the Dubois collection at Leiden sheds new light on the relative age of the <i>Homo erectus</i> localities. The fauna of the type locality of <i>Homo erectus</i> Trinil is older in age than the 'Jetis fauna' of von Koeningswald, 1934. The latter is similar to the fauna of Kedung Brubus. The Trinil fauna is poor in species with many endemics, which points to little or no faunal exchange with the Asian mainland; it cannot be excluded that during the Pleistocene Trinil was situated on an island. The Kedung Brubus and Jetis faunas are characterized by the presence of new Asiatic elements absent in Trinil. The fauna from the same level as the type locality of <i>Homo modjokertensis</i> is of the Kedung Brubus type and there are no arguments to suppose that this <i>Homo modjokertensis</i> antedates <i>Homo erectus</i> from Trinil.	The fauna from Trinil, type locality of <i>Homo erectus</i> ; a reinterpretation
VOLUME 61 NO 2 213	1982	61	2	213	216			Book reviews
VOLUME 61 NO 3 217	1982	61	3	217	227	Meulen, S. van der	Point bar deposits from a small, Eocene, molasse-type basin have been studied in detail in order to establish a spatial point bar model, which can be used to locate a vertical section in a three-dimensional sense. A model is designed which shows the sedimentation processes in the palaeochannel and the evolution of point bars. However, some of the deposit characteristics can only be explained in terms of the wider, environmental setting. The development of facies and of larger sedimentary features can be recognised in the surface of a meander lobe, associated palaeochannel and fine fill, and in the vertical section of a comparable meander lobe. Most deposits comprise a lower, medium- to coarse-grained sandstone facies with trough-shaped crossbedding (0.15 m thick) and an upper facies with an inclined interbedding of sandstone and mudstone. Epsilon Cross Stratification has been developed extensively. Strong mottling has destroyed most of the sedimentary structures in the upper lithofacies interval. The exposed palaeochannel varies considerably in width and depth. Palaeochannel sediments are well graded in a vertical sense; laterally, however, there is only a minor gradation. During high discharge the lower lithofacies developed on a low platform at the point bar base. The upper facies originated on a steep upper point bar slope. Mud drapes were deposited during falling discharge. During periods of low discharge the upper part of the deposits was exposed to the air and strongly mottled and oxidized. Point bar deposits are arranged in meander lobes. A uniform dip direction often appears in transverse sections. Lateral grain-size variation in these sections can be large. In this respect the relatively coarse, initial part is important. Mud fills are found in the	The sedimentary facies and setting of eocene point bar deposits, Monllobat formation, southern Pyrenees, Spain.

VOLUME 61 NO 3 229	1982	61	3	229	242	Priem, H.N.A.; Andriessen, P.A.M.; Boelrijk, N.A.I.M.; Boorder, H. de; Hebeda, E.H.; Huguett, A.; Verdurmen, E.A.T.; Verschure, R.H.	The Amazonas region of southeastern Colombia is underlain by the western part of the Guiana Shield. Isotopic age measurements are reported on granites and gneisses of the shield basement, mafic intrusives, and a sequence of rhyodacitic lavas overlying the shield. Rb-Sr whole-rock analysis of 46 granites and gneisses and U-Pb analysis of two suites of zircons and a monazite reveal that during its development the Guiana Shield passed through at least two major orogenic episodes. The present basement was essentially formed during the Parguazan tectonomagmatic episode by large-scale granitic plutonism and metamorphic reconstitution of older crustal material, about 1560-1450 Ma ago. Most of the older isotopic record was obliterated during the Parguazan reworking, but some Rb-Sr whole-rock and U-Pb zircon systems indicate relict ages of at least 1850-1800 Ma, suggesting that the pre-Parguazan crust may be related to the Trans-Amazonian Orogenic Cycle. Rb-Sr and K-Ar analyses of 37 micas from basement rocks which are widely distributed over the area display ages cluster between about 1350 Ma and 1250 Ma; they are attributed to a general resetting of the isotopic systems by the Nickerie Metamorphic Episode about 1300 Ma ago. Evaluation of the Rb-Sr whole-rock data from five mafic intrusives and a suite of six samples from the rhyodacitic lavas suggest ages of about 1200 Ma and 920 Ma, respectively.	Geochronology of the precambrian in the Amazonas region of southeastern Colombia (Western Guiana Shield)
VOLUME 61 NO 3 243	1982	61	3	243	252	Deeny, D.E.	Based on the body of available data it is argued that the Irish midland Devonian-Carboniferous developed as a graben structure of the type currently exhibited at the Red Sea/African and Rhine upwarp systems. Evidence, both data-based and inferential, is drawn from studies of basement framework, regional Devonian-Carboniferous stratigraphy and inferred palaeogeography, igneous geology, geophysical (gravity) patterns and known Irish Devonian-Carboniferous fault systems. Examples of two of the latter are presented. This Irish central graben is argued to have developed in Late Devonian times along the axis of a crustal upwarp inferred to have resulted from plate collision during Late Ordovician to Early Devonian times. It is hypothesized that rifting may have been preceded by possible deep-seated carbonatite intrusion along the upwarp axis, possibly coeval with and/or following intrusion of the Late Caledonian Irish granites. Carbonatite evidence may have been subsequently destroyed by intrusion of 'embryonic spreading centre' magmas, so providing a possible explanation for present day regional Irish gravity values. For reasons presently unknown this 'foetal' spreading centre failed, the rift tilted and subsequent (Hercynian) overthrusting and crustal shortening has resulted in Irish regional geology as it is today.	Further evidence for Devonian-Carboniferous rifting in Central Ireland

VOLUME 61 NO 3 253	1982	61	3	253	263	Berg, J.H. van den	Recent large-scale crossbedded sands have been studied in two construction pits of the 'Delta Project' in the Oosterschelde, The Netherlands. The deposits form long crested megaripples of about two metres high at a depth of 4 to 17 metres below Mean Sea Level. Crossbedded sets have been analysed for stand-still phases of megaripple migration during the subordinate tide (pause planes). An average lee side accretion rate of the dunes was calculated from the cyclic neap to neap tide change in thickness of the sand layers between successive pause planes. Information on the morphodynamics of the environment of deposition and the rate of accumulation of the discussed units was acquired through some particular sedimentary structures and through the study of series of hydrographic charts of the area. The latter information also strongly suggests a wide occurrence of alike sedimentary units in the subsurface of shoals of the Oosterschelde mouth and outer delta. Finally the thickness and the number of the sets in relation to sandwave migration and rate of accumulation is discussed.	Migration of large-scale bedforms and preservation of crossbedded sets in highly accretional parts of tidal channels in the Oosterschelde, SW Netherlands
VOLUME 61 NO 3 265	1982	61	3	265	279	Pigram, C.J.; Challinor, A.B.; Hasibuan, F.; Rusmana, E.; Hartono, U.	The Misool Archipelago contains one of the most complete and richly fossiliferous Mesozoic sequences in southeast Asia and the southwest Pacific. The excellent exposures offer an opportunity to establish a reference biostratigraphy for the region as well as a detailed lithostratigraphy. Metamorphics form a basement overlain by ?Triassic flysch which was block-faulted and uplifted during the Carnian, after which platform carbonates were deposited followed by a period of non-deposition. Marine sedimentation resumed in the Early Jurassic with fine clastics and bathyal carbonates. Early Cretaceous volcanism was accompanied by a change to a fluvio-deltaic environment. By Tertiary times sediment supply waned and a marine carbonate regime was established. Marl was deposited after Late Oligocene folding and by middle Miocene times a carbonate regime was re-established until Quaternary uplift formed the Misool Archipelago. The Misool stratigraphy is a continuation of the northwestern Australian rift-drift sequence formed during the breakup of northern Gondwana. It provides precise timing for these events and hence vital information for the assessment of hydrocarbon potential.	Lithostratigraphy of the Misool Archipelago, Irian Jaya, Indonesia

VOLUME 61 NO 3 281	1982	61	3	281	292	Cloetingh, S.; Wortel, R.	Passive continental margins are in general characterized by the lateral contrast between oceanic and continental lithosphere and by the presence of thick sedimentary deposits which cause flexure and stressing of the lithosphere. Passive margins therefore, are potential sites for plate rupture and initiation of subduction. To investigate the evolution of passive margins, we have constructed finite element models, in which we have incorporated a complex system of forces, depth-dependent rheological properties and lateral variations across the margin. Sediment loading generates differential stresses of several kilobars and dominates the state of stress at passive margins. Stresses of this order of magnitude may cause failure of the lithosphere and initiation of subduction. We have found that the aging of passive margins alone does not make them more susceptible to initiation of subduction. However, extensive sediment loading on young lithosphere might be an effective mechanism for closure of small oceanic basins. This phenomenon plays an important role in the process of mountain building.	Finite element models of passive continental margins with implications for the initiation of subduction zones
VOLUME 61 NO 3 293	1982	61	3	293	295	Keet, B.	A program is presented to obtain a fine-scale correlation between discrete temperature logs and lithology. The algorithm is essentially the least square method. The limitations and an example of application of this program are given.	Temperature log analysis with a pocket calculator: interpretation program for discrete temperature logs in small-diameter wells
VOLUME 61 NO 3 297	1982	61	3	297	300	Jungblut, G.; Riezebos, P.A.; Slotboom, R.T.	Heavy mineral and palynological investigations of slope-covering materials near Kirf (Rhineland-Palatinate) reveal the presence of the Allerød Laacher See ash. This ash is characterized by the brown amphibole-pyroxene-sphene association, that was described earlier from peat bogs of the Semois valley (Belgium) and from several maars in the western Eifel (Germany).	An outcrop of the late glacial Laacher See ash near Kirf (Rhineland-Palatinate)
VOLUME 61 NO 3 301	1982	61	3	301	304	Oen, I.S.; Verschure, R.H.		Isotopic age determinations in Bergslagen, Sweden: I. introduction
VOLUME 61 NO 3 305	1982	61	3	305	307	Oen, I.S.		Isotopic age determinations in Bergslagen, Sweden: II. The Filipstad-type granite of Rockesholm, Grythyttan area
VOLUME 61 NO 3 309	1982	61	3	309	312	Oen, I.S.; Wiklander, U.		Isotopic age determinations in Bergslagen, Sweden: III. The Hyttsjö suite of gabbro-diorites and Tonalite-Granites, Filipstad area

VOLUME 61 NO 4 313	1982	61	4	313	320	Hartman, P.	A review is given on current theories about the growth mechanisms of a crystal face. The growth depends on internal factors (crystal structure and defects) and on external factors (supersaturation, temperature and presence of impurities). Three categories of faces are distinguished, depending on the number of periodic bond chains (PBCs) present in a slice d_{hk} . Only F (flat) faces containing two or more PBCs can grow according to a layer mechanism. They grow slowly and are important. Other faces grow continuously and fast. Impurities adsorbed on the crystal usually retard, but sometimes accelerate the growth and may even provoke the apparition of other faces. Beyond the roughening temperature T_R the flat surface structure of an F face transforms into a rough surface and the growth occurs continuously and is faster. T_R becomes lower when the interaction between crystal and fluid increases. The growth rate of an F face increases when the attachment energy of a new layer is higher. This allows to define a theoretical habit as exemplified for fluorite, quartz, olivine, feldspar, dolomite and calcite.	Crystal faces: structure and growth
VOLUME 61 NO 4 321	1982	61	4	321	324	Meinardi, C.R.	A new mapping technique is proposed to represent on one sheet the hydrogeological data of a region. The main features represented are: - the structure of the alternation of aquifers and resisting layers. The map gives the transmissivity of aquifers and the ranges in hydraulic resistance of less pervious layers. The symbols used are coloured beams (thickness indicating transmissivity values and colour the geological origin). - Ground-water heads in the form of contour lines and the relevant surface water pattern. - The location and the extent of ground-water extraction, indicated by circles of squares of a variable size. - Ground-water quality by means of the distribution of fresh and brackish ground-water. The map has been composed for the situation of the Netehrlands, but can most likely be used for any area, where the aquifer systems consist of unconsolidated sediment. Another requirement is that the available data allow a quantitative representation.	A new hydrogeological map of Guelderland and Flevoland
VOLUME 61 NO 4 321	1982	61	4	321	324	Meinardi, C.R.	Enclosure	A new hydrogeological map of Guelderland and Flevoland

VOLUME 61 NO 4 325	1982	61	4	325	333	Kroonenberg, S.B.	Precambrian high-grade metamorphic rocks emplaced tectonically in the Central and Eastern Cordillera of Colombia define a granulite belt which is lithologically, petrologically and geochronologically distinct from the adjacent part of the Guiana Shield. This Garzón-Santa Marta Granulite Belt was formed at the western border of the Early to Mid Proterozoic nucleus of the Shield by an orogenic event around 1.2-1.4 Ga. The Nickerie Metamorphic Episode, characterized in the whole western part of the Guiana Shield by mica age resetting around 1.2 Ga, extensive mylonitization along prominent ENE-WSW shear zones, and low-grade metamorphism, is brought into relation with this orogenic event. A continental collision model and a relationship with the Grenville Orogeny are suggested for this orogeny.	A Grenvillian granulite belt in the Colombian Andes and its relation to the Guiana Shield
VOLUME 61 NO 4 335	1982	61	4	335	341	Nwajide, C.S.; Hoque, M.	Two lithostratigraphic units in southeastern Nigeria, the Maastrichtian Ajali and the Eocene Nanka Formations, described as quartz arenites, have been found to contain significant amounts of feldspars in their intercalated mudrocks. If intense chemical weathering prior to transport could eliminate feldspars from the source rocks of these formations, it ought to have been reflected equally in both the sandstones and the mudrocks. Diagenetic elimination (intrastratal solution) may be discounted in these cases on the grounds of lack of petrographic evidence as well as its demonstrable ineffectiveness in the older (Turonian) Makurdi Formation of the same area whose sandstones and mudstones both are dominantly feldspathic or arkosic. It is therefore suggested that feldspars, which are characteristically mechanically unstable, become progressively comminuted along cleavage and twin composition planes, and bypass the coarser bedload during transport. The result is the impoverishment of bedload in feldspar and simultaneous enrichment of suspension load. The impervious nature of mudrocks protects the feldspars from intrastratal solution. The result is a feldspathic mudrock in a feldspar-poor sandstone. Comminution and sorting together are therefore considered effective processes that are capable of producing quartz arenites in a sedimentary system.	On the origin of feldspathic mudrocks associated with quartz arenites

VOLUME 61 NO 4 343	1982	61	4	343	353	Donselaar, M.E.; Nio, S.D.	Several barrier island sand bodies are well exposed in the southern Pyrenees, Spain. They belong to the Pano Formation of Lutetian (Upper Eocene) age and were formed in an environment which was strongly influenced by rising sea level. A detailed sedimentological study of a calcarenitic sediment body in this Formation is presented. The larger part of the barrier system described here is made up of tidal inlet deposits and washover sequences. The sediment body has a lense-shaped geometry. The width of the exposed body is 260 m and its maximum thickness is 20 m. It is made up of thin to thick bedded calcarenites. The tidal inlet part consists of massive, and tabular to lense-shaped beds. Laterally, in a landward direction, massive beds alternate with thinner washover beds, which have a primary landward directed dip. The marl/sand ratio increases in this direction. In their proximal parts, washover beds are subdivided by horizontal erosional surfaces. The subdivision shows a regular pattern and is attributed to varying storm intensities during one single storm event. Vertical stacking of tidal inlet and washover deposits is ascribed to a balance between the amount of sediment deposited and the rate of relative rise of sea level.	An Eocene tidal inlet/washover type barrier island complex in the South Pyrenean marginal basin, Spain
VOLUME 61 NO 4 355	1982	61	4	355	356	Dozy, J.J.	Research on Coal in The Netherlands	I - Introduction
VOLUME 61 NO 4 357	1982	61	4	357	358	Harst, T.H. van der	Research on Coal in The Netherlands	II - Geological/Geophysical reconnaissance - 1. The Geology of coal in the Netherlands
VOLUME 61 NO 4 359	1982	61	4	359	366	Voogd, N. de; Staudt, C.	A brief description is given of the programme for coal exploration in The Netherlands. The problem of detailing coal seams in the Dutch geological environment is described. With respect to resolution and lateral continuity promising results have been obtained using a field technique with the following main features: single deep shots with 0.5 kg charges, 10 m receiver group interval, and six 50 Hz geophones per group.	The Geology of coal in the Netherlands II - Geological/Geophysical reconnaissance - 2. Seismic exploration for coal in the Netherlands
VOLUME 61 NO 4 367	1982	61	4	367	372	Roest, J.P.A.	The aim of the project is to control the fracturing process of rock surrounding underground galleries under severe stress conditions. Model experiments indicate that a considerable decrease of convergence of galleries will occur if a circular zone of rock with a certain width around the gallery is artificially weakened and destressed. An underground field test confirmed that a destressed tubular rockmass around the excavation could support serious stress deviations of the surrounding bedrock, so that the gallery remained practically undamaged. It is expected that procedures following the lines of the described tests will improve the economy and the extent of deep coal mining	The Geology of coal in the Netherlands III - Conventional deep mining research - Rock support by a destressed ring of rock around a gallery under severe stress

VOLUME 61 NO 4 373	1982	61	4	373	376	Dozy, J.J.	The history of underground coal gasification and the achievements in the USSR and the USA are briefly reviewed. The different conditions under which coal occurs in Western Europe and The Netherlands are indicated and field tests in Belgium and France are mentioned. In The Netherlands research is mainly undertaken by the Delft University of Technology.	The Geology of coal in the Netherlands IV - New production methods - 1. Underground gasification of coal, past and present
VOLUME 61 NO 4 377	1982	61	4	377	381	Baaren, J.P. van; Ketting, J.	A concept for coal gasification of deep lying thin coal layers via borehole linking and repeated sand-fill of the reaction chamber is described. The influence of high temperatures (up to 1000° C) on the rock properties are summarised. The stability of a borehole leading to an underground coal gasification chamber can be simulated by means of a finite element computer programme. Forthcoming research on this subject for the next 3 years is indicated.	The Geology of coal in the Netherlands IV - New production methods - 2. Stability of an underground coal gasification cavity
VOLUME 61 NO 4 383	1982	61	4	383	388	Coppes, J.	The practice of directional drilling in the petroleum industry is explained. It is shown that the drilling of horizontal boreholes of a few hundred meters is technically feasible. Measuring-while-drilling techniques have been developed and experiments are carried out towards achieving 'steered' drilling.	The Geology of coal in the Netherlands IV - New production methods - 3. Directional drilling
VOLUME 61 NO 4 389	1982	61	4	389	393	Dietz, D.N.; Bruining, J.	Gasification of coal occurs at high temperatures. The energy present in the coal, as far as it is not converted into the chemical energy of the gas produced, is liberated in the form of sensible heat. This heat will be carried along by the gases and is partly lost to the cap and base rock of the thin coal layer; the rest of this heat is carried off through a production well. During the cooling process, part of the combustible gas will be reconverted into non-combustible components. This generates further heat. All this heat represents an important part of the energy originally present in the coal. This part can approach values of 100% under unfavourable process conditions or even more than 100% if steam is injected. Because coal in The Netherlands occurs in thin layers and at great depth only small amounts of this sensible heat can be recuperated at the surface. By adapting a heat recuperation method from the oil technology we aim to transfer the heat left upstream of the reaction zone back to this process zone, to accomplish a more efficient gasification process and to avoid excessive temperatures in the production well.	The Geology of coal in the Netherlands IV - New production methods - 4. Underground coal gasification with heat recuperation
VOLUME 61 NO 4 395	1982	61	4	395	395	Dozy, J.J.		The Geology of coal in the Netherlands V - Summary and conclusions
VOLUME 61 NO 4 397	1982	61	4	397	399	Plassche, O. van de		Significance of a new basal peat date for the trend of Holocene mean sea level rise in the Netherlands

VOLUME 61 NO 4 401	1982	61	4	401	402	Wells, N.A.; Asif Jah, M.	Wrinkles of mud forming a mudcrack-like pattern across the top of a small mud-filled depression are explained as the result of extrusion of slightly overpressured underlying fluid mud. On a small scale, this confirms a mode of formation of soft-sediment dikes hypothesized by Oomkens (1966).	An example of extrusion of fluid mud through mudcracks and an origin of sediment dikes
VOLUME 61 NO 4 403	1982	61	4	403	408			Book reviews
VOLUME 62 NO 1 1	1983	62	1	1	1	Kaasschieter, J.P.H.; Reijers, T.J.A.		Petroleum geology of the southeastern north sea and the adjacent onshore areas (the Hague, 1982) - Preface
VOLUME 62 NO 1 3	1983	62	1	3	23	Harding, T.P.	Hydrocarbon occurrences, types of traps, and structural styles have been synthesized from the Sirte, Suez, and Viking grabens. Hydrocarbons occur in a stacked succession of one or more basins: pregraben, graben and interior sag. Preservation of pregraben reservoirs depends on late initiation of crustal arching and limitation of uplift to the graben shoulders. Trap closure in pregraben and graben-fill deposits is primarily dependent on the multidirectional orientation of normal faults, tilting of fault blocks, and flexing or erosion parallel to block edges. Fault patterns include dominant longitudinal faults parallel to the graben axis and oblique faults. Block rotation is influenced by fault profile, amount of extension, fault pattern, downwarping of the sag basin, and isostatic adjustments between large blocks. Fold closures result from the upward termination of faults into forced folds that are subsequently accentuated by fault drag. Folds extend to shallower depths and into the interior-sag base by passive drape and differential compaction. Traps above this level are dependent on factors other than graben tectonics.	Graben hydrocarbon plays and structural styles
VOLUME 62 NO 1 25	1983	62	1	25	33	Best, G.; Kockel, F.; Schöneich, H.	The structural history of the southern Horn Graben is analysed based on the data of the released German offshore wells Q-1, R-1 and S-1 and two E-W directed seismic lines. Rifting presumably already started during the Late Carboniferous. The main phase of taphrogenesis took place during the deposition of the Lower and Middle Buntsandstein (Bacton interval) and an asymmetric graben with a more pronounced western flank was formed. During Röt and Muschelkalk sedimentation, Permian salts mobilized at the boundary faults and in the graben center, forming salt pillows. These salt structures entered the diapiric stage mainly during Keuper deposition while subsidence continued. At the beginning of the latest Jurassic and during the Early Cretaceous general subsidence and tilting towards the west took place, following a Middle-Late Jurassic period of uplift and erosion of the Graben and its surroundings. The negative movements have continued at increasing rates till present times. Weak diapiric movements in the salt structures persisted until the Late Miocene.	Geological history of the southern Horn Graben

VOLUME 62_NO 1_35	1983	62	1	35	45	Skjervén, J.; Rijs, F.; Kalheim, J.E.	The Late Palaeozoic to Cenozoic structural development of the southern and southeastern Norwegian offshore sector is described, based on detailed maps of Top Chalk, Base Valanginian and Base Zechstein levels. The history of the main structural elements confirms that block faulting has occurred through the Permian, Triassic and Jurassic along NW-SE, N-S and E-W trending fault systems. Shear movements occurred in the Late Jurassic and in the Late Cretaceous/Early Tertiary, mainly along the N-S and E-W trends.	Late palaeozoic to Early Cenozoic structural development of the South-Southeastern Norwegian Sea
VOLUME 62_NO 1_47	1983	62	1	47	50	Olsen, J.C.	The structural outline of the Horn Graben is discussed on the basis of four seismic lines and the Danish North Sea wells R-1, S-1 and C-1. The basic outline of the general N-S trending Horn Graben is defined by several deep-seated faults established during the Early Permian or possibly pre-permian. During the Late Permian, Triassic and Jurassic, these faults were reactivated, and created in the southern area an asymmetrical graben with a very pronounced western flank. The western flank becomes less pronounced towards the north, where the tectonic activity created an asymmetrical graben with a pronounced eastern flank	The structural outline of the Horn Graben
VOLUME 62_NO 1_51	1983	62	1	51	62	Bless, M.J.M.; Bouckaert, J.; Paproth, E.	The palaeogeographic evolution of NW Europe during the Pre-Permian has been controlled by three important orogenic periods since the Late Precambrian. Since the end of Cadomian times, a blockfaulted platform seems to exist to the southwest of the Fenno-Scandian Shield: the Belgo-Dutch Platform. One of the main structural elements in this platform is the London-Brabant Massif that was uplifted by the Late Caledonian movements. The Brabant Massif and its surrounding areas form the best-known part of the Belgo-Dutch Platform. Recent geological work in this area has focussed, e.g. on the extension of the allochthonous thrustsheets south of the Brabant Massif (Dinant Nappes), the rapid lateral facies and thickness changes in the Devonian-Dinantian carbonate deposits (e.g., in the St.-Ghislain and Visé-Puth areas, respectively south and east of the Brabant Massif), and the Upper Carboniferous (Silesian) coal deposits to the north and northeast. The present review is meant as a preliminary synthesis of the state of these exploration projects.	Recent exploration in pre-permian rocks around the Brabant Massif in Belgium, the Netherlands and the federal republic of Germany

VOLUME 62 NO 1 63	1983	62	1	63	74	Lith, J.G.J. van	The Bergen Concession is located onshore in the Netherlands province of Noord-Holland, about 25 km NW of Amsterdam and 150 km SW of Groningen gas field. The Concession was granted on May 1, 1969, on the basis of gas discoveries drilled in 1964 and 1965. In 1972 the first field came on stream. Currently five fields are producing and one more is planned to be connected in 1983. The gas from all fields is treated at a central gas drying plant and is delivered to the Netherlands marketing organization N.V. Nederlandse Gasunie. The gas is sold to German power companies. Productive reservoirs have been found in Permian Upper Rotliegend Slochteren sandstone, Upper Permian Zechstein 3 Carbonate (Platten dolomite) and Lower Triassic Main Buntsandstein (Middle Bunter sandstone). Operations in the Concession have progressed slowly due to environmental considerations. The area contains nature-reserve and drinking-water areas in the dunes which protect polder areas from the sea. The ecological and economic quality of the polder land below sea level is maintained by strict management of surface and ground water. The geology of the Concession area and the impact of environmental requirements on the gas exploration and producing operations are discussed.	Gas fields of Bergen concession, the Netherlands
VOLUME 62 NO 1 75	1983	62	1	75	82	Roos, B.M.; Smits, B.J.	In the Dutch offshore Block K/13, two Lower Permian Rotliegend and two Triassic Main Buntsandstein gas fields were discovered between 1972 and 1976. The coincidence of these gas accumulations is the result of a combination of several factors: - excellent reservoir sands sourced by Carboniferous gas, - gas trapped in salt-sealed Rotliegend structures flanking the Broad Fourteens Basin prior to inversion. Some gas re-migrated into Main Buntsandstein traps during and after Late Cretaceous inversion movements.	Rotliegend and main Buntsandstein gas fields in Block K/13 - A case history
VOLUME 62 NO 1 83	1983	62	1	83	92	Adrichem Boogaert, H.A. van; Burgers, W.F.J.	The Zechstein Group can be divided into four, locally five, evaporitic cycles. The margin of the Zechstein basin passes through the southern Netherlands and adjacent offshore area. It is characterized by fringing carbonates and clastics. In the southern offshore area a strong influx of sand is evident. The Zechstein is absent by erosion on the Late Kimmerian Texel-IJsselmeer High. A few indications suggest that part of this High was a positive area during Zechstein times. The first evaporitic cycle forms an E-W trending anhydrite platform in the central Netherlands and offshore continuation with a thickness of over 250 m. Halite is locally developed in this platform region. The major basinal halite sequences of the second and third cycle tie north of the platform. The carbonate members of these cycles have their main development along the basinward edge of the first cycle anhydrite platform. The fourth and fifth cycles are of modest dimensions and contain no carbonates.	The development of the Zechstein in the Netherlands

VOLUME 62 NO 1 93	1983	62	1	93	102	Michelsen, O. Andersen, C.	The structural framework of the Central Graben, probably created in Late Palaeozoic times, controlled the sedimentary conditions during major parts of the Mesozoic. The Danish Central Graben is subdivided into a number of sub-areas each characterized by specific structural styles, the most important being the Northern and Southern Salt-dome provinces. the Tail End Graben and the Dogger High. During the Triassic subsidence a sedimentary sequence not surpassing 2000 m was deposited. The Early Kimmerian tectonic phase caused erosion into the top of the Triassic sequence on anticlinal structures. The Jurassic and Early Cretaceous periods were dominated by strong subsidence and more than 4000 m of sediments were accumulated in the Tail End Graben. Both the Mid and Late Kimmerian tectonic phases affected the Central Graben. During the Late Cretaceous the change from a rifting phase into one of gradual subsidence was accompanied by inversion tectonics.	Mesozoic structural and sedimentary development of the Danish Central Graben
VOLUME 62 NO 1 103	1983	62	1	103	114	Hamar, G.P.; Fjæran, T.; Hesjedal, A.	Three major Early - Middle Jurassic unconformities in the Fiskebank Sub-Basin are represented by a hiatus in the Central Graben. The axial North Sea dome collapsed in Late Callovian, initiating the Central Graben, and causing coarse clastic sedimentation near topographic highs. The facies developments within the Norwegian-Danish Basin are controlled by the Lista Ridge. Anaerobic conditions are typical of the Late Jurassic, but highly radioactive shales are found only in the Central Graben and the Fiskebank Sub-Basin. A Mid-Volgian transgression established a seaway connection between these basins. Fifteen lithostratigraphic units are mapped. Evidence of strike-slip faulting in the Farsund Sub-Basin, and of halokinetic effects on the Jurassic sedimentation are presented.	Jurassic stratigraphy and tectonics of the south-southeastern Norwegian offshore
VOLUME 62 NO 1 116	1983	62	1	116	129	Koch, J.O.	A regional review is presented of the sedimentology and reservoir parameters of the Middle Jurassic Haldager Formation and J-2 unit, as well as the Upper Jurassic Frederikshavn Member, W-1 and V-1 units from the Danish Subbasin and the Danish Central Graben, respectively. New coredata are presented from the Haldager Formation of two D.O.N.G. wells in the Danish Subbasin and from the Upper Jurassic W-1 unit of the D.U.C. W-1 well in the Danish Central Graben	Sedimentology of Middle and Upper Jurassic sandstone reservoirs of Denmark

VOLUME 62 NO 1 131	1983	62	1	131	134	Dunay, R.E.; Dronkers, A.J.	A palynostratigraphic examination of the Early Cretaceous Vlieland and Delfland units was undertaken. The Vlieland Sandstone and the overlying Vlieland Shale in all locations contained among others, the dinoflagellates <i>Broomea/Batioladinium</i> , <i>Spiniferites dentatus</i> , <i>Hystrichodinium furcatum</i> and <i>Lithodinia pertusa</i> . Furthermore, recycled Triassic taxa were found in the Vlieland Sandstone in the southwestern portion of the study area. The underlying Delfland sediments usually exhibited a typical Early Cretaceous, probably Valanginian, terrestrial palynoflora. The P/6-2 well was, however, anomalous in that it contained an extremely thick shale sequence exhibiting such Early Cretaceous dinoflagellates as <i>Subtilisphaera</i> .	Stratigraphic correlation of the Vlieland and Delfland units in the Dutch offshore, based on palynology
VOLUME 62 NO 1 135	1983	62	1	135	144	Hesjedal, A.; Hamar, G.P.	The Early Cretaceous sedimentary sequence is subdivided into seven formations in the southern Norwegian Offshore. It is dominated by marine fine-grained argillaceous sediments with varying calcareous content. The Sola Formation is found to be relatively rich in organic carbon and is, therefore, expected to have a good source rock potential. A small number of sandstone accumulations is located in the vicinity of penecontemporaneously reactivated highs. The northern part of Fiskebank Sub-Basin was inverted during the Cenomanian. This correlates with renewed strike-slip movements along the Fjerritslev Fault and at other places at the edge of the Fennoscandian Shield. The 'Late Kimmerian Unconformity' is discussed.	Lower Cretaceous stratigraphy and tectonics of the south-southeastern Norwegian offshore
VOLUME 62 NO 1 145	1983	62	1	145	156	Bosch, W.J. van den	The Harlingen gas field, at the top of the Chalk, is situated in Petroland's Leeuwarden Concession in the province of Friesland, northern Netherlands. The structural closure developed partly during the Early Oligocene, after approximately 500 m of sediment had been deposited on top of the Chalk. Shortly hereafter, gas migrated into the structure. The presence of the gas strongly reduced the further loss of porosity and permeability by diagenesis, whereas the overpressuring reduced further compaction. A final deformation phase, probably at the end of the Early Miocene, slightly enhanced the curvature at the top Chalk and gently folded the then relatively porous gas cap, resulting in a folded gas-water contact. Unlike the situation in the Chalk fields in the Central North Sea, fracturing of the reservoir is very limited and has not resulted in increased effective permeability. This is probably due to the weak curvature of the structure. Notwithstanding the low average permeability (1-2 mD), a production rate of over 60 000 m ³ /day was maintained for a period of five months after stimulation, without any signs of pore collapse, common in many unfractured chalk reservoirs-elsewhere. A field development plan is being considered.	The Harlingen field, the only gas field in the Upper Cretaceous chalk of the Netherlands

VOLUME 62 NO 1 157	1983	62	1	157	168	Hurst, C.	The Gorm field is located within the Central Graben of the North Sea. It is a broad, domal, salt-induced structure of 750 ft closure, cut by a major, NNE-SSW striking, normal fault. The downthrown, 'western A block is dissected by high angle, tensional faults while the upthrown, eastern B block is relatively unfaulted. Downthrow of the A block appears to have been accompanied by a southward tilt relative to the B block. The reservoir rock comprises high porosity, low permeability, Danian and Maastrichtian chalks which are in pressure and fluid equilibrium. The upper Maastrichtian, with porosities of 30-40% , contains the bulk of the reservoir volume, porous Danian also contributing significant volume in the B Block. Gorm is an undersaturated oil reservoir with no initial gas cap and an oil column of up to 500 ft. Fluid levels are horizontal in the B block and apparently dipping to the south in the A block. To date, production performance in A block wells is better than that in B block wells.	Petroleum geology of the Gorm Field, Danish North Sea
VOLUME 62 NO 1 169	1983	62	1	169	175	Skovbro, B.	A study of Late Cretaceous-Early Paleocene deposits in the Ekofisk area is based on a large amount of data available in the Norwegian Petroleum Directorate. The quality of this material was furthered by additional detailed micropalaeontological, sedimentological, structural and diagenetic studies. Several prominent units of allochthonous chalk deposits have been recognized. Based on micropalaeontological and sedimentological data, it is now possible to define these units properly. It has been attempted to map these allochthonous units as well as their source areas in order to gain a better understanding of the depositional environments during Chalk deposition in the Central Graben.	Depositional conditions during chalk sedimentation in the Ekofisk area Norwegian North Sea
VOLUME 62 NO 1 177	1983	62	1	177	190	Nygaard, E.; Lieberkind, K.; Frykman, P.	The Chalk Group is subdivided into Chalk Units. The regional development of these is the basis for a depositional model implicating a high degree of redeposition and resulting in a geographic zonation of the Danish Central Graben into 'Deposit Zones'. Wireline log interpretations suggest good reservoir-intervals to coincide with specific lithologies. These are proximal allochthonous deposits, i.e. debris flows, which are found to be most common in the Chalk Units 6 Upper Part, Unit 5 and locally in Unit 2. The matrix permeability is best developed in the highly porous intervals. In the most favourable reservoirs fracturation has enhanced the permeability up to hundred times.	Sedimentological and reservoir parameters of the chalk group in the Danish Central Graben

VOLUME 62 NO 1 191	1983	62	1	191	202	Gdula, J.E.	The De Wijk gas field is situated near the town of Meppel in the Dutch province of Drenthe. It produces gas from Carboniferous, Triassic and Tertiary. The largest gas accumulation is contained within a system of Triassic reservoirs and is trapped in a broad salt induced structure some 10 by 11 km. Within this structure Triassic sediments, ranging from the Lower Muschelkalk Member in the east to the Main Claystone Member in the west, subcrop with marked angularity on the Late Kimmerian erosion surface. Vertical sealing is provided by Lower Cretaceous shales and marls which unconformably overlay the Triassic sediments. So far economic gas production has been established from the shallow Basal Dongen Tuffite Member in the lower part of the Tertiary, from the Triassic Rogenstein oolite, Volpriehausen Sandstone and Lower Muschelkalk members, as well as from a small Carboniferous reservoir. The fact that gas is produced from the Basal Dongen Tuffite, Rogenstein oolite and Lower Muschelkalk makes the De Wijk field unique among Dutch gas fields; nowhere else in The Netherlands are any of these reservoirs gas productive. The reservoir properties of the Triassic reservoirs are due to diagenetic effects; in particular to leaching of anhydrite during the Kimmerian erosional phases.	Reservoir geology, structural framework and petrophysical aspects of the Wijk gas field
VOLUME 62 NO 1 203	1983	62	1	203	210	Kettel, D.	Coalification data measured in Late Carboniferous strata are available from wells in the Ems estuary and in the southern part of the German North Sea. The grade of maturity was calculated for the surveyed horizons using Lopatin's method, from the burial history, present temperature gradient and surface temperature, and these calculated data were compared with the measured ones. Positive differences (measured value higher than calculated) indicate the presence of a heat anomaly probably caused by a buried intrusive body. The 'East Groningen Massif'. The shape of this anomaly coincides with the present and past regional structural trend in this area. The same applies for a positive aeromagnetic anomaly in this area. It can be assumed that the age of the East Groningen Massif is around the Jurassic-Cretaceous boundary. i.e. Late Kimmerian.	The East Groningen Massif - detection of an intrusive body by means of coalification

VOLUME 62 NO 1 211	1983	62	1	211	219	Taylor, J.C.M.	Permo-Carboniferous redbeds encountered in some deep German North Sea wells are commonly altered when drilled with diamond bits. The process has been referred to as 'bit-metamorphism' by well-site geologists and others. Severely altered cuttings constitute over 80% of samples; they are hard, and when oil-based muds have been used are almost black and generally magnetic. Study of cuttings using petrographic, X-ray and chemical methods, supplemented by scanning electron microscopy, demonstrates that the process involves the reduction of particle size by shearing, followed by cementing or welding of the particles into a matrix superficially resembling a glass. The bulk chemical analysis of strongly altered cuttings is similar to that of accompanying unaltered material, though slightly richer in silica, but X-ray reflections of all minerals except quartz and feldspar are reduced or lost. All rock types are believed to be affected, but abundance of quartz and accompanying above-average hardness probably favour the process. Oil-based muds are not thought to be a necessary factor, but when used their breakdown may give rise to spurious gas readings. It is not certain whether the altered cuttings are bound together by precipitation of colloidal silica or by fusion to a glass. Further research is needed and might be expected to lead to better cuttings, reduced drilling torque, and less bit wear.	Bit-metamorphism, illustrated by lithological data from German North Sea Wells
VOLUME 62 NO 1 221	1983	62	1	221	239	Thomsen, E.; Lindgreen, H.; Wrang, P.	Source rock analyses are carried out at the Geological Survey of Denmark using mineralogical, coal petrographical and organo-chemical methods. Investigations have been concentrated on Mesozoic deposits from the Danish part of the Central Graben and on Palaeozoic and Mesozoic deposits from the Danish onshore area. The results from the Central Graben indicate that the Kimmeridgian deposits are the principal source rocks for the known oil fields in the Danish sector, but with regional variations with respect to richness and maturity, the northern part of the study area being the most promising. From the Danish onshore area coal petrographical analyses indicate that Rhaetian-Jurassic-Early Cretaceous deposits are mainly immature-premature with respect to oil generation. Combined mineralogical and coal petrographical analyses on a limited number of samples from the Palaeozoic indicate post-mature Early Palaeozoic deposits. while Carboniferous and Permian sediments have been found to be in a premature-mature stage.	Investigation on the source rock potential of Denmark

VOLUME 62 NO 2 241	1983	62	2	241	254	Bosma, W.; Kroonenberg, S.B.; Maas, K.; Roever, E.W.F. de	The crystalline basement of Suriname was formed essentially in the Lower Proterozoic during the Trans-Amazonian orogeny around 2000 to 1870 Ma ago. Two belts of high-grade metamorphic rocks probably developed as intracratonic basins within an older, possibly Archaean continent. A greenstone belt with basic and intermediate volcanics, volcanoclastic greywackes and coarse-clastic (molassic?) sediments is supposed to have formed in an island-arc-back-arc marginal basin environment at the northern margin of the older continent. Deformation and metamorphism took place around 2000 Ma ago. Extensive acid magmatism around 1870 Ma represents a subsequent stage in the Trans-Amazonian Orogenic Cycle, marked by acid ignimbritic volcanism, and next by granitoid and gabbroic intrusions. Most of the older basement was remobilized and reworked during this stage. Cratonization of the region was completed before the deposition of the Roraima Formation sandstones and pyroclastics around 1650 Ma and the intrusion of the Avanavero and Käyser Dolerites. Metamorphism, mylonitization and mica age resetting occurred around 1250 Ma in western Suriname during the Nickerie Metamorphic Episode. The intrusion of the Permo-Triassic Apatoe Dolerite around 230 Ma marks the beginning of the separation of South America and Africa.	Igneous and metamorphic complexes of the Guiana shield in Suriname
VOLUME 62 NO 2 241	1983	62	2	241	254	Bosma, W.; Kroonenberg, S.B.; Maas, K.; Roever, E.W.F. de	Enclosure	Igneous and metamorphic complexes of the Guiana shield in Suriname
VOLUME 62 NO 2 255	1983	62	2	255	265	Veeken, P.C.H.	Within the mainly clastic sediments of the Neogene-Quaternary Pulpi Basin several transgressions are recognized: a Late Burdigalian, a Langhian, a Late Langhian-Serravalian, a Tortonian, an Early Messinian, and an Early Pliocene transgression. Each of these transgressions is preceded by either a phase of structural deformation, erosion, a hiatus and/or by deposition of red-bed sediments. No evaporitic Messinian sediments are exposed; at the southwestern border of the Pulpi Basin, however, an erosional and slightly angular unconformity is present between marine Late Messinian marls and fine-grained marine Early Pliocene deposits. Evidence is provided for considerable horizontal displacements along the sinistral 'Aguilon' wrench-fault which disrupts the Sierra Cabrera and the Sierras de Almagrera-Almenara, during Serravalian, Tortonian, and Messinian times. In and since the Pliocene only minor faulting occurred. During the Pliocene-Pleistocene regression a conglomeratic massflow dominated shallow-marine fan-delta prograded from the north to the south in the Pulpi Basin. In the adjacent Vera Basin this delta system it was subsequently divided in a westerly direction.	Stratigraphy of the Neogene-Quaternary Pulpi Basin, provinces Murcia and Almeria (SE Spain)

VOLUME 62 NO 2 267	1983	62	2	267	273	Sanberg, J.A.M.; Oerlemans, J.	Results are presented from a numerical model of the Scandinavian Ice Sheet, in which the effect of upslope precipitation is included explicitly. The model is forced by changing the environmental conditions, formulated in terms of the annual mean temperature and the annual temperature range. These factors determine snowfall and melting rates, in dependence of the local conditions. It appears that orographically induced precipitation, which causes zones of high precipitation to shift with the ice-sheet edge, and ocean temperature are very important with regard to the growth rate of the Scandinavian Ice Sheet. In particular, upslope snowfall causes the ice sheet to advance westwards into the North Sea region much more easily. Stable equilibrium states of the ice sheet were calculated for various climatic conditions. A large ice sheet is only possible in cold conditions, whereas under very warm conditions no ice cover can be maintained. However, in between is a range of temperatures (2.5 to 6 K lower than present temperature) for which three stable equilibrium states exist: (i) no ice sheet, (ii) small ice sheets in them Scandinavian mountains, and (iii) a large ice sheet. This indicates that the response of the Scandinavian Ice Sheet to time-dependent forcing will be very complex.	Modelling of Pleistocene European ice sheets: the effect of upslope precipitation
VOLUME 62 NO 2 275	1983	62	2	275	284	Stienstra, P.	Rock-phosphates front Table Mountain Santa Barbara (Curaçao, Leeward Netherlands Antilles), were investigated in the field and by evaluating data from cores of 203 drill holes. The distribution of phosphate- and fluorine-contents and recovery were studied in detail. Arrangement of several zones of maximum mineralization suggests that phosphatization, caused by the influx of a guano-derived phosphate-brine, was mainly governed by (a) the primary stratification and other primary petrological trends, and (b) the hydrogeochemical environment as defined by a phreatic fresh water-salt water mixing zone. A direct relationship is suggested between the two main zones of mineralization and two specific periods of relative stable sea level during the Pleistocene.	Structure and general chemistry of table mountain Santa Barbara phosphates, Curaçao, Netherlands Antilles
VOLUME 62 NO 2 285	1983	62	2	285	295	Gans, W. de	The brook deposits of the Singraven Formation in the Aa valley are described and dated by respectively six cross sections and seven pollen diagrams. Three lithozones are discriminated: a sand bed, a detritic gyttja bed and a peat bed. The influence of the Holocene sea level rise on the deposition of the detritic gyttja bed in the downstream part of the valley is discussed. From the palynological data it is concluded that the Singraven Formation in the valley is confined to the Holocene. Two fluvial erosion phases causing headward erosion are distinguished: a Late Dryas phase, anticipating the deposition of the Singraven Formation, and a Late Boreal/Early Atlantic phase. Possible causes of these erosion phases are mentioned.	Lithology, stratigraphy, and palynology of Holocene deposits in the Drentsche Aa valley system

VOLUME 62 NO 2 297	1983	62	2	297	300	Bor, T.J.	Teeth of a new species of Guitarfish (Elasmobranchii, Batomorphii), <i>Rhinobatos mariannae</i> nov. sp., are described from three exposures of the Maastricht Formation (Upper Maastrichtian, Cretaceous) in the Netherlands and Belgium	A new species of Rhinobatos (Elasmobranchii, Batomorphii) from the Upper Maastrichtian of the Netherlands and Belgium
VOLUME 62 NO 2 301	1983	62	2	301	303	Oen, I.S.	Rb-Sr whole-rock isotope analyses of ten samples of Grängen granite yield a best-fit line corresponding to an age of 1663 ± 51 Ma with an initial $^{87}\text{Sr}/^{86}\text{Sr}$ ratio of 0.70844 ± 0.00578 . Four samples of Tallåsberget granite give a best-fit line corresponding to an age of 1639 ± 185 Ma with an initial $^{87}\text{Sr}/^{86}\text{Sr}$ ratio of 0.70191 ± 0.04241 . Isochron relationships appear disturbed by the low-grade retrograde metamorphism which has affected the granites. Taking account of the limits of error it is suggested that the Grängen and Tallåsberget granites in the Hjulsjö region, Bergslagen, Central Sweden, are coeval with the 1.7-1.6 Ga granites of the Småland and Värmland Groups in S and SW Sweden.	Isotopic age determinations in Bergslagen, Sweden: IV granites of the Grängen area, east of Hjulsjö
VOLUME 62 NO 2 305	1983	62	2	305	318	Letsch, W.J.; Sissingh, W.	Analysis of stratigraphic relationships and depositional characteristics shows that the deposition of the Paleogene of The Netherlands was governed particularly try global cycles of (marine) transgressions and regressions. Shorelines generally lay in the south and southeast. Intercalated sands were derived from the Central European hinterland. The depositional history of the Neogene is closely related to the development of the Lower Rhine Embayment and the Rhine River system. It also manifests the onset of the formation of the deltaic fan system which has characterized the onshore Netherlands since the early Pleistocene.	Tertiary stratigraphy of the Netherlands
VOLUME 62 NO 2 319	1983	62	2	319	328	Weering, T.C.E. van	Acoustical reflection profiles of the area show four sedimentary units which reflect depositional events in and since the last glaciation. Two units (4 and 3) have a morainic character. The morainic units are covered by late Weichselian glacio-marine (unit 2) and Holocene (unit 1) sediments. The distribution of the postglacial basin infill has been mapped and shows that at present sedimentation rates are low. Storm induced wave abrasion of Vikingbank has resulted in selective removal of fines from west to east. The recent hydrographic regime is expressed in the distribution of the sand fractions, in the carbonate- and organic carbon content, and in the C/N ratios of the bottom sediments. Pockmarks are present along the western slope of the Channel which becomes highly dissected and irregular towards the south.	Acoustical reflection profiles, sediments and late Quaternary history of the Norwegian channel north of Bergen
VOLUME 62 NO 2 329	1983	62	2	329	343	Bartstra, G.J.; Hooijer, D.A.; Sondaar, P.Y.; Vos, J. de; Leinders, J.J.M.		Comments and reply on: The fauna from Trinil, type locality of Homo Erectus: A reinterpretation
VOLUME 62 NO 2 345	1983	62	2	345	352			Book reviews

VOLUME 62 NO 3 354	1983	62	3	354	354	Berg, M.W. van den; Felix, R.	This special issue of Geologie en Mijnbouw is dedicated to prof. dr. J. D. de Jong on the occasion of his retirement on August 31, 1982, from the chair of Geology at the Agricultural University Wageningen, The Netherlands.	Preface special issue Prof dr J.D. de Jong
VOLUME 62 NO 3 355	1983	62	3	355	372	Oele, E.; Apon, W.; Fischer, M.M.; Hoogendoorn, R.; Mesdag, C.S.; Mulder, E.F.J. de; Overzee, B.; Sesören, A.; Westerhoff, W.E.	In 1953, under J. D. de Jong's supervision, a new mapping programme was started to meet the expected demand for more detailed information. At that time, the only available method of collecting data was based on rather simple hand-operated sampling equipment. Technical developments as well as the demand for more detail information led to the application of improved sampling techniques and geophysical methods. More information is now presented on the maps whereas other types of maps, such as the offshore geological maps, have been added to the programme. As expected, the demand for geological information today is great. The present article reviews the surveying methods applied by the Survey and the maps which are in preparation. Some case histories are given to illustrate the application of the results of the mapping programme.	Surveying the Netherlands: sampling techniques, maps and their application
VOLUME 62 NO 3 373	1983	62	3	373	382	Twidale, C.R.; Milnes, A.R.	Topographic, chronologic and climatic implications of siliceous duricrusts that are widely developed and preserved in inland arid Australia are discussed. Plateaux capped by siliceous duricrusts are characteristic, but are probably manifestations of large-scale relief inversion. Such duricrusts have been widely used as morphostratigraphic markers, and despite many possible difficulties, these interpretations may well be valid; but caution and consideration of the local evidence are necessary. The climatic context of silcrete both from the viewpoint of its formation and its degradation is uncertain. It may be that the various solutional features developed on these siliceous materials offer evidence on this point complementary to that derived from stratigraphic studies.	Aspects of the distribution and disintegration of siliceous duricrusts in arid Australia
VOLUME 62 NO 3 383	1983	62	3	383	388	Aleva, G.J.J.	Divide areas and associated interfluves of upstream tributaries, mark the outer boundaries of the wide, flatly concave final landscape forms resulting from BÜDEL'S (1957) concept of double planation surfaces. The details of the weathering and denudation processes in these divide and interfluve areas have been studied during exploration work for placer tin and bauxite deposits. resulting in two distinct profiles: (i) the saprolite-mass flow profile and (ii) the saprolite-laterite profile. In addition to the denudation level and the weathering front level, making up BUDEL'S double planation surfaces, each of these profiles have one additional level. Both profiles are described in some detail; the effects of unequal downward progress of the various levels and the separation in space of both types of weathering profiles are discussed in the light of parent rock composition and climatic variation.	On weathering and denudation of humid tropical interfluves and their triple planation surfaces

VOLUME 62 NO 3 389	1983	62	3	389	399	Kroonenberg, S.B.; Melitz, P.J.	A comparison between summit levels distinguished by various authors in the basement of Suriname, photogeological landscape units, lithological information from the new geological map and LANDSAT imagery shows that many summit levels coincide with photogeological and lithological units in the lowlands that form the main part of the basement. Steps that separate summit levels of different altitude commonly are also lithological discontinuities. Such steps might originate under humid climatic conditions as jumps in the weathering front due to differential chemical weathering of contrasting rock types. The steps are exposed at the surface during periods of semi-arid conditions under savanna vegetation by stripping of the saprolite. In this etchplain model, summit levels at different heights do not differ essentially in age but only in resistance of underlying rocks to deep weathering. Only those levels that are protected by means of duricrusts against further surface lowering, or that were exhumed as domed inselbergs survived several cycles of etching and stripping.	Summit levels, bedrock control and the etchplain concept in the basement of Suriname
VOLUME 62 NO 3 401	1983	62	3	401	408	Kuyl, O.S.	During the Late Cretaceous Sub-Hercynian tectonic phase, transitory inversion of movements took place in the Central Graben. This NW-SE running graben is limited in the NE by the Peelrand Fault and in the SW by the Feldbiss (Fig. 1). During this period the graben floor became uplifted. Inversion first occurred in the SW part of the graben north of the Feldbiss and the Heerlerheide Fault during the deposition of the Vaals Formation (Campanian) and spreaded further south, during the deposition of the Vaals and the Gulpen Formation (Campanian to Maastrichtian) to the faults blocks north of, respectively, the Benzenrade - the Kunrade - and the Schin op Geul Fault and its southeastern extension into Germany, the Laurensberg Fault. These conclusions are based on the study of the formation thicknesses and age on opposite sides of the respective faults. On the base of similar facts it has been deduced that the inversion has been discontinued during the deposition of the Maastricht Formation (Kunrade facies) after which the Central Graben became a sedimentation area again.	The inversion of part of the southern border of Central Graben in South Limburg during the Late Cretaceous

VOLUME 62 NO 3 409	1983	62	3	409	415	Boeschoten, G.J.; Buurman, P.; Reeuwijk, L.P. van	Infillings between pillows in the lavas of Curaçao consist of zeolites, notably offretite, as well as the clay minerals palygorskite and smectite. The material is dissected by veins of analcite. The zeolites have been formed from the glassy crust of the pillow lava upon subaerial weathering in a dry and hot climate creating a pseudo-closed system. Under these conditions, hydrolysis of the glassy basaltic material generates a saline alkaline environment favourable for zeolite formation. Behind the weathering front the altered material will be exposed to gradually less saline and less alkaline interstitial fluid and the zeolites are transformed to palygorskite. Next, at a still greater distance, palygorskite is transformed to smectite. Analcite is precipitated from a brine formed by evaporation of the interstitial fluid in fissures.	Zeolites and palygorskite as weathering products of pillow lava Curaçao
VOLUME 62 NO 3 417	1983	62	3	417	425	Gutjahr, C.C.M.	Microscope investigation of oil and gas source rocks has experienced a rapid development during the last two decades. This is mainly due to the advent of improved fluorescence microscopes, the development of new sample preparation techniques and the availability of computers. The new observations have led to the recognition of three main source rock types and six sub-types. This classification is similar to that proposed by Van Krevelen and by Tissot and Welte. However, it is not based on time-consuming elemental analyses, but can be achieved by simple and efficient incident-light microscopy. Differences in optical behaviour of source rocks with increasing maturation can now be observed in much greater detail than in the past. With increasing levels of organic metamorphism the hydrogen-rich, insoluble organic matter (precursor of oil) in source rocks shows: 1) changes in fluorescence colour; 2) a decrease in fluorescence intensity; 3) plastic behaviour; 4) generation of mobile products and immobile residues. These changes occur in bacterial organic matter at lower levels of maturation than in well preserved algal source rocks.	Introduction to incident-light microscopy of oil and gas source rocks
VOLUME 62 NO 3 427	1983	62	3	427	430	Overweel, C.J.	Nine stone axes, examined macroscopically, and by a comparative specific gravity investigation, proved to be made of rocks composed essentially of jadeite. Two X-ray powder diffraction exposures affirmed the results. Since the first petrographical studies of European jadeite implements at the end of last century, the attempts to determine the sources have been without much success. A collection of references of the European jadeites might facilitate the search for the unknown source areas.	A petrography of 'Jade-axes' from the eastern and southern Netherlands

VOLUME 62 NO 3 431	1983	62	3	431	436	Buurman, P.; Janssen, A.W.	The Holset Sands are Tertiary sands of uncertain age that occur on old surfaces in Dutch South Limburg. By comparing the extent and facies of well-known Tertiary deposits in the neighbourhood with those of the Holset Sands, the authors arrive at a likely correlation with the Latdorlian Grimmertingen and Neerrepn Sands. The lower part of the Boncelles Sands from the region of Liege. which were considered to belong to the Upper Oligocene. is also correlated with the Latdorlian sands, while the upper Boncelles Sands are correlated with the Rupelian Berg Sands. This model requires a minimum number of large transgressions and assumes that the Grimmertingen transgression was the only one to reach high Belgium.	The stratigraphic position of the enigmatic Tertiary deposits called Holset sands, and of related sands in Belgium
VOLUME 62 NO 3 437	1983	62	3	437	450	Zagwijn, W.H.	This paper deals with the determination of relative heights of the seal-level during the Eemian in The Netherlands and adjacent parts of the North Sea region. Dating was based on pollen analysis. Eight levels have been established, four of them determining the phase of rising levels. one indicating the peak height of the sealevel, which is estimated at 8 m below the present sea-level at high tide during the period of the <i>Carpinus</i> zone, and three indicating the phase of falling sea-level, which took place in the last part of the Interglacial. After the beginning of the Weichselian, the sea-level dropped below minus 40 m and remained below that level until the early part of the Holocene. Comparison with the Channel area yielded a value of 1.42cm/century for long-term subsidence of The Netherlands since the Eemian.	Sea-level changes in the Netherlands during the Eemian
VOLUME 62 NO 3 451	1983	62	3	451	453	Maarleveld, G.C.	Possible differences in shape, angularity of edges, and surface polish in lydites sampled from fluvial deposits (Urk Formation) and the stone pavements have been investigated. Lydites from the Hattem Layer have been included in this research in connection with the question whether they originate from stone pavements.	A note on ventifacts and the shape, angularity and surface polish of lydites in fluvial deposits and in stone pavements
VOLUME 62 NO 3 455	1983	62	3	455	469	Zandstra, J.G.	The inland-ice cap in the Saalian in the central part of The Netherlands caused the formation of glacial basins and ice-pushed ridges and the deposition of till as well as glaciofluvial and glaciolacustrine material (Drente Formation). Crystalline assemblages of pebbles in these deposits, especially in till, are discussed and a new subdivision based on the Fennoscandian area of origin is introduced. The composition of the indicator pebbles made it possible to distinguish various deposition areas as the effect of one inland-ice cap.	A new subdivision of crystalline Fennoscandian erratic pebble assemblages (Saalian) in the Central Netherlands

VOLUME 62 NO 3 471	1983	62	3	471	486	Jelgersma, S.	This paper deals with the sediments that have filled up the Bergen inlet. The scouring effect of the inlet caused significant erosion of the Pleistocene sandy sediments. In the deepest part of the inlet a 15 m sandy clay deposit is encountered interpreted als Regression L. This deposit was caused either by enlargement of the ebbtidal delta or by clogging of the smaller inlets situated further inland. During the deposition of the sandy clay the coastline south of the inlet is supposed to be near the present one. After that time this shoreline moved landwards to the region of Uitgeest. In the inlet itself the clay deposits were covered by sandy deposits. North of the inlet curved spits moved landwards. Finally a significant progradation of the coastline south of the inlet and a retreat in southeastern direction of the hooked spits north of the inlet resulted in the closing of the Bergen inlet. Dating by mean of pollen analysis indicate a short 'life' of the Bergen inlet (5300-3300 B.P.). Investigation of the underlying Pleistocene layers give evidence of a deep valley at the end of the Saalian glaciation overlain by a late Eemian estuarium. The formation of the Bergen inlet is thought to be related to these Pleistocene erosion phenomena. The sources of the sediments in and near the Bergen inlet are discussed	The Bergen inlet, transgressive and regressive Holocene shoreline deposits in the Northwestern netherlands
VOLUME 62 NO 3 487	1983	62	3	487	491	Verbraeck, A.	This paper is focussed on the distribution of river-dune deposits and characteristic overbank deposits, the so called 'Hochfluthlehm', in the central Netherlands river Rhine area. They are reckoned to the Lateglacial member of the Kreftenheye Formation. By means of pollen analyses and ¹⁴ C-datings, the age of these deposits can be fixed. As a consequence of this lithological study a more precise picture can be presented of the changes from a Pleniglacial braided river system into a more channel-bound river system.	Sedimentation in the Mid-Netherlands river area during the Late Weichselian

VOLUME 62 NO 3 493	1983	62	3	493	498	Loon, A.J. van	<p>In the Cantabrian Mountains (northern Spain) the Upper Carboniferous contains various formations with a typically syntectonic character; one of them is the Westphalian Prioro Formation which crops out in the Tejerina Syncline (province of León). This formation mainly consists of fine-grained turbidites (laminites), but intercalations of pebbly mudstones are present. In 11 exposures the pebble fabric has been determined. In most cases the orientation of 50 pebbles was measured, in two cases this was possible only for 25 pebbles: it appears that these restricted numbers do not influence the overall picture. Another observation is that the orientation of the pebbles is not influenced by the degree of flatness, if the flatness value is 1.25 at least. The fabrics of the pebbly mudstones are pictured in contour diagrams: it appears that various patterns can be found, but in relative frequencies which are unexpected. The explanation for this phenomenon is that the tail of the mudflow should be considered as built up by a large number of individual small tongues (which behave like separate frontal lobes), moving more or less independently.</p>	<p>The stress systems in mudflows during deposition, as revealed by the fabric of some Carboniferous pebbly mudstones in Spain</p>
VOLUME 62 NO 3 499	1983	62	3	499	510	Nio, S.D.; Siegenthaler, C.; Yang, C.S.	<p>Large-scale cross-bedded sets from a Holocene subtidal sequence exposed in a construction pit at the mouth of the Oosterschelde were used for comparative studies with present-day tidal processes. The periodic variation which can be observed within a large-scale cross-bedded set of a subtidal megaripple is used to reconstruct the tidal hydraulic parameters such as the shear velocity, the tidal current velocity and the tidal range. In addition to this, the aperiodical variation of the set is used to evaluate the storm-induced components of these parameters. The main steps of the procedure are: (1) the identification of the tidal features of the set such as the lateral bundle sequence; (2) an appropriate selection of the sediment transport rate function; and (3) the development of a function relating the tidal range with the shear velocity based on an estimate of the water depth. Additionally a simple expression is derived, which relates the ratio of the astronomical tides and the atmospheric disturbance to the mean standard deviation of the bundle thicknesses. The calculated tidal current velocities, tidal ranges and its standard deviations from a subrecent example show a good agreement with the actual hydraulic parameters.</p>	<p>Megaripple cross-bedding as a tool for the reconstruction of the Palaeo-hydraulics in a Holocene subtidal environment, S.W. Netherlands</p>

VOLUME 62 NO 3 511	1983	62	3	511	517	Nota, D.J.G.; Bakker, A.M.G.	Within the framework of a training project for students from the Agricultural University in Wageningen. hydrogeological studies have been undertaken in the valley of the Gulp creek in the SE part of The Netherlands. This report deals with the chemical characteristics of natural surface and groundwater; the analytical data cover a 4-years period of sampling. The water composition is studied not only to determine the overall chemical character of the water the data of the water-analyses are primarily used as a tool to investigate the relation among basin geology and the groundwater and surface water regimes as a sequential dynamic unity. The water bearing sequence in the Gulp Basin is not homogeneous, but a multiple layer aquifer composed of a Mesozoic series of fine grained sands, silty clays and limestones overlying the Palaeozoic bedrock. Generally, the surface water and groundwater are of the calcium-bicarbonate type. Differences found for samples from wells are related to the geological formations. Surface water samples show seasonal variations of the dissolved solid species that are related to the varying contributions of base flow and subsurface flow to the total discharge; the period of drought in 1975 and 1976 is also reflected.	Surface water and groundwater in the basin of the Gulp Creek - some major characteristics
VOLUME 62 NO 3 519	1983	62	3	519	528	Pomper, A.B.	This paper gives a conspectus of the geohydrological situation of the area. Based on surveys carried out during the last decade. Not only a description of the geological situation to establish which layers in the subsoil have importance for groundwater flow has been given, but also the hydrological properties of the observed layers were calculated. It appeared that there is a basic difference between the geohydrological situations in the northern and the southern part of the area studied. The observed variations in transmissivity mostly are due to differences in thickness and less to different hydraulic conductivities. Beside this the hydrological units appeared to belong to layers of different geological origin. Also, intercalating clay layers may divide stratigraphic units in parts belonging to different aquifers.	The gehydrological situation of the Western part of the Netherlands
VOLUME 62 NO 4 529	1983	62	4	529	530	Terwindt, J.H.J.; Steijn, H. van		Preface - Developments in physical geography, a tribute to J.I.S. Zonneveld
VOLUME 62 NO 4 531	1983	62	4	531	534	Neef, E.	The interpretation of the landscape as the integrative field of human activities leads to some new theoretical questions. Whereas single disciplines study landscapes as defined systems, natural or cultural, the integrative aspects must regard the full reality of a landscape. The interdisciplinary combination of studies depends on the kind of problem structure. The main view point is the changing landscape under the influence of modern technology.	Die landschaft als integrationsebene Gesellschaftlicher Raumgestaltung
VOLUME 62 NO 4 535	1983	62	4	535	536	Galon, R.		On the nature of physical geography

VOLUME 62 NO 4 537	1983	62	4	537	544	Jungerius, P.D.; Wiggers, A.J.	Geomorphologists have shown an increasing interest in soils. This also applies to paleosols, which provide information on past environments in terms of their age, landscape development and geomorphic processes. The nature of these aspects of paleopedology is demonstrated with the analysis of a sequence of buried podzols in drift sand overlying a truncated periglacial soil on the ice-pushed ridge of Uelsen, W. Germany. Evidence for the reconstruction of the geomorphic history of this area is derived from grain size, heavy mineral and pollen analyses. The sequence of buried soils reflects the same climatic periodicity as was observed in peat of Atlantic/Subboreal age found in the Wilsumer Moor, 4 km to the NE; dry phases with eolian activity were followed by humid phases with soil formation and splash erosion. The present surface is formed by an exhumed podzol of Atlantic/Subboreal age.	Geomorphological significance of paleosol analysis; a case study of a drift sand section with podzols on the ice-pushed ridge West of Uelsen, W. Germany
VOLUME 62 NO 4 545	1983	62	4	545	549	Juvigné, E.	In the last 15 years several authors have mentioned the occurrence of volcanic ash in high Belgium. Because different preparation techniques have been used, the quantitative results cannot be compared. Applying the same method to different ash layers, two volcanic ash-falls of Alleröd age are distinguished: the 'Brackvenn ash-fall' (14C age: 10 830 ± 45 a B.P.) and the 'Konnerzvenn ash-fall' (14C age: 11 030 ± 160 a B.P.).	Two different volcanic ash-falls of Alleröd age in High Belgium
VOLUME 62 NO 4 551	1983	62	4	551	555	Pissart, A.	Five new sections were cut through ramparts surrounding depressions of the Hautes Fagnes plateau. When earlier work of 1974 and 1980 is included, a total of seven sections have been studied. For six of the seven, the internal structure of the ramparts is similar to Fig. 3. The other section shows only solifluction lobes (Fig. 6). A polyhedric structure which appears related to the growth of segregation lenses was seen in several sections. A new ¹⁴ C age determination show that a second mound grew during the last Dryas. The facts suggest a periglacial genesis for the Hautes Fagnes depressions. They are not pingo scars but probably remnants of palsas without peat which are not yet well known today.	Remnants of periglacial mounds in the Hautes fagnes (Belgium): structure and age of the ramparts

VOLUME 62 NO 4 557	1983	62	4	557	561	Tricart, J.L.F.	During the last ice age, the Northern Vosges have been intensely glaciated. The climatic snow line was at an altitude of approximately 700 m. Nevertheless, the floors of some typical cirques do lay at even lower altitudes, as a result of important snow drift by SW winds. Comparison of snow drift mechanisms and of the loess distribution pattern in the Alsatian graben suggests frequent anticyclonic conditions during winter in Central Europe. This was probably in the form of a high pressure bridge linking the early autumn. High temperatures resulted in more abundant precipitation, mostly snow which played a major role in the glaciation, principally replenishing glaciers on leeslopes, facing NE, in the Buntsandstein plateau area. Nevertheless, 'typical' glacial landforms are uncommon. They are restricted to cirques. This suggests that the so-called 'typical' glacial landforms are an extreme case, their occurrence depending on specific lithological characteristics.	Glacial forms and ice distribution in the Northern Vosges during the last ice age
VOLUME 62 NO 4 563	1983	62	4	563	568	Bijlsma, S.; Lange, G.W. de	Detailed investigations were carried out on a pingo remnant near Daarle in the province of Overijssel, The Netherlands. The pingo developed in an abandoned alluvial plain after the end of the fluvial activity. The time of both the pingo growth and the first part of the decay must be placed before the end of the deposition of the Older Coversand I, which means between about 28 000 BP and 23 000 BP. After partial melting the remaining ice-core formed a level surface that was covered with Older Coversand I and deposits of the Beuningen Complex. Final melting of the ice-core was retarded until shortly before the Bølling Interstadial, when a lake was formed in which organic material accumulated.	Geology, palynology and age of pingo remnant near Daarle, Province of Overijssel, the Netherlands
VOLUME 62 NO 4 569	1983	62	4	569	576	Teunissen, D.	As appears from geomorphological and palynological data, the Heerenven lake in the nature reserve De Hamert forms a remnant of a branch of the river Meuse, dating from the Weichselian Glacial Period. In the early Holocene this river branch was almost completely covered by eolian sands; only the Heerenven remained free of an eolian cover. In the area between the Heerenveir and the present valley of the river Meuse there is a clay layer with peaty intercalations between the eolian cover and the underlying terrace sediments; the peat/clay layer could palynologically be dated in the Weichselian Late-Glacial. The combined data permit the conclusion that the terrace west of the Heerenven-Meuse belongs to the Weichsel-glacial Lower Terrace. The terrace at the east side of the Heerenven is older and can be correlated with the 'Krefelder Mittelterrasse', the sediments of which were formed during the height of the Saalian glaciation.	The development of the landscape of the nature reserve De Hamert and its environs in the Northern part of the Province of Limburg, the Netherlands

VOLUME 62 NO 4 577	1983	62	4	577	583	Berg, J.A. van den	<p>Concentrations of salt ions in groundwater bearing Quaternary sediments in the IJsselmeer area have been changed by different processes such as transport, diffusion and dispersion. and the exchange of dissolved and adsorbed ions. Two case studies at Oostelijk Flevoland, the IJsselmeerpolder which was drained in 1957, illustrate how the predominating process alternated, in relation with the geological and hydrological configuration and with human interference. At Lelystad, in the central part of the IJsselmeer, the variation of chloride content with depth could originally be explained by diffusion. However, recently ion exchange and mixing of different types of groundwater are the main processes which determine groundwater quality, as the drainage of the polder Oostelijk Flevoland has initiated significant groundwater flow. Using the Piper diagram an interpretation is given for the origin of the various groundwater types, found near Lelystad. A second case study (Bremerberg) revealed the importance of a semi-impermeable layer of Eem clay in the underground. The groundwater under this layer initially had low concentrations of ions as it originated from the Veluwe area. As a consequence of the polder construction and the subsequent lowering of the piezometric head, the seepage direction was inversed. Surface water from the border lake with higher ion contents started to affect the original groundwater. Contrary to this negative development, the initiated downward seepage resulted in a decrease of the relatively high ion content of the groundwater outside the area with Eem clay. The importance of the water quality in the border lake is stressed, in relation to use of the groundwater for the public water supply.</p>	Relationship between Quaternary history and groundwater in the IJsselmeer area
VOLUME 62 NO 4 585	1983	62	4	585	592	Pomper, A.B.	<p>The western Netherlands encompasses a polder area with the land surface predominantly some tens of cm to several m below mean sea level. The history of salinization of this area has been and is governed by the geologic history, the reclamation history of the former lakes, and the hydrological groundwater situation. This has resulted in a complicated hydrochemical groundwater situation. The practical significance of studies like the one described is that processes in progress can be explained, that earlier situations can be reconstructed, and that a prediction of future situations can be made. At the start of the study only the chloride contents of the groundwater were taken into account; at a later stage other ions were included, and this gives a good conspectus of the hydrochemical groundwater situation of the area. Since in many parts of the area upward seepage occurs, the groundwater composition is of great importance for the composition of the open water.</p>	Observations on the hydrochemical groundwater situation of the Western Netherlands

VOLUME 62 NO 4 593	1983	62	4	593	598	Meene, E.A. van de	Penetration testing is basically aimed at the assessment of soil mechanical properties, especially the bearing capacity of the soil. It can, however, be applied to determine the dimensions and composition of lithological units as well. A short description of the method is given and a case study presented. This case concerns the survey of a horizon with fluvatile clay and silt and peat deposits overlain and underlain by sands. It was found that 85% of the sounding graphs could be adequately interpreted and that the geometry of the deposit could be established with reasonable accuracy. The paper concludes with a brief discussion of the expenditure involved, showing the relatively low cost of soundings compared with bailer drillings.	A study of Late-Pleistocene river deposits of the Rhine system based on static penetrometer soundings
VOLUME 62 NO 4 599	1983	62	4	599	604	Tjia, H.D.; Fujii, S.; Kigoshi, K.	Ten new radiocarbon ages of biogenic shoreline indicators from tectonically stable Tioman island, Malaysia, demonstrate that regional sea level was between 1.4 m and 3.7 m above present mean sea level during the period 6000 BP to 1900 BP, and that the sea level fluctuated several times in the order of 1 to 2 metres. The dates also suggest that sea level rose twice at rates of 1 m in 300 years but dropped at least twice at slower rates of about 1 to 2 m in 1400 years. In general, a very good correspondence is shown between the eustatic sea level curve constructed on the basis of about 40 dated shorelines from Peninsular Malaysia and that of Tioman island.	Holocene shorelines of Tioman island in the South China Sea
VOLUME 62 NO 4 605	1983	62	4	605	610	Dorsser, H.J. van; Salomé, A.I.	Three mapping systems are applied to an area of the North German Lowland. on a scale 1:25000. The Dutch and German systems have been developed for geomorphological mapping of those particular countries. The Polish map is a more general environmental map. The mapped area comprises an icepushed ridge and a river valley. Large parts of the area are overlain by coversand. Human activity changed the physiognomic appearance of the landscape. The mapping systems are introduced and the maps are compared. The two geomorphological maps contain much information for the professional geomorphologist. The maps are not intended for the general public. The accessibility for application purposes, e.g. in environmental planning, is restricted. With the data contained in the geomorphological maps it was easy to construct a physico-geographical map according to the Polish system. This map gives less information on the morphogenesis of the area but is more suitable for environmental planning.	Mapping in physical geography, three maps of a formerly glaciated lowland

VOLUME 62 NO 4 611	1983	62	4	611	620	Cate, J.A.M. ten	Detailed systematic geomorphological mapping in The Netherlands started in 1966. Since 1975 these maps have been printed in colour. This paper describes the structure of the legend of the 1:50000 geomorphological map of The Netherlands and discusses the practical applications. These include geological and soil surveys, the conservation of important localities of earth science interest. The execution of multidisciplinary projects and mappings for contractors.	Detailed systematic geomorphological mapping in The Netherlands and its applications
VOLUME 62 NO 4 621	1983	62	4	621	628	Meijerink, A.M.J.; Verstappen, H.T.; Zuidam, R.A. van	Considerable progress has been made in the standardization of concepts and legends of geomorphological maps. Diversity inevitably persists where applied maps are concerned. Three types can be distinguished: <i>analytical geomorphological maps</i> emphasizing morphogenetic and chronological aspects, <i>synthetic (holistic) geomorphological maps</i> encompassing also terrain parameters related to soils, hydrology, etc., and pragmatic maps, tailor-made for specific purposes, such as natural hazard zoning. The contents of applied geomorphological maps can either be derived from analytical and/or synthetic data or be decided upon prior to the survey. Storage of all data gathered in a geobased information system and the subsequent retrieval of the data relevant for specific purposes only, holds a promise for the future.	Developments in applied geomorphological survey and mapping
VOLUME 62 NO 4 629	1983	62	4	629	635	Vink, A.P.A.	Landscape ecological surveys are used for mapping landscapes as carriers of natural and cultural ecosystems. Some examples from two regions are briefly discussed. These are: 1) the Upper Arno basin (Tuscany, Italy), 2) a Prealpine Flysch area of Switzerland. In the Upper Arno basin different landscapes were recognized on the basis of geological formations. Calculations on the land characteristics of these landscapes resulted in the characterization of correlative complexes and differentiative complexes to characterize and differentiate the mapping units. In the Prealpine landscape of Fribourg (Switzerland), calculations of the 'mutual information values, I_m ' made it possible to give a quantitative characterization of the land mapping units as correlative complexes. Good correlations were found between the biotic variables and the abiotic and land management variables. Geological formations proved to be major independent variables in all cases where such differences occurred within a mapping area. One or more geomorphic variables also proved to be independent variables (differentiating characteristics).	Numerical assessment of geology and geomorphology in landscape ecological surveys, some examples

VOLUME 62 NO 4 637	1983	62	4	637	641	Kooistra, M.J.	For centuries tides have played a major role in the estuaries and sea-arms in the southwest of the Netherlands. Tidal currents are responsible for deposition of subtidal and intertidal sediments in which several characteristic geomorphological units can be distinguished. The tidal wave comes from the south of the North Sea. The tidal amplitude decreases from south to north and consequently the induced tidal currents reduce in velocity in the same direction. These changes are reflected in the deposits and their geomorphology. First an overview is given of the occurrence of different geomorphological units and their stability in estuaries from entrance landinward and the changes in the successive estuaries from south to north. Secondly an example is given of the differentiation and stability in a high silted-up intertidal area. The stability of the geomorphological pattern in these areas is not only governed by the tides. Aeration and physical ripening also become important.	Geomorphology of subtidal and intertidal areas in the Southwest of the Netherlands
VOLUME 62 NO 4 643	1983	62	4	643	652	Colaris, W.J.J.	For a long term strategy on nature and landscape conservation in behalf of a revision of the regional plan for Twente, a structural concept together with a map has been composed. The theory of island biogeography has been used for the design of the nature part of the concept. The most important factor in the landscape part is the spatial structure of hedgerows, copses, clumps of trees, etc. Thoughts about improving this structure, emphasizing the contrast between hill-side open field and lowland enclosure and emphasizing landforms have been worked out for Twente. The article catches on the conception of vulnerability as a central element in the structural concept. The realization of the map of the structural concept including the mapping units is described. A major application of the map is the creation of zones within the rural area for the regional plan. Some conclusions are: - Segregation of nature and agriculture is proposed in areas with large extended nature areas; - Concentration areas are most important for nature conservation; it is desired to concentrate attention and application of means on these areas; - In case of protection conservation of characteristic ecotopes has to be pointed out; - The importance of a structural concept is the creation of an instrument that can be used to carry out a consistent policy on nature and landscape with an eye on the future; - Application of ideas described here seems to be possible in other landscape types; - Regular evaluation and, if necessary, adjustment of the structural concept is proposed, running parallel with the design of a regional plan.	Application of the theory of island biogeography in the design of a structural concept of nature and landscape conservation

VOLUME 62 NO 4 653	1983	62	4	653	658	Scholten, J.J.	In western Jamaica detailed land use planning was carried out between 1977 and 1981 for the development of ten agricultural settlement schemes. The planning process included three steps, i.e. inventory survey, quantitative land capability assessment, and development plan preparation. In this paper the role of physical geography as a basic attribute to the physical planning activities in western Jamaica, is discussed for all three steps.	Physical geography and rural settlement planning in western Jamaica
VOLUME 62 NO 4 659	1983	62	4	659	668	Schouten, C.J.	Distribution in time and space of the catchment-outputs of water, dissolved matter and suspended matter of streams in the Lake Taupo basin of New Zealand has been investigated. The hydrological data base is formed by a small number of instrumented sites and relatively few gaugings on streams, that were not instrumented permanently. It appears that the Lake Taupo catchment can be divided into regions with similar flow- and concentration duration characteristics. The forcing factor behind these flow duration characteristics is the presence of unconsolidated volcanic cover deposits in the catchment of a stream.	Volcanic cover deposits and streamflow behaviour in the Central North Island of New Zealand
VOLUME 62 NO 4 669	1983	62	4	669	675	Riezebos, H.T.	A landscape model of a tropical rain forest environment is described. The main events of the geomorphological evolution of the study area since the late Tertiary comprise the development of a planation surface during the Miocene followed by deposition of Pliocene continental Upper Coesewijne sediments and subsequent dissection during Quaternary times. Parent material and geomorphology led to the development of Entisols and Ultisols. The occurrence of various subgroups of these orders is closely related to the distribution of the main vegetation formation types, mesophytic semideciduous forest. Xeromorphic formations like walaba forest and savanna forest, and mixed mesophytic and walaba forest. Differences in chemical properties of four representative soils which are all very poor, appear to be small and it is suggested that they cannot be regarded as main causes of the vegetation differentiation in the study area. Differences in soil physical properties are more pronounced resulting in distinct variations of soil water retention characteristics. Under the given climatic conditions a comparison is made of the water balance of the representative soils. Results suggest that the mean monthly plant-available soil moisture is a major variable in vegetation differentiation. whereas the length of the edaphically dry period is of lesser importance. In relation to the implementation of the Kabalebo storage lakes project these findings imply the necessity for research into the risks of savannisation and increased sediment production.	Geomorphology, soils and vegetation differentiation in a tropical rain forest environment in Suriname

VOLUME 62 NO 4 677	1983	62	4	677	682	Steijn, H. van; Hof, G.J.J. van den	A systematic inventory of geomorphological phenomena combined with general information about lithology, climate, and the hydrological situation of a region can be used to draw a slope stability map at intermediate scales (1:10000 to 1:25000). As a case study the realization of such a map for a small area in the French Alps is described. The map not only shows stability classes, but also summarizes important features with regard to slope stability, such as slope angle, lithology, and signs of present-day geomorphological processes. Applications are the identification of unstable areas early in a planning procedure and of areas where site investigation will be necessary prior to construction. It appeared that in the area around Barcelonnette town enlargement plans include many unfavourable places.	Stability of slopes near Barcelonnette (Alpes de Haute Provence, France): A case study in slope stability mapping
VOLUME 62 NO 4 683	1983	62	4	683	688	Asch, T.W.J. van	A number of slope studies in the Ardennes region have revealed that the mode of slope angle frequency distribution for the steep slopes is about 30°. It has been suggested by several authors that this angle corresponds to 'the angle of rest' of the regolith materials on these slopes. Recently, however, new concepts of slope development under mass failure have been elaborated, which show that there may exist more than one critical slope angle value. Steep straight slope segments were measured and the stability properties of regoliths were determined in a part of the Ardennes region. Stability analysis performed with the obtained strength parameters, revealed that the slopes can develop by mass failure towards two so called ultimate threshold values, one of about 42° in case no pore water pressure develops in the regolith, and one of about 21° in case the regoliths are completely saturated with ground water that runs parallel to the slope. It turns out that the population of the measured steep slope segments is enclosed between these two threshold values. The mode of the measured slope angle values does not differ between the different lithological units. It is suggested that in periglacial times the slopes became unstable, due to a blockage of the groundwater by the permafrost in the subsurface. At that time the slope population changed from the upper threshold value for dry regoliths to the lower one for completely saturated regoliths via a flattening of the slopes.	The stability of slopes in the Ardennes region
VOLUME 63 NO 1 1	1984	63	1	1	2	Rondeel, H.E.; Simon, O.J.		In memoriam - Prof. Dr. C.G. Egeler
VOLUME 63 NO 1 3	1984	63	1	3	4	Linden, W.J.M. van der		In memoriam - Prof. Dr. Ir. R.W. van Bemmelen
VOLUME 63 NO 1 5	1984	63	1	5	5	Debets, G.B.		In memoriam - Ir. C.P.E.M. Raedts

VOLUME 63 NO 1 7	1984	63	1	7	11	Mees, R.P.R.; Meijs, E.P.M.	Loess sections along the Albert Canal and in Kesselt (Belgium) are described. The presence of pre-Weichselian loess is demonstrated. This is done on the basis of the occurrence of the Rocourt tuff near Vroenhoven and on differences in the heavy mineral composition of the various loess deposits (fraction 30-63 µm). Besides the Rocourt Paleosol (Eemian interglacial), two other interglacial paleosols have been observed.	Note on the presence of Pre-Weichselian Loess deposits along the Albert Canal near Kesselt and Vroenhoven (Belgian Limbourg)
VOLUME 63 NO 1 13	1984	63	1	13	18	Pye, K.; Paine, A.D.M.	An extensive blanket of white sandy silt near the summit of Ben Arkle, northwest Scotland, consists of recent wind-transported material derived from frost-weathered quartzite regolith. Cryogenic processes are operative to a limited extent at present, but much of the weathered debris may have formed during the Last Glacial period. The aeolian silt grains are predominantly sub-angular and have irregular blocky surface textures with numerous adhering particles of clay-size quartz and kaolinite. Current aeolian reworking of the formerly-vegetated frost-weathered debris may be due to a slight climatic deterioration or to grazing by animals introduced since the late 19th century	Nature and source of aeolian deposits near the summit of Ben Arkle, Northwest Scotland
VOLUME 63 NO 1 19	1984	63	1	19	29	Reijers, T.J.A.	The Middle-Upper Devonian carbonate facies of the Dinant Synclinorium, Belgium are discussed. During the Middle Devonian the influence of the Old Red Continent is still appreciable and coarse to fine siliciclastics fringe the continent and the positive elements on the shelf. From Couvinian times onwards the shelves of the Cornwall-Rhenish basin are partially covered by carbonate masses. During the Givetian and the Frasnian the influence of siliciclastic sediments on. Carbonate production is only noticeable in the northern lagoonal settings. In the Frasnian a distinct separation into a northerly carbonate platform and a southerly basin is apparent. Carbonate bodies within the basin are 'stacked' in the south, whereas they 'float' in the north. The 'stacked' bioherms are perhaps related to rejuvenation of block faults, whereas the 'floating' mud mounds are characterised by their red colour, their age and the fact that they overstep the middle Frasnian carbonate platform from a southerly direction. Textural and structural differences are discussed, illustrated and interpreted. The carbonate platform is characterised by a porous dolomitised edge and a lagoonal interior with cyclic carbonate deposition.	Devonian carbonate facies patterns in the Dinant synclinorium, Belgium

VOLUME 63 NO 1 31	1984	63	1	31	38	Brunet, M.; Heintz, E.; Battail, B.	The mammalian fauna from Molayan (Afghanistan) is compared with that of the Kaur Siwaliks of Pakistan. The detailed comparison reveals that, in spite of the geographical proximity of the two faunas, there is no recorded species in common between them. The differences cannot be attributed to a chronological gap; they can be partly explained by a difference in the palaeoenvironments. Another cause of the faunal differences must have been the existence of a mountain barrier separating the Indian subcontinent from Afghanistan. As a consequence, the Late Miocene hominoid primates from the Indian subcontinent were isolated from the Greek and Turkish ones.	Molayan (Afghanistan) and the Kaur Siwaliks of Pakistan: an example of biogeographic isolation of Late Miocene mammalian faunas
VOLUME 63 NO 1 39	1984	63	1	39	46	Mäkel, G.H.; Roep, T.B.; Kate, W.G.H.Z. ten	The sediment petrography of Malaguide sequences from the Sierra de Espuña has been studied with an 'intuitive and descriptive' method for the analysis of sediments in thin sections. This method comprises an initial intuitive grouping based on a few characteristics of the sediment and a subsequent detailed description of the thin section. Differences between specific members of the Malaguide sequences, that were found with this method, are confirmed by a quantitative analysis based on point count data. It is concluded that the intuitive and descriptive method is an adequate tool for the study of the sediment petrographical aspects of a sedimentary sequence and that it produces results in a relatively short time.	Sediment-petrography of Malaguide rocks from the Sierra de Espuña (Betic Cordilleras, Spain): comparison of results from a descriptive and a quantitative analysis
VOLUME 63 NO 1 47	1984	63	1	47	54	Veenstra, H.J.	Size analyses of sand samples taken from the islands and sand flats in the eastern part of the German Bight indicate that each island shows a separate grain size population. This rules out important longshore sand transport from island to island. Comparison with sediment maps of the adjacent seafloor suggests that the islands were formed by wave action. On the other hand rollability analysis reveals that the percentages of angular grains in the samples increase towards the north. It is held that this increasing angularity reflects the shape sorting of the sediments of the seafloor. The spit of Skallingen shows a decreasing angularity of the sand grains towards its end, probably caused by prevailing influence of shape selection by coastal erosion over longshore transport. In most cases the dune sands contain more angular grains than the beach sands.	Size and shape-sorting of coastal sands in the eastern part of the German Bight (North Sea)

VOLUME 63 NO 1 55	1984	63	1	55	70	Nio, S.D.; Hussain, T.	We measured a section along the southern limb of the Marwat Kundi anticline near the village of Malagan in northwestern Pakistan. Three major depositional systems were differentiated that were based on the sampled data from this section and on some comparisons with their lateral equivalents. The lower system, the Kargocha Formation, consists of a thick succession of mainly mudstones with intercalations of conglomeratic and sandy sheet- or ribbon-like alluvial bodies. This lower depositional system was characterized by relatively small fluvial systems. The following Marwat Formation consists mainly of very thickbedded sandstones, followed by thinner bedded sandstones in its upper parts. The thick sandstone beds represent large fluvial channel complexes that were formed by a large sandy braided river, comparable to the present-day Indus river. The thin-bedded succession represents an abandonment of this large river system and a migration of the paleo-Indus towards the east to its present-day position. Finally, the Malagan Formation is formed by terminal fluvial fans, of which its modern analogue can be found within the present-day intramontane basins.	Sedimentological framework of late Pliocene and Pleistocene alluvial deposits in the Bhattani range, Pakistan
VOLUME 63 NO 1 71	1984	63	1	71	74	Dozy, J.J.	For the first time a Precambrian trace fossil, possibly a sea pen, has been found in Spain. A description of the find and its stratigraphic position is given.	A Late Precambrian Ediacara-type fossil from Calicia (NW Spain)

VOLUME 63 NO 1 75	1984	63	1	75	83	Biermann, C.	Bedding-parallel foliations may cause serious problems for structural geologists who try to unravel the sequence of deformational events in polyphase deformed rocks. In many cases it may be difficult to prove whether an early bedding-parallel foliation represents an inherited sedimentary fabric or has formed during an early phase of deformation. In the past there have been such problems in several tectonic units in the Internal Zone of the Betic Cordilleras of S.E. Spain. This paper describes the microstructure of early foliations in low grade slates and metasandstones from the Almagro and Almazora Units in the Sierra de Almagro and upper greenschist facies micaschists from the Variegato Unit in the N.E. Sierra de los Filabres (province of Almeria). It is shown that the dominant planar structure in the Almagro and Almazora Units represents the first tectonic cleavage (St) that has been formed in these rocks. The foliation is axial planar to first phase folds and shows different stages of cleavage development from initial sedimentary microstructures to the fully developed slaty cleavage fabric. In upper greenschist facies micaschists of the Variegato Unit there is a preferred orientation of phyllosilicates parallel to bedding. In contrast to previous interpretations it is argued that this fabric does not represent an inherited sedimentary fabric. Pressure solution processes were involved in cleavage formation indicating non-hydrostatic stress conditions during tectonic deformation. Metamorphic conditions-culminating in upper greenschist facies grade after formation of the early foliations-can not be explained by contact metamorphism during burial underneath a thick pile of undisturbed sediments. They indicate that the rocks have been transported deep into the crust	On the parallelism of bedding and cleavage in deformed rocks from the internal zone of the Betic Cordilleras-S.E. Spain
VOLUME 63 NO 1 85	1984	63	1	85	88	Oen, I.S.; Verschure, R.H.; Wiklander, U.	Rb-Sr whole rock data of 17 Horrsjö granite samples from 5 localities show a best-fit line corresponding to an age of 1.76 ± 0.04 Ga. This result is unsatisfactory in view of the presumed age of the Horrsjö granite, which is coeval with the 1.84 ± 0.06 Ga Hytttsjö; Suite of rocks. Six samples from one locality give a best-fit line corresponding to 1.86 ± 0.12 Ga; three samples from another locality show a best-fit line corresponding to 1.84 ± 0.44 Ga. These two localities presumably represent relic domains of Hörrsjo granite that have escaped post-emplacement, metamorphic- Rb-Sr isotopic resettings of whole-rock samples. The data show a large geological variance in excess of the analytical variance. This may be due to variation in initial $87\text{Sr}/86\text{Sr}$ in the samples, possibly caused by contamination of the granite magma by basic magma and/or seawater.	Isotopic age determinations in Bergslagen, Sweden: v. de Horrsjö Granite, Filipstad area
VOLUME 63 NO 1 89	1984	63	1	89	92	Vissers, R.L.M.; Compagnoni, R.	Detailed structural analysis and mapping in the northern part of the Gran Paradiso massif suggest that the massif is a gneiss-cored fold nappe. The timing of the associated deformation relative to the Alpine metamorphism points to development of the nappe structure in a stage between the Eoalpine HP metamorphism and the peak of the Lepontine greenschist facies event.	The structure of the Gran Paradiso basement (Pennine zone, Italian W. Alps)

VOLUME 63 NO 1 93	1984	63	1	93	108	Ziegler, P.A.	The crystalline basement of Western and Central Europe consists of a mosaic of crustal elements which were consolidated during pre-Grenvillian, the Grenvillian-Dalslandian, Moravian, Cadomian, Caledonian and Hercynian orogenic cycles. Contemporaneous with the Caledonian suturing of the Precambrian Laurentian-Greenland and Fennosarmatian shields a number of Gondwana-derived Cadomian micro-cratons were accreted to the southern margin of Laurasia. Following the Late Caledonian paroxysm, the Devonian and Early Carboniferous evolution of Europe was dominated by continued subduction of the Proto-Tethys plate at an arc-trench system paralleling the southern margin of Laurasia, the accretion of additional Gondwana-derived continental fragments, back-arc rifting, and a sinistral translation of major proportions between the Laurentian-Greenland and the Fennosarmatian sub-plates. The Acadian and Bretonian orogenies were of the Pacific type. The Viséan collision of Gondwana with Laurasia marked the onset of the Himalayan-type Variscan orogeny during which collision related compressive stresses overpowered the Devonian-Early Carboniferous back-arc rift systems and caused the development of A-subduction zones. The Central Armorican-Saxothuringian successor basin became folded and destroyed during the latest Viséan, whilst the Variscan foredeep became scooped out, in part by basement nappes, during the latest Westphalian. Major crustal shortening during the Variscan diastrophism was accompanied by the anatectic remobilisation of subducted lithosphere and a widespread syn- and late orogenic magmatism. The latest Carboniferous-Early Permian reorientation of the convergence	Caledonian and Hercynian crustal consolidation of Western and Central Europe - A working hypothesis
VOLUME 63 NO 1 93	1984	63	1	93	108	Ziegler, P.A.	Enclsoure 1	Caledonian and Hercynian crustal consolidation of Western and Central Europe - A working hypothesis
VOLUME 63 NO 1 93	1984	63	1	93	108	Ziegler, P.A.	Enclsoure 2	Caledonian and Hercynian crustal consolidation of Western and Central Europe - A working hypothesis
VOLUME 63 NO 1 109	1984	63	1	109	112	Ketelaar, A.C.R.; Giberti, I.; Menne, B.	One of the electromagnetic methods of geophysical prospecting is known as 'VLF'. The method is outlined in the introduction. The traditional use of VLF lies in the exploration for sulphide orebodies. 'We suggest that a VLF survey contains information about the geology in a wider sense and indicate ways of extracting that information by applying techniques borrowed from seismic data-processing. Unlike the large and expensive computers which are used in the seismic industry, for our application we only need 'pocket computers'.	On the use of the VLF signature in geological mapping
VOLUME 63 NO 1 113	1984	63	1	113	118	Heijnen, W.; Have, T. ten; Stienstra, P.		Comment and reply on - Structure and general chemistry of Table mountains Santa Barbara phosphates, Curaçao, Netherlands Antiles
VOLUME 63 NO 1 119	1984	63	1	119	128			Book reviews
VOLUME 63 NO 2 129	1984	63	2	129	130	Zwart, H.J.; Hartman, P.; Tobi, A.C.		To Professor Dr. Emile den Tex - on the occasion of his retirement from the chair of Petrology, Mineralogy and Crystallography, which he held at the State Universities of Leiden (since 1959) and Utrecht (1978-1983)

VOLUME 63_NO 2_131	1984	63	2	131	140	Vogel, D.E.	Petrological, structural and geochemical data are consistent with emplacement of the Cabo Ortegal Complex by two separate Paleozoic thrusting events which elevate successively deeper levels of crust. The existence of only one, premetamorphic, 'ophiolite' suite is argued for Cabo Ortegal, as well as for the other catazonal metamorphic complexes in Galicia.	Cabo Ortegal, mantle plumbe or double Klippe?
VOLUME 63_NO 2_141	1984	63	2	141	150	Coleman, R.G.	Present studies reveal that ophiolites from the Alpine and Cordilleran orogenic belts may not represent deep abyssal oceanic crust but seem to have formed mainly in interarc or small ocean basin spreading centres. Abundant petrologic data on basalts from mid-ocean spreading centres (MORB) reveal a uniform and characteristic chemical nature. Current petrologic studies have shown an apparent scarcity of MORB within lavas of ophiolites from Phanerozoic orogenic belts. Peridotites from ophiolites reveal a complicated history of sub-solidus deformation and partial melting resulting from their diapiric rise into spreading centres and final incorporation into the oceanic crust. Structural studies reveal that ophiolites are emplaced either across passive continental margins or as basement fragments in accreted terraines. Attenuation of continental crust along passive margins in the formation of small ocean basin characterizes the tectonic setting for Tethyan ophiolites, whereas the ophiolites of Western North America are usually the oldest units in allochthonous tectonostratigraphic terraines and have formed in interarc spreading centres along the continental margins. Terrain accretion of these arc complexes preceded the continuous subduction of the Pacific and Farallon plates consisting of abyssal oceanic crust (MORB). Thus, ophiolite associations are mainly products of continental break-up or interarc spreading. Abyssal oceanic crust has been mainly consumed by subduction and only in extremely rare instances has it become accreted into continental crust.	The diversity of ophiolites
VOLUME_63_NO_2_151	1984	63	2	151	158	Avé Lallemand, H.G.	Ophiolite complexes in northeastern Oregon are distinctive because of the large volume of silicic plutonic and volcanic rocks, the similar radiometric ages of mafic and silicic rocks, a mild iron enrichment trend in the ultramafic and mafic cumulates, similar REE abundances and patterns in silicic and basaltic rocks, the lack of dike complexes, and the presence of sill complexes. It is speculated that the ophiolites formed in mantle diapirs ascending beneath pull-apart basins within a volcanic island arc. The basic magmas formed by partial melting in the upper mantle and the silicic magmas by partial melting of hydrous mafic rocks at the base of the volcanic island arc.	Speculations on the origin of the ophiolites of northeastern Oregon (U.S.A.)

VOLUME 63 NO 2 159	1984	63	2	159	164	Vlaar, N.J.; Cloetingh, S.A.P.L.	We develop a geodynamic scenario that explains many features of Alpine orogeny and ophiolite thrust sheet emplacement. Important elements of this scheme are: 1. age-dependent subduction and a related compressive regime upon the closing of small and young oceanic basins. 2. the induction of thermal upper mantle anomalies by spreading and lithospheric doubling and subsequent apparent migration by lithospheric shifting. It is shown that these processes, which have hitherto not been taken into account in intra-continental tectonics, play a crucial role in mountain building. This applies in particular to their function in gravity tectonics, metamorphism and post-orogenic epeirogenesis and foreland uplift.	Orogeny and ophiolites: plate tectonics revisited with reference to the Alps
VOLUME 63 NO 2 165	1984	63	2	165	177	Beccaluva, L.; Dal Piaz, G.V.; Macciotta, G.	The Zermatt-Saas, Combin and Antrona ophiolite units represent tectonic fragments of the oceanic to transitional lithosphere of the upper Jurassic-lower Cretaceous Piedmont basin, a section of the Western Alpine Tethyan basin. The investigated area is located around the Monte Rosa massif between the middle Aosta valley and the Ossola valley, Italian Northwestern Alps. The Piedmont ophiolite nappe, i.e. the couple of the Zermatt-Saas and Combin juxtaposed tectonic elements, is interposed between the overlying paleo-African continental crust (the Austroalpine tectonic system of the Dent Blanche and Sesia-Lanzo nappes) and the underlying paleo-European continental crust (the Pennine Monte Rosa and St. Bernhard nappes). On the contrary, the Antrona ophiolite unit occurs at a lower structural level, and is sandwiched between the overlying Monte Rosa nappe and the underlying Comughera-Moncucco units, the 'root zone' of the St. Bernhard nappe. Bulk rock analyses of 29 selected samples from these units demonstrate: 1- that the petrogenetic characteristics of the metabasalts and metagabbros from both the Zermatt-Saas and Combin units are strictly comparable to those of normal-MORB magmatism, and 2- that the features of the Antrona metabasalts indicate an oceanic nature for these metamorphic ophiolites with a distinct transitional-MORB affinity. This seems to reflect incipient oceanic rift conditions for the related segments of the Piedmont basin. The available petrochemical data from the Alps, Northern Apennines, Corsica and Calabria, indicate that ophiolites with transitional-MORB affinity represent an early ocean-type magmatism. This was later confined to the external sectors of the accreting Alpine-Apennine oceanic	Transitional top normal MORB affinities in ophiolitic metabasites from the Zermatt-Saas, Combin and Antrona units, Western Alps: implications for the paleogeographic evolution of the Western Tethyan Basin

VOLUME 63 NO 2 179	1984	63	2	179	188	Boudier, F.; Jackson, M.; Nicolas, A.	Among the ultramafic bodies included in the Ivrea zone, the Balmuccia lherzolite massif offers a particularly well-preserved contact with the granulitic lower crust. The eastern margin of the massif presents a transition to the granulitic gabbros through a layered sequence including pyroxenites and dunites. A chronological evolution of textures in the peridotite is established, showing a continuous evolution from mantle-derived textures (porphyroclastic) located in the southwestern domain to recovered textures (equigranular) developed to the northeast along the preserved transition with the granulites. This recovery process is considered to be enhanced by fluid circulation, it would occur in granulite facies temperature conditions. The map of penetrative structures confirms this chronology: the foliation and lineation attitude follows a progressive evolution with a steep lineation associated with mantle textures and a flat one associated with crustal textures, this last orientation being concordant with that of the surrounding granulites. The structural analysis is consistent with a diapiric emplacement model of the Balmuccia lherzolite developed in asthenospheric mantle conditions and ending in the granulite facies conditions of the lower crust.	Structural study of the Balmuccia Massif (Western Alps): A transition from mantle to lower crust
VOLUME 63 NO 2 189	1984	63	2	189	196	Compagnoni, R.; Radicati di Brozolo, F.; Sandrone, R.	A mylonitic gabbro, intruding and partly re-equilibrating the Lanzo peridotite in Val di Viù, is described. It consists of Ol + Opx + Cpx + Ti-rich Ho porphyroclasts included in a fine-grained matrix, where primary plagioclase is replaced by the Jd + Zo + Qz assemblage. Geothermobarometric calculations have given T: 1000 °C and P : 0.5 GPa (5 kbar) for the gabbro crystallization. Both gabbro and host spinel/plagioclase lherzolite are crosscut by mm-sized mylonitic veins of brown Ho + Ilm + Ap + Plag. Geologic and petrologic considerations suggest that these veins crystallized from a highly differentiated tholeiitic magma, introduced - most likely immediately after gabbro crystallization - into both gabbro and peridotite. Mineralogic and petrologic evidences indicate that both gabbro and host lherzolite experienced a subsolidus polyphase HT deformation and recrystallization from hornblende granulite- to amphibolite-facies conditions. The metamorphic re-equilibrations, characterized by initial Hp mineral assemblages and late greenschist-facies parageneses, indicate an Alpine orogenic history consistent with that inferred elsewhere for the internal Western Alps.	Kaersutite-bearing mylonitic gabbro from the Lanzo-peridotite (Western Italian Alps)
VOLUME 63 NO 2 197	1984	63	2	197	200	Bogdanov, N.A.	The mechanism of emplacement of ophiolites in recent and pre-Mesozoic mountain chains is different and depends on their occurrence in Pacific-type fold belts or intercontinental orogenies. A correlation can be made between spreading events in the Cretaceous and periods of increased tectonic activity on continents.	Tectonic shift of ophiolites

VOLUME 63 NO 2 201	1984	63	2	201	212	Sturt, B.A.	The timing of ophiolite emplacement is discussed and it is demonstrated how the accretion of ophiolitic terrains is related to the Finnmarkian Orogeny. The continental miogeocline of the Scandinavian Caledonides is shown to relate to the pre-Finnmarkian continental margin, and that it was effectively destroyed during the Finnmarkian Orogeny. The final assembly of the tectonostratigraphy of the Scandinavian Caledonides, is however the result of superimposed orogenic cycles. The pattern of development bears many resemblances to that of the Appalachian orogen in North America.	The accretion of ophiolitic terrains in the Scandinavian Caledonides
VOLUME 63 NO 2 213	1984	63	2	213	219	Wyllie, P.J.	The system CaO-MgO-SiO ₂ -CO ₂ includes mineral assemblages corresponding to model lherzolite: forsterite(Fo) + orthopyroxene(Opx) + clinopyroxene(Cpx), and model harzburgite: Fo + Opx, as well as model websterite and wehrlite. When fully carbonated, the peridotites are converted to limestones: dolomite(Do) + magnesite(Mc) + quartz(Qz), or Mc + Qz. When partly carbonated, the peridotites are converted to carbonate-lherzolite and magnesite-harzburgite, which cannot coexist with CO ₂ . Available experimental and calculated reaction data are presented for carbonate lherzolite: (6) Opx + Do = Cpx + Fo + CO and (6A) Opx + Cc = Cpx + Fo + CO ₂ , where Do is dolomite and its solid solution, and Cc is magnesium calcite; for magnesite-harzburgite: (3) MC + En = Fo + CO ₂ ; for websterite + carbonate: (O) Mc + Cpx = Do + Opx and (01) Do + Cpx = Cc + Opx; and for carbonate-wehrlite: (9) Do + Cpx = Fo + Cc + CO ₂ . Conditions for the occurrence of dolomite(stoichiometric)-lherzolite are evaluated. Comparison of fossil geotherms deduced from kimberlite nodules with the phase diagrams for model harzburgite and lherzolite, and solidus curves with H ₂ O present, indicates that partially melted lherzolite may coexist with solid magnesite-harzburgite between about 175 and 195 km depth. Dissociation of magnesite could disrupt the harzburgite nodules during eruption, distributing low-calcium garnet through kimberlite.	The effect of carbon dioxide on phase relationships for synthetic lherzolite and harzburgite
VOLUME 63 NO 2 220	1984	63	2	220	221			Book reviews
VOLUME 63 NO 3 225	1984	63	3	225	229	Berendsen, H.J.A.; Zagwijn, W.H.	Factors that possibly influenced the events during the period 1000-1300 AD are: climatic changes, sealevel changes, changes in river pattern and human influence. The impact of these factors is briefly discussed and the most important conclusions of the symposium are summarized.	Some conclusions reached at the symposium on geological changes in the Western Netherlands during the period 1000-1300 AD

VOLUME 63 NO 3 231	1984	63	3	231	240	Berendsen, H.J.A.	The Dutch fluvial area changed drastically during the period 1000-1300 AD, mainly due to human influence. Four topics are discussed: 1. On the basis of new radiocarbon datings and calculations of the rate of sedimentation it is concluded that the River Lek came into existence about 2000 years ago; 2. The silting up of the Kromme Rijn near Wijk bij Duurstede did not occur before the second half of the eleventh century. A dam was constructed in the river in 1122 AD; 3. The present rivers have a steeper gradient than recently abandoned meander belts. Changes in gradient are shown to be complex and not necessarily related to changes that occurred between 1000 and 1300 AD. 4. During the period 1000-1300 AD the main rivers were embanked; smaller branches were dammed. The embankments made it possible to reclaim the low-lying peat areas.	The evolution of the fluvial area in the western part of the Netherlands from 1000-1300 AD
VOLUME 63 NO 3 241	1984	63	3	241	248	Heidinga, H.A.	In the Kootwijkerzand on the Veluwe (The Netherlands) a settlement has been excavated that was buried beneath wind-blown sands and that was dated 750-1000 AD. For its water supply, this settlement depended on a nearby pool, which owed its existence to an impervious horizon in the subsoil. Since fluctuations in the water level of this pool could be reconstructed it could be established that the pool dried out relatively quickly in the 10th century. In addition a rainfall chart for the 8th- 10th centuries was constructed. It appears that the first half of the 10th century heralded a period of drought, of a severity hitherto unknown, which must have affected large areas of Europe. A relationship, either direct or indirect, is sought between the lack of rainfall and features which appeared on the Veluwe and elsewhere around 1000 AD, such as: 1. turf-manuring and the shift in emphasis from summer cereals to winter cereals (rye) on the high, sandy soils; sand-drifting, both inland and along the coast; the reclamation of part of the high moor in the western Netherlands.	Indications of severe drought during the 10th century AD from an inland dune area in the central Netherlands

VOLUME 63 NO 3 249	1984	63	3	249	258	Roep, T.B.	In this paper the literature on the dating of barrier progradation and erosion of the coastal barriers of the western Netherlands is critically reviewed. It is concluded that progradation started around 5000 BP when the rise of sea level diminished, and ended around Roman times' or even later. This conclusion is based on ¹⁴ C dated peat from depressions behind a protecting coastal barrier, ¹⁴ C dated shell pairs in the barrier deposits, a progradation distance-age diagram, and reworked dated shells on the recent beach. The coastline was drastically reshaped around 2300 BP and around 1200 AD. During active progradation the coastal gradient down to a depth of 5 m was about 1:200, compared with a present gradient of 1: 100. Supply of sand from the English channel region started after 7000 BP and ended before 2000 BP. Supply of sand by the rivers Rhine and Meuse probably stopped around 2000 BP. Some evidence points to a climatic change which might be an important factor affecting barrier behaviour and sand supply.	Progradation, erosion and changing coastal gradient in the coastal barrier deposits of the Western Netherlands
VOLUME 63 NO 3 259	1984	63	3	259	268	Zagwijn, W.H.	The formation of the Younger Dunes on the west coast of The Netherlands is discussed in some detail. The onset of overblowing along the beach can be placed around AD 1000. Around AD 1600, the general outline of today's dune morphology was already present except in areas close to the coast. The behaviour of the water table and the sedimentary processes of the Younger Dune formation are dealt with.	The formation of the younger dunes on the west coast on the Netherlands (AD 1000-1600)
VOLUME 63 NO 3 269	1984	63	3	269	275	Jong, J. de	This paper presents the results of radiocarbon datings and pollen analyses of the coastal dunes of the Frisian islands off the northern coast of The Netherlands. The oldest dates obtained at each individual island decrease in an easterly direction and range from about 2800 BP for Vlieland to about 400 BP for Schiermonnikoog. Two types of deposits are distinguished: a. Older Dunes and b. Younger Dunes. The Older Dunes are characterized by intercalated organic beds. They formed between well before the beginning of the Christian era (e.g., on the island of Vlieland) and 755 ± 45 BP, locally even as late as 625 ± 50 BP (Ameland) or 430 ± 45 BP (Schiermonnikoog). The Younger Dune deposits, in which humic intercalations are very rare are related to a relief of parabolic dunes of considerable elevation. The formation of the Younger Dunes started before approximately AD 1400 (probably even more than a century earlier), and continues up to the present. A comparison with the coastal dune area of the Western Netherlands is discussed as well as some characteristics of the vegetational development.	Age and vegetational history of the coastal dunes in the Frisian islands, the Netherlands

VOLUME 63 NO 3 277	1984	63	3	277	286	Westerhoff, W.E.; Cleveringa, P.; Mûcher, H.J.	Dunkirk III sediments (<i>pik</i> clay, <i>rekere</i> clay, and <i>del</i> soils) in the province of Noord-Holland lie on top of tidal-flat deposits (Calais IV and Dunkirk O) and/or Holland peat with a time stratigraphic hiatus in between. Deposition during the Dunkirk III transgression probably took place in various phases under changing environmental conditions with varying sedimentation rates between AD 1050 and 1250. This conclusion is based on geological and historical data. The initial sedimentation phase is represented by a thin layer of clay rich in organic matter, deposited under slightly brackish conditions. In the following phase of virtual non-deposition, sediment accumulated under almost freshwater conditions. Soil micromorphological, pollenanalytical, and malacological data confirm soil formation during the initial sedimentation phase while agriculture continued. Between AD 1150 and 1250 the bulk of the Dunkirk III sediments were deposited under brackish conditions. The interrelationships between <i>pik</i> clay, <i>rekere</i> clay, and <i>del</i> soils are discussed.	Development of Dunkirk III near Alkmaar, the Netherlands
VOLUME 63 NO 3 287	1984	63	3	287	298	Jong, J. de	The Spaarne river, exists since the Early Subboreal and drains into the former IJ estuary. Its main sand deposits date from the Early Subatlantic, other deposits from after the beginning of the Christian era. Sands of medium grain size are obviously derived from reworked dune and beach sands. They were deposited partially as point-bar deposits, but dune sands blown into the water of the Spaarne may also be present. Substantial amounts of organic material were deposited after the beginning of the Christian era. A clay bed Bakenes clay, covers the much older Holland Peat along both sides of the Spaarne. The clay probably dates from the XIIIth century and reflects a period of flooding, including some storm surges which are mentioned in historical sources. In late medieval times a strip of land along the Spaarne was reclaimed; the resulting shift of the Spaarne bank is discussed.	Geological investigations in the centre of Haarlem (the Netherlands) and the development of the river Spaarne
VOLUME 63 NO 3 299	1984	63	3	299	307	Hallewas, D.P.	This paper gives a summary of the archaeological and historical datings concerning the reclamation of the peatbogs, the formation of the Younger Dunes, sedimentation, erosion and lake formation. The size of the areas, in which these changes in the physical environment took place was estimated for parts of the provinces of North and South Holland. These estimates enabled us to demonstrate the differences in the effects of these events on the society in both areas.	The interaction between man and his physical environment in the county of Holland between circa 1000 and 1300 AD: a dynamic relationship
VOLUME 63 NO 3 309	1984	63	3	309	313	Berkhout, A.J.	Seismic data provide an invaluable amount of information on the subsurface geology, particularly because of its dense lateral sampling. However, on the spatial resolution properties there is still a lot to be desired. In this paper the principles of seismic resolution are discussed and limitations in practical situations are indicated.	Detailed geologic information from seismic data

VOLUME 63 NO 3 315	1984	63	3	315	322	Cloetingh, S.; Nieuwland, F.	To investigate the thermo-mechanical aspects of lithospheric thinning and rift formation we have constructed finite element models for doming and stretching. We have found that the magnitude of stretching forces required to induce failure in oceanic lithosphere is proportional to lithospheric age. Updoming of the lithosphere caused by a temperature perturbation in the upper mantle can be an effective mechanism for rifting only when updoming is associated with a reduction in the thickness and the strength of the mechanically strong part of the lithosphere. These findings explain why relatively low uplifts generate new rifts.	On the mechanics of lithospheric stretching and doming: a finite element analysis
VOLUME 63 NO 3 323	1984	63	3	323	331	Donselaar, M.E.	The Menefee Formation (Mesaverde Group, Late Cretaceous) in the San Juan Basin, northwestern New Mexico, consists largely of deltaic plain and paralic deposits. The deposits were formed along the west coast of the Cretaceous Seaway. The upper part of the Menefee sequence displays isolated sandstone bodies with a lobate geometry. The sandstone bodies are embedded in carbonaceous shales of coastal swamp/lagoonal origin. Sedimentary structures include inclined lamination, tabular and wedge-shaped cross-bedding in the lower parts of the sandstone bodies, and trough cross-bedding in the upper parts. The bipolar distribution of transport directions, as well as the presence of mud drapes on foresets and bottomsets, point to a tidal environment of deposition. The lobate sandstone bodies are thought to have been generated as flood tidal deltas. Based on theoretical models for the stacking of tidal delta deposits, an indication is given of the relation between relative rise of sea level and behaviour of the flood tidal deltas and connected tidal inlets on the barrier coast of the Cretaceous Seaway.	Flood tidal delta sedimentation in the Late Cretaceous Menefee formation (Mesaverde group), San Juan Basin, Northwest New Mexico

VOLUME 63 NO 3 333	1984	63	3	333	336	Rácz, L.G.	A colony-forming organism, constructed of single, pairs or bundles of wavy, locally constricted tubular filaments, is described here as new Middle Carboniferous algal genus <i>Iberiaella</i> of uncertain affinity. <i>Iberiaella</i> superficially resembles <i>Donezella</i> , a widespread organism observed in shallow water carbonates of the Cantabrian Mountains. However, the multi-layered tubular tissue, the nonperforated wall structure of the tubes and the encrusting habitus make <i>Iberiaella</i> easily distinguishable from <i>Donezella</i> with its dichotomously branching single layers of detached septated tubes. It is believed that <i>Iberiaella</i> with its anastomosing branching-network and encrusting character forms the rigid skeleton of the organic mounds which occur commonly in the carbonate beds on the southern slope of the Cantabrian Mountains. <i>Donezella</i> had the function of a stabilizer in the process. The fine (micritic) internal sediment - the bulk of the material filling up the open spaces in the algal network - suggests low to moderate energy during deposition and absence of drastic diagenetic alterations.	<i>Iberiaella</i> , a new fossil alga from the Middle Carboniferous of NW Spain
VOLUME 63 NO 4 337	1984	63	4	337	341	Andel, T.H. van	plate tectonics has been in the foreground of geological thinking for almost twenty years. It has proved to be an immensely useful concept and its consequences, especially for the history of the earth and life, have by no means been fully explored. As is inevitable with any comprehensive theory, however, flaws are also beginning to show, mainly in the form of a growing of <i>ad hoc</i> modifications which cast doubt on the claim that this is the ultimate unifying new global tectonics. What the future shall bring is a matter of conjecture, but any new dynamic theory of the earth is certain to include continental drift.	Plate tectonics at the treshold of middle age

VOLUME 63 NO 4 343	1984	63	4	343	350	Berendsen, H.J.A.	Until recently it was thought that sedimentation in the perimarine area of the Netherlands occurred synchronously with sedimentation in the marine area. The observed alternation of clastic sediments and peat in both areas was attributed to an alternation of transgressions and regressions. Quantitative analysis of available radiocarbon dates of the perimarine area leads to the following conclusions: 1-It is impossible to establish a chronology of periods of sedimentation and periods of sedimentation (peat formation) which corresponds with any of the existing chronologies in the marine area. The observed alternation of clastic sediments and peat in the perimarine area is determined by avulsion rather than by an alternation of transgressions and regressions; 2-Peat formation in residual channels west of a line from Utrecht to Den Bosch is determined to a high degree by the general rise of mean high water in the Netherlands; 3-Peat formation in residual channels in the perimarine area starts mainly during periods of regression; 4-Avulsion occurred almost exclusively during periods of transgression.	Quantitative analysis of radiocarbon dates of the perimarine area in the Netherlands
VOLUME 63 NO 4 351	1984	63	4	351	354	Berendsen, H.J.A.	The definition and subdivision of the Westland Formation, especially with regard to the so-called 'perimarine deposits', has met with serious objections. These objections result from the mingling of the concepts of lithostratigraphy, chronostratigraphy, and genesis. It is concluded that the lithostratigraphic classification of the Holocene sediments in the Netherlands' coastal area has to be disconnected from the genetic concept of a 'perimarine' area. A new system for lithostratigraphic classification of the deposits in the perimarine area is proposed'	Problems of lithostratigraphic classification of Holocene deposits in the perimarine area of the Netherlands
VOLUME 63 NO 4 355	1984	63	4	355	362	Balescu, S.; Haesaerts, P.	This study is a pedological and mineralogical diagnosis of the loamy cover deposits of the Sangatte raised beach (Strait of Dover), presently at almost 10 m N.G.F. ⁴ , to determine their chronostratigraphy. The analytical data are compared with those obtained for the Cagny-la-Garenne (Somme, Picardie) section, which is considered a stratotype for Middle Pleistocene loesses of Northern France. Our results support the notion that formation of the Sangatte raised beach can be attributed to a high sea level of the Middle Pleistocene. This provides further evidence on the paleogeographical evolution of the Southern North Sea Basin during the latter half of the Middle Pleistocene. It confirms the previous assumption of an early opening of the Strait of Dover in the Middle Pleistocene. Furthermore, it demonstrates that the loesses with high green hornblende and garnet content, that were previously supposed to be restricted to the Weichselian, were already deposited during the Saalian.	The Sangatte raised beach and the age of the opening of the strait of Dover

VOLUME 63 NO 4 363	1984	63	4	363	375	Berg, J.H. van den	The ebb-tidal delta of the Eastern Scheldt consists of a complicated system of shifting channels and shoals. From 1959 onwards detailed soundings of the area have been carried out almost yearly and thus the most important morphological changes in the last 25 years have been established. An attempt has been made to trace the impact of 'Delta-project' constructions which have already been completed upon the trend of the morphological evolution. Attention is paid to implications of this investigation for the study of fossil examples of ebb-tidal deltas. A main conclusion is that a rather small increase in tidal discharge at the entrance of the Eastern Scheldt basin resulted in a remarkable and rapid expansion of the ebb-tidal delta.	Morphological changes of the ebb-tidal delta of the eastern Scheldt during recent decades
VOLUME 63 NO 4 377	1984	63	4	377	380	Woude, J.D. van der	A Late Glacial lake fill in the eastern Netherlands' acolian sand district shows a very gradual transition from the Alleröd to the Younger Dryas pollen zone. This contrasts with most pollen sections from the wide surroundings, where this transition is sharper. As, however, in most of these sections the pollen zone boundary coincides with a rather sharp lithologic change, local influences and/or time lags might have caused the sharper pollen zone transition there. Hence, the hypothesis is formulated that, as to regional vegetation history, the transition from Alleröd to Younger Dryas may indeed have been gradual.	Gradual pollen zone transition from Alleröd to younger Dryas in an eastern Netherlands' lake fill
VOLUME 63 NO 4 381	1984	63	4	381	386	Dost, B.; Wettum, A. van; Nolet, G.	We present a detailed description of the instrumentation and design of the Network of Autonomously Registrating Stations (NARS). The instrumentation of each station consists of three Teledyne Geotech SL 210/220 long period seismometers and a Kinematics PDR-2 digital event recorder. This off-the-shelf technology was supplemented by specially designed pre-amplifiers, response shaping filters and time receivers which calibrate the PDR-2 clock in an automatic fashion. Expressions for the full system response are derived. and station locations are given.	The Nars array

VOLUME 63 NO 4 387	1984	63	4	387	398	Rondeel, H.E.; Weijermars, R.; Dorssen, H.G. van	Detailed structural and lithological analysis in the Macizo de Nevera, Spain, has revealed that the structure of the Palaeozoic basement rocks is much more complex than hitherto recognized. Alternations of pelite and psammite, separated by distinct thin intervals of orthoquartzite, are folded around shallow north-plunging fold axes. Detailed mapping of these folds disclosed that the synforms are consistently excised by reverse faulting along strike. In the western part of the Macizo de Nevera, this essentially simple structure is seriously complicated by a NE-SW trending system of en-echelon arranged dextral strike-slip faults, that partly reactivated the earlier reverse faults. Due to reworking of the latter faults, the crustal section was further shortened in an E-W direction, the motion being mainly concentrated on faults on either side of the Vallejo Hondo Anticline. Neither of the fault generations discussed continue into the Mesozoic cover of Triassic and Jurassic sediments which surrounds the Macizo. In an appendix to the paper, the Palaeozoic rock units are described.	Reactivation of early reverse faults associated with oblique strike-slip faulting: a mechanism for crustal shortening (Macizo de Nevera, Sierra de Albarracín, Spain)
VOLUME 63 NO 4 399	1984	63	4	399	410	Verhoef, P.N.W.; Vissers, R.L.M.; Zwart, H.J.	Detailed structural analysis has yielded new data on the structural and metamorphic evolution of the western Aston Massif and on the nature of the transition zone between the supra- and infrastructure in the central Pyrenees. The low-grade suprastructure is characterized by a steep axial-plane cleavage, whereas a flat-lying schistosity predominates in the high-grade infrastructure. Structural cross sections through the transition zone indicate that the steep cleavage is a first (F_1) structure which becomes progressively deformed towards the higher grade rocks by second and third generations of structures (F_2 and F_3). The third deformation in particular is characterized by a flat-lying axial-plane schistosity. Two dome-shaped metamorphic isograd patterns occur in the area. These isograd patterns match with a structural dome which largely results from F_2 deformation. Third generation flat-lying structures, while being moderately developed in the transition zone, predominate in the central part of the dome, suggesting thermally induced vertical shortening. Two younger generations of broadly post-metamorphic steep folds (F_4 and F_5) only slightly affected the major structure. The relationship of deformation and metamorphism is different for the two metamorphic thermal highs. In areas where these two thermal highs intersect, two phases of metamorphic mineral growth can be demonstrated, indicating the complex nature of the Pyrenean metamorphism in such localities.	A new interpretation of the structural and metamorphic history of the western Aston Massif (Central Pyrenees, France)
VOLUME 63 NO 4 411	1984	63	4	411	413	Stride, A.H.; Nio, S.D.		Comment and reply on The North Sea and Northeastern Bering Sea: A comparative study of the occurrence and geometry of sand bodies of two shallow epicontinental shelves

VOLUME 63 NO 4 414	1984	63	4	414	414	Fick, L.J.		In memoriam, Dr G.L. Krol
VOLUME 63 NO 4 415	1984	63	4	415	416			Book reviews
VOLUME 64 NO 1 5	1985	64	1	5	15	Westbroek, P.; Vrind-de Jong, E.W. de; Wal, P. van der; Borgman, A.H.; Vrind, J.P.M. de	Various metals are known to be accumulated by both intra- and extracellular biopolymers. Such accumulations may lead to the formation of biominerals, whereby the biopolymers may assume a regulatory role in crystallization processes. Two examples are discussed that are studied in our laboratory, calcium and manganese. <i>Emiliana huxleyi</i> is a unicellular marine alga that produces calcite discs - coccoliths - within an intracellular vacuole. Much attention has been given to the probable involvement of a complex acidic polysaccharide that is associated with the crystalline phase. <i>E. huxleyi</i> is the most productive lime-secreting species on earth and is likely to play an important role in the oceanic carbon cycle. Manganese-oxidizing bacteria occur associated with recent sedimentary Mn-deposits. Manganese oxidation in two species is briefly discussed. There are strong indications suggesting that extracellular biopolymers regulate the binding of reduced manganese and its subsequent oxidation. Biopolymer-mediated metal accumulation and biomineralization occur at a huge scale in the biosphere, and hence may have important geological implications. The processes may be utilized for the reclamation of heavy metals from natural and polluted environments, for the prevention of 'scaling' in industrial practice, and for the treatment of pathological (de)mineralizations in humans.	Biopolymer-mediated Ca and Mn accumulation and biomineralization
VOLUME 64 NO 1 17	1985	64	1	17	24	Zagwijn, W.H.	A review is presented of the chronostratigraphy and lithostratigraphy of the Quaternary of the Netherlands. The influence of glaciations is discussed and correlations indicated with the terrace systems of the river Rhine.	An outline of the Quaternary stratigraphy of the Netherlands

VOLUME 64 NO 1 25	1985	64	1	25	40	Nagtegaal, P.J.C.; Weerd, J.T. de	The Cambro-Ordovician, Silurian and Devonian sedimentary sequences in the Southern pyrenees were deposited on the northern, then passive, margin of the early Iberian plate. Supply of an increasingly mature clastic assemblage was sourced from the south. In pre-Variscan Carboniferous time this margin was activated as is evident from the appearance of abundant metamorphic and volcanic lithics in the sandstones. The Variscan chain, which had emerged in the Late Westphalian, dictated a new clastic dispersal pattern with southwards-directed paleotransport. The sandstones of these early post-Variscan times typically represent a 'recycled orogen' facies with variations in composition that can be attributed to contemporaneous volcanism, relief and paleoclimate (Westphalian D - Early Triassic). Towards the end of the Mesozoic (Santonian) southern clastic sources, collectively referred to as the 'Ebro High', had again become active. They supplied stable terrigenous assemblages until the end of the Maastrichtian' As a result of the Late-Cretaceous collision of Iberia with stable Europe, the main clastic dispersal systems changed drastically and in Paleocene time supply was from the northeast where uplifted Mesozoic carbonates were subjected to erosion. This dispersal system, which gradually also involved supply directly from the north and from deeper stratigraphic levels, became very important in Eocene and in Oligocene time, and, in essence, even persists today.	Provenance of Cambro-Ordovician to Oligocene sandstones in the Southern Pyrenees, Spain
VOLUME 64 NO 1 41	1985	64	1	41	62	Reijers, T.J.A.	The evolution of the Pre-Devonian and the Devonian sedimentary basin in the Cantabrian Mountains (N.W. Spain) and in part of the Belgian Ardennes is traced and compared. Emphasis is on the palaeogeography reflected by lithofacies in the carbonate platforms in both basins. Lithofacies from the Devonian system have been chosen because the Devonian is the Period of relative tectonic quiescence between the Caledonian and the Variscan orogenies. It could be attempted for such a Period to characterise sediment patterns and the nature of carbonate in terms of the megatectonic and geodynamic frame within which they are formed. For Iberia a geodynamic mobile model has been proposed in the literature, whereas the tectonically imbricated Belgian Ardennes are geodynamically a stable area. The Belgian carbonate platforms appear to have a Pacific faunal/particle affinity, and they evolved from rimmed margin to knoll-reef rimmed ramp platforms. The Spanish carbonate platforms appear to have an Atlantic faunal/particle affinity and evolved from ramp type to reef-rimmed carbonate platforms.	Devonian basin-fill histories of the Spanish Cantabrian Mountains and the Belgian Ardennes; a comparison

VOLUME 64 NO 1 63	1985	64	1	63	67	Ruiter, H. de	One of the difficulties of ore reserve calculations is the determination of the factor to convert a volume to be mined into a tonnage to feed the mill. This factor is normally referred to as 'tonnage factor', 'density' or 'specific gravity'. At Nanisivik, a zinc-lead mine located in Canada's High Arctic problems occurred with the tonnage factor when, 2½ years after start-up, a stockpile of 91 000 tonnes of ore had accumulated on paper, while actually only 11 000 tonnes could be identified. These stockpile differences indicated that the ore density of 4.4 t/m ³ was probably no longer appropriate. The influence of survey errors in measuring were evaluated. Density calculations were carried out on 345 samples taken underground. The moisture content of the ore in the millfeed was used to calculate the density for two periods of about one year. Ultimately it was concluded that the actual density was around 4.0. This figure was then adopted and ore reserves were adjusted accordingly.	Problems of ore density determinations at Nanisivik mines
VOLUME 64 NO 1 69	1985	64	1	69	77	Nwajide, C.S.; Hoque, M.	The fluvial sandstones of the late Cretaceous Makurdi Formation of the middle Benue Trough of Nigeria are composed of feldspathic wackes (average matrix content 25.4%) and subarkosic arenites (average matrix content 9.3%). Except for the differences in the matrix content, the framework mineralogy of the two groups of sandstones is very similar. The interstitial clay matrix is both primary and diagenetic in origin. Regression analysis shows an inverse correlation between the proportion of matrix and the incidence of detrital feldspars in the sandstones. It implies that postdepositional alterations of feldspars have given rise to a mineral assemblage which is more mineralogically and less texturally mature than the original deposit, thus invalidating genetic significance in sandstone nomenclature. Neither the clay content nor the zircon-tourmaline-rutile (ZTR) index is a reliable measure for textural or mineralogical maturity of the Makurdi sandstones. It is proposed that several other attributes, such as roundness, ratio of undulose-to-nonundulose quartz, and MQ/PQ ratio which are less susceptible to diagenetic alteration, can be used as reliable indices of textural maturity. A mineralogical maturity scale, based on inert versus labile components (Q/F+L) of framework composition of a sandstone, is proposed to facilitate quantitative analysis of maturity data.	Problems of classification and maturity evaluation of a diagenetically altered fluvial sandstone

VOLUME 64 NO 1 79	1985	64	1	79	87	Paulissen, E.; Vandenberghe, J.; Gullentops, F.	An intensive geoelectric campaign in the Maas valley (Rotem area, Limburg, Belgium) allowed the location of the Bichterweert scarp, a (buried) scarp at the base of the Maas valley bottom gravels. This scarp, tectonic in origin, is attributed to the Feldbiss fault system at the southern border of the Central Graben. The Bichterweert scarp is the result of Saalian and Weichselian movements. Due to this activity the thickness of the Maas gravel beds suddenly increases north of the scarp. The electric specific resistivities are a measure for the gravel quality.	The Feldbiss fault in the Maas valley bottom (Limburg, Belgium)
VOLUME 64 NO 1 89	1985	64	1	89	102	Buurman, P.; Jongmans, A.G.; Broekhuizen, J.; Miedema, R.	The flint eluvium in South Limburg and Belgium is a dissolution residue of Upper Cretaceous chalk which may occur either at the present surface or below a cover of Early Oligocene sand. Eluvia with sand cover contain weathered glauconite and iron accumulations but no birefringent, oriented clay. Similar eluvia without sand cover show strong orientation of clay throughout the residue. Such orientation of residual clay immediately follows dissolution of the chalk and is not derived from overlying deposits. As eluviation and orientation of clay are strictly bound to subaerial weathering, eluvia with this property must have formed after erosion of the Early Oligocene sands. Eluvia that are covered by sand do not represent a pre-Oligocene soil formation, but have formed below the sand cover. The <i>kleefaarde</i> , a weathering residue without flints, but with properties similar to those of the eluvia without sand cover, is probably a lateral equivalent of the latter and much older than presumed. Accumulation at the base of the beds continues to this day, but weathering at the soil surface is different from that during the Tertiary. The paper presents a dynamic model of the formation of such eluvia.	Genesis of the flint eluvium and related beds in South Limburg, The Netherlands
VOLUME 64 NO 1 103	1985	64	1	103	111	Bianchi, F.R.; Driever, B.W.M.; Jonkers, H.A.; Kreuzer, H.	Four of five size fractions of two biotite samples from a volcanic ash bed in the marine Pliocene Prassas section on Crete yielded almost concordant K-Ar dates of 3.20 to 3.25 Ma. The youngest date of 3.20 ± 0.03 Ma is interpreted to be a close estimate of the age of the ash. The tephra layer is situated in the lower part of the planktonic foraminiferal <i>Globorotalia crassaformis</i> Zone. In terms of calcareous nannofossil biostratigraphy, the ash bed can be assigned to the <i>Discoaster surculus</i> Zone (NN16). The ash bed was also recognized in the nearby sections of Aghios Vlassios and Finikia and on the island of Koufonisi, SE of Crete. A tentative correlation with an ash level in the Mediterranean D.S.D.P. site 378 is proposed. The biochronologic scheme of the Mediterranean Pliocene, based on four K-Ar dates from volcanic intercalations in marine sequences, differs by its greater age estimates from the one commonly constructed on the basis of age-extrapolation of geomagnetic or biostratigraphic horizons from other areas.	K-Ar date and biostratigraphic position of a volcanic ash-layer in the marine Pliocene of Crete, Greece
VOLUME 64 NO 1 113	1985	64	1	113	117			Book reviews
VOLUME 64 NO 1 119	1985	64	1	119	120	Hageman, B.P.		In memoriam - Prof. Dr. Ir. F.J. Faber

VOLUME 64 NO 2 123	1985	64	2	123	129	Glasbergen, P.	Two approximately 500 m deep boreholes were drilled in Maastricht (The Netherlands) and in one piezometers were placed at respectively 240 and 480 m depth. From the piezometric heads, which are several metres above ground level, and the existing groundwater contour maps of the area no firm conclusions concerning the groundwater origin can be drawn. However, oxygen-18 and carbon-14 isotope analyses of the groundwater indicate a meteoric source. The calculated subsurface migration times suggest infiltration in the Middle-Weichselian for water from the upper piezometer and an Early-Weichselian age for water from the lower piezometer. Ionic ratios for bromide and chloride indicate that both groundwater types are influenced by salts dissolved from the rock matrix. Dissolved salts are supposed to be taken up by diffusive transport from pores with stagnant water into the cracks where the main groundwater flow takes place. Well tests performed on both piezometers yielded hydraulic conductivity. It is concluded that the flow velocities in the upper and lower layers are different. However, the area of origin of the groundwater found in both screens could be the same, taking into account the differences in conductivity and piezometric head.	The origin of groundwater in Carboniferous and Devonian aquifers at Maastricht
VOLUME 64 NO 2 131	1985	64	2	131	143	Gaudette, H.E.; Olszewski, W.J.	The Amazonas Territory of Venezuela is a large area of Precambrian basement rocks overlain in some locales by the supracrustal sedimentary and volcanic rocks of the Roraima Formation. The basement rocks are medium to high grade gneisses with both igneous and sedimentary protoliths, plutonic rocks ranging in composition from granite to tonalite, and meta-volcanic rocks. Rb-Sr whole rock, and U-Pb isotopic analyses of zircons indicate a period of medium to high grade metamorphism and intrusion from 1860 to 1760 Ma. Post-tectonic plutonic activity continued to 1550 Ma. The volcanic rocks of the Roraima Formation in Venezuela give an age of 1746 Ma comparable to volcanic rocks of the Roraima Formation in other parts of the Guiana Shield. The ages and distribution of the basement rocks suggest the presence of a tectonic zone, approximately coincident with the Venezuelan-Colombian border, representing an active orogenic boundary between distinct tectonic provinces. The rocks to the northeast of this zone are part of the Trans-Amazonian of the Guiana Shield, while to the southwest and in adjacent Brazil and Colombia, new younger continental crust has been developed and cratonized. We suggest a model of collision and subduction followed by a change in tectonic style to extensional-vertical to produce the basement rocks of the western Guiana Shield in the Amazonas Territory.	Geochronology of the basement rocks, Amazonas Territory, Venezuela and the tectonic evolution of the western Guiana Shield

VOLUME 64 NO 2 145	1985	64	2	145	157	Cuevas Gozalo, M.	Among the coarse clastic deposits of the mainly alluvial Capella Formation several sediment bodies with characteristics of depositional lobes are recognized. These lobes are characterized and distinguished from other macroforms by their geometry, basal contact and lithofacies. A classification of the lobes is proposed on the basis of the geometry and the lithofacies. The most common geometrical type is tabular to wedge-shaped; a second geometrical type is sigmoidal. Two main lithofacies types are distinguished on the basis of the bedding pattern: a horizontally and an inclined bedded type. The lobes were deposited in the lower part of an alluvial fan system. The sedimentation of some of the lobes was influenced by tidal currents. Several models of sedimentary lobes are recognized: overbank splay lobes, terminal lobes, debris flow lobes and spillover lobes.	Sedimentary lobes in a tidally influenced alluvial area, Capella Formation, Tremp-Graus Basin, Southern Pyrenees, Spain
VOLUME 64 NO 2 159	1985	64	2	159	165	Bhattacharya, A.R.; Siawal, A.	The paper reports a phenomenon of flattening in mesoscopic folds around a major geotectonic element of the Himalaya, called the Main Central Thrust (MCT). The study demonstrates that the amount of flattening of folds gradually increases towards the MCT. The MCT zone itself shows the strongest flattening of associated folds. A direct control of the MCT is established over the fold shape in a zone of 5 to 6 km across. This phenomenon appears significant for the Himalayan terrain. It is held to represent a well-defined zone of ductile deformation around a 'ductile thrust'.	A phenomenon of unusual flattening in folds associated with a Himalayan thrust
VOLUME 64 NO 2 167	1985	64	2	167	173	Leinders, J.J.M.; Aziz, F.; Sondaar, P.Y.; Vos, J. de	The new standard biozonation for the Plio-Pleistocene continental deposits of Java, and its paleogeographical implications, are discussed. The four oldest faunal zones, Satir, Ci Saat, Trinil and Kedung Brubus, of this biozonation are identified in the famous vertebrate-bearing strata around Sangiran. Thanks to this biostratigraphy and to the availability of lithostratigraphically controlled absolute dates from the Sangiran area (provided by the joint Indonesian-Japanese Research Programme CTA-41) it is now possible to date the biostratigraphy: Kedung Brubus fauna: around 0.8 Ma Trinil H.K. fauna: around 1.0 Ma Ci Saat fauna: Satir fauna: around 1,2 Ma around L.5 Ma Semah's (1982) interpretation of the magnetostratigraphic data from the Sangiran area is not the most plausible one and an alternative is presented.	The age of the hominid-bearing deposits of Java: state of the art

VOLUME 64 NO 2 175	1985	64	2	175	179	Oen, I.S.; Verschure, R.H.	Metavolcanic rocks of the Bergslagen Supracrustal Series in the Grythytan-Hjulsjö area, central Sweden, are 1.9-1.8 Ga old according to published zircon U-Pb data. Rhyolitic rocks from Gillershöjden-Kullberget and Norr-Algen and metatuffites from Salbosjön and Kranktorp give Rb-Sr whole-rock ages of 1.6 ± 0.1 Ga and 1.8 ± 0.1 Ga, respectively. The rhyolitic rocks show reset Rb-Sr whole-rock ages due to a thermal event related to the intrusion of 1.7-1.6 Ga old granites, whereas the Rb-Sr whole-rock ages of the metatuffites still approximate the age of emplacement and earliest metamorphism of the supracrustals.	Isotopic age determinations in Bergslagen, Sweden: VI. acid metavolcanics of the Bergslagen Supracrustal Series, Grythytan-Hjulsjö area
VOLUME 64 NO 2 181	1985	64	2	181	197	Wamel, W.A. van; Bons, A.J.; Franssen, R.C.M.W.; Lingen, W. van; Postuma, W.; Zutphen, A.C.A. van	Four nappes have been distinguished in the Ligurian units of the N. Apennines between Rapallo and Bettola. The uppermost Antola Nappe is non-metamorphic. It contains a rock sequence of distant origin, that has been folded during one single phase of deformation. The immediately underlying Lavagna Nappe shows signs of very low-grade metamorphism. The constituent rock sequences originate from the Internal Ligurian Basin and have been subjected to polyphase folding and thrusting. Contrary to all later folding, the first folding phase (Fr) produced large-scale isoclinal folds that originally had a SW facing. These seem to have formed in an accretionary wedge, associated with a NE inclined subduction zone. The Mélange Nappe underlies the Lavagna Nappe. It is non-metamorphic in the area studied and contains rocks from the Bracco Zone (Ridge) and the External Ligurian Basin. Synsedimentary deformation is common in the Mélange Nappe. This nappe is also characterized by the occurrence of large-scale isoclinal recumbent folds with a NE facing. Together with gravitational sliding and spreading phenomena, this isoclinal recumbent folding seems to have been coherent with the gliding of the rock sequences, now incorporated in the Mélange Nappe, off a NE slope. The Canetolo Nappe is the lowermost thrust unit treated in this paper. It is non-metamorphic and the constituent rocks originate from the Subligurian Basin. After one phase of internal folding, the Canetolo Nappe was coupled together with the earlier stacked nappes. This pile of nappes overthrust the Tuscan units in a NE direction.	A structural geologic traverse through the Northern Apennines from Rapallo to Bettola (N. Italy)
VOLUME 64 NO 2 199	1985	64	2	199	203	Schuiling, R.D.; Meijer, R.J. de; Riezebos, H.J.; Scholten, M.J.	A beach sediment from Ameland, the Netherlands was divided into 9 grain size fractions. For each fraction the heavy minerals were separated subsequently and split in a number of magnetic fractions, roughly coinciding with particular minerals. All these fractions were weighed, and their mineral composition determined. The resulting grain size distribution for each different mineral turns out to be determined mainly by its specific density, and only to a minor degree by differences in the shape of grains.	Grain size distribution of different minerals in a sediment as a function of their specific density

VOLUME 64 NO 2 205	1985	64	2	205	209	Tuuk, L.A. van der	Recently discovered rhyncholites (Cephalopod mandibles) from the Upper Maastrichtian of the province of Limburg make it possible to describe a new species: <i>Rhyncholites marcellae</i> .	Note on a new rhyncholite from the Maastrichtian of Limburg, The Netherlands
VOLUME 64 NO 2 211	1985	64	2	211	215	Loon, A.J. van	Lithostratigraphic mapping always faces the problem of to what detail separate units should be distinguished. It is quite clear, for instance, that a rough first mapping requires other standards than a highly specialized investigation. Consequently, the choice of lithostratigraphic units should be based on flexible criteria (cf. Hedberg 1976). In practice the rules applied seem to be strongly influenced by national and historical developments. In the USA, for instance, hard-rock formations tend to be several hundreds of metres thick; in The Netherlands, in contrast, the Quaternary succession has been subdivided in formations and members which often have a local or even regional thickness of less than one metre. Berendsen (1984b), in an elegant analytical paper, recently argued that the detailed 'lithostratigraphic' subdivision of (sub)recent deposits in The Netherlands, as applied by the Dutch Geological Survey, gives rise to serious problems since various concepts are mixed and used simultaneously in an unacceptable way. In fact, he underlined rather similar views published earlier in a special issue of this journal on Quaternary geology (Van Loon 1981). A main problem is the term 'Westland Formation', formally introduced by Doppert et al. (1975) in an explanation to the new geological maps (Zagwijn & Van Staalduinen 1975). Berendsen (1984b) once more demonstrate that both the theoretical definition and the practical mapping of the Westland Formation are based on illogical concepts.	Problems of lithostratigraphic classification of Holocene deposits in the perimarine area of The Netherlands
VOLUME 64 NO 2 217	1985	64	2	217	220	Deeny, D.E.	The current state of central Irish sedimentary-exhalative metallogenetic theory is summarily reviewed. There is disagreement concerning the significance of primary sulphur in the genesis of the Tynagh/Silvermines ore deposits, the most popular view being that seawater sulphate, via biogenic reduction processes provided the bulk of the sulphur. It is shown that the extreme physico-chemical environmental conditions envisaged in a model which associates sulphide genesis with rifting may provide a framework wherein inorganic fractionation processes in primary sulphurous fluids may have contributed to a greater extent than currently recognised in producing the measured isotope distribution patterns at Tynagh and Silvermines. It is also noted that if catastrophic sulphide genesis on the scale of the Irish model were an historically recurring global event it might assist towards an explanation of the known isotopic history of the whole world ocean.	Central Irish sulphur isotope data in the light of the rift geological-metallogenetic model

VOLUME 64 NO 2 221	1985	64	2	221	231	Cuevas Gozalo, M.	Four types of sedimentary macroforms are described from well exposed Eocene deposits in the Tremp-Graus Basin, Spain: channel deposits, depositional lobes, sheet deposits and composite forms of lobe and channel origin. The channel deposits comprise sediment bodies either formed by lateral accretion or by vertical aggradation. Mixed forms also occur. The form of the channel base is used for further subdivision of the channel bodies. The association of the sedimentary macroforms indicates deposition on distal parts of alluvial fans. Influence of tides is suggested by the bipolar cross-stratification, reactivation surfaces and mud drapes occurring in some of the channel deposits and depositional lobes. At some locations intensive burrowing suggests marine conditions.	Geometry and lithofacies of sediment bodies in a tidally influenced alluvial area. Middle Eocene, Southern Pyrenees, Spain*
VOLUME 64 NO 2 233	1985	64	2	233	236	Tex, E. den		Eervolle vermelding - Hendrik Jan Zwart
VOLUME 64 NO 3 237	1985	64	3	237	244	Ramakrishna, R.S.; Rajaseelan, R.E.; Karunaratne, J.M.T.B.; Balasubramaniam, M.; Brooks, R.R.; Ryan, D.E.; Holzbecher, J.	Thirteen elements (Au, Co, Cr, Cu, Fe, Mn, Mo, Ni, Pb, Sn, Th, U and Zn) were determined in 120 heavy mineral concentrates from Sri Lankan stream sediments of the Highland Group of rocks in central Sri Lanka. The data indicate sporadic occurrences of gold, notably in the north of the region where this metal had not previously been found. The possibility of the existence of a previously unknown area of ultramafic rocks near Balangoda close to the plate boundary with the Vijayan Complex was indicated by high levels of chromium and nickel in the sediments. Background levels of uranium (8 µg/g) were relatively high and three anomalies (>35 µg/g) were detected in stream sediment concentrates. The project has pinpointed several areas where localized intensive exploration for specific minerals should be undertaken. Background levels have also been established for thirteen elements in stream sediment concentrates derived from the Highland Group of rocks.	A geochemical reconnaissance survey of Sri Lanka using panned mineral concentrates of stream sediments
VOLUME 64 NO 3 245	1985	64	3	245	249	Boer, R.B. de; Houbolt, J.J.H.C.; Lagrand, J.	Gas migrating upwards in deep sea sediments can form a thin zone of solid gas hydrates, which can act as a seal below which free gas is trapped. The acoustical contrast between the water-bearing sediments above this seal and the gas-containing sediments below it could cause seismic reflectors with a negative polarity running subparallel to the sea floor. The gas hydrate seal itself would be too thin to be resolved by seismic methods. To clarify whether gas hydrates could form such thin seals that are still effective, the formation of gas hydrates in a sediment has been simulated in laboratory experiments. An effective seal was formed from propane and water within 15 minutes in a coarse sand pack. This seal when 5 cm thick, could withstand a pressure difference of 2.4 bar. This finding supports the above model.	Formation of gas hydrates in a permeable medium

VOLUME 64 NO 3 251	1985	64	3	251	261	Jones, F.W.; Ertman, M.E.	A numerical method is outlined for the solution of the conduction equation with source term for regions with thermal anisotropy. A number of general models are considered and temperatures, thermal gradients and heat flows are calculated to show the anisotropy effects. The model is applied to an area of the southwest Scottish Highlands to investigate the possible effect of thermal anisotropy on metamorphism. It is found that thermal anisotropy may have contributed to the metamorphism, but the most important effect is that of non-uniformity of thermal conductivity in the vertical direction. Deep local sources may also contribute to the conditions causing metamorphism.	Heat flow through thermally anisotropic media: A numerical method and its application to an area of the southwest Scottish Highlands
VOLUME 64 NO 3 263	1985	64	3	263	269	Kolstrup, E.	During pipe line construction in Blaksmark north of Varde in Denmark a shallow depression with a tilted block of sand and gravel, and an infill of layered sand and silt was found. It is suggested that fluvio-thermal erosion has taken place here. Ice wedge casts present in the adjacent sand indicate that permafrost existed during a former cold period. It is suggested that the thermal erosion and the filling, as well as the formation of the frost wedges date from the last permafrost period of the Weichselian.	Late Pleistocene periglacial conditions in Blaksmark near Varde (Denmark)
VOLUME 64 NO 3 271	1985	64	3	271	280	Weijermars, R.	Singly folded and coaxially refolded rocks generally have axial directions that plot as unimodal clusters and either small or great circle girdles. Cluster distributions of axes are characteristic of either cylindrical folds or sheath folds developed at high shear strains. Girdle distributions may occur due to conical folding or sheath folds developed at intermediate shear strains. A variety of axial distributions can occur in non-coaxially refolded regions, since the variation of the axes of folds due to refolding depends on the initial interlimb angle and the angle between the older and younger axial planes. Characteristic fold axial distributions are summarised in a practical chart for general application (Table 1). This study is illustrated by the analysis of axial directions of isoclinal minor folds cogenetic with the final emplacement of the Aguilón fold nappe in S Spain. The axial directions of these (D_3) folds show a bimodal girdle distribution which is ascribed to their superposition on opposing limbs of the preceding (D_1) folds. Directional statistics suggests that D_1 folds were of chevron or similar type with interlimb angles of about 65 degrees before they all but disappeared after non-coaxial isoclinal D_2 refolding.	Directional variations of fold axes in progressive deformation, an example from a Betic fold nappe in S Spain

VOLUME 64 NO 3 281	1985	64	3	281	295	Linden, W.J.M. van der	<p>The Alpine-Mediterranean system consists of an African and a European orogenic belt which - with a few discontinuities - extend in great loops and bends between the Atlantic Ocean and the Middle East. The evolution and deformation of these belts or so-called oroclinal bending presupposes the evolution of relatively thick and rigid ribbon continents marginal to the African and European cratons. These ribbons are considered to have formed within the passive continental margins on either side of the Mediterranean while this seaway opened in a transtensional setting, starting in the Triassic. While the ribbons contorted the sedimentary basins in between were squeezed up and out in diapiric fashion to later be thrust (obducted) over their peripheries and to be emplaced as sedimentary and ophiolitic nappes. Orogenesis finished with the isostatic uplift of the oroclinal and the subsidence of the deflated and denudated diapirs.</p>	Looping the loop; geotectonics of the Alpine-Mediterranean region
VOLUME 64 NO 3 297	1985	64	3	297	310	Have, T. ten; Heijnen, W.	<p>Calcite crystals have been grown with the objective of studying the cathodoluminescence (C.L.) characteristics. No trace elements other than Mn^{2+} were needed to activate luminescence similar to that observed in natural carbonates. C.L. observations, combined with Mn and Fe analyses of synthetic crystals, natural calcites and dolomites, show that: 1. 15-30 ppm and 30-35 ppm Mn is sufficient to activate luminescence in calcites and dolomites, respectively. 2. The intensity of luminescence is controlled by the absolute amount of Mn^{2+} and not by the Fe^{2+}/Mn^{2+} ratio. Both conclusions are valid provided Fe concentrations are low (< 200 ppm). 3. Luminescent zonation, common in synthetic and natural carbonates, reflects differential Mn^{2+} uptake during growth, caused by: a. changes in the Mn^{2+} concentration of the precipitating fluid, or b. changes in the rate of crystal growth independent of the Mn^{2+} concentration in the fluid. The latter process has not been considered sufficiently in former C.L. studies, but will have important consequences for interpretation of luminescence features: e.g. definition of the geochemical history of pore fluids by characterisation of the rock's C.L., may not always be justified. Specifically, the concept of cement stratigraphy (i.e. correlation of similar luminescent colours or intensities) should be handled with care and only applied when it can be demonstrated that the zones are the result of bulk geochemical changes in the pore fluids and not merely of differences in crystal growth rate. Tentative criteria for such a differentiation are discussed.</p>	Cathodoluminescence activation and zonation in carbonate rocks: an experimental approach

VOLUME 64 NO 3 311	1985	64	3	311	326	Boorder, H. de; Lutgert, J.E.; Nijman, W.	The Muschelkalk of the eastern Netherlands, as exposed in quarries east of Winterswijk, is made up of sequences of dolomitic lime-mudstones. These are interpreted as stromatolites, particularly because of their characteristic algal growth patterns around mudcracks which show evidence of intermittent cracking and sealing. Rare, intercalated skeletal packstone layers with cyclic grain-size grading are thought to represent storm layers deposited within the high intertidal to supratidal algal mat environment. Pyrite, marcasite, sphalerite and galena occur widely dispersed in the limestone but have been concentrated more conspicuously in the storm layers and mudcrack fillings. A widespread occurrence of algal mats could account for initial concentration of considerable amounts of base metals. These probably did not derive from the deeper portions of the main Triassic basin to the north but are more likely of southern provenance, transported in meteoric water draining the emerged Variscan massifs. Secondary concentration of metals during dolomitization and compaction has demonstrably occurred, preferably in coarser-grained fabrics. Supergene enrichment is inferred from high strontium, lead and zinc values below a red bed interpreted to be a paleosol. A further analysis of the metal distribution is required. The area investigated is considered immature as regards economic mineral concentration. However, a place for base metal exploration is advocated in the course of the systematic investigation of the Netherlands subsurface.	The Muschelkalk and its lead-zinc mineralization in the eastern Netherlands
VOLUME 64 NO 3 327	1985	64	3	327	332	Rappol, M.	Elongated-clast fabrics of Alpine till from western Allgäu (southern West Germany) and of lowland ice-sheet till from The Netherlands are compared with published results from other areas. A quantitative comparison is made through the use of an eigenvalue method which produces measures of fabric shape and strength for three-dimensional orientation data. Clast fabrics of subglacial till in Western Allgäu tend to have lower strength than those from The Netherlands. Similar differences have been noted by comparing melt-out till fabrics of the Matanuska Glacier (Alaska) with Cordilleran ice-sheet and Alpine tills in North America. The possible reasons for these differences are discussed. Clast fabrics of ice-marginal debris-flow deposits in western Allgäu are similar to fabrics from sediment-flow deposits reported from other areas. Eigenvalue plots of clast fabrics do not distinguish clearly between subglacial till and debris flows from western Allgäu.	Clast-fabric strength in tills and debris flows compared for different environments
VOLUME 64 NO 3 333	1985	64	3	333	336	Juvigné, E.	It is shown that Saalian loess deposits which accumulated in a cut-off meander of the Lesse River at Wanlin, is partly characterized by a mineralogical index similar to that of Weichselian loesses. This is in agreement with a similar observation for loesses of northern France published recently by Balescu & Haesaerts (1984).	The use of heavy mineral suites for loess stratigraphy

VOLUME 64 NO 3 337	1985	64	3	337	339	Graaff, W.J.E. van de; Berendsen, H.J.A.		Problems of lithostratigraphic classification of Holocene deposits in the perimarine area of the Netherlands
VOLUME 64 NO 3 341	1985	64	3	341	347			Book reviews
VOLUME 64 NO 4 349	1985	64	4	349	356	Weijermars, R.	The cooling and subsidence history of the Alboran Basin suggests that it is underlain by a diapiric mantle bulge. Numerical models of crustal doming by Cloetingh & Nieuwland (1984) are applied to investigate the deep lithospheric structure beneath the Alboran Basin. At least two 300 km long high angle faults of east-west strike would be expected directly north and south of the Alboran Sea if the Alboran Diapir had penetrated far into the lithosphere. As there is no record of such faults, it is probable that the Alboran Diapir is a shallow bulge in the lithosphere-asthenosphere interface, which deformed the overlying MOHO. The suggested profile for the deep lithosphere in the Alboran area allows discussion of the details of Weijermars' (1985) model for the tectonic evolution of the Alboran Basin and peripheral Betic-Rif orogens during the past 30-25 Ma.	Uplift and subsidence history of the Alboran Basin and a profile of the Alboran Diapir (W-Mediterranean)
VOLUME 64 NO 4 357	1985	64	4	357	363	Nyong, E.E.	Deep-sea benthic foraminiferal assemblages of Campanian to early Maastrichtian age in the western North Atlantic are taxonomically similar to coeval assemblages in deep-sea sections from various parts of the world. Species composition in the sections studied is largely the product of selective dissolution of less resistant species at depth in relation to a late Cretaceous CCD and partly due to local submarine volcanism or to local incursions of corrosive bottom water. The uniformity in distribution of these assemblages at different latitudes was also partly aided by the absence of vigorous bottom water circulation during the late Cretaceous in the world oceans.	Implications of Campanian to early Maastrichtian deep-sea benthic foraminiferal distribution in the western North Atlantic
VOLUME 64 NO 4 365	1985	64	4	365	372	Akpan, E.B.	Trace fossils are described for the first time from Cenomanian-Turonian rocks of the Calabar Flank, SE Nigeria. The rocks essentially consist of SW dipping shales intercalated with thin beds of calcareous mudstone. In places, marly limestone occurs as low ridges parallel to the strike of the sequence. <i>Thalassinoides</i> are common in the calcareous rocks. Another, less numerous trace fossil, is probably the borings of phoronid. Marine benthonic pelecypods and gastropods, although of low diversity, are common in the mudstone and are rare or absent in most of the shale intervals which contain planktonic and impoverished benthonic foraminifera. Ichneological analysis supported by palaeontological and sedimentologic evidence suggest a depositional environment with fluctuating shallow, aerated and oxygen-deficient bottom conditions.	Ichneology of the Cenomanian-Turonian of the Calabar Flank, SE Nigeria

VOLUME 64 NO 4 373	1985	64	4	373	384	Zutphen, A.C.A. van; Wamel, W.A. van; Bons, A.J.	Detailed structural analysis and mapping in the Lavagna Nappe reveals the effect of various phases of deformation on a regional scale. The earliest phase produced large isoclinal, originally SW-facing folds (F_1). A second phase led to the development of open folds (F_2). The vergence of the younger folds (F_3, F_4) is NE. Thrusting occurred in two stages: post F_2 -pre F_3 and syn F_4 . Hereafter the previously stacked thrustsheets, together forming the Lavagna Nappe, were emplaced on top of the Mélange Nappe by NE-directed thrusting. A final phase of gentle folding (F_5) caused an undulation of all older structures.	The structure of the Lavagna Nappe in the region of Monte Ramaceto and Val Graveglia (Ligurian Apennines, Italy)
VOLUME 64 NO 4 385	1985	64	4	385	388	Oen, I.S.; Verschure, R.H.	Rb-Sr whole-rock analysis of seven samples of the Fellingsbro-type Younger Granite east of Kopparberg gives an age of 1715 ± 50 Ma and an initial $^{87}\text{Sr}/^{86}\text{Sr}$ ratio of 0.7046 ± 0.0026 (errors 95% confidence level). This age falls in the age range determined for the Younger Granites of the Värmland-Småland, Dala and Fellingsbro Groups, 1.74-1.64 Ga. Reliable age data from from the Malingsbo-type granites in the Kopparberg area are still lacking, however, so it is uncertain whether they can be included in the Fellingsbro Group of Younger Granites	Isotopic age determinations in Bergslagen, Sweden: VII. The Fellingsbro-type Granite east of Kopparberg
VOLUME 64 NO 4 389	1985	64	4	389	395	Aber, J.S.	Glaciotectonic features are those structures and landforms produced by deformation and dislocation of pre-existing soft bedrock and drift masses as a direct consequence of glacier-ice movement. Some glaciotectonic structures form essentially in-situ; however, most glaciotectonic features involve detachment of a large rock or sediment mass, called a raft, floe, or megablock, and its transportation and deposition by the ice. The main factors in determining whether glaciotectonic structures could develop are: (1) competence of the bedrock relative to glacier ice, (2) distance of megablock transportation, and (3) mode of deposition. Development of glaciotectonic features depends to a large degree on lithology of the affected rocks or sediments. Glaciotectonism does not represent a special or unique process operating within the ice; the same dynamic conditions which cause normal glacial erosion and deposition also create glaciotectonic features in appropriate kinds of bedrock.	The character of glaciotectonism

VOLUME 64 NO 4 397	1985	64	4	397	411	Weijermars, R.; Roep, T.B.; Eeckhout, B. van den; Postma, G.; Kleverlaan, K.	Structural, stratigraphical and sedimentological studies of the Alhamilla region show that the Sierra Alhamilla was elevated relative to the surrounding basins by open folding towards the end of the Tortonian period (about 7 Ma ago) and before the onset of Messinian sedimentation. The main arguments are: (1) the dominant current direction in the Neogene cover changes from southward to southeast- and southwestward during the Late Tortonian, (2) Late Tortonian seismites suggest contemporaneous major tectonic activity which is contrasted by low tectonic activity during the Messinian, (3) Messinian reefs colonise Nevado-Filabride basement exposed (near Polopos) in the eroded hinge of the Alhamilla Anticlinorium, (4) the Northern Boundary Fault which is interpreted to be cogenetic with the formation of the Alhamilla Anticlinorium transects Tortonian sediments but is covered (near Cantona) by unfaulted Messinian reefs, and (5) the base of an almost non-tectonised Messinian succession (in the Sorbas Basin) unconformably overlies an erosion surface of folded Tortonian sediments, Neogene uplift of the Alhamilla region is interpreted here to be due to isostatic recovery after the emplacement of the Alboran Diapir between 20 and 25 Ma ago. Estimates of the average uplift rates vary between 0.7 to 0.5 mm a ⁻¹ for the Miocene and 0.15 to 0.1 mm a ⁻¹ for the Pliocene and Quaternary. Pliocene and Quaternary uplift rates are almost identical to the sedimentation rates of 0.23 to 0.2 mm a ⁻¹ estimated previously for the Alboran Basin.	Uplift history of a Betic fold nappe inferred from Neogene-Quaternary sedimentation and tectonics (in the Sierra Alhamilla and Almería, Sorbas and Tabernas Basins of the Betic Cordilleras, SE Spain)
VOLUME 64 NO 4 413	1985	64	4	413	422	Barrera, J.L.; Bellido, F.; Klein, E.	The thermal effects produced by relatively late granitoids on older synkinematic two-mica granites were studied. Both groups of granitoids are of late-Hercygan age and form part of the large Galician granite area in the N.W. of the Hesperian Massif. The thermometamorphic effects observed in the synkinematic two-mica granites consist of a complete recrystallization with progressive breakdown of biotite and muscovite and formation of andalusite, sillimanite, corundum, spinel, cordierite, quartz, plagioclase, K-feldspar and opaque minerals. Breakdown reactions of biotite and muscovite in the presence of quartz and under oxidizing conditions are proposed to explain the appearance of some of the newly formed minerals.	Contact metamorphism in synkinematic two-mica granites produced by younger granitic intrusions, Galicia, N.W. Spain
VOLUME 64 NO 4 423	1985	64	4	423	431			Book reviews
VOLUME 64 NO 4 433	1985	64	4	433	434			Ter nagedachtenis aan Prof. Ir. Th.R. Seldenrath

VOLUME 65 NO 1 3	1986	65	1	3	12	Vandenberghe, J.; Krook, L.; Valk, L. van der	Two series of Early Pleistocene fluvial deposits near Galder (southern Netherlands) are overlain by a series consisting of Weichselian aeolian and locally reworked aeolian deposits. Each of the three series is characterized by its own specific mineral association. Special attention is drawn to the origin of the upper fluvial unit which belongs to the 'Alphen Sands'. Mineralogical and petrographical analyses indicate a mainly southern ('pre-Scheldt') provenance of the sand fraction and a mixed southern and southeastern (Meuse) origin of the gravels. The Meuse transported gravel from the Ardennes and from the Cretaceous plateau between Liège and Maastricht.	On the provenance of the Early-Pleistocene fluvial system in the southern Netherlands
VOLUME 65 NO 1 13	1986	65	1	13	22	Calsteren, P.W.C. van	Two meteorite falls in Indonesia were described and classified. Kangean has Fe/Si= .73, olivine Fo= 17.5 with 1.7 Percent Mean Deviation, paucity of clinopyroxene, plagioclase, and glass and with weakly undulose olivine, and is classified as H5b. Mineralogically Kediri is unshocked and shows virtually no signs of metamorphic reequilibration although the mineral chemical evidence is ambiguous. Classification of Kediri as L3a is proposed. Kediri contains grains that may have survived chondrule formation without melting, and shows evidence for hot accretion.	The Kangean and Kediri, Indonesia meteorites
VOLUME 65 NO 1 23	1986	65	1	23	34	Baumfalk, Y.A.; Willemsen, F.	Morphometric analysis of the larger foraminifer <i>Orbitoides apiculata</i> Schlumberger from the type Maastrichtian shows that the general evolutionary trend within the genus continued in Maastrichtian times, but that the local evolutionary pattern is not gradual and unidirectional. Specimens from the lower part of the type section on the average have smaller embryos and fewer epi-auxiliary chambers than those from the upper part of the section. Besides, a new phenomenon can be observed: in the latest Maastrichtian the species had developed an asymmetric test, with one thin, superficial lateral layer of the ordinary <i>Orbitoides</i> type but with the other layer much thicker and lacking the usual subdivision into lateral chamberlets. The pattern, however, is not a strictly evolutionary one, but seems to be related to the prevailing environmental conditions. The more advanced populations are only found in debris layers overlying hardgrounds. In the intervals between the hardgrounds, <i>O. apiculata</i> is much less abundant and, moreover, has the same morphology as the older, more primitive populations. A comparison with <i>O. apiculata</i> from deposits in southern France, sometimes considered to be slightly younger than the type Maastrichtian, suggests that the development within the Maastrichtian stratotype may be the result of geographic separation.	Ecophenotypic variation of the larger foraminifer <i>Orbitoides apiculata</i> from the Maastrichtian stratotype

VOLUME 65 NO 1 35	1986	65	1	35	40	Priem, H.N.A.; Beets, D.J.; Verdurmen, E.A.T.	A U-Pb analysis of seven zircon fractions from a granulitic pebble in the Late Paleocene and/or Eocene fluviatile Soebi Blanco conglomerate on Bonaire, Netherlands Antilles (southern Caribbean borderland) indicates that the rock has been derived from a Precambrian basement with an age of approximately 1150 Ma. Such basement rocks do not occur on Bonaire. The nature of the conglomerate testifies to derivation from a nearby topographic high. It is suggested that the source area was located in the Guajira area, implying an eastward migration of Bonaire of some 300 km relative to the South American mainland since the beginning of the Tertiary.	Precambrian rocks in an Early Tertiary conglomerate on Bonaire, Netherlands Antilles (southern Caribbean borderland): evidence for a 300 km eastward displacement relative to the South American mainland?
VOLUME 65 NO 1 41	1986	65	1	41	46	Kasse, C.	In northern Belgium a fining upward sequence in the Campine clays and sands (Formation of Tegelen) has been studied. Thinly interlayered sediments of fine sand and clay are overlaid by two claylayers with an intercalated peat-layer. In the sand-clay alternations small scale current ripples with opposed high-angle cross lamination indicate tidal movements. Ebb and flood ripples, covered with mud, point to subtidal deposition. The absence of bioturbation and the presence of fresh water peat indicate a fresh or brackish subtidal (lagoonal) depositional environment.	The tidal character of the Formation of Tegelen in northern Belgium
VOLUME 65 NO 1 47	1986	65	1	47	56	Passchier, C.W.	In medium to high grade metasediments of the Proterozoic Mt. Isa Inlier, Australia, at least three regional phases of deformation can be recognized. Early events of low angle brittle faulting at low grade conditions (D_{1a}), probably followed by localized transcurrent flow along a N-S ductile shearzone (D_{1b}) were overprinted by a phase of intense E-W shortening and vertical extension (D_2). During this phase, strain was accommodated without significant flow localization, i.e. without development of major shearzones. Important granite and gabbro intrusion occurred before and early during D_2 . Crustal shortening values of up to 80% have been realized during D_2 leading to large-scale folding and the development of spectacular strain shadows around the major plutons. D_3 is characterised by strike-slip faults and minor accommodation structures.	Proterozoic deformation in the Duchess belt, Australia: A contribution to the BMR Mount Isa Regional Tectonic History Program

VOLUME 65 NO 1 57	1986	65	1	57	74	Leine, L.	A description is given of the Tarfaya oil shale deposit which is located in the Moroccan Sahara along the Atlantic coast, at the latitude of the Canary Islands. The deposit consists of kerogenous chalks of Upper Cretaceous age, which are colloquially called 'oil shales' following general usage. The paper discusses the tectonic setting, stratigraphy and depositional environment of the kerogenous chalks and provides details on their petrography, chemical composition and mineralogy. Some mining criteria are also given such as oil yield, thickness and geological reserves of the oil shales, as well as characteristics of the overburden. Preliminary remarks are made regarding the hydrology of the mining area.	Geology of the Tarfaya oil shale deposit, Morocco
VOLUME 65 NO 1 75	1986	65	1	75	78	Boyce, A.J.		Central Irish sulphur isotope data in the light of the rift geological-metallogenic model
VOLUME 65 NO 1 79	1986	65	1	79	86	Linden, W.J.M. van der; Andréasson, P.G.; Boekschoten, G.J.; Harten, D. van; Rondeel, H.E.; Reijers, T.J.A.		Book reviews
VOLUME 65 NO 2 89	1986	65	2	89	90	Zwart, H.J.; Wortel, M.J.R.		Preface - Dutch contribution to the International Lithosphere Program
VOLUME 65 NO 2 91	1986	65	2	91	101	Vlaar, N.J.	Archaean global tectonics and continental growth is founded on the existence of a differentiated upper mantle of average Iherzolite composition. A thick segregated basalt layer constitutes the upper part of the upper mantle. The geodynamic state is determined by a high deeper mantle temperature and a mobile cool shallow basalt layer and this can explain the growth of the Archaean craton and its geothermal state. Of particular importance for continental tectonics are isostatic conditions which differ from the present in allowing for large relative and absolute vertical displacements.	Archaean global dynamics

VOLUME 65 NO 2 103	1986	65	2	103	117	Cloetingh, S.	Thermo-mechanical modelling demonstrates that tectonically induced vertical motions of the lithosphere can explain the major part of the short-term fluctuations in apparent sea level deduced from the seismostratigraphic record at passive margins. The interaction of intraplate stresses and the deflection of the lithosphere caused by sedimentary loading can produce apparent sea level changes of up to 100 metres at the flanks of passive margins. This mechanism is most effective for young passive margins subject to rapid sediment loading. Stress variations in the lithosphere of a few hundred bar are sufficient to explain most of the lowerings in sea level shown in the Vail et al. (1977) curves. To induce apparent sea level fluctuations with magnitudes greater than 50 metres, changes in stress level of more than 1 kbar are required, which must be related to major reorganizations at convergent plate boundaries, fragmentation of plates, or collision processes. By its nature, the tectonic model can explain contemporaneous fluctuations in apparent sea level in neighbouring depositional environments. In principle, it implies the possibility of regional correlations in different basin settings. Specific short-term fluctuations in the Vail et al. curves can be associated quantitatively with particular plate-tectonic reorganizations of lithospheric stress fields. The seismostratigraphic record may provide a new source of information on paleo-stress fields to be correlated with results of independent numerical modelling of intraplate stresses.	Tectonics of passive margins: implications for the stratigraphic record
VOLUME 65 NO 2 119	1986	65	2	119	132	Wortel, M.J.R.	Many tectonic processes along active continental margins (and convergent plate boundaries, in general) are closely related to the dynamics of the subduction process. A major force associated with the subduction of oceanic lithosphere is the slab pull, the result of the density contrast between the cold and dense descending slab and the surrounding warmer mantle. This force is generally assumed to be compensated by resistive forces acting on the slab. In this paper I emphasize that such a compensation may be valid for a plate's convergent boundary as a whole but certainly not always for each segment of the trench system. Stress may be transmitted from the subducted slab to the attached lithospheric plate at the surface, and taking this into account provides insight into the relationship between upper mantle processes and tectonic processes near the surface (e.g. fragmentation of plates, accretion of sediments at trenches, and vertical tectonics of active continental margins).	Dynamical aspects of active continental margins

VOLUME 65 NO 2 133	1986	65	2	133	143	Beukel, J. van den; Wortel, R.	The temperature structure of the shallow part of a subduction zone. i.e. the region between the trench and the volcanic arc, has been calculated with finite difference methods. Published heat flow measurements are used as a constraint for the thermal models. Heat flow in the arc-trench region is low ($<40\text{mW m}^{-2}$) for subduction zones which have been active for more than about 60 Ma. In the central part of the arc-trench region of these subduction zones average heat flow values range from 30 to 36 mW m^{-2} . From the thermal modelling it follows that such a heat flow level requires shear stresses of 20-60 MPa near the upper surface of the descending slab at depths between 25 and 75 km. In addition, it is shown that the pressure-temperature relations, inferred from mineral assemblages in high-pressure metamorphic belts, can only be reached if significant heat production by friction takes place, with shear stresses similar to those inferred from heat flow data. Subduction related volcanism is caused by high temperatures in the asthenospheric wedge above the slab. It is likely that the volcanic line marks the boundary of the asthenospheric wedge.	Thermal modelling of arc-trench regions
VOLUME 65 NO 2 145	1986	65	2	145	153	Spakman, W.	In this paper we present new results concerning the existence and subduction of Meso-Tethyan oceanic lithosphere in the upper mantle beneath Europe, the Mediterranean and the Middle-East. The results arise from a large scale body wave tomographic analysis of the upper mantle in this region. It is shown that much more subduction has taken place beneath the Aegean and Tyrrhenean region than was previously estimated. The Eastern Mediterranean basins are linked to the old Meso-Tethyan passive margin and may in some parts be underlain by oceanic lithosphere. We demonstrate the existence of an old northward dipping subducted slab beneath Spain and the Western Mediterranean. A large zone of subducted oceanic lithosphere is found beneath the entire Alpine orogenic belt from Spain to Iran at depths between 250-600 km. This zone represents major parts of the Meso-Tethys.	Subduction beneath Eurasia in connection with the Mesozoic Tethys

VOLUME 65 NO 2 155	1986	65	2	155	165	Nolet, G.; Dost, B.; Paulssen, H.	Using teleseismic recordings of 5 strong Japanese earthquakes in 1983/84, Dost (in press) has recently determined average higher mode phase velocities with the broad-band digital NARS array. These are the first such results ever to be obtained for a single geophysical province, in this case the west European platform. Moreover, the frequency range has been doubled with respect to earlier higher mode phase velocity determinations. It is to be expected that we will refine and extend our measurements in the coming years. No strong earthquake at intermediate depth has so far occurred since the installation of the NARS network, which leaves important gaps in velocity measurements at several frequencies. Nevertheless we have made a preliminary interpretation of the data now available, giving us guidelines for future observational efforts. Inversion of the phase velocities for an average velocity/density structure for the west European platform results in an upper mantle with a low velocity channel between 120 and 250 km that is not very pronounced (average V_s is 4.35 km/s) and with remarkable layer of high velocity and density at roughly 100km depth. Comparison with older higher mode data enables us to determine the difference in shear velocity between the Scandinavian shield and the west European platform: shield V_s is 4.49 km/s averaged over 120-250km. The velocity difference between shield and platform can be explained by a temperature difference of at least 250 degrees, or effects of partial melting under the platform. We have extrapolated laboratory values of shear velocity and density of single crystal specimens of 4 different rock types (olivine, orthopyroxene, clinopyroxene and garnet) to ambient upper mantle pressure and temperature. Despite	The upper mantle under Europe: an interpretation of some preliminary results from the NARS project
VOLUME 65 NO 2 167	1986	65	2	167	176	Passchier, C.W.	Shear zones in the continental crust can accommodate much of the regionally imposed shortening or extension. An analysis of the flow patterns and flow history in active shear zones and of their geometry and orientation contributes to the understanding of large-scale crustal deformation. Information on the flow behaviour in 'fossil' ductile shear zones can be obtained from deformation fabrics in exposed mylonitic fault rocks. Unfortunately, the geometry and orientation of such exposed zones have often been modified by uplift and overprinting, masking the original aspect. However, in situ information on the shape and orientation of active ductile shear zones can be obtained from deep reflection seismograms. Provided the zones have a gentle dip, the unique homogeneous nature of mylonitic fabrics in them can generate high amplitude seismic reflections of large lateral continuity.	Mylonites in the continental crust and their role as seismic reflectors

VOLUME 65 NO 2 177	1986	65	2	177	187	Bresser, J.H.P de; Majoor, F.J.M.; Ploegsma, M.	<p>We distinguish four deformation phases of major importance in the Cambro-Ordovician metasediments of the western Lys-Caillaus massif. During D1 a steep, regionally dominant, foliation developed. This foliation was folded during D2 into a large overturned isoclinal antiform. The third deformation phase D3 resulted in complex rotations of porphyroblasts, crenulation of the S1 foliation and development of a gently dipping crenulation cleavage S3. At a deep structural level, S1 was completely transposed into the plane of S3, which forms a dome-type D3 structure. D1, D2 and D3 are of Variscan age. D4 included Alpine thrusting along the Gavarnie thrust and accompanying folding and faulting. The Alpine folding led to a considerable amount of ductile shortening in the footwall rocks of the thrust. The Cambro-Ordovician rocks show a Variscan plurifacial metamorphism during D3. Peak values were 600-660°C and 2.5-3.5kbar. Two metamorphic domes of slightly different age with respect to D3 are distinguished. One of these metamorphic domes coincides with the D3 structural dome. The Alpine D4 occurred under low grade metamorphic conditions. In comparison with current notions on the Lys-Caillaus massif the data presented a) reveal a more complex deformation history; b) fit the development of some controversial large scale structures within the deformation history; c) give a more complete picture of the metamorphic evolution of the rocks and d) show that Alpine folding was more widespread than previously thought.</p>	New insights in the structural and metamorphic history of the western Lys-Caillaus massif (Central Pyrenees, France)
VOLUME 65 NO 3 189	1986	65	3	189	195	Elueze, A.A.	<p>The Ilesha amphibolite belt is composed of metasedimentary rocks and a mafic complex comprising mostly amphibolites and amphibole schists, with intercalations of talc bodies. These assemblages occur within a polycyclic basement of largely ancient gneisses and migmatites, and underlie alluvial gold deposits. In addition, the district is characterized by minor and major structural features including folds, fractures and lineaments which commonly have a northerly strike. Auriferous quartz veins are known to be emplaced along structural elements in the amphibolite complex. It is believed that the alluvial gold deposits were derived from weathered auriferous veins and veinlets. Sulfur contents of the amphibolites and amphibole schists are relatively high, supporting the occurrence of sulfides, possibly in relation to primary gold. The mafic units are magmatic and are therefore considered the ultimate source of the vein-type gold deposits. On the basis of overall geological and geochemical characteristics, it is suggested that the mineralization was linked to metamorphic-hydrothermal processes.</p>	Petrology and gold mineralization of the amphibolite belt, Ilesha area, Southwestern Nigeria*

VOLUME 65 NO 3 197	1986	65	3	197	204	Koopmans, B.N.	A synoptic view of radar images enables deduction of the regional structural setting which is often not possible from aerial photographs and/or fieldwork only. An interpretation is made of part of a Shuttle Imaging Radar strip of the eastern Vogelkop Peninsula (Jazirah Doberai). The principal structural units that can be distinguished are 1. the Paleozoic igneous metamorphic complex, including the Kemoem Formation, 2. the principal Mesozoic/Tertiary central Vogelkop monocline, 3. the northern extension of the Cretaceous/Tertiary Lengguru fold belt, and 4. the Tertiary Bintuni Basin area. The abutment of the E-W running central Vogelkop monocline against the NNW-SSE running Lengguru fold belt appears to be fault-controlled. Also the Bintuni Basin seems to be controlled by faults that parallel the monoclinical structure on the northern and southern sides of the radar image, and by faults parallel to the Lengguru fold belt on the eastern side. The anomalous fold direction of the Imskin anticline is a surface expression of block movements along these faults.	Satellite radar interpretation of the Bintuni Basin area, Eastern Vogelkop Peninsula, West Irian, Indonesia
VOLUME 65 NO 3 205	1986	65	3	205	213	Gaans, P.F.M. van; Vriend, S.P.; Schuiling, R.D.	Integral Rock Analysis is a new approach to the acquisition and interpretation of (exploration) geochemical data. An integrated procedure for the rapid and cost-efficient sampling, sample preparation, analysis and statistical treatment of geochemical data is presented. Applicability of the method is discussed on the basis of some examples. The task of sample preparation is significantly shortened by omitting grinding and homogenization. Flat sections of solid rock-samples, sawn of (small) drill cores, are directly analysed by X-Ray Fluorescence spectrometry (XRF). Analytical results are generally in acceptable agreement with those of conventional methods. Conclusions based on the analysis are not adversely influenced by lower analytical accuracy and precision. Moreover, important additional information with respect to small scale features (mineralogy, texture, alteration processes) is obtained as well. Because the method is non-destructive, the same sections can be investigated by microscope, electron microprobe or X-Ray diffraction. This facilitates the correlation of chemical and mineralogical data and the study of small scale features.	Integral Rock Analysis: a new approach in lithogeochemical exploration with use of X-Ray Fluorescence spectrometry
VOLUME 65 NO 3 215	1986	65	3	215	221	Jagt, J.W.M.	On the basis of fairly well preserved specimens of a holopodid crinoid of the genus <i>Cyathidium</i> , a new species of this genus is described: <i>Cyathidium vlieksi</i> sp. nov. As yet, fossils of this crinoid were found only in the Upper Maastrichtian of the province of Limburg. They occur in the Kunrade facies of the Maastricht Formation as well as in the type-area of the Maastrichtian stage (Maastricht, The Netherlands).	<i>Cyathidium vlieksi</i> , a new holopodid crinoid from the Upper Maastrichtian (Late Cretaceous) of southern Limburg, The Netherlands

VOLUME 65 NO 3 223	1986	65	3	223	241	Wong, T.E.	The stratigraphy and the geological history of the Suriname coastal plain are reviewed, using recently updated and new information. The geological history covers an interval ranging from Late Cretaceous to Holocene. The various transgressive and regressive cycles during this time have been correlated with the global eustatic sea level movements.	Outline of the stratigraphy and the geological history of the Suriname coastal plain
VOLUME 65 NO 3 243	1986	65	3	243	246	Schuilting, R.D.; Herk, J. van; Pietersen, H.S.	Industrial waste acids such as sulphuric and hydrochloric acid are produced in large quantities. This note deals mainly with waste sulphuric acid, although similar results have been obtained with hydrochloric acid. A method is described by which these acids can be neutralised using crushed olivine rock. This process produces silica. The heavy metals present can be precipitated from the resulting solution. The remaining clean magnesium-sulphate solution can be dumped at sea without adverse environmental consequences. The process has been patented (Dutch patent PCT NL 85/00026), and is being further developed in cooperation with Dutch industries. Silica, one of the major products of the process has been tested as an additive to concrete. An addition of between 5 and 10% silica greatly decreases the permeability of concrete, thereby increasing the resistance of concrete constructions under chemically aggressive conditions.	A potential process for the neutralisation of industrial waste acids by reaction with olivine
VOLUME 65 NO 3 247	1986	65	3	247	256	Priem, H.N.A.; Beets, D.J.; Boelrijk, N.A.I.M.; Hebeda, E.H.	Rb-Sr data of tonalitic whole-rocks and biotites and K-Ar data of hornblendes, biotites and mafic wholerocks are reported from the crystalline core of Aruba, a remnant of a Late Cretaceous oceanic island arc that collided in the Santonian (between approximately 88 Ma and 83-84 Ma ago) with the passive margin of northern South America. The age data are interpreted to indicate that the intrusion of the composite (tonalite/gabbro) batholith took place 88.5 ± 0.8 Ma ago, in the Coniacian or around the Turonian/Coniacian boundary. This confirms that the intrusion has occurred prior to the collision. The tonalites of the batholith have an initial $^{87}\text{Sr}/^{86}\text{Sr}$ ratio of 0.70351 ± 0.00014 . Thermal events about 72 Ma and possibly about 62 Ma ago have led to some isotopic resetting.	On the age of the Late Cretaceous tonalitic/gabbroic batholith on Aruba, Netherlands Antilles (southern Caribbean borderland)

VOLUME 65 NO 3 257	1986	65	3	257	268	Lambers, P.; Boekschoten, G.J.	This study on recent and fossil acrothoracic cirripeds describes burrows of the recent species <i>Trypetesa lampas</i> in the same way as fossil burrows. Subsequently, fossil and recent burrows are compared. Recent burrows of <i>T. lampas</i> were found in whelk shells (<i>Buccinum undatum</i>) inhabited by pagurids; fossil burrows resembling <i>Brachyzapfes elliptica</i> in belemnites (<i>Oxyteuthis</i> sp.) from the Barremian of Alstätte, West- Germany. The burrows of <i>T. lampas</i> are smaller but relatively deeper and wider than the Alstätte material. This is probably due to the reduction of the abdomen and appendages in <i>T. lampas</i> . The brood pouch and ovaria of <i>T. lampas</i> are probably larger than those of the fossil borer. In the present material, burrows of <i>T. lampas</i> were mainly produced by young barnacles. This may be explained by a frequent change of shells by hermit crabs which causes an early death of the acrothoracics.	On fossil and recent borings produced by acrothoracic cirripeds
VOLUME 65 NO 3 269	1986	65	3	269	271	Boogaard, M. van den; Helmers, H.; Loon, A.J. van; Boekschoten, G.J.		Book reviews
VOLUME 65 NO 4 273	1986	65	4	273	286	Elzenga, W.; Schwan, J.; Baumfalk, Y.A.; Vandenberghe, J.; Krook, L.	Surface features of quartz grains from periglacial aeolian and fluvial deposits from two areas in The Netherlands and adjacent Germany have been studied with a Scanning Electron Microscope. The relative abundance of the 29 distinguished characteristics is statistically analysed in an attempt to correlate the surface features with the regionally and genetically determined sediment types. Frequencies of individual grain surface characteristics vary widely and are usually insufficient to separate the sediment types. This is partly due to the variable degree of surface pattern overprint caused by the polygenetic nature of the sediments concerned. However, linear combination of the sample variables (using principal component analysis) allows the discrimination of several distinct clusters, that show a fair correspondence with the macroscopically defined depositional groups. The regional and stratigraphical patterns observed, seem to be dominated by two factors: one which is related to the transport energy and the mode of deposition involved and perhaps connected with the prevailing wind regime; the other with chemical alterations, probably reflecting the source area of the sediment. New perspectives are opened for the genetical interpretation of sediments by grain morphoscopic analysis when combined with multivariate statistics.	Grain surface characteristics of periglacial aeolian and fluvial sands

VOLUME 65 NO 4 287	1986	65	4	287	296	Dolors Pi Pujol, M.; Buurman, P.	Paleogene distal fan and playa deposits in the SE Ebro Basin contain authigenic palygorskite and smectite. The formation of these minerals is related to sedimentary environment rather than to soil formation, although the sediments contain abundant traces of paleosols. Palygorskite was precipitated from solution, or formed from inherited mica minerals. Sedimentary conditions and soils suggest that palygorskite was formed in rather well-drained conditions while smectite is mainly found in lacustrine environments. There is no clear relation of palygorskite occurrence with caliche formation.	Authigenic palygorskite and smectite in early paleogene paleosols of the SE Ebro basin (Catalonia, NE Spain)*
VOLUME 65 NO 4 297	1986	65	4	297	308	Daams, R.; Freudenthal, M.; Alvarez Sierra, M.	The name Ramblian is proposed for a new stage of continental deposits, covering a part of the Early Miocene, The Ramblian is stratigraphically higher than those beds that contain ancient Eomyidae (Rodentia, Mammalia) such as Rhodanomys and Ritteneria, and it is lower than the Aragonian. The Ramblian is subdivided into two zones on the basis of the fossil mammal content. The Aragonian is redefined.	Ramblian; A new stage for continental deposits of early miocene age
VOLUME 65 NO 4 309	1986	65	4	309	315	Berg, L. van den	The Argille Scagliose (scaly clays) in the Apennines of Italy are intensely deformed clays that contain a characteristic shear fabric, defined by anastomosing slip planes. Experimental redeformation showed mechanical ductile behaviour along such slip planes. Direct shear tests at stresses up to 0.5 MPa resulted in common values of shear strength with a cohesion of 18 kPa and an internal friction coefficient of 0.31. However, triaxial tests at higher stresses up to 11.6 MPa resulted in a much lower internal friction coefficient of 0.026. This indicates a transition from cataclastic deformation at low stresses to a deformation at high stresses that is hardly dependent on confining pressure. This transition is correlated with yielding of weak bondings of interlayer water molecules in expanding clay minerals. It follows that nappes with Argille Scagliose at the base could spread if the surface slope was only a few degrees and without abnormally high fluid pressure as is frequently supposed.	Experimental redeformation of naturally deformed scaly clays

VOLUME 65 NO 4 317	1986	65	4	317	325	Leeuwen, P. van	The Urucum-Mutun jaspilitic banded oxide facies iron-formation (BIF) which straddles the Brazilian-Bolivian border was discovered in 1894 and has a checkered history of exploration and development. The BIF contains segregations within the iron-formation of important beds and lenses of high grade manganese oxides. The BIF is predominantly of chemical sedimentary origin and suffered relatively little alteration after deposition. This condition profoundly affects the metallurgical behaviour of the iron ores compared to normal metamorphic BIFs. The manganese oxide beds and lenses do have a high alkali content throughout the entire region, particularly potassium which is troublesome and can be detrimental to furnace operation producing ferromanganese. Besides, a major economic problem has been the transportation of the ores to industrial centres. However, the very size of the iron and manganese deposits in this region is a strong argument for stimulating studies and research into the development of these important resources. This requires an integrated study of economic-geology, metallurgical processing and transport involving all the Paraguay-Paraná River Basin nations.	The Urucum-Mutun iron and manganese deposits, Mato Grosso do Sul, Brazil and Sta. Cruz, Bolivia - Part I. The region's potential as an economic source of iron and manganese
VOLUME 65 NO 4 327	1986	65	4	327	343	Leeuwen, P. van; Graf, J.L.	A description is given of the Urucum-Mutun iron and manganese deposits which lie astride the Brazilian-Bolivian border, directly south of Corumbá in Mato Grosso do Sul. The iron ore deposits are remnants of an unmetamorphosed banded oxide facies iron-formation (BIF), containing extensive segregated manganese oxide beds and lenses, of Late Precambrian or even Eocambrian age and, therefore, much younger than the more common BIFs. The paper discusses the stratigraphy, the age of the sedimentary rocks, the lithology of the ore deposits and the origin of the BIF. The BIF with segregations of manganese oxides is predominantly of chemical sedimentary origin. The required low Eh conditions for the accumulation of large quantities of iron, manganese and silica were provided by a glacial sheet cover on whose periphery the Urucum-Mutun region was located. The manganese oxide beds were formed by the introduction of high concentrations of K^+ into a colloidal suspension rich in iron and manganese under the prevailing Eh-pH environment. Deposition of the BIF took place in continental or possibly epicontinental basins under relatively arid conditions.	The Urucum-Mutun iron and manganese deposits, Mato Grosso do Sul, Brazil and Sta. Cruz, Bolivia - Part II. Stratigraphy, lithology and origin

VOLUME 65 NO 4 345	1986	65	4	345	355	Elueze, A.A.	<p>The granitic rocks of the Ilesha area include granites and pegmatites which are intrusive into metasediments. In terms of field and petrographic features, the units are quite distinct. The Itamerin medium-grained granite and the adjacent pegmatite in the western part of the area contain muscovite and biotite, whereas the southeastern Ipetu porphyritic granite bears biotite plus hornblende. Chemical data show that the Ipetu body unlike the Itamerin rock, commonly displays regular interelement variations. It has lower values of SiO₂, K₂O, Rb and Rb/Sr ratio, but is significantly higher in TiO₂, total Fe, MgO, CaO, Ba, Sr and its Ba/Rb ratio. The pegmatite, though slightly more acid, is generally comparable in major and trace element data, with the Itamerin granite. It is surmised that the compositional differences between the Ipetu and the Itamerin granites, are partly or wholly due to disparities in the nature of parent magmas, crystallization and extent of post-magmatic alterations. The porphyritic type possibly consolidated from a relatively less fractionated magma, while the muscovite-bearing one probably evolved from a water-rich melt. The pegmatite is considered to be genetically related to the latter, a conclusion based on intimacy in field occurrence and petrochemical character.</p>	Compositional characteristics in relation to the evolution of granitic rock units in the Ilesha area, SW Nigeria
VOLUME 65 NO 4 357	1986	65	4	357	379	Speksnijder, A.	<p>The Cormorant Field is situated on the crest of one of the elongated N-S striking, westward-tilted fault blocks that characterise the western part of the northern Viking Graben, northern North Sea. Besides normal faults which separate these fault blocks, the Caledonian basement in the western part of the Graben has been affected by NE-SW and NW-SE oblique-slip faults; movement along these faults is synthetic to (and a result of) the opening of the Viking Graben during the Mesozoic. In the Cormorant area, N-S normal faulting and synthetic NE-SW and NW-SE oblique-slip faulting caused an overall eastward movement of the triangular Block IV with respect to the main Cormorant structure. These basement kinematics resulted in considerable 'growth' across normal listric faults in the sedimentary cover of Block IV, both at (Brent) reservoir level and in younger Jurassic deposits. Extension during the Early Cretaceous (post-'X'-unconformity) led to further movement along older - and the generation of new - listric faults. All listric faults flatten downwards and join in a common décollement level about a hundred metres above the Caledonian basement, inducing a complete or partial detachment of the sedimentary cover. Consequently, the sedimentary cover was affected by normal faulting only. Despite important differences in style, both the basement and cover structures formed as a result, of east-west horizontal extension. The production performance in Block IV suggests the presence of small reservoir blocks separated from each other by faults that act as barriers to cross-flow. Because faulting in the reservoir is of an extensional nature, the development of clay smears along the planes of normal faults is considered to be the only</p>	The structural configuration of Cormorant Block IV in context of the northern Viking Graben structural framework

VOLUME 65 NO 4 381	1986	65	4	381	384	Loon, A.J. van; Rondeel, H.E.; Verschure, R.H.; Aleva, G.J.J.		Book reviews
VOLUME 66 NO 1 3	1987	66	1	3	14	Andriessen, P.A.M.; Banga, G.; Hebeda, E.H.	Isotopic dating proves the existence of pre-Alpine basement rocks on the islands of Naxos, Sikinos and Ios in the Greek Cyclades. The U-Pb systematics of a suite of zircons from the migmatite dome on Naxos shows that the main generation of zircons of late Paleozoic age contains a minor amount of old radiogenic lead. Rb-Sr analysis of whole rock samples of a metadiorite on Sikinos substantiates the existence of a late Paleozoic or early Mesozoic basement. K-Ar analysis of white micas from the augengneiss on Ios revealed ages of about 125 Ma to about 23Ma, intermediate between the Hercynian and the Alpine orogenesis. On the basis of textural- and chemical characteristics it is suggested that some of these micas represent partially reset Hercynian micas, other Alpidic micas with excess radiogenic Ar, and a few reflect a complete rejuvenation during the Alpine orogenesis.	Isotopic age study of pre-Alpine rocks in the basal units on Naxos, Sikinos and Ios, Greek Cyclades
VOLUME 66 NO 1 15	1987	66	1	15	20	Enu, E.I.	Extensive black shale facies of Late Maastrichtian to Paleocene age are associated with the equally widely distributed tar sand sequence in the Nigerian sector of the Dahomey Basin. The shales are commonly finely laminated and are rich in organic carbon. They contain an abundance of pyrite and have yielded a rich faunal assemblage indicating shallow water conditions. The co-occurrence of abundant benthos, pyrite and enhanced organic carbon contents in the shales suggests an overall euxinic depositional palaeoenvironment that was episodically oxygenated.	The palaeoenvironment of deposition of Late Maastrichtian to Paleocene black shales in the eastern Dahomey Basin, Nigeria
VOLUME 66 NO 1 21	1987	66	1	21	34	Riezebos, P.A.; Rappol, M.	Vivianite particles have been found within the gravel and sand fractions of a specific level of a Saalian till layer. Besides with gravel constituents, which are common in Dutch till deposits, the vivianite granules are associated with sedimentary rock fragments containing a.o. glauconite and a kind of phosphoritic grains that are cemented by carbonates. The vivianite aggregates can be observed inside this carbonate matrix. Individual vivianite granules were studied in thin section and by SEM, X-ray diffraction, microprobe and differential thermal analyses. Only the monoclinic phase of $Fe_3(PO_4)_2 \cdot 8H_2O$ could be established with certainty. The vivianite of the granules contains lower Ca, Mn, Mg, Si and Al abundances than the vivianite of the aggregates included in the carbonate matrix. It is concluded that the vivianite granules are of nondetrital origin.	Gravel- to sand-sized vivianite components in a Saalian till layer near Borne (The Netherlands)

VOLUME 66 NO 1 35	1987	66	1	35	42	Wintle, A.G.	Nine TL dates were obtained from a section at Rocourt. The dates were self-consistent. A date of 24.8 ± 2.1 ka for a sample from the base of the Upper Weichselian loess indicated that it was part of the massive loess sheet deposited in Europe about 25 thousand years ago. The overlying decalcified loess gave dates indicating deposition after the glacial maximum. However, the proposed chronology is in disagreement with that based on radiocarbon dates on humic material from the 'horizon à langues' at two nearby sites.	Thermoluminescence dating of loess at Rocourt, Belgium
VOLUME 66 NO 1 43	1987	66	1	43	55	Wijk, A. van der; Mook, W.G.	Ten cores from seven shallow (average depth less than 2m) moorland pools in the Netherlands have been analysed for ^{210}Pb in an attempt to obtain reliable chronologies to be used in acidification studies. Although the sediment stratigraphy may be disturbed by many external influences, the shape of ^{210}Pb activity versus depth profiles appears to result in reliable chronologies in agreement with biological data. However, the time resolution is primarily determined by uncertainties about the validity of the basic assumptions in the dating model rather than by the accuracy of the measurements.	^{210}Pb Dating in shallow moorland pools
VOLUME 66 NO 1 57	1987	66	1	57	63	Jagt, J.W.M.; Michels, G.P.H.	Two fairly well preserved specimens of the brissid echinoid <i>Cyclaster platornatus</i> Kutscher, 1978 are described from the late Maastrichtian Vijlen Member (Gulpen Formation) as exposed in the SA Ciments Portland Liégeois (CPL) quarry at Haccourt, municipality of Oupeye, province of Liège, Belgium Kutscher (1978) introduced this taxon for a small population of brissid echinoids from the early Maastrichtian white chalk of Rügen (GDR). Despite slight morphological differences the Belgian specimens are considered to be conspecific with the Rügen type population. The occurrence in the late Maastrichtian of NE Belgium constitutes the first record of this species beyond the North European white chalk facies of Rügen. The Belgian specimens are herein compared and contrasted with morphologically similar (<i>Hemiaster aquisgranensis</i> Schlüter, 1899 and <i>Diplodetus</i> species) from the Vijlen Member. Some remarks on other late Cretaceous spatangoids are added.	<i>Cyclaster platornatus</i> Kutscher, 1978: an addition to the echinoid fauna from the late Maastrichtian of NE Belgium
VOLUME 66 NO 1 65	1987	66	1	65	66	Finlow-Bates, T.		The possible significance of uncommon barium-rich mineral assemblages in sediment-hosted lead-zinc deposits
VOLUME 66 NO 1 67	1987	66	1	67	74	Machel, H.G.		Cathodoluminescence activation and zonation in carbonate rocks: an experimental approach
VOLUME 66 NO 1 75	1987	66	1	75	84			Book reviews

VOLUME 66 NO 2 89	1987	66	2	89	99	Wensink, H.; Hartosukohardjo, S.; Kool, K.	A paleomagnetic study has been carried out on deep sea sediments of the Nakfunu Formation of Early Cretaceous age. The sediments have an allochthonous position in the south-central part of Western Timor, Eastern Indonesia. To determine the characteristic remanence samples were partially progressive demagnetized by applying alternating magnetic fields and by heating. The following results were obtained: $I = 34.7^\circ$, $\alpha = 5.7^\circ$, which implies a paleolatitude of 19.1° , derived from the mean of 11 sites; and $I = 37.8^\circ$, $\alpha = 8.3^\circ$ implying a paleolatitude of 21.2° , derived from a selection of the mean of 6 sites. Therefore, the original site of deposition of the Nakfunu sediments must have been 10° south of its present position on the island of Timor. The sediments have moved about 1200 km in a northerly direction since deposition in an oceanic environment, north of the former rim of the Australian continental margin. The remanence carriers in the sediments are both magnetite and hematite.	Paleomagnetism of the Nakfunu Formation of Early Cretaceous age, Western Timor, Indonesia
VOLUME 66 NO 2 101	1987	66	2	101	110	Alvarez, F.	The Cantal and Miñarros units, two of the tectonic units that belong to the Internal Zone of the Betic Cordillera, bear evidence of a ductile shear deformation which led to the development of mylonites. In the Cantal unit, the mylonitic deformation began during the last part of a second penetrative deformation phase; it is restricted to the unit and is unrelated to its present-day position over the Palomas unit on which it has been emplaced later, under much more brittle conditions. In contrast, the mylonitic deformation observed in the Miñarros unit extends for a few metres into its relative autochthon (Lomo de Bas unit) where it affects third phase folds; these observations allow us to establish a direct relationship between the shear deformation and emplacement of the Miñarros unit over the Lomo de Bas unit. The distribution of the stretching lineations in the shear zones considered and the study of the preferred crystallographic c-axis orientation of quartz in the associated mylonites show that the direction of movement within the Cantal unit was from WSW to ENE, and that the Miñarros unit was emplaced from S to N.	Subhorizontal shear zones and their relation to nappe movements in the Cantal and Miñarros units. Eastern Betic Zone (Spain)

VOLUME 66 NO 2 111	1987	66	2	111	120	Verschure, R.H.; Oen, I.S.; Andriessen, P.A.M.	Biotite Rb-Sr data from 1.70-1.65 Ga old rocks of the Gothian Trans-Scandinavian Småland-Värmland Granitic Belt and from 1.90-1.84 Ga old rocks of the adjoining Sveconorwegian Bergslagen Region indicate complete Sveconorwegian resetting 0.90 Ga ago, but a K-Ar analysis of the same biotites and of coexisting hornblendes yields significantly older ages. Some biotites and hornblendes have exceptionally high apparent ages, much older than those of the host rocks, pointing to the presence of excess radiogenic argon. The other K-Ar mineral ages are intermediate between the age of the host rocks and the 0.90 Ga old Sveconorwegian resetting. The hornblendes and biotites with intermediate ages show a weak positive correlation between radiogenic argon content and whole-rock potassium content. It is concluded that there was only limited mobility of radiogenic argon during the Sveconorwegian event. Apparently, the physicochemical conditions during Sveconorwegian recrystallisation were suitable for complete resetting of the Rb-Sr biotite systems, whereas the behaviour of radiogenic argon in the biotites and hornblendes was complex, leading to anomalous K-Ar dates.	Isotopic age-determinations in Bergslagen, Sweden: VIII. Sveconorwegian Rb-Sr resetting and anomalous radiogenic argon in the Gothian Trans-Scandinavian Småland-Värmland Granitic Belt and bordering parts of the Sveconorwegian Bergslagen Region
VOLUME 66 NO 2 121	1987	66	2	121	138	Abdel Wahab, S.; Mahfouz Ahmed, S.	The Abu Dabbab Formation is part of a Middle Miocene sedimentary sequence along the Red Sea Coast that is composed of evaporites with some clastic and carbonate intercalations. These rocks extend for hundreds of kilometres in variable thicknesses and are capped by a fractured and brecciated limestone with surficial calcareous crusts of caliche type. Detailed field and petrographical studies helped in establishing ten lithofacies types within the Abu Dabbab Formation, mainly evaporites with some dolostones along the upper part of the sequence. These lithofacies types represent different subenvironments probably indicative of a coastal tidal flat that was intermittently flooded by the sea, thus creating shallow brine-filled depressions or ponds. There is evidence of alterations in the evaporites brought about by diagenetic processes that were associated with changing environmental conditions. The diagenetic sequence could be subdivided into three stages: (1) a pre-burial early stage, (2) a burial stage and (3) an uplift late stage.	Evaporite facies and depositional environment of the Abu Dabbab Formation, Red Sea coast, Egypt

VOLUME 66 NO 2 139	1987	66	2	139	145	Lootens, M.	The lithostratigraphic units in the Upper-Pleistocene Lys valley may be subdivided into two distinct populations, each with its own characteristic heavy mineral assemblage. The Eemian and Early Weichselian sediments, which belong to the Formations of Oostwinkel/Templeuve, Dendermonde and Oostakker, are characterized by a very high opaque grains and ubiquists content and by rather low proportions of epidote, garnet and hornblende. These sediments originate mainly from the erosion of the Eocene deposits in the studied area. The overlying deposits, which make up the Formations of Oeselgem/Wevelgem, Eke, Gottem, St.-Baafs-Vijve and the youngest alluvial sediments, show a duplication in the number of garnets, epidotes and amphiboles and hence a considerable reduction in the amount of ubiquists. This heavy mineral association was influenced by an eolian supply from the north, in this case from the bottom of the then aerially exposed North Sea.	Heavy minerals as a stratigraphical tool for the Eemian and Post-Eemian deposits in the lower Lys valley (Belgium)
VOLUME 66 NO 2 147	1987	66	2	147	150	Demoulin, A.	A new Cretaceous sand deposit of supposedly Campanian age and coastal origin is described from the southern flank of the Baraque Michel massif on the Hautes Fagnes plateau. Also presented is an updated distribution map of Cretaceous sand and flint accumulations on the plateau. The data show that during the Campanian the shoreline in High Belgium lay south of the Hautes Fagnes ridge and that it still moved further south during the Maastrichtian.	The distribution of Cretaceous deposits on the Hautes Fagnes plateau (Belgium)

VOLUME 66 NO 2 151	1987	66	2	151	164	Dahlberg, E.H.	Bornite and apatite mineralizations are found in a granulite facies section of the Trans-Amazonian Central Guiana mobile belt. The copper and phosphate mineralizations are associated with monzonitic to syenitic metavolcanic rocks, which in part occur interbanded with gabbro-norite gneiss. The country rocks include banded charnockitic granulites of the basement, granulites and gneisses of a Proterozoic supracrustal cover, and metamorphosed mafic to ultramafic intrusive rocks in basement and cover. Mineralization was located by a geochemical follow-up of coinciding aeromagnetic and electromagnetic anomalies, the latter with considerable in-phase components. The peculiar association of copper and phosphate mineralizations on the West flank of the Bakhuis granulite dome in the Central Guiana mobile belt shows aspects of volcanosedimentary phosphorus and copper accumulations in an intracratonic rift basin. The supracrustal sequence of volcanics, clastic and chemical sediments in the basin was intruded by mafic magmas, which assimilated phosphorus- and copper-rich supracrustal rocks and on crystallization gave rise to copper- and phosphate mineralized mafic-ultramafic rocks. The subsequent mobile belt-style deformation and granulite to amphibolite facies metamorphism of the Central Guiana mobile belt have given rise to copper-mineralized monzonitic-syenitic and clinopyroxene-apatite rocks, representing a layered sequence of granulite facies metamorphosed cupriferous felsic volcanics and intercalated phoçhatic siliceous carbonate sediments of the supracrustal sequence. The copper- and phosphate mineralizations of this volcano-sedimentary association occur associated with the	Copper and phosphate mineralization in the lower Proterozoic mobile belt of Bakhuis mountains, Upper Nickerie, Western Suriname, Guiana shield
VOLUME 66 NO 2 165	1987	66	2	165	176	Urai, J.L.; Spiers, C.J.; Peach, C.J.; Franssen, R.C.M.W.; Liezenberg, J.L.	In this paper we describe the microstructures of naturally deformed rocksalt samples from the Asse salt anticline, FRG, as revealed by a chemical polishing-etching procedure, and by gamma-irradiation. Evidence is presented for the operation of dislocation creep processes, accompanied by extensive strain-induced grain boundary migration. Grain boundaries can be shown to have contained thin brine films during recrystallization, suggesting that solution-precipitation processes could also have been important deformation mechanisms. Recrystallization and solution transfer processes have not been reported in most experimental work to date, thus casting doubt on the validity of extrapolating these data to predict the long-term creep behaviour of salt during natural flow.	Deformation mechanisms operating in naturally deformed halite rocks as deduced from microstructural investigations

VOLUME 66 NO 2 177	1987	66	2	177	190	Gaans, P.F.M. van; Schreurs, J.M.C.M.; Vriend, S.P.; Majjer, C.	A charnockitic and granitic rock suite from the high-grade metamorphic Precambrian of southwest Norway was investigated for its geochemical characteristics. Whole rock major element analyses of 37 samples, taken from 8 localities which cover a range of metamorphic grade, were made. Multivariate statistical methods, R-mode and extended Q-mode component analysis, were used to aid the interpretation of the complex data set. Application of these methods resulted in a main division into melanocratic and leucocratic sample groups. A further analysis of the two groups showed that while the melanocratic samples form a homogeneous group, the leucocratic samples display a geochemical variability which is explained here by partial anatexis. Combined geological and geochemical data suggest a primary formation of the rock suite as a series of basic and acid volcanic rocks, that are intercalated with sediments. The charnockitic rock suite (granulite facies) shows no evidence of depletion of magmatophile elements compared to the granitic rock suite (amphibolite-facies).	The petrogenesis of charnockitic and granitic migmatites of the high-grade metamorphic Precambrian of Rogaland/Vest-Agder, S.W. Norway – A statistical interpretation of major element rock chemistry
VOLUME 66 NO 3 191	1987	66	3	191	199	Reed, W.E.; Douglass, D.N.; Lamar, D.L.	Devonian Old Red Sandstone exposed within and west of the Billefjorden fault zone in Dicksonland, central Spitsbergen, consists of up to 3000 m of conglomerate, sandstone, and mudstone that rapidly thin eastward. The Devonian sediments form a single, large-scale fining upward sequence of fluvial, paludal, and marginal marine origin. Low-sinuosity channel processes dominated the lower portion of the sequence; the middle portion was transitional, probably deposited in meandering channels, and by proximal overbank processes on levees and floodplains. The upper portion of the sequence consists of floodbasin and marginal marine sediments. Nodular calcrete zones suggest prolonged weathering and root mottles indicate plant growth. Trace fossils suggest periods of marine and brackish water conditions within the fluvial-appearing sequence. Current directions and facies distributions indicate gradual wearing down of a source area to the south. The sedimentation pattern within the Old Red Sandstone adjacent to the Billefjorden fault zone contrasts with that of known strike-slip fault-bounded basins: there is no repetitive stacking of facies, and there are no thick sequences of conglomerates or breccias; none of the units show coarsening near the fault. Units thin to the east and lack evidence of faulting contemporaneous with deposition. The eastern distal edge of the Devonian basin may coincide with the gently sloping edge of a half-graben. The early to middle Devonian passive basin margin, late Devonian reverse slip on the Billefjorden fault zone, and normal faults controlling the western margin of the Carboniferous depositional basin may coincide because all were controlled by a Caledonide zone of weakness along a pre-Old Red	Devonian Old Red Sandstone sedimentation and tectonic history of Billefjorden fault zone, Spitsbergen

VOLUME 66 NO 3 201	1987	66	3	201	212	Ruig, M.J. de; Mier, R.M.; Stel, H.	The Alicante region forms part of the External Zone of the Betic Cordilleras. The regional fold trend is ENE, but in the central part of the area studied, an anomalous N-S trend dominates. In previous publications the N-S folds have been interpreted as structures formed by diapiric movements of Triassic evaporites. However, analysis of tectonic stylolites and structural style of the folds show that both trends were formed by crustal shortening. Interference patterns suggest overprinting of the two fold trends. A model is proposed in which the N-S trending folds are interpreted as the result of right-lateral movement along a basement fault. The wrench fault involved would be an offshoot of the important Crevillente fault. The occurrence of both wrenching and compressional tectonics in the Alicante region is discussed in respect with existing plate tectonic models.	Interference of compressional and wrenching tectonics in the Alicante region, SE-Spain
VOLUME 66 NO 3 213	1987	66	3	213	220	Veen, A.H. van der	The Stillwater Complex of South Montana is a layered differentiated ultramafic intrusive body of late Archaean age. It crops out along strike over 48km and contains one of the richest zones of platinum group elements (PGE) in the world - the JOHNS-MANVILLE Reef. This reef is almost two metres thick and consists of 0.5 to 2.0% sulfide enclosed in noritic rocks. The sulfides are principally pentlandite, pyrrhotite and chalcopyrite with locally minor pyrite. Minerals of the braggite-vysotskite series contain the bulk of the platinum group elements. A relatively high Ni/Cu ratio of 1.3, and extremely high - 32 g/ton - concentration of platinum and palladium, a (Pt + Pd)/(Os + Ir + Ru) ratio of 230 and a high magma/sulfide or R ratio are quite different from what may be expected from sequential differentiation and crystal settling in an ultrabasic magma chamber. The most acceptable genetic model for the chemistry and geometry is one suggesting turbulent injection of a second buoyant magma into the original magma chamber to so alter the magma/sulfur ratios that the observed metal abundances and ratios are reached. A number of the petrological and geochemical features of the Stillwater Complex, and particularly their geometrical distributions are of significance for the understanding of such complexes and can be used in exploration. Some of these can be summarized as follows: If in a sulfide zone, 400-1000m above the first appearance of cumulus plagioclase, one finds - the presence of chromitite layers, - that olivine is the cumulus mineral in addition to plagioclase, - the presence of 'pegmatoid' zones (i.e. distinct orthocumulate texture), - that there is evidence of magma injection (slump textures etc.), - that the Ni/Cu ratio is greater than 1, - that there is no apparent nickel depletion of the	A review of some features potentially indicative of the presence of platinum mineralization as deduced from the Stillwater Complex, Montana (USA)

VOLUME 66 NO 3 221	1987	66	3	221	237	Masurel, H.	Deltaic sequences of the 5-Yard Limestone cyclothem forming part of the Yoredale Series, have been studied at different localities in Wensleydale and Bishopdale, N. Yorkshire. The northernmost, Wensleydale sections contain upward coarsening clastic sequences that are characterized by gradational passages from one lithology into another, suggesting slow deltaic progradation. Highly fossiliferous, calcareous shales, deposited in a shallow, open sea, pass up into less fossiliferous, sometimes evaporitic shales indicating a restricted connection with the sea. The latter show an increase of silt content, ultimately merging into finegrained sandstones of the delta plain facies. A different general picture is found in the Bishopdale sections located in the south. These locations apparently were frequently subject to fluctuations in sediment input and water turbulence, which resulted in periods of abundant algal growth, explosive colonization by the probably opportunistic brachiopod <i>Gigantoproductus</i> and minor transgressions of the sea. It is suggested that current patterns and sediment influx from the north initiated growth of a coastal barrier, causing development of different environmental conditions in the northern and southern part of the area. Due to partial separation from the sea, the northern part changed into a lagoon with variable salinity conditions, while progradation of the delta was slow enough to permit small-scale transgressions over the southern part of the area, eventually followed by deposition of fine-grained, evenly laminated sandstones and medium grained, cross-bedded sandstones characteristic of a seaward prograding barrier beach.	Macrofossils and their palaeoecology in deltaic sequences of the Lower Carboniferous Yoredale Series, Yorkshire, England
VOLUME 66 NO 3 239	1987	66	3	239	250	Groot, T. de; Cleveringa, P.; Klijnstra, B.	Small, oval to round depressions in Weichselian deposits near Scheemda in the northern Netherlands were formed in Late Dryas time. Lithology, sedimentology, and stratigraphic position indicate that these depressions were produced by seasonal frost action followed by thermokarst solution. Comparison with the results of earlier studies on similar features in the northern part of the Netherlands shows that climatic change during the Late Glacial was strongly influenced by local environmental factors.	Frost-mound scars and the evolution of a Late Dryas environment (northern Netherlands)
VOLUME 66 NO 3 251	1987	66	3	251	258	Bos, A.; Haas, G.J.L.M. de; Voncken, J.H.L.; Eerden, A.M.J. van der; Jansen, J.B.H.	The hydrothermal synthesis of well-crystallized ammonium-phlogopite has been performed in our department's high pressure and temperature (HPT) laboratory. The experimental techniques are described. The experimental conditions for the synthesis of the mica were 550°C and 2000 bars. Scanning electron microscopy (SEM), infrared spectroscopy (IR), and X-ray diffraction (XRD) characteristics of the ammonium-phlogopite are discussed. Implications for the natural occurrence of the mineral are considered and potential environments for its discovery are suggested.	Hydrothermal synthesis of ammonium-phlogopite

VOLUME 66 NO 3 259	1987	66	3	259	269	Voncken, J.H.L.; Wevers, J.M.A.R.; Eerden, A.M.J. van der; Bos, A.; Jansen, J.B.H.	Ammonium-bearing micas are prominent nitrogen containing minerals in the Earth's crust. Various starting materials and a range of conditions were applied for the hydrothermal synthesis of tobelite, the ammonium analogue of muscovite. The natural occurrence of the mineral is elucidated. The best crystallised tobelite is carefully investigated with XRD, SEM, DTA, TGA, and IR-spectroscopy. Cell parameters of the tobelite are $a_0: 5.230 \pm 0.007$; $b_0: 9.02 \pm 0.01 \text{ \AA}$; $c_0: 10.55 \pm 0.01 \text{ \AA}$; $\beta: 101.560 \pm 0.01$; $V: 487.5 \pm 0.7, \text{ \AA}^3$. Tobelite is indexed on the basis of a 1M cell. Tobelite decomposes at temperature above 500°C in TGA/DTA studies, using heating rates of 10° C/min. Ammonia loss and dehydroxylation are separate processes. Ammonia loss proceeds relatively faster and it is a lower temperature process. In an IR spectrum of tobelite the NH ₄ ⁺ vibrations are readily perceivable, and they are determinative for tobelite with respect to other dioctahedral micas. Tobelite is easily identified by X-ray diffraction. The present synthesis results and literature data indicate that tobelite is readily formed in NH ₃ -rich environments. Such environments are likely to exist in fossil fuel deposits, where decomposition of amino-acids under reducing conditions normally yields NH ₃ -rich gas or fluid phases. Ammonium micas may be formed directly from ammonium bearing clay minerals, or by ammonia incorporation in pre-existing micas.	Hydrothermal synthesis of tobelite, NH ₄ Al ₂ Si ₃ AlO ₁₀ (OH) ₂ , from various starting materials and implications for its occurrence in nature
VOLUME 66 NO 3 271	1987	66	3	271	274	Veen, A.H. van der; Boogaard, M. van den; Rondeel, H.E.		Book reviews

VOLUME 66 NO 4 275	1987	66	4	275	292	Priem, H.N.A.	One of the features which makes the planet Earth a strange anomaly in the Solar System is the presence of continental crust, unknown on the other terrestrial-type planets. In contrast to the basaltic crust underlying the ocean basins, which is nowhere older than 200 Ma (million years) because of its continuous recycling through the mantle by plate-tectonic processes, the continental crust (with the average composition of diorite) is composed of rocks with ages ranging from zero to ~3,900 Ma. It is thus on the continents that 95% of the Earth's geologic record is to be found, including the origin of the unique geosphere-biosphere system. The mainstream of present-day opinion is that these ancient entities were derived from the mantle through magmatic processes, but conflicting views prevail with regard to their growth rates. In this lecture the view is taken that the continents have grown through geologic time by irreversible differentiation from the mantle. The task of gaining insight into the evolution of the continental crust has fallen mainly to the isotope geochemists. Application of radiogenic isotopes (Pb, Hf, Nd, Sr) provides reliable constraints on the age and temporal evolution of rock units, on the time of primary separation of continental material from the mantle, and on the assessment of the relative contributions of mantle and ancient continental crust to magma genesis. Recorded geologic history begins at ~3,900Ma with the oldest preserved continental crust. There is evidence that (some) continental crust was already in existence by ~4,300Ma ago. Most of the insight into the pre-recorded history of the Earth stems from studies of meteorites and other planets. One of the results of planetary exploration is the recognition of large-scale impact	Isotopic tales of ancient continents
VOLUME 66 NO 4 293	1987	66	4	293	296	Arua, I.; Hoque, M.	A quantitative assessment of naticid and muricid borings in mainly small (<10mm) gastropod and bivalve shells from the Ameki Formation (Eocene) shows that the degree of shell ornamentation appears to have played a significant role in predation intensity. It was observed in gastropods that a smooth shell is preferred by predators to an ornamented one. In bivalves a growth-lined shell is preferred to either a ribbed or a mixed one (growth lines and ribs present) and a ribbed shell is preferred to a mixed shell. It is suggested that the predation intensity was controlled by the predator-defensive adaptation. The favoured predator food source during the Eocene in Nigeria was bivalves, as far as shown by fossil shells.	Predation intensity in an Eocene molluscan assemblage from southeastern Nigeria

VOLUME 66 NO 4 297	1987	66	4	297	311	Kroonenberg, S.B.; Berg van Saparoea, R.M. van den; Jonker, A.T.J.	Palynological, micromorphological, tephrochronological and sedimentological studies of the deposits in semi-closed depressions in the Limagne Rift Valley in France testify to development in five stages: (1) an erosional, probably interglacial stage, with differential fluvial erosion of soft Oligocene marls not protected by overlying terrace gravels; (2) a fluvial-periglacial stage, with deposition of fluvio-periglacial sediments, partly involuted subsequently; (3) a lacustrine stage, possibly related to thermokarst, with deposition of calcareous mud and volcanic ash layers in the Late Glacial; (4) peat growth and deposition of black clays in the Preboreal, Boreal and Atlantic, and (5), depending upon local conditions, fluvial deposition, soil formation, or lacustrine deposition until recent times.	Late Glacial and Holocene development of semi-closed depressions (thaw lakes?) in the Limagne Rift Valley, French Central Massif
VOLUME 66 NO 4 313	1987	66	4	313	326	Muchez, P.; Viaene, W.; Wolf, M.; Bouckaert, J.	During the Visean, four major lithological and biostratigraphical sequences formed in the Campine-Brabant Basin, north of the London-Brabant Massif. The Visean strata are mainly composed of carbonates. The first sequence was formed during the Early Moliniacian. At this time, the Heibaart area was a structural high. During the late Moliniacian, when the second sequence was formed, the whole Campine-Brabant Basin was characterized by carbonate sedimentation on a broad shallow shelf. The third sequence formed during the Livean. Sedimentation was restricted in the Turnhout and Halen area. In the Heibaart area, sediments were deposited in an environment with open water circulation. During the Early Warnantian the fourth sequence was formed. Reef mounds developed in the Poederlee-Heibaart area and probably also in the Turnhout area. The sediments penetrated by the Halen borehole were deposited alternately in an open and in a restricted environment. The thickness variations of the different sequences and the facies distribution indicate that synsedimentary faults were active in the Campine-Brabant Basin during the Visean. A comparison with the Upper Westphalian of the Campine-Brabant Basin, and with the Lower Carboniferous of northern England suggests a block-faulted structural framework for the Campine-Brabant Basin during the Visean. The paleogeothermal gradient of the Visean and the Namurian-Westphalian A strata of the western zone of the Campine-Brabant Basin has been calculated. The coalification data at the top of the Visean confirm the existence of a fault zone near the London-Brabant Massif and of a shelf bordered to the north by a listric fault.	Sedimentology, coalification pattern and paleogeography of the Campine-Brabant Basin during the Visean
VOLUME 66 NO 4 327	1987	66	4	327	332	Reed, J.R.; Condie, K.C.	Using petrographic detrital modes and major-element concentrations in matrix-rich sandstones, it is possible to calculate upper limits of the amounts of various detrital components that may have recrystallized in sandstone matrices. With exception of samples in which the matrix includes large contributions of recrystallized detrital feldspar, detrital modes of graywackes can provide accurate provenance and tectonic setting information.	Geochemical constraints on the composition of sandstone matrix and interpretation of Detrital modes

VOLUME 66 NO 4 333	1987	66	4	333	341	Biermann, C.	The structure of the Mosel area is characterized by major NW-directed overthrust faults, that formed in a late stage of the deformation history, after two phases of ductile deformation. The traces of the major overthrust faults are indicated by discontinuities in stratigraphy, metamorphic grade and intensity of the pre-thrusting deformation structures. The thrust planes separate rock sequences that have rotated by foreland-directed movement on SE-dipping listric surfaces. Large scale normal and reverse cleavage fans have formed in the hanging wall of the main overthrust planes. It is suggested that the overthrust planes, cleavage fans and the large scale rotations have formed in relation to bending of the detached sedimentary cover over pre-existing ramps in the crystalline basement. These ramps represent inherited normal faults, that formed during syn-sedimentary differentiation of the Lower Devonian sedimentary basin.	Basement topography and thrust fault ramping, a model to explain cleavage fans in the Mosel area (Rheinisches Schiefergebirge)
VOLUME 66 NO 4 343	1987	66	4	343	355	Zijlstra, H.J.P.	Silica concretions, known as chert, flint or silex, are common in Late Cretaceous chalks of the Maastrichtian type locality (Maastricht, the Netherlands). They show differences in shape, size and distribution that can be related to depositional structure and texture of the carbonates. It is suggested that the source of the silica was biogenic opal (diatoms), dissolving in the sediment after deposition. Precipitation of dissolved opal started during early diagenesis, at the boundary between oxidizing and reducing sediment. Anaerobic decomposition of organic matter by archaeobacteria lowered the hydrogen ion concentration in pore fluids. The alkaline conditions at the boundary between oxidizing and reducing sediment, caused dissolved biogenic silica to polymerize and precipitate. Later, during further burial, a high concentration of primary silica precipitates enhanced further precipitation. The concentration gradient that was generated in this way, forced dissolved silica to diffuse from the surrounding sediment towards the sites of primary high silica precipitation. After all biogenic opal had been dissolved to nourish the growing 'protonodules', further precipitation resulted in the lowering of dissolved silica in pore fluids below the saturation level of the new polymorph. Then this polymorph started to dissolve and precipitated as a lesser soluble and more ordered polymorph at the most dense parts of the 'protonodule'. This process, resulting in the generation of dense, sharp rimmed nodules, ended when all silica was precipitated as stable quartz. Silica concretions in chalks can be used to determine palaeoredox zones and the depositional and early diagenetic conditions of the chalks.	Early diagenetic silica precipitation, in relation to redox boundaries and bacterial metabolism, in late cretaceous chalk of the Maastrichtian type locality
VOLUME 66 NO 4 357	1987	66	4	357	360			Book reviews

VOLUME 67 NO 1 3	1988	67	1	3	17	Demathieu, G.R.; Oosterink, H.W.	The Middle Triassic of Winterswijk has yielded an interesting ichnofauna (reptilian and amphibian footprints) during the past few years. Recently discovered new species add greatly to our knowledge of the Winterswijk fauna. Three vertebrate tracks are described and illustrated: <i>Brachychirotherium paraparvum</i> , <i>Coelurosaurichnus ratumensis</i> and <i>Sustenodactylus hollandicus</i> . Some remarks on species described earlier are added.	New discoveries of ichnofossils from the Middle Triassic of Winterswijk (the Netherlands)
VOLUME 67 NO 1 19	1988	67	1	19	29	Groot, P.A. de; Baker, J.H.; Oen, I.S.	Western Bergslagen, Central Sweden contains a number of large scale features including long, narrow, synformal, sediment-filled basins, separated by wide intervening areas of felsic metavolcanics in which anticlinal structures are absent. Synvolcanic granites intrude the felsic metavolcanics. Bedding, foliation and mineral lineations are sub-parallel both where bedding is sub-vertical or more rarely sub-horizontal. These features, taken in their geological context, are consistent with a dynamic system in which granite diapirism and gravity tectonic processes operated. Previous models (Oen et al., 1982; Oen, 1987) emphasize the continental rift setting of Bergslagen. We propose the following four stage tectono-magmatic model to account for the structure of the area: Phase 1: A primary crust forming event at about 2.1.Ga. Phase 2: Subsequent attenuation produced rifting accompanied by melting of the lower crust to give large scale felsic volcanism, contained predominantly in sinking grabens of a wider rift structure. Granite diapirism was initiated. Phase 3: Tectonic inversion followed, with an uplift of the graben floors, and a higher emplacement of the granite diapirs. At the same time a second generation of rift basins evolved on the flanks of the updomed areas, to be filled with debris derived from the felsic volcanics. A gravity instability developed as the heavier sediments filled the grabens, contributing to the overall tectonic process. Phase 4: A younger event of granitic magmatism. The development of the sediment filled rift basins is the surficial expression of the deeper gravity tectonic system.	Evidence for gravity subsidence and granite diapirism in the 1.8-1.9 Ga Proterozoic succession of W. Bergslagen, Sweden
VOLUME 67 NO 1 31	1988	67	1	31	40	Vos, P.C.; Wolf, H. de	A major problem in paleo-ecological research of diatoms in tidal environments is the distinction of autochthonous and allochthonous diatom valves. A new approach applying several diatom- and non-diatom-related criteria is introduced in order to solve the autochthonous/allochthonous problem. A classification of coastal diatoms in ecological groups, and the relation between these ecological groups and the sedimentary environments are discussed.	Methodological aspects of paleo-ecological diatom research in coastal areas of the Netherlands

VOLUME 67 NO 1 41	1988	67	1	41	51	Akande, S.O.; Fakorede, O.; Mucke, A.	The Bini Yauri and Okolom primary gold occurrences are localized within the Precambrian to Lower Paleozoic schist belts of western Nigeria. These belts consist of gneisses, migmatite, quartzite, mica schist, phyllites, amphibolite, and granite which represent suites of metasedimentary, metavolcanic and intrusive rocks that are infolded into the Nigerian basement complex. Gold-bearing veins in the Bini Yauri lode occur as lenticular bodies within altered mica schists at the contactzone with a granite porphyry. At Okolom, the veins are hosted in sheared zones within a sequence of silicified biotite gneiss, amphibolite and schist. Vein contacts in the two deposits are generally sharp, steeply dipping at ca. 80°E and commonly contain stockworks and discordant stringers adjacent to the wall rocks. Vein constituents are essentially quartz, sericite, chlorite, albite, tourmaline calcite, magnetite and hematite. These are commonly intergrown with pyrite, pyrrhotite, chalcopyrite, arsenopyrite, galena, sphalerite and argentite which altogether may constitute up to 3% of the vein systems. Alteration minerals like sericite, chlorite, epidote, calcite and quartz are common in wall rocks adjacent to veins. The alteration minerals are commonly associated with quartz, magnetite, ilmenite, hematite, zircon, rutile and limonite. Fluid inclusion studies in vein quartz reveal a bimodal distribution of filling temperatures which suggests at least 2 temperature regimes centred on 170°C and 240°C up to a maximum of 320°C during mineral deposition. Salinity estimates for the ore fluid average 1.5 equivalent weight percent NaCl and ore precipitation appears to have taken place at a minimum depth of about 1.4km. Our study of the contacts, shape, petrography and fluid inclusion aspects of the	Geology and genesis of gold-bearing quartz veins at Bini Yauri and Okolom in the Pan-African domain of western Nigeria
VOLUME 67 NO 1 53	1988	67	1	53	60	Roep, T.B.; Beets, D.J.	A trendcurve for the rise of mean sea level (MSL) since 5600 BP is given based on ¹⁴ C-dated coastal sequences. Mean High Water level (MHW) is inferred from the deepest occurrence of dry eolian scour and the highest marine burrow-level and small-scale cross-lamination. Estimates of Mean Low Water levels (MLW) are based on the level of thickest shell beds, the range of structureless sand or bubblesand, the range of low-angle bars and the occurrence of cm-thick clay intercalations. Estimates of MHW have an error of a few decimetres. Those of MLW somewhat more. All data are presented in a 14C time-depth graph and also in a historical time-depth graph (calibrated years BC). MSL is drawn halfway MHW and MLW estimates. The MSL trendcurve indicates a rise of ca. 2 m between 4500 cal BC and 3000 cal BC and ca. 3.5 m during the last 5000 historical years. Our data suggest a tidal amplitude of ca.2m between 4500 cal BC and 3000 cal BC and of ca. 1.50m during the last 2000 historical years.	Sea level rise and paleotidal levels from sedimentary structures in the coastal barriers in the western Netherlands since 5600 BP

VOLUME 67 NO 1 61	1988	67	1	61	74	Meulen, S. van der	<p>A group of Weichselian pingo remnants on the southeast Frisian till plateau has been investigated in 2 m deep ditch exposures and in borings. Pingo geometry comprises a more or less continuous outer till rim, an inner till terrace, and a central depression, which runs down through the 3.5-5 m thick till. The rim developed in a peripheral stressfield, the inner terrace consists of sagged pingo skin, and the central depression approximately represents the former pingo crater. Sand, gyttja, and peat cover the inner terrace and fill the central depression, which possibly contains some till interlayers in the basal parts. The pingos originated at the flanks of a winding erosion valley (80 m wide), a tributary to one of the main valleys of the till plateau. This setting and the minor relief of the area indicate a closed-system pingo origin. However, the interpreted positions of the former pingo ice lenses at the base of the till layer, for pingos which are strongly different in size, may indicate some artesian influence (open-system processes). The pingos and sand wedges (2 m long, several decimetres wide) originated under an arid, arctic climate which succeeded a wet, Pleniglacial phase. Pingo degradation with some climatic amelioration was accompanied by minor lateral transport of the pingo skin, which explains the low relief of the rampart. Aeolian sand accumulated in the remnants, where furthermore loess became mixed with organic material (gyttja). Under Holocene climates aeolian transport ceased and peat growth started, together with the formation of podzolic soil profiles.</p>	The spatial facies of a group of pingo remnants on the southeast Frisian till plateau (the Netherlands)
VOLUME 67 NO 1 75	1988	67	1	75	89	Kroonenberg, S.B.; Moura, M.L.; Jonker, A.T.J.	<p>The distribution of 24 major and minor elements has been studied in 66 sand samples of different grain sizes from six terrace levels along a stretch of 40 km along the Allier river, which drains an area mainly underlain by granitic and gneiss Hercynian basement and alkalibasaltic Cenozoic volcanic rocks in the French Central Massif. The river sands show a large spread in SiO₂ (63-97%). Principal component analysis shows two factors, F1 composed of Ti, Mg, Fe, Mn, Ca, P, Ni, Cr, V, Sr, Nb and Zr, together with -Si, mainly elements from basaltic components, and F2 composed of K, Na, Al, Rb and Ga, mainly elements of alkalifeldspar and micas. Within single terrace levels F1 varies mainly due to lateral and downstream density sorting of basaltic rock fragments, and F2 due to increasing concentration of micas in finer-grained samples. Variations in F1 between terrace levels reflect partly uplift and erosion history, partly increasing contribution of fluvioglacial basalt-rich sediment in glacial times and of basement-rich sediment in interglacial times. Weathering of basaltic components with increasing sediment age is reflected in decreasing Ca/Ti and Mg/Fe ratios with terrace height. The results show that the geochemical study of unconsolidated fluvial sands is a rapid and useful tool next to classical sedimentary petrography.</p>	Geochemistry of the sands of the Allier river terraces, France

VOLUME 67 NO 1 91	1988	67	1	91	105	Fortuin, A.R.; Smet, M.E.M. de; Sumosusatro, P.A.; Marle, L.J. van; Troelstra, S.R.	Mio-Pliocene deposits of Buru have been investigated in order to provide additional data concerning the timing, rate and magnitude of vertical movements in the northwestern end of the outer Banda Arc structure. Geohistory analysis of field and laboratory data of two sections recorded in NW Buru provide broad age-depth constraints only. Four episodes in the history of uplift and subsidence are distinguished and discussed in the light of present plate tectonic concepts. Deposition of the Early Miocene Hotong Formation, bathyal sandy clays and marls with intercalated turbidites, followed after a mid Tertiary period of open folding, uplift, erosion and, finally, partial resubmergence. These changes may be related to plate tectonic interaction with southeast Asia and not necessarily with the Australian continent - from which Buru initially derived - which is now colliding with the Banda Arc. The Middle - Late Miocene (and possibly the Early Pliocene) left no sediments in Buru; it was a time of differential uplift (up to 20cm/ka), related to reorganisation of the regional deformation pattern, i.e. evolution of the Banda Arc system. During a poorly dated Pliocene depositional episode shallow marine fan-delta clastics were laid down in giant prograding sets, up to 50 m high and dipping up to 20 degrees, thus witnessing continuing differential movements in NW Buru. The same pattern of deformation exists to the present day.	Late Cenozoic geohistory of NW Buru, Indonesia and plate tectonic implications
VOLUME 67 NO 1 107	1988	67	1	107	110	Verschure, R.H.; Vandenberghe, J.; Loon, A.J. van; Finlow-Bates, T.; Rondeel, H.E.		Book reviews
VOLUME 67 NO 2-4 115	1988	67	2-4	115	115	Baker, J.H.; Hellingwerf, R.H.		Dedication to Professor I.S. Oen, on special volume on the geology and ore forming processes of Bergslagen, Central Sweden
VOLUME 67 NO 2-4 119	1988	67	2-4	119	119	Baker, J.H.; Hellingwerf, R.H.		Preface special volume on the geology and ore forming processes of Bergslagen, Central Sweden

VOLUME 67 NO 2-4 121	1988	67	2-4	121	138	Baker, J.H.; Hellingwerf, R.H.; Oen, I.S.	Bergslagen is the ore-bearing part of the 1.9-1.86 Ga Svecofennian of central Sweden, characterized by large thicknesses of felsic metavolcanics and sediments, with an intricate association of local and regional hydrothermal alterations and mineralizations related to the development of mostly submarine rift basins. Mineralization types show a change with time in response to the evolving geotectonic setting. The change in lithology from predominantly volcanic Bergslagen to more sedimentary in the easterly Stockholm region is accompanied by an increase in metamorphic grade and change in deformational style. The main geological features of the three granitoid magmatic regions, and intervening sedimentary areas of the Svecofennian are summarized and related to the processes affecting the northern Archean block during Proterozoic times. A two stage model for the evolution of the 1.9-1.86 Ga Svecofennian of the Baltic Shield is proposed. New crust of felsic to intermediate composition was generated in the period 2.6-2.1 Ga by multiple subduction from the SSE. In this period the Archean block underwent deformation as an active margin. Accretion of the newly formed crust occurred during a collision type orogeny with the Archean block in the period 2.1-2.0 Ga. Reworking of the accreted crust in Central Finland, Skellefteå-Kiruna and Bergslagen occurred in the period 1.9-1.86 Ga, with elongate volcanic basins developing in transtensional strike slip zones, where deep faulting penetrated to the lower crust.	Structure, stratigraphy and ore-forming processes in Bergslagen: implications for the development of the Svecofennian of the Baltic Shield
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VOLUME 67 NO 2-4 139	1988	67	2-4	139	155	Rickard, D.	Regional metamorphism in the Bergslagen Province of South Central Sweden reached but did not significantly extend beyond the granulite facies boundary. It occurred during a less than 20 Ma, and probably less than 5 Ma, period between 1.89 and 1.84 Ga. It resulted from burial metamorphism in an extensional basin under a moderately high geothermal gradient of at least 50°C km ⁻¹ . Within this relatively warm terrane, submarine areas of recharge are delineated by zones with lower metamorphic facies. The high heat flow produced deep hydrothermal convection through the volcano-sedimentary pile resulting in extensive alteration, particularly alkali metasomatism, and concomitant ore formation. Migmatite development, related to incipient melting occurred in the pelite-filled, deeper part of the basin. At this high heat flow, melting occurred at less than 13 km depth. The granitoids resulting from this process represent the urgranit of central Sweden and display mixed S- and I-type characteristics. Intrusive activity in a region with intense hydrothermal activity resulted in substantial explosive volcanic activity and the formation of large volumes of volcanoclastics. Sediment and subsequent volcanoclastic loading provided a virtually autocatalytic subsidence driving mechanism for the basin, resulting in extensive melting. The basin developed through lithospheric stretching and attenuation of an earlier continental crust. Nd isotopic systematics may be reinterpreted to suggest a substantial 2.2-2.0 Ga component in the older granitoids. This is consistent with other isotopic and geochemical data which strongly suggest an ensialic development for the district. The earlier crust is now represented by the older granitoids, which were	Regional metamorphism in the Bergslagen Province, South Central Sweden
VOLUME 67 NO 2-4 157	1988	67	2-4	157	164	Lundström, I.	The regional tectonic and metamorphic features common to western Bergslagen and to the region lying to the east are described. Metamorphic grade varies from low grade greenschist facies in the west to higher grade amphibolite facies in the east, where migmatized gneisses are also developed. Deformation is also stronger in the eastern region, where E-W trending isoclinal folds predominate, while N-S trending, more open structures are found to the west. Stratigraphic and lateral inter-relationships of the two regions indicate a volcanic proximal area in western Bergslagen, which fed tephra into a depositional basin to the east.	Regional inter-relationships in the Proterozoic geology of Bergslagen and Southeastern Central Sweden

VOLUME 67 NO 2-4 165	1988	67	2-4	165	176	Lagerblad, B.	<p>The Proterozoic Svecofennian volcano-plutonic rocks in Bergslagen, central Sweden, exhibit changes in both geochemistry, grade of deformation and metamorphism going from the west toward the eastern and more interior parts of the south Svecofennian volcanic belt. In the west geochemically homogeneous rhyolitic volcanic rocks cover vast areas while towards the east the magmatic variation is larger, and dacitic volcanic rocks become increasingly common. Andesites are locally present. Similarly coeval granitoids in western Bergslagen are granitic, while granodiorite and tonalite plutonic complexes are more common to the east. A change in the magmatic character of the rocks is substantiated by their trace element signatures. The rocks in the westernmost parts of Bergslagen have characteristics similar to modern continental within-plate settings, while those in the easternmost parts of Bergslagen have characteristics similar to volcanic arcs. The change in magmatic character is successive, and resembles the compositional polarity across a Phanerozoic magmatic arc at a destructive plate margin. The more continental character of the Svecofennian rocks in western Bergslagen implies thicker crust. This is substantiated by the more homogeneous magmatic character of the volcanic rocks which can be taken to imply larger magma chambers. Thus, when the Svecofennian crust, shortly after its consolidation, was subjected to an E-W compression, the crust in western Bergslagen acted as a more competent block relative to the thinner more 'primitive' crust in east. This resulted in stronger compression of the crust to the east, which in turn explains more intense folding and higher grades of regional metamorphism in these areas.</p>	Evolution and tectonic history of the Bergslagen volcano-plutonic complex, central Sweden
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VOLUME 67 NO 2-4 177	1988	67	2-4	177	188	Groot, P.A. de; Sheppard, S.M.F.	Carbon and oxygen isotope ratios for calcite and dolomite from stratabound carbonates, carbonate veins and clots in W-(Mo-) and Zn-Pb sulphide skarns, and for a calcite from a Mn-skarn from the Bergslagen region, central Sweden, are presented. Stratabound carbonate carbon isotopes ($\delta^{13}\text{C} - 0\text{‰}$) imply a marine milieu of deposition. The $\delta^{18}\text{O}$ values of stratabound carbonates can be divided into two groups: one associated with stratiform iron-oxide deposits (RSC) and the other unrelated (NRSC). Stratabound dolomites of the NRSC are depleted in ^{18}O compared to the 'most Proterozoic dolomite' field. NRSC calcites have a range of $\delta^{18}\text{O}$ values (+12 to +19‰) similar to the lower half of the 'most Proterozoic calcites' field. Whether the RSC $\delta^{18}\text{O}$ values (+6 to +11‰) are primary values or values formed by exchange of the RSC with a hydrothermal fluid during the skarn alteration of associated stratiform iron-oxide deposits, is not clear. Calcites and dolomites, from skarn altered iron-oxide deposits, W-(Mo-)skarns, and a sulphide skarn, as late phase veins and clots, have distinguishable $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ values, placing the respective skarns into separate fields. They have, in general, low $\delta^{13}\text{C}$ (-2 to -8‰) and low $\delta^{18}\text{O}$ (+6 to +12‰) values, except for the calcite veins in the sulphide skarn. The ^{18}O -depletion of the carbonates most probably occurred during exchange with sea water at temperatures of $300 \pm 50^\circ\text{C}$, or meteoric waters if the temperatures were lower. The types of $\delta^{18}\text{O}$ values and their range are comparable to well documented sea water hydrothermal systems of younger age from ocean floor ophiolites and many relatively low altitude meteoric-hydrothermal systems. The low carbon and oxygen isotope values of the carbonate	Carbonate rocks from W. Bergslagen, Central Sweden: isotopic (C, O, H) evidence for marine deposition and alteration by hydrothermal processes
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VOLUME 67 NO 2-4 189	1988	67	2-4	189	202	Parr, J.M.	An extensive suite of exhalites of sub-economic potential occurs in a succession of Lower Proterozoic quartzofeldspathic gneisses in the Ljusnarsberg district, central Sweden. Previously economic varieties include Fe-Mn oxides, silicates, and carbonates, Cu-Pb-Znbearing and W bearing rocks all of which have been mined in the past. The stratigraphic succession of the Ljusnarsberg-Ställaldalen area is conformable and changes from a lower metavolcaniclastic pile of >5 km thickness (the Kumlan Group) to a mixed metavolcanic and metasedimentary sequence (the Ställaldalen Group). To the east the mixed metavolcanic and metasedimentary succession (the Wigström Group) is thought to be stratigraphically equivalent to the Upper Kumlan Group and Lower Ställaldalen Group. The Kumlan Group is dominated by primary rhyodacitic volcanoclastic material partly subaerial. The rapid decline in volcanism is coeval with an increase in the sedimentary component and marks the conformable contact of the upper and lower groups. The dominantly stratabound mineralization is concentrated in two main ore horizons in the upper group: (1) a lower Cu-Pb-Zn sulphide-rich horizon with some magnetite and (2) an upper Fe-Mn enriched horizon. The ore deposits are spatially associated with the metamorphic equivalents of a variety of clastic and chemical sediments including quartz-feldspar-biotite rocks, with minor calcite, hornblende, garnet, pyroxene, epidote and magnetite; quartz-K feldspar-plagioclase-garnet-amphibole-pyroxene-calcite-epidote-biotite rocks with minor chlorite, apatite and sphene; and pyroxene-epidote-K feldspar rocks. The varied chemistry of both ores and barren chemical sediments suggests the palaeoenvironment was continental with	The metasediments associated with stratabound base metal mineralization, Ljusnarsberg District, Central Sweden
VOLUME 67 NO 2-4 203	1988	67	2-4	203	212	Meerten, T.G. van	The predominantly felsic volcanics and intrusives of the Grythyttan basin in W. Bergslagen, are subdivided into four successive stages illustrating the development of a subaqueous continental rift zone. A change in the type of volcanism from Plinian type eruptions with thick fall deposits (stage 1) into Pelean type with extensive flows (stages 2, 3 and 4) is seen. A rift stage (stage 4) is unconformably superimposed on the former three stages and is characterized by bimodal felsic and mafic magmatism and the presence of turbiditic sediments. Fe-ore rich layers associated with fine ashes and limestones, are found throughout the sequence, with a major concentration in stage 3 preceding the rift stage proper. This ore deposition is associated with large hydrothermal activity and the ascent of basic material. Mn-rich, Fe-ores are found in the stages 2,3 and 4, indicating the former presence of oxidation/reduction boundaries during ore formation. Ore formation and intrusive and volcanic activity should be considered as inter-related processes, linked to the development of an asymmetrical continental rift, presumably triggered by magmatic underplating.	Lithostratigraphic correlations in an asymmetrical rift-basin: the Grythyttan area, W. Bergslagen, Sweden

VOLUME 67 NO 2-4 213	1988	67	2-4	213	225	Öhlander, B.; Zuber, J.	<p>The Fellingsbro granite <i>sensu stricto</i> is a massive coarse-grained rock characterized by red, angular microcline megacrysts up to 7 cm long. The Lisjö granite is of the same type as the Fellingsbro granite but is situated 20km to the NE. Both intrusions belong to a belt of c. 1.78 Ga old granites coinciding with the major so-called Central Swedish Gravity Low. Gravity studies suggest that the Fellingsbro and Lisjö granites rose from a huge granite ridge through structurally controlled root zones, forming mushroom-shaped intrusions. These porphyritic granites have the geochemical characteristics (e.g. high Y, Nb, Zr and HREE) of granites generated in 'within-plate' or tensional rifting environments. Even-grained granites of approximately the same age occurring in heterogeneous mixtures of granites, pegmatites, xenoliths and partly assimilated country rocks e.g. in the Fellingsbro and Låsen areas, probably represent minimum melt type rocks that have not moved far from their source. The even-grained interior of the Lisjö granite and the contemporaneous Dingtuna and Pingstabergr granites, were generated by differentiation of granites with similar characteristics as the porphyritic Fellingsbro granite. Recently published U-Pb zircon datings have demonstrated that the Småland-Värmland granite-porphry Belt has approximately the same age as the granites in this study. We speculate that both groups were emplaced in a tensional environment on the continental side of a subduction related calc-alkaline belt, remnants of which may be preserved in the SW Swedish Gneiss Region. The Fellingsbro and Lisjö granites were generated more towards the interior of the pre-existing c. 1.89 Ga old continent than the Småland-Värmland granites.</p>	Geochemistry of the Fellingsbro type granites, South Central Sweden
VOLUME 67 NO 2-4 227	1988	67	2-4	227	237	Baker, J.H.; Drucker, W.H.	<p>The 1.9-1.86 Ga Bergslagen Older Granite Suite forms part of a comagmatic series together with a > 10 Km thick sequence of felsic metavolcanics developed in the 3000 km² of western Bergslagen, Central Sweden. The granites, divided into three geographical groups, are fine to medium grained biotite granites, with field and petrological evidence of high level emplacement, the intrusions cutting their own extrusiva. Postmagmatic hydrothermal alteration has resulted in albitization and variable iron oxidation ratios. Unaltered granite samples are characterized by a high silica content and weak inter-element variations, showing restricted minimum melt compositions. In terms of multicationic classifications the granites belong to an aluminous association, compatible with an origin by anatexis of a felsic to intermediate precursor, with no significant contribution from mafic sources. An origin by anatexis supports current models for a rifted intra-continental or continental margin setting.</p>	The major element geochemistry of the 1.9-1.86 Ga Bergslagen Older Granite Suite, W. Bergslagen, Central Sweden

VOLUME 67 NO 2-4 239	1988	67	2-4	239	253	Bromley-Challenor, M.D.	The main lithostratigraphic units of the felsic supracrustal sequence of the Falun area are described. The > 100 km ² , E-W trending synformal enclave is bordered to the N and S by co-magmatic Svecokarelian granites. The 4.5 km thick sequence comprises lower units of rhyolitic tuffs with minor mafic intercalations, passing up through felsic volcanics to the sulphide-bearing ore horizon. The primary geochemical characteristics of the felsic volcanics and the Svecokarelian granites are illustrated using multicationic classification diagrams. The results for 360 samples collected at ± 50 m intervals along 3 lithogeochemical traverses reveal primary lithogeochemical features which in the B-A classification of magmatic associations diagram (Debon & Le Fort, 1983) are considered to reflect a horizontal to positive aluminous trend for the Falun supracrustals. The Svecokarelian (early - to synorogenic) granites (urgranit) close to the supracrustal border also reveal a similar trend.	The Falun supracrustal belt. Part 1: primary geochemical characteristics of proterozoic metavolcanics and granites
VOLUME 67 NO 2-4 255	1988	67	2-4	255	263	Billström, K.; Åberg, G.; Öhlander, B.	An isotopic and geochemical investigation of the Pingstabergr Mo-occurrence in the Bergslagen region, south-central Sweden, has been undertaken. The mineralization is of an intra-granitic type, and is situated within an undeformed granite of a minimum melt composition. In comparison with a 'normal granite', the mineralized part of the Pingstabergr granite is enriched in Y, Nb, Rb, U, Th and HREE, and depleted in Zn, Cu, Zr, Sr and Ba. Several of its characteristic isotopic and geochemical features are probably due to the Mo-mineralizing solutions, and these are likely also to have caused the strongly corroded structure of the analyzed zircons. As a result the U-Pb zircon and Rb-Sr whole-rock isotopic systems have been affected in various ways. The achieved U-Pb zircon age of 1781 ± 46 Ma is, however, considered to be essentially undisturbed, and this age is considered to represent both the time of granite emplacement and the mineralization episode. The Rb-Sr whole rock age of 1.53 Ga, on the other hand, has been reset and is interpreted as reflecting a post-crystallization hydrothermal event. The results presented in this study suggest that the Pingstabergr granite was formed at a late-orogenic stage (1.80-1.75Ga) of the Svecokarelian orogeny.	Isotopic and geochemical data of the Pingstabergr Mo-bearing granite in Bergslagen, South Central Sweden

VOLUME 67 NO 2-4 265	1988	67	2-4	265	278	Plimer, I.R.	<p>The sulphide deposits of the Broken Hill and Bergslagen areas occur in Lower-Middle Proterozoic sequences of variably deformed low to high metamorphic grade rocks. The number of events of coeval deformation and metamorphism, intensity of deformation and grade of metamorphism at Broken Hill are higher than in the Bergslagen area. A long history of retrograde metamorphism has been recognised at Broken Hill. Furthermore, granitic rocks in Bergslagen are coeval with volcanicity associated with ore deposition or are post-tectonic whereas at Broken Hill all plutonic rocks can be related to events of metamorphism, specially retrogression. Bergslagen is characterised by abundant metavolcanics (especially explosive acid volcanics) and moderately shallow water sequences probably deposited in a rift whereas metasediments deposited in a deep rift predominate at Broken Hill. Mineralization at Broken Hill is at least two orders of magnitude larger than at Bergslagen, is intimately associated with three events of paired volcanism and is associated with a great volume of extremely diverse exhalite deposited in a moderately reducing environment. The Bergslagen mineralization was probably deposited from numerous small seawater-dominated convective geothermal systems leaching metals from porous, permeable hot acid volcanic rocks. These geothermal systems produced regional alteration and localised intense footwall Mg-metasomatism associated with egress and ore deposition. In contrast, mineralization at Broken Hill formed in a deep rift every time there was a massive invasion of basaltic magma into faulted wet sediments. This increase in the geothermal gradient resulted in lower crustal melting, paired volcanism, initiation of geothermal</p>	Broken Hill, Australia and Bergslagen, Sweden - Why God and Mammon bless the Antipodes!
VOLUME 67 NO 2-4 279	1988	67	2-4	279	292	Carlson, C.J.; Bleeker, W.	<p>A complex sulphide mineralisation occurs within calc-silicate rich dolomite-calcite marble at Håkansboda, Bergslagen, Central Sweden. Exploration during 1980-86 has defined the distribution and nature of the mineralisation and its structural setting. Three zones of mineralisation are identified. The central or B zone, with up to 900 m strike length and 80 m wide, is proven to a depth of 600 m. It forms an envelope around previously mined massive and streaky chalcopryrite-pyrrhotite and chalcopryrite-arsenopyrite-tennantite ore shoots, containing minor antimony, bismuth, gold and molybdenum. A similar, but lower grade mineralisation forms the A and C zones. The deposit is spatially associated with strongly altered felsic volcanic rocks and volcaniclastics, especially in the stratigraphic footwall, and areally extensive exhalite horizons with Pb-Zn-Cu-Ag-Sb sulphides and Mn-rich magnetite ores in the stratigraphic hangingwall. The 'ore'-hosting sequence occurs on the overturned limb of a regional F, syncline and is refolded by steeply plunging F, folds. Brecciated host rock-sulphide lenses and the geometry of individual ore shoots indicate remobilisation and extension of the sulphides into pipe-like bodies parallel to local F, fold axes.</p>	The geology and structural setting of the Håkansboda Cu-Co-As-Sb-Bi-Au deposit and associated Pb-Zn-Cu-Ag-Sb mineralisation, Bergslagen, Central Sweden

VOLUME 67 NO 2-4 293	1988	67	2-4	293	311	Cheilletz, A.	Based mostly on a review of the existing literature and on the experience of the author, a new classification and diagrammatic representation of stratiform tungsten deposits is proposed. It includes three classes of deposits: 1) continental weathering deposits essentially of exogenic origin; 2) Exhalative-volcanogenic deposits divided into proximal, distal and metamorphic-amphibolite types; 3) Concordant replacement deposits divided into calc-silicate band and hornfels band types. An epigenetic two stage model is proposed for the formation of stratiform tungsten mineralizations associated with calc-silicate bands; this model can be applied to the genesis of Central Sweden tungsten deposits.	Stratiform Tungsten deposits: a review
VOLUME 67 NO 2-4 313	1988	67	2-4	313	332	Hellingwerf, R.H.; Lilljequist, R.; Ljung, S.	The stratiform Zn-Pb sulphide mineralization of the Älvtlängen-Vikern area, central Sweden, is contained in an iron-rich meta-sedimentary unit at the base of a sequence of dolomitic marble and metachert of Mid-Proterozoic age, deposited in a fault-bounded sedimentary basin. This basin probably developed during a phase of extensional tectonics. The mineralized unit is a steeply south-easterly dipping zone of 6 km long, extending from Lake Vikern in the NE to Lake Älvtlängen in the SW. Sphalerite, galena, magnetite and minor arsenopyrite, pyrite, pyrrhotite, chalcopyrite and marcasite occur in fine-grained, well banded and laminated garnet-biotite-cummingtonite-tourmaline-rich rocks of presumably sedimentary-exhalative origin. Characteristic are the small quantities of scapolite and orthite, and the high Ba and Cl contents of various micas and amphiboles. Apart from Zn, Pb, Fe, Mn, Ba and Cl the ore zone is enriched in As, Sb, Ag, Ba, Th, U, Ti, Cr, Co, Ni and V. A distinct metal (Zn + Pb à Fe + Mn + Ba) and mineral (sulphides + tourmaline + oxides + cummingtonite) zonation has been observed along the ore zone from the centre, where Zn and Pb contents are highest, to the margin of the basin. The marbles just below the ore zone are locally brecciated, showing network veins with phlogopite, tourmaline and traces of chalcopyrite and pyrrhotite, and corroded rhyolitic fragments. This brecciation of marbles is associated with extreme calc-silicate alteration of intercalated metatuffites and metacherts along veins and fractures. The breccias and calc-silicate alteration, occurring in narrow zones following the fault-bounded basin, are considered to represent hydrothermal feeder channels. The metapyroclastic rocks below the ore-hosting marbles are albitized,	Stratiform Zn-Pb-Fe-Mn mineralization in the Älvtlängen' Vikern area, Bergslagen, Sweden

VOLUME 67 NO 2-4 333	1988	67	2-4	333	348	Oen, I.S.; Hellingwerf, R.H.	<p>Metatuffites in a skarn- and sphalerite ore-bearing metatuffite-exhalite sequence near Nora, Bergslagen, Sweden, have preserved the petrographic structure of a felsic tuff with quartz pyroclasts in a very finegrained, strongly fractured and veined quartzo-feldspathic or sericite-rich matrix. Coeval differential compaction, recrystallization, and veining of tuffitic sediments is reflected by: parquet, rosette and parallel structures of micas; compaction-related 'ghost' veinlets, blind veinlets, and straight, folded, and refracted cross-veinlets; bending of schistosity around blind veinlets and quartz pyroclasts; rotation of pyroclasts in soft matrix; and compaction-controlled fracturing, veining, recrystallization and replacement of quartz pyroclasts, locally resulting in albite-quartz or carbonate-quartz pseudomorphs after the pyroclasts. Albite, garnet, scapolite, and other late mineral growths sequential to, but overlapping with the formation of the compaction-related structures, are indicated by: poikiloblasts in the pseudomorphs after quartz pyroclasts; late mineral growths in and along compaction-related veinlets; disseminated poikiloblasts traversed by compaction-related, often blind veinlets; and coarser grained bands and streaks of late minerals parallel to compaction banding. Garnet, scapolite, albite, carbonate, and other minerals show a layer-bound distribution. The paragenetic sequence of textures and minerals can be interpreted as the result of seafloor, soft rock hydrothermal metamorphism, involving interaction of different lithologies with hydrothermal fluids of rapidly changing PTX-characteristics, evolving from fluids in equilibrium with the host rocks to metasomatising fluids; these changes may be related to PTX-gradients around</p>	Textural evidence for seafloor, soft rock hydrothermal metamorphism in a garnet-scapolite-bearing metatuffite-exhalite - skarn-sphalerite ore sequence, Nora, Bergslagen, Sweden
VOLUME 67 NO 2-4 349	1988	67	2-4	349	355	Kieft, C.; Eriksson, G.	<p>The ores of Sågmurgruvan consist of nearly massive magnetite with locally important concentrations of sulfides: pyrite, pyrrhotite, iron-rich sphalerite, galena, very minor chalcopyrite and accessory cobaltite, linnaeite and Ag minerals. The Ag minerals are native Ag, acanthite, stephanite and pyrargyrite. However, the majority of the Ag is present as minute, nearly submicroscopic, inclusions of native Ag in porous pyrite. Younger granite, in contact with the massive magnetite-sulfide ores, locally contains small amounts of sulfides (pyrite, galena and nearly iron-free sphalerite) and rather large grains of native Ag. The magnetite-sulfide ores are interpreted as the metamorphic equivalent of siliceous exhalative-sedimentary ores. Occasional spherical pyrite grains are thought to form relicts of the primary sedimentary texture. The mineralization in the granite is thought to originate from local selective remobilization of the magnetite-sulfide ore, caused by the hydrothermal activity accompanying the granite intrusion. The deposition of native Ag in the porous pyrite is probably a low temperature event, during retrogressive metamorphism.</p>	Cryptic silver mineralization in the magnetite-sulfide ore of Sågmurgruvan, Central Sweden

VOLUME 67 NO 2-4 357	1988	67	2-4	357	362	Zakrzewski, M.A.	The abandoned Ni-Cu ore deposits of southern Sweden are associated with Proterozoic mafic intrusions. Their mineralogy is similar to that of Sudbury-type deposits. The dominant primary sulphides are: pyrrhotite or pyrite, pentlandite, chalcopyrite and sphalerite. Pentlandite in ores with primary pyrite has a high Ni/Fe ratio and is associated with millerite and siegenite. Secondary minerals include pyrite after pyrrhotite, bravoite replacing secondary pyrite, violarite after pentlandite. There is strong evidence that the formation of the observed violarite took place on the mine dumps during the last 40 years.	Mineral parageneses of the sulphide ore deposits of Bergslagen metallogenic province: I. Ni-Cu deposits of southern Sweden
VOLUME 67 NO 2-4 363	1988	67	2-4	363	378	Baker, J.H.; Andersson, L.G.; Marinou, A.	Nickel sulphide breccias form an uncommon type of Ni mineralization. The development of a Proterozoic mafic breccia dyke and Ni-Cu-Fe skarn in felsic metavolcanic wall rocks at Annehill, Bergslagen, Sweden, is genetically related to the emplacement of a continental tholeiite dyke. Hydrothermal alteration prior to and during brecciation distinguishes this mineralization from intramagmatic Ni mineralizations. Breccia development can be divided into two stages: An initial pre-brecciation stage of pervasive alteration of the felsic metavolcanics produced minerals in the paragenetic order hydromuscovite-tourmaline-phlogopite-amphibole. Microprobe data shows this corresponds to B, F and Cl metasomatism respectively, and can be correlated with major element variations. High Ti mobility is demonstrated by the development of sphene poikiloblasts in the metavolcanics. A second stage of mechanical fracturing developed a 1 km long, up to 20m wide, breccia zone, with fragments of more or less altered metavolcanics in an amphibole matrix. Amphibole compositions become more Fe-rich closer to the tholeiitic dyke, which itself has undergone autometamorphism, with no magmatic minerals present. Fe and V provide the best indicators of chemical variation in the altered rocks, breccia dyke and tholeiite. Highest B contents coincide with highest K, Rb, Li and Co in the altered rocks. There is a steady decrease in Fe, V, Ti, Mn, Co, and P from the tholeiite through the breccia and pervasively altered metavolcanic to least altered metavolcanic. With decreasing Fe there is an increase in Ca, Mg, and K, and Fe also shows a positive correlation with Be, Pb, Sc and Eu. REE contents of pervasively altered and brecciated samples generally	Geochemical variations in a Proterozoic hydrothermal mafic breccia dyke related to Ni-Cu-Fe skarn mineralization at Annehill, Bergslagen, Sweden
VOLUME 67 NO 2-4 379	1988	67	2-4	379	395	Jasiński, A.W.	Both 2- and 3-dimensional activity diagrams for the MgO-Na ₂ O-K ₂ O-SiO ₂ -Al ₂ O ₃ -H ₂ O-HCl system at temperatures of 298 to 623 K and 1 bar pressure are presented, showing the stability fields and volumes of phlogopite, Mg-chlorite, muscovite, paragonite, microcline, albite, kaolinite, and Mg-, Na-, and K-montmorillonite. Additionally, the expressions of reaction constants also contain the pressure term. The geological application of these diagrams to geochemical interpretation is briefly discussed in relation to the formation of 1900 Ma phlogopite-Mg-chlorite-sericite-quartz rocks in W. Bergslagen, Central Sweden.	Activity diagrams for the MgO-Na ₂ O-K ₂ O-SiO ₂ -Al ₂ O ₃ -H ₂ O-HCl system in the temperature range 298 to 623 K and 1 bar pressure: application to the 1900 Ma phlogopite-Mg-chlorite-sericite schists of W. Bergslagen, Sweden

VOLUME 67_NO 2-4 397	1988	67	2-4	397	409	Trägårdh, J.	The Riddarhyttan Proterozoic predominantly felsic, alkali-enriched metavolcanic rocks have been affected by extensive synvolcanic hydrothermal Mg-alteration. After amphibolite facies metamorphism and deformation this is reflected in the occurrence of large elongated zones of tourmaline-bearing cordierite-micaquartz schists, spatially related to numerous volcanogenic-exhalative iron formations. Geochemical evidence suggests that seawater-based fluids caused substantial mobilization of both major and trace elements, resulting in the formation of Fe-depleted and Fe-enriched Mg-schists. The latter is commonly gradational to cordierite-anthophyllite wall-rocks. The geochemical pattern is compatible with subseafloor hydrothermal circulation leaching iron and minor amounts of base metals from the felsic volcanic rocks, the emerging fluids precipitating these elements close to exhalative vents.	Cordierite-mica-quartz schists in a Proterozoic volcanic iron ore-bearing terrain, Riddarhyttan area, Bergslagen, Sweden
VOLUME 67_NO 2-4 411	1988	67	2-4	411	424	Outhuis, J.H.M; Berkel, J.T. van	Felsic rocks with randomly orientated biotite crystals up to 1.5 cm long, occurring NE of Persberg, Sweden, are strongly recrystallized felsic metatuffites. There is a gradual transition from the surrounding weakly recrystallized to the strongly recrystallized metatuffites. Recrystallization resulted from hydrothermal alteration of the metavolcanic rocks, which also caused the development of mafic aggregates, mainly consisting of biotite and/or cordierite. Considerable mobility of major, trace and rare earth elements accompanied the hydrothermal alteration: the strongly recrystallized metatuffites are depleted in K, Rb, Ba and Sr, and enriched in Na, Fe, Mg, Zn, Zr, REE, Hf and W. Compared to their host rocks the mafic aggregates are depleted in Na, Si, Y, W, Th and REE, and enriched in K, Fe, Mg, Sc, Cr, Co, Ni, Ti, Zn, Rb, Sr, Ba and Cs. Mobility of Zr is illustrated by the morphological characteristics of the zircons present in the strongly recrystallized metatuffites and mafic aggregates. Many of the larger grains show a conspicuous zoning and it is argued that unusual clusters of small zircon grains, often occurring on the boundaries of quartz and albite grains, are probably non-magmatic. The hydrothermal alteration is thought to be driven by the ascending nearby Horsjö granite and enhanced by the Hyttjö gabbro-tonalite-granite which intruded shortly after the Horssjö granite and probably before the collapse of the hydrothermal system.	Petrographic and geochemical evidence for major and trace element metasomatism in recrystallized felsic metatuffites from the Persberg area, Bergslagen, Central Sweden

VOLUME 67 NO 2-4 425	1988	67	2-4	425	432	Valbracht, P.J.; Helmers, H.	Felsic metavolcanites of the Lower Leptite Group of the 1.9-1.8 Ga Svecokarelian Bergslagen Supracrustal Series, Sweden, are locally pervasively altered into actinolite-magnetite skarns, showing euhedral magnetite blasts in an amphibole matrix. The alteration comprises two stages: after complete albitization the felsic metavolcanites are characterized by extremely low K and high Na contents and LREE depleted patterns relative to least altered metavolcanites. Incipient replacement of albite by amphibole leads to enrichment in MgO, CaO and FeO*, whereas the light rare earth element (LREE) abundances remain unchanged. Subsequent massive actinolite growth in the matrix and in veins is characterized by a strong enrichment in MgO, CaO, FeO* and LREE.	Metasomatic alteration of a felsic metavolcanite to an actinolite skarn near Ställbergstorp: evidence for high LREE mobility
VOLUME 67 NO 2-4 433	1988	67	2-4	433	442	Damman, A.H.	The Gåsborn metamorphosed manganese iron ore horizon consists of Mn-poor (<1 wt% Mn) iron ore-bearing marbles and metavolcanics and manganese (5-25 wt% Mn) iron ore-bearing metavolcanics and metacherts, displaying lateral facies transitions. The ore horizon is concordantly intercalated in a pile of felsic metavolcanics. It shows a concentric zoning around two pipe-like structures which consist of extremely Mn-poor (<0.1 wt% Mn) iron ore-bearing Mg-enriched metavolcanics, located directly below the ore horizon. Major- and trace-element analyses suggest that (1) the ore horizon is of exhalative-sedimentary origin and (2) the Mg-enriched metavolcanics mark the top of a (now metamorphosed) conduit zone for hydrothermal fluids from which the ores were deposited	Exhalative-sedimentary manganese iron ores from the Gåsborn area, W. Bergslagen, Central Sweden

VOLUME 67 NO 2-4 443	1988	67	2-4	443	457	Ripa, M.	The Proterozoic Fe-Pb-Zn-Mn(-Ag) ores at Stollberg in Bergslagen ore province, south central Sweden were formed as stratiform, stratabound exhalites in a volcano-sedimentary environment. The surrounding rhyolitic rocks were altered hydrothermally. This alteration predominantly affected the foot-wall rocks. The metamorphic mineral assemblages in the altered rocks were formed during a subsequent episode of regional metamorphism. They comprise gedrite, biotite and muscovite, indicating chlorite and sericite as original hydrothermal alteration products. Structures resembling hydrothermal breccias support an alteration model. More than 2500 samples have been taken from drill-cores and outcrops, and analyzed for major and trace elements. The geochemistries and the densities of the least and the most altered samples have been used to estimate gains and losses during hydrothermal alteration. Fe, Mg, Mn, Ti and K have been added, whereas Si, Ca, and Na have been removed. Plotting elements along the length of a drill-core, cutting the karnaltered exhalitic horizon, shows that the exhalites comprise potassium-rich meta-volcanic material mixed with chemical precipitates. Relative to unaltered volcanites these rocks are richer in Si, Fe, Mg, Ca, Mn, Pb and Zn, and poorer in Ti, Al, Ba, Na and K. The metamorphic mineral assemblages (ortho- and clinoamphiboles, garnet, diopside, epidote, gahnite, cordierite, staurolite, serpentine/olivine, fluorite, calcite, quartz, micas and feldspar) are developed in rocks with a bulk marly composition.	Geochemistry of wall-rock alteration and of mixed volcanic-exhalative facies at the Proterozoic Stollberg FePb-Zn-Mn(-Ag)-deposit, Bergslagen, Sweden
VOLUME 67 NO 2-4 459	1988	67	2-4	459	465	Bode, P.; Meerten, T.G. van	Geological research groups at the universities of Amsterdam and Utrecht obtain multi-element concentration data of their samples to a large extent by instrumental neutron activation analysis. At the Interfaculty Reactor Institute (IRI) of the Delft University of Technology, a system for routine INAA has been adapted to be used by laymen (non-specialists in radiochemistry), thus enabling geologists to carry out the analyses themselves. Much attention has been paid in developing the technique to the incorporation of quality control procedures, to ensure that the results reflect a realistic situation. Routinely, about 40-45 elements (including 9 REE) are determined with adequate accuracy. Procedures, performance and organizational aspects are discussed and the application of analytical data to geological problems in the Bergslagen region of central Sweden is briefly illustrated.	Quality assessment and organizational aspects of multi-element analyses of geological material with the IRI-system for routine INAA
VOLUME 67 NO 2-4 467	1988	67	2-4	467	469	Boekschoten, G.J.; Raad, A.C. van der; Kenter, J.A.M.; Reymer, J.J.G.	At Grimsudden south of Grythyttan relatively well preserved limestones are present in a sequence of volcanoclastics of mid-proterozoic age. In these limestones textures were found that are characteristic for stromatolites.	Note on a mid-Proterozoic stromatolite limestone, south of Grythyttan, Bergslagen, Sweden

VOLUME 67 NO 2-4 471	1988	67	2-4	471	476	Lindblom, S.; Burke, E.		Raman spectrometry and microthermometry data on CO ₂ -CH ₄ -bearing fluid inclusions in late-orogenic quartz from the Saxberget Zn-Pb-Cu-Ag deposit, Central Sweden
VOLUME 68 NO 1 1	1989	68	1	1	24	Coleman, J.M.; Roberts, H.H.	Modern-day deltas exist in a wide variety of settings. Despite the various environmental contrasts, all actively prograding deltas have at least one common attribute: a river supplies clastic sediment to the coast and inner shelf more rapidly than it can be removed by marine processes. The most important processes controlling the geometry and landforms in deltas are climate, water and sediment discharge and its variability, river mouth processes, nearshore wave power, tides and tidal regime, nearshore currents, shelf slope, tectonics of the receiving basin, and receiving basin geometry. Many present-day deltas are experiencing relatively large coastal landloss; this results from the complex interaction of many physical, chemical, and biological processes that operate in the natural environment and, in more recent times, the processes induced by man's utilization of this environment. All of these processes operate at different scales and magnitudes, in both time and space; some are amenable to manipulation by man, while others are essentially out of his control. Natural processes include sea level changes, subsidence and compaction, changes in deltaic sites of deposition, catastrophic events such as hurrisanes, and biologically-induced factors. Man-induced factors include dams and levees, canal dredging, and fluid withdrawal.	Deltaic coastal wetlands

VOLUME 68 NO 1 25	1989	68	1	25	34	Martini, I.P.	<p>The Hudson Bay Lowland is a vast (325,000km²), flat (average slope 0.5m/km) physiographic region of Canada located to the southwest of James Bay and Hudson Bay. It is underlain by Paleozoic and Mesozoic rocks and bounded by Precambrian terrains. Thin Pleistocene till sheets, locally deposited on fluted terrains mantle most of the Lowland, and they are overlain by thin marine and coastal Holocene deposits which have formed during the ongoing regression from an early post-glacial sea, the Tyrrell sea. The present shores of the James Bay and Hudson Bay are but one stage of development of such regressive sequences. More than 90% of the vast emerged Lowland is covered by one of the largest cold wetlands and peatlands of the world. Up to 3-4m thick peats have developed in the last 5000 years in inland fens and raised bogs. Fresh water is the major resource of the area, both for hydroelectric power and/or irrigation on a continent wide scale. Other resources not yet fully evaluated, consist of mineral deposits on or near Precambrian inliers, hydrocarbons in the relatively thin Paleozoic sequence, and lignite, kaolin and quartz sand in Mesozoic terrains. The damage generated by any development in the area, must be carefully weighted against the worldwide importance of this vast peatland on gaseous fluxes and atmospheric balance. Furthermore the coastal zone of the Lowland is a major staging and breeding ground for polar bears, migratory birds and other species. Perhaps assurance of preservation of the still pristine natural Hudson Bay Lowland should be achieved by establishing it as an international heritage park.</p>	The Hudson Bay Lowland: major geologic features and assets
VOLUME 68 NO 1 35	1989	68	1	35	48	Ping, S.L.	<p>Cyclic morphological changes occur in the ebb-tidal delta system of Texel Inlet (The Netherlands). This geomorphological cycle lasts about 70 years. The cycle starts with the development of a main ebb channel in the southern half of the inlet. A large ebb delta shoal forms north of this ebb channel. The shoal grows upwards into the inter- to supra-tidal zone and moves eastwards under the influence of wind and waves. The flood channel north of the shoal is forced to rotate clockwise, and it approaches the shoreline of Texel. The marginal ebb channel in the southern part of the inlet develops due to the tidal currents deflected to the south by the eastward migrating shoal and slowly rotates clockwise, forced by the small flood marginal channel that adjoins the mainland coast to the east. The cycle is completed by shoal attachment to the southern tip of Texel Island, which causes the northern marginal channel of the inlet to be buried. The eastward migration rate of the shoals is about 60-70 m per year, which involves a sediment transport rate of order of 580 to 0.64 x 10⁶m³/year.</p>	Cyclic morphologic changes of the ebb-tidal delta, Texel Inlet, The Netherlands

VOLUME 68 NO 1 49	1989	68	1	49	72	Kooi, H.; Cloetingh, S.; Remmelts, G.	We present results of stratigraphic modelling and quantitative analysis of subsidence data for the southern part of the North Sea Basin. Tectonic subsidence curves are given for fifteen wells in the northernmost segment of the Dutch North Sea and the southern part of the Dutch Central Graben. These curves have been supplemented with tectonic subsidence curves for eight wells from the Broad Fourteens and West Netherlands Basins. Subsidence analysis and thermo-mechanical modelling show that Late Jurassic and Early Cretaceous multiple stretching phases with a finite duration are required to explain the observed stratigraphic record. Our analysis demonstrates the important role of intraplate stresses in the evolution of these basins. The paleo-stress curve inferred from the stratigraphic modelling shows a trend with a change from tensional and neutral stresses during Mesozoic times to a stress regime of more overall compressional character during Cenozoic times. Superimposed on this long-term trend are short-term stress fluctuations. This paleo-stress curve and the associated stratigraphic record of the Dutch North Sea Basin sheds light on the record of paleo-stress measurements in the Northwestern European platform and is consistent with data on the kinematic evolution of the Tethys belt. These findings demonstrate the key-importance of tectonics and stress-induced vertical motions - related to rifting events in the northern Atlantic region and the interaction of the Eurasian and African plates - in controlling the stratigraphic evolution of the North Sea Basin.	Intraplate stresses and the stratigraphic evolution of the North Sea Central Graben
VOLUME 68 NO 1 73	1989	68	1	73	105	Herngreen, G.F.W.; Wong, T.E.	The 'Late Jurassic' stratigraphy of the Dutch Central North Sea Graben is revised. The sediments, ranging in age from Callovian to Ryazanian, are grouped in two lithological units: the mainly non-marine Central Graben Group (with Lower Graben Sand, Middle Graben Shale, Upper Graben Sand, Puzzle Hole, and Delfland formations) and the distinct marine Scruff Group (with Kimmeridge Clay, Scruff Greensand, and Clay Deep formations). The latter two formations are new and are introduced formally. Basic palynological and micropaleontological data are included to support age assignments of various formations. Several log correlations, range charts, distribution maps, facies maps and seismic sections are given to illustrate the stratigraphic framework. Finally, a synopsis of the geological history is presented, with special attention to sea-level changes and ensuing coastal developments, illustrating the relationships with the Danish and Norwegian sectors.	Revision of the 'Late Jurassic' stratigraphy of the Dutch Central North Sea Graben

VOLUME 68 NO 1 107	1989	68	1	107	120	Zagwijn, W.H.	The Netherlands and the adjoining southern region of the North Sea form part of a subsiding area with a complicated tectonic and sedimentary history. This area was either a shallow sea or a coastal lowland. After a compressional stage at the onset of the Tertiary, tensional forces dominated from the Oligocene onward and induced the formation of an intraplate rift system. The relationship between this system and sediment supply by rivers originating in the hinterland is discussed. In the Quaternary, depocentres shifted considerably. Here a role was played by changes in sea level due to build up of inland ice and repeated climatic changes, leading to increased sediment discharge. In the later part of the Quaternary, inland ice itself invaded the basin and reshaped the landscape.	The Netherlands during the Tertiary and Quaternary: A case history of coastal Lowland evolution
VOLUME 68 NO 1 121	1989	68	1	121	129	Kurfurst, P.J.; Dallimore, S.R.	The coastal zone of the southern Beaufort Sea and Mackenzie Delta forms an extensive area of coastal lowlands in northern Canada. This region is underlain by unstable, perennially frozen soils subjected to high rates of marine erosion and deposition. The nearshore sediments off northern Richards Island are comprised of a wedge of Holocene marine sand, silt and clay underlain by early Wisconsinan sand and clay. The geothermal regime is complex, reflecting deep permafrost conditions established during a period of terrestrial exposure and more recent marine submergence, which results in moderating ground temperatures and creation of a thick thawed layer at the sea bottom. Geotechnical problems encountered in the nearshore area include frost heave of Holocene sediments, thaw settlement related to degradation of ground ice in the early Wisconsinan sediments, and ice push and scour effects. Onshore sediments consist of early Wisconsinan and older glacial, fluvial and marine sediments overlain by late Wisconsinan and Holocene, eolian and lacustrine sediments. Ground ice, which forms a significant volumetric component of the near-surface soils, occurs as pore ice, wedge ice, pingo ice and as massive bodies of segregated ice of various ages. Geotechnical problems in onshore areas include thaw settlement due to degradation of ground ice, creep of ice-rich soils and frost heave.	Geological and geotechnical conditions of the Beaufort Sea coastal zone, Arctic Canada

VOLUME 68 NO 1 131	1989	68	1	131	142	Bauduin, M.H.; Moes, C.J.B.	The Dutch Meuse - Rhine Delta mostly consists of Holocene clay and peat layers, overlying a Pleistocene sand substratum. The lowlands are below MSL, are protected against inundation by riverdikes and are mechanically drained. Time dependent variations of the river levels provoke time and distance dependent piezometric level responses in the Pleistocene sand layers. During storm surges, high piezometric pressures may reduce the bearing capacity of the embankment's foundation. Predictions of the maximum piezometric pressures are needed for safe and economic design of the dikes, taking into account the unsteadiness of groundwater flow during design storm surge. An analytical method allows to describe the piezometric response for both a tidal and step (surge) input. This method has been applied for the geo-hydrological conditions of the Meuse-Rhine delta: a pervious aquifer (Pleistocene stratum) overlain by an aquitard (Holocene layers) with time dependent leakage. The model accounts for the possible presence of a silt or mud layer between the river and the aquifer. If the calculated pressure in the sand somewhere exceeds the weight of the Holocene layers, pressure redistribution occurs and an area will be uplifted. The model can be adapted to this non-linearity and then allow to evaluate the time dependent length of the uplifted area and new piezometric levels. The model parameters can be obtained from measurements made during normal tides.	Time dependent groundwater flow under river embankments
VOLUME 68 NO 1 145	1989	68	1	145	146			Toekenning van het Erelidmaatschap aan Ir B.P. Hageman
VOLUME 68 NO 1 147	1989	68	1	147	148			Presentation of the Van Waterschoot van der Gracht medal to Dr M. Teichmüller
VOLUME 68 NO 1 149	1989	68	1	149	151			Toekenning van de Van Waterschoot van der Grachtpenning aan Dr J. Stuffken
VOLUME 68 NO 1 153	1989	68	1	153	155			Toekenning van de Van Waterschoot van der Grachtpenning aan Professor E. den Tex
VOLUME 68 NO 1 157	1989	68	1	157	158			Toekenning van de Van Waterschoot van der Grachtpenning aan Dr P.A. Ziegler
VOLUME 68 NO 1 v	1989	68	1	v	vii	Zwart, H.J.		Coastal lowlands Symposium: Geology and Geotechnology. Preface

VOLUME 68 NO 2 161	1989	68	2	161	174	Gans, W. de; Cleveringa, P.; Jagerman, R.	Lithostratigraphic and palynological research of the sediments in a small brook valley in the central part of the Netherlands demonstrates the existence of three sedimentary sequences. From the data four fluvial adjustments are derived and successively dated as 1) the end Pleniglacial-early late Weichselian, 2) the transition late Weichselian - Holocene, 3) the Boreal and 4) the Late Subatlantic. The fluvial adjustments are related to variations in water discharge due to climate and human impact. An attempt has been made to generalize the fluvial activity of the small drainage basins in the Netherlands since the Late Glacial	Late Weichselian and Holocene sedimentary history of the Leuvenumse beek valley (The Netherlands)
VOLUME 68 NO 2 175	1989	68	2	175	187	Huybrechts, W.	This paper presents an outline of lithologic and morphologic developments in the alluvial environment of the Mark Basin in Central Belgium during Post Glacial times. By means of about 900 borings the spatial arrangement and stratigraphic position of palaeomorphologic features and sedimentary units in different parts of the basin was reconstructed. This, together with the radiocarbon datings, offers an insight into Holocene palaeohydrologic conditions in the Mark River floodplain. The influence of prevailing topographic and geologic conditions in the basin, and changes in external factors, such as climate and man, on the developments in the floodplain are evaluated.	Palaeohydrologic conditions in the Mark River basin during the last 15,000 years

VOLUME 68 NO 2 189	1989	68	2	189	200	Oenema, O.	<p>Surface and core samples of sediment were taken from 3 types of mud depositional areas in the Eastern Scheldt in 1985-1986, before the completion of the Storm Surge Barrier. Total accumulation rates of clay and silt were highest ($100-200 \text{ Gg yr}^{-1}$) in abandoned channels. Clay and silt were also deposited in large quantities ($30-80 \text{ Gg yr}^{-1}$) in salt marshes, and were cycled in large amounts ($200-500 \text{ Gg yr}^{-1}$) in mussel banks by deposition of faeces and pseudo-faeces. In the latter habitat no net accumulation occurred, because equal amounts were resuspended by wave agitation and dredging. The balance of sediment input and accumulation indicated a net seaward flux of $80-1800 \text{ Mg day}^{-1}$ of clay + silt and $3-80 \text{ Mg day}^{-1}$ of organic carbon through the mouth of the Eastern Scheldt. Most of the sediment probably came from eroding Holocene deposits elsewhere in the Eastern Scheldt, and smaller amounts from fluvial influx. Analysis of their elemental composition indicated that a major source of the sediments was formed by sandy deposits with clayey laminae of subrecent Dunkirk age, and a minor source was older, more clayey Calais deposits. The sedimentation rates were highest ($5-15 \text{ cm yr}^{-1}$) in abandoned channels near dams and dikes. In such environments, seasonal variations in sedimentation rates were clearly reflected in cyclic changes of porosity and organic carbon concentrations in the sediment. Similar seasonal changes were observed in the sediment at the surface of sandy intertidal flats.</p>	Distribution and cycling of fine-grained sediment in the Eastern Scheldt, Southwest Netherlands
VOLUME 68 NO 2 201	1989	68	2	201	210	Stampfli, G.M.; Höcker, C.F.W.	<p>The 3-D seismic survey shot in the Tarraco concession area enables a very detailed analysis of the Messinian unconformity in that area. The revealed palaeomorphological features in combination with well data confirm that during the Messinian the sea level dropped rapidly and substantially, resulting in the erosion of a pre-Messinian shelf and slope sequence under subaerial conditions. The magnitude of the sea level drop is estimated to be about 2000m. The nature of the infill of the Messinian valleys indicates a rapid return to normal global sea level.</p>	Messinian palaeorelief from a 3-D seismic survey in the Tarraco concession area (Spanish Mediterranean Sea)

VOLUME 68 NO 2 211	1989	68	2	211	219	Schwan, J.	This paper considers the two-dimensional grain fabrics of 23 natural and 3 experimental aeolian sand deposits. The generally low strength of the fabrics is thought to be an inherent characteristic of the investigated sediment type rather than a result of postdepositional disturbance. On a statistical basis, the 26 fabric plots can be grouped into three types of distribution patterns. In the first type, unimodal preferred orientation of elongate grains is unambiguous. In the second type, unimodal preferred orientation is either weakly developed or absent. In the third type, preferred orientation is bimodal or polymodal. The natural fabric samples are from three different exposures of Weichselian aeolian coversand. The fabric data from these sites do not contradict other available information on the paleodirection of the sand-transporting wind. The experimental fabric samples were produced in a wind tunnel. The experiments suggest that particle alignment by wind occurs almost instantaneously and that fabric strength does not depend on mode of deposition.	Grain fabrics of natural and experimental low-angle aeolian sand deposits
VOLUME 68 NO 2 221	1989	68	2	221	235	Smet, M.E.M. de; Sumosusastro, P.A.; Siregar, I.; Marle, L.J. van	Two sections in Plio - Pleistocene basin deposits were measured and systematically sampled in the southwestern part of Seram, the largest island in the northern Banda Arc, Indonesia. A geohistory analysis of field and laboratory data allows for a reconstruction of the vertical movements of the area and demonstrates that the basement of southwestern Seram was subsiding at an average rate of 50 cm/ka during the Late Pliocene - Early Pleistocene, an episode of relative tectonic quiescence, following Late Miocene compressional deformation and uplift. In the Late Pleistocene, compressional deformation and uplift was renewed but differed in style and orientation from the Late Miocene events. This history of the basins in southwestern Seram is very similar to that of the oil producing basins in the northeastern part of the island. The Late Cenozoic tectonic history of Seram can be interpreted in the frame of regional plate motions. Due to an anticlockwise rotation of the island and a relatively north to northwestward motion of Irian Jaya, the overall tectonic regime in the area gradually changed from compressional in the Late Miocene to strike-slip in the Late Pliocene. Finally, collision of Seram with the continental crust of Irian Jaya resulted in renewed compressional deformation from the Late Pleistocene onwards.	Late Cenozoic geohistory of Seram, Indonesia
VOLUME 68 NO 2 237	1989	68	2	237	240	Jagt, J.W.M.; Kennedy, W.J.	A specimen of the scaphitid ammonite <i>Acanthoscaphites varians</i> (Lopuski, 1911) is described from the late Maastrichtian Vijlen Member of the Gulpen Formation as exposed in the SA Ciments Portland Liégeois (CPL) quarry at Haccourt, Liège, NE Belgium. This record constitutes an important addition to the ammonite fauna of the Maastrichtian type area.	<i>Acanthoscaphites varians</i> (Lopuski, 1911) (Ammonoidea) from the Upper Maastrichtian of Haccourt, NE Belgium

VOLUME 68 NO 2 241	1989	68	2	241	252	Langenberg, W.; Kalkreuth, W.; Dawson, R.	In addition to mapping areas of deformed coal-bearing strata, structural geological studies are used to explain coal rank variations, to predict the location of the thickened coal and to explain certain optical properties of coal. In the coalfields of the Canadian Rocky Mountains and Foothills, north of Grande Cache, Alberta, the level of coalification decreases progressively from the undeformed part of the Alberta basin towards the western edge of the Foothills. This decrease is due to a westward decrease in duration and depth of burial as a consequence of the timing of Laramide deformation across the area, indicating synorogenic coalification. Within the smaller Grande Cache area it can be shown that coalification ended after deformation and resulting uplift and erosion. The presence of optically biaxial vitrinite anisotropy may indicate the presence of a tectonic stress field during the later stages of burial and subsequent deformation. The maximum vitrinite reflectance axis is generally oriented parallel to fold axes in the area. Structurally thickened coal can be attributed to at least two structural positions: fold hinges and fold limbs. Dilatation occurs at chevron fold hinges and incompetent material, such as coal, flows into these dilatation zones. The resulting structure is similar in geometry to a saddle reef. Duplexes are present in fold limbs, where the roof thrust is the top and the floor thrust the bottom of the coal seam, resulting in tectonic thickening of the coal. These structurally thickened coals are important exploration targets. Prediction of structurally thickened coal by computer constructed down-plunge cross sections has proved useful in coal exploration in the Canadian Rocky Mountain Foothills.	Influences of structural setting on coal rank and thickness in the Grande Cache area, Alberta, Canada
VOLUME 68 NO 2 253	1989	68	2	253	256	Verschure, R.H.; Majjer, C.; Andriessen, P.A.M.	Two samples of the fine-grained acidic matrix of the Skår volcanic breccia about 16 km WNW of Kristiansand in Vest Agder, southwestern Norway were investigated by whole-rock K-Ar. The breccia is situated on the intersection of a WNW and a NNE trending tectonic line, associated with the NE trending 'Great Breccia', a major tectonic feature of southern Norway. The samples yielded Late Permian ages of $248 \pm 15\text{Ma}$ and $233 \pm 15\text{Ma}$. This indicates that the explosive Skår volcanism was related to the period of epeirogenesis that in southern Norway gave rise to the formation of the Oslo-graben and Hardangerfjord-Graben. Possibly there is a genetic connection between the acid volcanism at Skår and periodic alkaline mafic magmatism in the whole of northern Europe and parts of northern North America during the late Palaeozoic and the Mesozoic. The alkaline magmatism in the South Scandinavian Shield during this prolonged period might be an expression of a fundamental, mainly tensional 'Basin and Range-like' tectonic regime which prevailed in the northern hemisphere after the Caledonian orogeny and which lead to the opening of the Atlantic Ocean. The acid volcanic breccia erupted at Skår could be a product of contact-anatexis of crustal material generated by intruding alkaline basic magma.	Isotopic age determinations in South Norway: I. The Skår volcanic breccia, Greipstad, Vestagder

VOLUME 68 NO 2 257	1989	68	2	257	262	Rodgers, K.A.		The thermochemical behaviour of vivianite and vivianite/metavivianite admixtures from Borne (Netherlands) and Mangualde (Portugal)
VOLUME 68 NO 2 263	1989	68	2	263	270	Weijden, C.H. van der; Middelburg, J.J.; Gaans, P.F.M. van		Early diagenetic silica precipitation, in relation to redox boundaries and bacterial metabolism, in late Cretaceous chalk of the Maastrichtian type locality
VOLUME 68 NO 2 271	1989	68	2	271	275	Schuiling, R.D.	The accumulation of potentially harmful substances in our environment bears a close similarity to ore-forming processes; this is particularly evident in the case of inorganic pollutants. A look at the ways in which Nature minimizes the impact of high concentrations of toxic substances on the environment can provide inspiration for environmentally sound sanitation techniques. At variance with official environmental policies in the Netherlands, but in line with the basic aims of environmental science, it is often better to leave contaminated sites untouched, than to mobilize toxic substances during sanitation, or pretend to isolate them forever from contact with the biosphere.	Environmental technologies based on geochemical processes
VOLUME 68 NO 3 277	1989	68	3	277	284	Caris, J.P.T.; Thewessen, T.J.M.; Felix, R.	A cliff-face stretching north-south in the southwest part of the Netherlands, (from Halsteren to near the Belgium border) separates Holocene marine sediments from tidal and aeolian Pleistocene deposits. There is a difference of opinion regarding the age of the formation of this cliff-face. The main objective of this study was to verify the origin of this feature. To this end auger drilling and pollen analysis on peat was carried out. The cliff-face proved to have been formed by marine erosion during the Eemian.	Genesis of the cliff-face near Bergen op Zoom in the southwest of the Netherlands
VOLUME 68 NO 3 285	1989	68	3	285	296	Poel, A.B. van der	Permian (Zechstein-3) carbonates in the P6 block, the Netherlands' offshore, were deposited in a subtidal/intertidal-supratidal setting, in an overall shallowing-upwards mega sequence. Interpreted diagenetic events include in order of occurrence: lithification, dessication, early leaching, dolomitisation, anhydritisation, calcitisation and also late leaching, compaction/stylolitisation and late fracturation. The diagenetic sequence is related to the reconstructed burial history by plotting on a burial graph. Present diagenetic porosity (Moldic- intraparticle- vuggy- (enlarged) intercrystalline- fracture porosity) predates renewed hydrocarbon gas generation. Gas generation is continuing today.	A case study on the hydrocarbon geology of Upper Permian (Zechstein-3) carbonates in licence P6, the Netherlands' offshore.

VOLUME 68 NO 3 297	1989	68	3	297	300	Antia, E.E.	This study evaluates the prospects of a new dimensional attribute of swash marks, herein referred to as swash angle, as a signature of wave-beach interaction. Results from three open Atlantic sea coasts of Nigeria indicate predominantly obtuse swash angle values. Mean swash angle values and the deviation from the mean tend to increase on beaches exhibiting fine grain sizes, elevated tidal ranges and high dissipative process signatures. The converse is the case on the microtidal, coarse-grained reflective beaches. From the obtained results and other published information, it is conceptualized that for a given beach, smaller swash angle mean and deviation would express the potential towards rapid beach mobility. On the contrary, relatively stable beaches typical of the dissipative state would reveal large swash angle and large deviation of the latter.	Studies on swash marks and swash angles on texturally, tidally and morphodynamically-distinct beaches
VOLUME 68 NO 3 302	1989	68	3	302	302	Eeckhout, B. van den	special section	Microstructures in the Pyrenees - a tribute to Henk J. Zwart - introduction
VOLUME 68 NO 3 303	1989	68	3	303	312	Bons, A.J.	The metamorphic grade of the Seo Formation, South-Central Pyrenees, has been determined using illite crystallinity measurements. The total range of the illite crystallinity indices of the K ⁺ -saturated fraction <2 μm is 0.21-0.31 °2 Θ and averages 0.26 ± 0.03 °2 Θ, which indicates metamorphism in the high-grade part of the anchizone. This is in agreement with mineralogical data, such as the absence of expandable clay minerals and of metamorphic minerals such as biotite and epidote. Illite crystallinity indices of the detrital micas suggest that they were derived from igneous rocks or from rocks with at least epizonal grade of metamorphism.	Very low-grade metamorphism of the Seo Formation in the Orri Dome, South-Central Pyrenees
VOLUME 68 NO 3 313	1989	68	3	313	321	Corstanje, R.; Klepper, C.; Rutgers, B.; Wal, I.J. van der; Eeckhout, B. van den	Strain analysis has been carried out on (micro)conglomeratic Cambro-Ordovician sediments from the Pallaresa area (Axial Zone of central Pyrenees). Twenty strain ellipsoids have been determined. After correction for refolding and faulting a bulk finite strain ellipsoid for the area was calculated. This ellipsoid has k-value 3.43 and low axial ratios (X/Y = 1.24, Y/Z:1.07). The ellipsoid has a long axis (X) plunging steeply NE, an intermediate axis (Y) parallel to the gently WNW plunging mean fold axis of the area, and a nearly horizontal south plunging short axis (Z). The shortening direction (Z) is normal to the steep N-NNE dipping cleavage. During deformation the sediment pile in the area must have undergone vertical tectonic thickening by factor 1.15. It is argued that this value is a minimal estimate and inhomogenous deformation must be taken into account.	Quantification of finite strain in the Pyrenean Slate Belt; a first assessment using R _i /Φ method

VOLUME 68 NO 3 323	1989	68	3	323	333	Kriegsman, L.M.; Aerden, D.G.A.M.; Bakker, R.J.; Brok, S.W.J. den; Schutjens, P.M.T.M.	Four deformation phases have been distinguished in the Cambro-Ordovician metasediments of the eastern Lys-Caillaouas massif. D1 only affected rocks of a stratigraphic unit below and Ordovician metaconglomerate horizon and is of pre-Variscan age. During D2 tight folds with steep E-W trending axial plane foliations S2 have formed, indicating N-S shortening. D3 consists of: (i) porphyroblast rotation, (ii) formation of gently dipping crenulation cleavages S3 and (iii) transposition of S2 to S3 in highest grade metamorphic rocks. D3 is interpreted as vertical shortening and horizontal extension. Both D2 and D3 are of Variscan age. D4 includes various deformation phenomena of unknown age, postdating peak metamorphism. Metamorphism started at the end of D2 and continued until after D3. Three phases have been distinguished: plurifacial regional metamorphism M1 and M3 and contact metamorphism M2 around the Lys-Caillaouas porphyritic biotite granite. This study shows that Variscan N-S shortening in the eastern Lys-Caillaouas massif was followed by metamorphism and crustal extension. Flat-lying structures overprinted steep structures during the extensional phase. Peak metamorphism was reached afterwards.	Variscan tectonometamorphic evolution of the eastern Lys-Caillaouas massif, Central Pyrenees - evidence for late orogenic extension prior to peak metamorphism
VOLUME 68 NO 3 335	1989	68	3	335	344	Kriegsman, L.M.	Low grade metamorphic rocks in the Trois Seigneurs massif characteristically exhibit steep foliations axial planar to tight folds, indicating horizontal shortening. An older deformation phase is indicated by a considerable spread of intersection lineations with bedding on the steep foliations. The steep foliations have been folded into a kilometre-scale inclined fold, which has a crenulation cleavage subparallel to the axial plane. Rotation sense of porphyroblasts, in medium to high grade rocks, is different in each limb of this fold. The fold is argued to result from late Variscan vertical shortening and horizontal extension following crustal thickening. The massif is transected by the Cap de las Costes fault, inferred to be a strike-slip fault with 5-6 km sinistral offset. Variscan metamorphism in the Trois Seigneurs massif started after the shortening phase and reached peak temperatures after the extensional phase. It is not related to a rifting event, as proposed by Wickham & Oxburgh (1985), but to late orogenic extension after considerable crustal thickening.	Deformation and metamorphism in the Trois Seigneurs massif, Pyrenees - evidence against a rift setting for its Variscan evolution

VOLUME 68 NO 3 345	1989	68	3	345	356	Gibson, R.L.	previous interpretations of the structure of the Canigou massif have related the development of the regional foliation to tectonic emplacement of the Canigou orthogneisses within the Infracaradocian sediments (Guitard 1970, Casas 1978, Lagarde 1978). Re-investigation of the structural evolution of the massif has shown that the regional foliation (S3) is preceded by the development of a pervasive S1 foliation and localized large-scale D2 folding. D2 folds affect the contact between the Canigou orthogneisses and underlying metasediments, indicating that the orthogneisses were emplaced within the sedimentary sequence prior to the development of the regional foliation. S3 is a subhorizontal crenulation foliation subparallel to S0-S1, except locally where D2 folding results in a more discordant relationship. Regional doming of S3 is associated with post-D3 folding and mylonite development. Porphyroblast-matrix microtextural relationships indicate that the peak of Hercynian low-P-high-T regional metamorphism is synchronous with progressive development of S3. Complex S_1/S_2 geometries indicate that deformation was inhomogeneous on a small scale.	The relationship between deformation and metamorphism in the Canigou Massif, Pyrenees: a case study
VOLUME 68 NO 3 357	1989	68	3	357	366	Soliva, J.; Salel, J.F.; Brunel, M.	The Canigou gneiss nappe is one of the most striking features developed during Variscan convergent tectonics in the Pyrenean chain. The Canigou structure is classically interpreted as a recumbent fold nappe. New data concerned with kinematic analysis of the deformation argue for the importance of thrusting tectonic imprints. Shear criteria analysis indicates that the main transport direction was towards the SW. The mylonitic shear zone described from the bottom of the Canigou gneiss is assumed to represent a main ductile thrust zone, with a magnitude of transport in excess of 30 km.	Shear deformation and emplacement of the gneissic Canigou thrust nappe (Eastern Pyrenees)
VOLUME 68 NO 3 367	1989	68	3	367	375	Bresser, J.H.P de	Orientations of calcite c-axes have been measured in limestones from the eastern part of the Gavarnie thrust zone, central Pyrenees. They show preferred orientations (textures) with one or more maxima. By comparing the textures with existing experimental and theoretical data, it was possible a) to confirm the regional sense of movement along the thrust, b) to interpret a significant contribution of pure shear to the total strain in the thrust zone, and c) to recognize natural patterns which have not been reported before. It is suggested that the studied limestone samples were deformed at a temperature of about 200° C in a transitional regime with textures ranging from low to high temperature types. Specific rock properties may have governed the local predominance of a high or conversely of a low temperature type. The data, however, appear to exclude grain size as a controlling factor.	Calcite c-axis textures along the Gavarnie thrust zone, central Pyrenees
VOLUME 68 NO 3 377	1989	68	3	377	380	Brok, S.W.J. den		Evidence for pre-Variscan deformation Central Pyrenees, France

VOLUME 68 NO 4 381	1989	68	4	381	390	Guerrera, F.; Veneri, F.	Numerous volcaniclastic deposits are found interbedded in several Neogene-Pleistocene units of the Apennines. They are mostly the result of volcanic activity that was contemporaneous with sedimentation and they thus have a specific geodynamic significance. These volcaniclastites are indicative of periods of intense volcanic activity (e.g. Aquitanian-Burdigalian-Langhian), alternating with periods of lesser activity (e.g. post-evaporitic Messinian). Periods of increased volcanic activity must be attributed to important tectonic phases in the Mediterranean area. Moreover, a migration of volcaniclastic products towards the external zones of the Apennines can be observed. The composition of the pyroclastites suggests an origin from calc-alkaline magmas that were generated in volcanic arcs probably developed on continental crust. No comprehensive hypothesis on the location of the Neogene-Pleistocene effusive centres has been put forward up to now. Nevertheless, some areas, such as the Po Plain and the Tyrrhenian zone, are particularly suspicious in this respect.	Neogene and pleistocene volcaniclastites of the Apennines (Italy).
VOLUME 68 NO 4 391	1989	68	4	391	408	Robaszynski, F.; Christensen, W.K.	The Upper Campanian-Lower Maastrichtian chalks of the Mons Basin in Belgium, in ascending order, Craie de Trivières, Craie d'Obourg, Craie de Nouvelles, Craie de Spiennes, and Craie Phosphatée de Cibly, are tentatively placed in the international stratigraphic framework on the basis of preliminary studies of belemnites and foraminifera, as well as some other macrofossils. The top of the Craie de Trivières, the Craie d'Obourg, the Craie de Nouvelles are from the lower part of the Upper Campanian, and the basal 10-12 m of the Craie de Spiennes from the upper part of the Upper Campanian. The Craie Phosphatée is regarded to be from the upper part of the lower Lower Maastrichtian. <i>Résumé</i> . Le Campanien supérieur-Maastrichtien inférieur du Bassin de Mons est constitué du bas vers le haut des Craies de Trivières, d'Obourg, de Nouvelles, de Spiennes et de Cibly. Ces différents niveaux de craie qui ont valeur de formations sont replacés dans le cadre stratigraphique international sur la base d'études préliminaires des bélemnites, de quelques autres groupes de macrofossiles et des foraminifères. Le sommet de la Craie de Trivières, la Craie d'Obourg et la Craie de Nouvelles sont attribués à la partie inférieure du Campanien supérieur et les 10 à 12 m de base de la Craie de Spiennes à la partie supérieure du Campanien supérieur. La Craie Phosphatée de Cibly est considérée comme appartenant à la partie supérieure du Maastrichtien inférieur, partie inférieure.	The upper Campanian-Lower Maastrichtian chalks of the Mons basin, Belgium: a preliminary study of belemnites and foraminifera in the Harmignies and Cibly areas

VOLUME 68 NO 4 409	1989	68	4	409	419	Hofstede, J.L.A.; Berendsen, H.J.A.; Janssen, C.R.	In the Holocene river basin 'Het Broek' (Fig. 1) fluvial deposition of clay by six different river systems alternated with peat formation. The accumulation rate of peat in the backswamps between 8000 BP and 4000 BP was fairly constant; it averaged about 7,5 cm/century. Pollen analysis and radiocarbon dating were used to determine phases of fluvial activity. Both the lithostratigraphy and the pollen diagram reflect a number of flooding phases. Phases of fluvial deposition do not seem to be synchronous with those in the perimarine area, farther to the west. A clear decline of elm contemporaneously with a maximum in the ash values in the Early Neolithic is discussed in terms of changes in the water regime of the river and possible human interactions.	Holocene palaeogeography and palaeoecology of the fluvial area near Maurik (Neder-Betuwe, The Netherlands)
VOLUME 68 NO 4 421	1989	68	4	421	432	Kleverlaan, K.	The Tabernas Basin is a structural depression in the Alpine nappes of the Betic Cordilleras in southeastern Spain. From the Tortonian to the Plio/Pleistocene, sedimentation in this basin was strongly influenced by tectonic activity. At the onset of the Tortonian, basin subsidence caused submergence of an alluvial fan system and a small submarine fan complex developed in a water depth of at least 600 m. Total basin subsidence was in the order of 1200 m. Initial Tortonian submarine fan growth and evolution of fan systems has been reconstructed and is shown in 6 palinspastic maps. In the early Messinian, sediment accumulation on the fan, and basement rise caused a regressive trend. Reefs along the NW margin of the basin were part of a regional barrier reef system and muddy sediments were deposited in its centre. Prior to the development of an evaporitic phase, uplift and emergence of the eastern half of the basin took place along NW-SE trending faults. During this evaporitic phase, selenitic gypsum formed on the muddy sediments of the still submerged sea floor of the western half of the basin. At the Messinian-Pliocene boundary, folding and emergence of the sea floor coincided with the genesis of an anticlinorium in the south: this is the now emerged Sierra Alhamilla. From Pliocene onward, after a short period of subsidence, uplift prevailed contributing to the development of a southward prograding fan delta in the western part of the basin. The structural and depositional history of the basin seems to agree with its setting within a strike-slip zone. Movement along this zone is associated with the convergence of the African and Iberian lithospheric plates.	Neogene history of the Tabernas basin (SE Spain) and its Tortonian submarine fan development
VOLUME 68 NO 4 421	1989	68	4	421	432	Kleverlaan, K.	Enclosure	Neogene history of the Tabernas basin (SE Spain) and its Tortonian submarine fan development

VOLUME 68 NO 4 433	1989	68	4	433	443	Alphen, J.S.L.J. van; Damoiseaux, M.A.	The last decades there has been a steady encroachment of human activities into the Dutch marine environment. Knowledge about the seafloor lithology and geomorphology is imperative for further development of the Continental Shelf but also for a proper management of the shoreface, beaches and dunes, that act as a sea defence for the densely populated, low lying areas of Holland. To ensure that the coastal strip retains this function in the future, an understanding of its morphodynamics and its governing processes is of primary importance, especially in view of the projected rise in sea level. Within this framework, a geomorphological map, scale 1:250.000, has been prepared of the Dutch coastal region and adjacent part of the continental shelf which shows the distribution and characteristics of major morphological elements below the LW-line such as the shoreface, ebbdelta's with related shoals and channels, tidal ridges and sandwaves. In this paper the units identified on the map are described and their origin and behaviour is discussed.	A geomorphological map of the Dutch shoreface and adjacent part of the continental shelf
VOLUME 68 NO 4 433	1989	68	4	433	443	Alphen, J.S.L.J. van; Damoiseaux, M.A.	Middle Sheet	A geomorphological map of the Dutch shoreface and adjacent part of the continental shelf
VOLUME 68 NO 4 433	1989	68	4	433	443	Alphen, J.S.L.J. van; Damoiseaux, M.A.	North Sheet	A geomorphological map of the Dutch shoreface and adjacent part of the continental shelf
VOLUME 68 NO 4 433	1989	68	4	433	443	Alphen, J.S.L.J. van; Damoiseaux, M.A.	South Sheet	A geomorphological map of the Dutch shoreface and adjacent part of the continental shelf
VOLUME 68 NO 4 433	1989	68	4	433	443	Alphen, J.S.L.J. van; Damoiseaux, M.A.	West Sheet	A geomorphological map of the Dutch shoreface and adjacent part of the continental shelf
VOLUME 68 NO 4 445	1989	68	4	445	454	Bredewout, J.W.	In the framework of the first National Research Program for Geothermal Energy in The Netherlands, geophysical measurements were performed in an area in the Dutch province of Limburg and the adjacent part of Germany, covering the Erkelenz intrusive. Surface magnetic data confirm the magnetic anomaly known from the German magnetic maps. That anomaly had been interpreted by Bosum (1965) to be caused by a huge intrusive of basic composition (the Erkelenz intrusive). The gravity data, those at the surface as well as those measured in the Sophia Jacoba colliery, do not show a big anomaly. This agrees better with an intrusive of acid than one of basic composition and it means that relatively high temperatures can still be expected due to radio-active heat production. The existence of high temperatures in the past could be proven by analysis of rock samples from the colliery. For recent high temperatures there are a few indications.	The character of the Erkelenz intrusive as derived from geophysical data
VOLUME 68 NO 4 455	1989	68	4	455	459	Ganssen, G.; Rondeel, H.E.; McGee, T.M.; Linden, W.J.M. van der; Westerhof, A.B.		Book reviews
VOLUME 68 NO 4 461	1989	68	4	461	463	Jordaans, J.K.H.		In memoriam ir. A. Hellemans

VOLUME 69 NO 1 1	1990	69	1	1	2	Wamel, W.A. van		Dedication to Professor Dr. Ernst ten Haaf, preface special issue on the structural geology of the Northern Appenines, Italy
VOLUME 69 NO 1 3	1990	69	1	3	17	Drury, M.R.; Hoogerduin Strating, E.H.; Vissers, R.L.M.	In the Erro-Tobbio peridotite three generations of shear zone structures are developed in granular peridotite: peridotite tectonites, peridotite mylonites and serpentinite mylonites. Peridotite tectonites occur in a kilometre-scale shear zone developed under estimated conditions of 1100 to 1220°C and 16 ± 6 kbar, and flow stresses between 4 and 11 MPa. The deformation in this shear zone involved dislocation creep and concurrent recrystallization of olivine by a combination of subgrain rotation and extensive grain boundary migration. With decreasing pressure and temperature and increasing flow stress, spinel peridotite mylonites (T= 800-925°C, P = 6-8 kbar, σ = 93-153 MPa) and chlorite peridotite mylonites (T = 550-800°C, P = 4-6 kbar, σ = 331-786 MPa) developed in up to hundred metre scale shear zones transecting the peridotite tectonites. The mylonitic microstructures suggest that dynamic recrystallization of olivine occurred by a mechanism involving grain boundary bulging to nucleate new strain free grains. In addition, 'fluidal' microstructures dominated by pyroxene clasts with tails of fine-grained amphiboles suggest that superplastic mechanisms may have been operative in these mylonites. The sequence of tectonite shear zones followed by peridotite mylonites is inferred to result from the progressive ascent of asthenospheric peridotites during opening of the Mesozoic Piemonte-Ligurian ocean. Serpentinite mylonites, developed at temperatures of 300-550°C and pressures of about 4kbar, are observed in shear zones mostly associated with ductile overthrusting and imbrication. These structures are clearly related to nappe emplacement during Alpine collision.	Shear zone structures and microstructures in mantle peridotites from the Voltri massif, Ligurian Alps, N.W.. Italy

VOLUME 69 NO 1 19	1990	69	1	19	29	Thio, H.K.; Wamel, W.A. van	Comprehensive structural geologic studies reveal a complex tectonic history of the Antola and Lavagna Nappes. Within the slightly metamorphic Lavagna Nappe the effect of five phases of folding have been established. The first phase (F1) is characterized by large isoclinal folds with an originally southwestern vergence. During the second phase (F2) large-scale open folding took place, whereas F3 and F4 produced folds with a northeastern vergence on a regional scale. These first four phases all produced co-axial folds with NW-SE trends. F5-folds are open and have an approximately NE-SW trend. Internal thrusting, associated with F1 and F3 has been established. After a first period of folding, the non-metamorphic rock sequences of the Antola Nappe thrust over the Lavagna Nappe. Associated with this, thrusting within the S part of the Lavagna Nappe took place. The first four folding phases of the Lavagna Nappe and its metamorphism were achieved prior to nappe-emplacment. The mutual stacking of the Antola and Lavagna Nappes must have taken place before the Eocene-Oligocene transition. Only F5 postdates the nappe-emplacment.	The Lavagna and Antola Nappes in the upper Lavagna and Bisagno Valleys (N. Italy)
VOLUME 69 NO 1 31	1990	69	1	31	41	Hoogerduin Strating, E.H.	Basin development in the Jurassic-Cretaceous Piemonte-Ligurian ocean as inferred from geological data is compared with a model for folding of oceanic lithosphere and subsequent flexuring due to sediment loading. According to the model, basins with a width between 130 and 160 kilometres and a relative depth ranging from 2000 to 2500 metres will develop on oceanic lithosphere with a cooling age between 35 and 55 My. These results are in good agreement with the dimensions of the Internal and External Ligurian basins, calculated from geological reconstructions. Furthermore, the model provides an explanation for the occurrence of slumps and olistostromes observed in the sedimentary record from the Aptian onwards, and for the extensive erosion on the 'Bracco Ridge', a submarine high which separated the Internal from the External Ligurian basin.	Folding of lithosphere in the Piemonte-Ligurian ocean

VOLUME 69 NO 1 43	1990	69	1	43	52	Berg, L. van den	<p>The mechanics and geometry of thin-skinned tectonic wedges are a function of the parameters top and basal slope, strength of wedge and basal layer, pore-fluid pressure and sea level. An analysis of a mechanical model, that takes these parameters into account, shows that alternating submarine and subaerial conditions can have important consequences for the stability of such a wedge. The model is applied to the Northern Apennines. It can explain multiple phases of gravitational sliding in the Ligurian scaly clay melanges. The contrasting style of deformation of different tectonic units, and temporary suppression of synsedimentary thrusting in the Romagnan sequences can also be explained by this model. It is shown that gravity spreading, induced by brittle-ductile transition, provides a mechanism which can explain the metamorphic gap at the tectonic boundary between the doubled Tuscan sequences in the Alpi Apuane, as well as the simultaneous spreading at the rear and the shortening at the front of the Northern Apennine foldbelt.</p>	<p>Application of a mechanical model to the Northern Apennines, with special reference to the effect of sea level changes</p>
VOLUME 69 NO 1 53	1990	69	1	53	68	Wamel, W.A. van; Zwart, P.E.	<p>Combined stratigraphic and structural geologic studies in the region of the Upper Savio- and Upper Bidente Valleys lead to a re-interpretation of the Romagnan-Umbrian thrust zone, especially of the extent of the Castellaccio thrust unit. The Romagnan-Umbrian thrust zone may be characterized as a generally piggy back propagated, imbricate stack with a complex evolution. The presence of a time equivalent turbidite marker bed (= 'Contessa Bed') within all thrust units enabled the balancing and restoration of the Romagnan-Umbrian thrustzone. The minimum amount of shortening of the 'Contessa Bed' appears to be about 48% of its original length. Folding accounted for about 49% and thrusting for about 51% of the total amount of shortening. The restoration indicates that, during the 'Contessa' event (dated as the Early Serravallian <i>Globozotilia peripheroronda</i> Zone: 14-14,5 Ma), the Romagnan-Umbrian turbidite basin had a minimum NE-SW width of 50km. After the 'Contessa' event, still during the Early Serravallian, an anticlinal culmination (= the San Paolo high) formed within the Romagnan-Umbrian turbidite basin, probably generated by blind thrusting during the Serravallian and Early Tortonian. On top of the anticlinal culmination a condensed section of clayey San Paolo Marls accumulated until the Middle Tortonian (9-10 Ma). The more calcareous Veghereto Marls have been deposited on the SW dipping limb of the San Paolo anticlinal culmination. During the Middle Tortonian (9-10Ma) sedimentation in the SW part of the Romagnan-Umbrian turbidite basin was abruptly terminated by the Ligurian overthrust. Simultaneously or shortly thereafter, the Romagnan-Umbrian sequences were also intensively folded and thrust. The Romagnan-</p>	<p>The structural geology and basin development of the Romagnan-Umbrian zone (Upper Savio- and Upper Bidente Valleys, N. Italy)</p>

VOLUME 69 NO 1 69	1990	69	1	69	86	Feyter, A.J. de; Molenaar, N.; Piali, G.; Menichetti, M.; Veneri, F.	The Northern Apennines are characterized by more or less severely deformed clastic wedges which originated in elongate foredeeps. These foredeeps were generated successively at the expense of the Adriatic Foreland. A thick turbidite sequence accumulated in the Umbro-Romagnan Foredeep during the Middle to Late Miocene. The variability of this sequence indicates that sedimentation and deformation patterns migrated within individual foredeeps. Marked facies and thickness changes were caused by the successive subsidence of foredeep segments in response to ensialic shearing. Subsequent multi-level gravitational spreading resulted in the development of synformal sub-basins at a later stage of the turbidite cycle within the successive foredeep segments. The gravity displacement structures in the M. Pollo Syncline in the Umbro-Marchean Apennines support such a differentiation. Additional ensialic shearing caused the out-of-sequence evolution of some thin-skinned structures. Ultimately, these were preferentially affected by extension tectonics associated with Tyrrhenian crustal stretching.	Palaeotectonic significance of gravity displacement structures in the Miocene turbidite series of the M. Pollo Syncline (Umbro-Marchean Apennines, Italy)
VOLUME 69 NO 1 87	1990	69	1	87	89	Rondeel, H.E.; Schlager, W.; Boekschoten, G.J.; Vandenberghe, J.		Book reviews
VOLUME 69 NO 2 93	1990	69	2	93	103	Marle, L.J. van; Smet, M.E.M. de	Field and laboratory data on Cenozoic deposits of the islands of Kai Kecil and Kai Besar provide broad age-depth constraints, but are insufficient for a detailed geohistory analysis to determine the timing, rate and magnitude of vertical movements in the eastern segment of the outer Banda Arc. Yet, a tentative reconstruction of the vertical movements of the islands could be made. On Kai Besar, lower bathyal-upper abyssal Middle-Late Eocene calcilutites and marls, in combination with Upper Oligocene and Lower-Middle Miocene middle bathyal deposits record an Eocene-Miocene passive margin fill. Kai Besar must have emerged sometime during the Late Miocene to Pliocene-Pleistocene, associated with the development of the Banda Arc thrust belt. The absence of elevated coral reefs, which are present on surrounding islands, suggests that the island is presently subsiding. On Kai Kecil, Late Pleistocene middle bathyal bioclastic turbidites and marls are nowadays situated just above sea level documenting uplift rates up to 500 cm/ka. In contrast to Kai Besar, Kai Kecil has 4-5 elevated reefs, unconformably overlying the Pleistocene core, showing that the island continues to rise.	Notes on the Late Cenozoic history of the Kai Islands, Eastern Indonesia

VOLUME 69 NO 2 105	1990	69	2	105	120	Bouvier, J.D.; Gevers, E.C.A.; Wigley, P.L.	<p>The objectives of a seismic study of the Amposta Marino field, offshore Spain, were threefold: firstly, to map the top of the main karstified reservoir (C horizon) accurately in order to identify any possibly remaining attic oil; secondly, to map and interpret a sub-horizontal, semi-continuous anomalous reflection (C2 horizon) within the karstified Montsia carbonate reservoir; thirdly, to assess the feasibility of predicting porosity in karstified reservoirs. 1. The acoustic impedence at the interface between cap rock and top reservoir can be increasing or decreasing, depending on the degree of karstification. Hence, the top reservoir reflection can be positive or negative. This interpretation problem, once recognised, could be solved and led to improvements in the structural map. 2. The synthetic seismogram, logs and drilling records of well AMB-10 indicate that the C2 horizon represents a porous karstic layer. It occurs as a semi-continuous, sub-horizontal feature around the flanks of the structure. Distribution of the C2 marker and also the reservoir performance data and geological history of the Amposta Marino field indicate that the actual porosity system in the Montsia reservoir could be the product of an originally compartmentalised porosity network (resulting from karstification) with greatly increased lateral communication as a result of subsequent mixing-zone corrosion. The C2 event is interpreted as a high-porosity layer caused by a sea level stillstand which allowed intense mixing-zone corrosion to occur. 3. The areal distribution of collapse breccia and cave development can be mapped by displaying the root mean square of the amplitude measured in a window corresponding to the karstified reservoir. Qualitatively, areas with high amplitudes</p>	3-D Seismic interpretation and lateral prediction of the Amposta Marino field (Spanish Mediterranean Sea)
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VOLUME 69 NO 2 121	1990	69	2	121	131	Imeokparia, E.G.; Badejoko, T.A.	<p>The Shere Igneous Complex comprises a sequence of metaluminous-peraluminous and peralkaline granites in the following order: (1) a central amphibole-fayalite granite, metaluminous in the core and peralkaline towards the margin; (2) a mildly peraluminous biotite granite in the east of the complex; (3) a peralkaline arfvedsonite-aegirine granite forming a peripheral ring around the central amphibole fayalite granite; (4) a peralkaline arfvedsonite-biotite granite forming a semi-circular body between (1) and (3); and (5) a peralkaline albite-arfvedsonite granite forming an outer semi-circular intrusion in the west of the complex. The peralkaline and metaluminous/peraluminous granites show some overlap of agpaitic indices, but marked dissimilarities in trace element characteristics. The amphibole-fayalite granite has high contents of Ba, Sr, Zr and low contents of Rb, Th, Y and Li. The biotite granite is enriched in Rb, Y, Th, Li, F relative to the amphibole-fayalite granite and is presumably crystallized from a differentiated magma produced by fractional crystallization of the amphibole-fayalite granite magma. The arfvedsonite-aegirine granite, the arfvedsonite-biotite granite and the albite-arfvedsonite granite are enriched in HFS elements and strongly depleted in Sr and Ba; these granites are presumably associated with a fluorine-bearing phase carrying high concentrations of HFS and other trace elements. This volatile phase has caused metasomatic alterations in surrounding rocks. The part of the arfvedsonite-biotite granite that is characterized by extreme levels of HFS elements is believed to have formed by metasomatic alteration of amphibole-fayalite granite along the contacts with arfvedsonite-biotite granite. The granitic magmas were presumably</p>	<p>The Shere Igneous Complex, Central Nigeria, geochemical constraints on the origin of peralkaline and associated granites</p>
VOLUME 69 NO 2 133	1990	69	2	133	150	Thorp, M.B.; Thomas, M.F.; Martin, T.; Whalley, W.B.	<p>Widespread Quaternary alluvial sediments occur around the coastal margins of western Kalimantan. These strongly podzolised 'white sands' occur as major alluvial bodies that may be 15-20m higher than Holocene/ contemporary floodplains inland but converge and pass beneath them towards a near coastal hinge line. It is presumed that the sediments continue off-shore and correlate with previously documented 'Alluvial Complex' sequences on the submerged areas of Sundaland. Microscopic and SEM examination of quartz indicates minimum wear on most grains, and the alluvial sediments can be distinguished clearly from those of contemporary beach environments. Their extent, morphology and sedimentary characteristics indicate rapid aggradation within coastal catchments, and some formations appear to be low angle, wet alluvial fans. Radiocarbon assay indicates ages greater than 40000 RC yr BP for the sediments with 2 finite dates of 54200 +3400/-2400 RC yr BP and 51000 +2100/-1700 RC yr BP. It is concluded that they were laid down during low sea levels and by rapid erosion and deposition possibly caused by increased seasonality of rainfall, decreased total precipitation and associated ecological changes. Neogene tectonic movements may also affect their disposition.</p>	<p>Late Pleistocene sedimentation and landform development in western Kalimantan (Indonesian Borneo)</p>

VOLUME 69 NO 2 151	1990	69	2	151	158	Joon, B.; Laban, C.; Meer, J.J.M. van der	Compilation of available data from boreholes and seismic surveys in the Dutch part of the North Sea has led to a new map of Saale glacial features. The distribution of Saale sediments in this map in combination with the morphology enable a tentative reconstruction of the Saalian ice margin parallel to the Dutch coast. This suggests a revision of recent theories of Saale glacial events based on land data.	The Saalian glaciation in the Dutch part of the North Sea
VOLUME 69 NO 2 159	1990	69	2	159	171	Dill, H.	Fan deposits from the Stockheim, Erbendorf, Weiden and Schmidgaden Basins in the immediate surroundings of the Mid-European Variscan basement contain translucent and opaque heavy mineral assemblages which have been strongly controlled by intrabasinal (volcanism, hydrothermal activity and weathering) and extrabasinal (provenance) parameters. Sediments of this marginal facies are less intensively altered by diagenesis than equivalent beds in the basin centre. Therefore, the amount and type of heavy minerals present in these depositional basins may contribute to basin and provenance analyses of these terrigenous fan sediments. Pyroclastic fan deposits contain smaller amounts of allogenic heavy minerals and in places they have a larger proportion of authigenic heavy minerals than found in alluvial fans. Crystal habits of zircon, apatite and anatase or mineral ratios (e.g. anatase/Fe silicate) are supplementary tools for the determination of sediment sources related to denudation of metamorphic rocks or bear a significant volcanic-derived influx. Deeply circulating waters and paleosols may be recognized on the basis of mineral transformation in the system Fe-Ti-O (giving rise to plates of anatase) and by a conspicuous depletion of particularly phosphates. Moreover, the heavy minerals in the fan deposits are an immediate response to the basement uplift in the hinterland. The history of basin subsidence, denudation of the basement and even the P-T slope of the metamorphic source area may be inferred from the reverse order of heavy minerals discovered in the foreland. This will work well if metapsammopelitic rocks are present in the hinterland, but less well, if ultrabasic rocks occur in the source area. This procedure may	Variation in heavy mineral associations of Permo-Carboniferous fan sequences (Southern Germany); Their implications concerning provenance and basin evolution

VOLUME 69 NO 2 173	1990	69	2	173	178	Schwan, J.	In contrast to the Late Dryas Stadial aeolian coversands in the Netherlands, there are no frost structures in their approximately coeval counterparts in north Lincolnshire, England. Faunal evidence for cold conditions in the latter category can be reconciled with the absence of cryogenic deformations by assuming that the annual snow cover was thick enough to insulate the sands from frost action. This paper discusses two types of postdepositional deformations in the north Lincolnshire coversands to which, at first glance, a cryogenic origin might be attributed. It is shown, however, that nonperiglacial processes account more adequately for their presence in these deposits. Involutions associated with a hydromorphic paleosol are due to unequal loading and slow upward percolation of ground water when the sands that underlie the contorted layer were waterlogged during some period in the past. Fissures reminiscent of frost cracks, are interpreted as tension gashes produced by a slight updoming of the clayey or shaley substrate of the coversands in the proximity of cuesta scarp-faces.	Noncryogenic deformations in Loch Lomond Stadial to Early Flandrian coversands in North Lincolnshire, England
VOLUME 69 NO 2 179	1990	69	2	179	185	Jagt, J.W.M.; Michels, G.P.H.	The discovery of six additional specimens of the brissid echinoid <i>Cyclaster platornatus</i> Kutscher, 1978 in the lower part of the Vijlen Member (Gulpen Formation) as exposed at the SA Ciments Portland Liègeois (CPL) quarry near Haccourt (Liège, Belgium) enables an analysis of its range of variation. Sexual dimorphism as reflected in the size of the gonopores, which has previously been described in the literature for two species of <i>Cyclaster</i> , can now possibly be demonstrated for <i>C. platornatus</i> as well. Some remarks on the biostratigraphy and macrofauna of the Vijlen Member at this locality are added.	Additional note on the echinoid genus <i>Cyclaster</i> from the Late Maastrichtian of northeastern Belgium

VOLUME 69 NO 2 187	1990	69	2	187	204	Smit, J.	At present the two major hypotheses to explain the mass-extinctions at the Cretaceous-Tertiary boundary (KTB) are a large meteorite impact and widespread volcanism. High resolution stratigraphy across the Cretaceous-Tertiary boundary in the Agost and Caravaca sections in Spain provides a test for these hypotheses. Hard to explain by any sort of volcanism are the shocked minerals, stishovite and the round form and distribution of microtektite remains, which are found worldwide at the KTB. It is now likely that several impacts occurred simultaneously. The low REE-abundances in the KT ejecta layer and quench crystals of clinopyroxene and other crystalline textures in the KTB microtektites betray an impact in ocean-floor basalt, whereas shocked quartz and stishovite favour a continental target. Stable oxygen and carbon isotope studies of both sections offer a glimpse of what catastrophic environmental changes may in fact have caused the extinctions. Carbon isotopes show that photosynthesis was strongly reduced at the KTB. A 8°C rise in ocean surface temperatures indicates that a greenhouse atmosphere followed the impact event. This greenhouse atmosphere may have lasted for several thousands of years.	Meteorite impact, extinctions and the Cretaceous-Tertiary Boundary
VOLUME 69 NO 3 205	1990	69	3	205	206	Cleef, A.; Geel, B. van; Hooghiemstra, H.; Roeleveld, W.; Wijmstra, T.A.		Preface - Palynology, a key to climatic and geographic change - A tribute to Thomas van der Hammen
VOLUME 69 NO 3 207	1990	69	3	207	218	Ran, E.T.H.; Bohncke, S.J.P.; Huissteden, K.J. van; Vandenberghe, J.	An ice-wedge cast level, dated between ca 41,000 and 36,600 years BP. has been found in Tubantian (Weichselian) deposits near Hengelo (Twente district, Eastern Netherlands). So far, well developed ice-wedge casts of Middle Pleniglacial age have not been recorded for the Netherlands. It is argued that mean annual temperatures were near the upper limit to permit ice-wedge development. In that case substrate and hydrological conditions are critical. Sedimentary structures overlying the ice-wedge cast level point to thaw lake development. Palaeoecological evidence shows that the sequence started in open (periodically running) water. Under a declining water budget a phase with terrestrial peat sedimentation was initiated which, after a short interval, culminated in an increasingly dry environment as indicated by xerophilous taxa. The ice-wedge cast level is associated with taxa indicative of bare, disturbed grounds and with the break up of a continuous vegetation cover. Subsequently a phase with (temporary) running water, predominantly standing, shallow water and a return to running water are recognized. The top of the sequence shows a vegetation which can be compared with a chionophilous arctic dwarf shrub tundra. Vegetation development could be explained in terms of changing moisture conditions, while temperature changes are of minor importance.	Evidence of episodic permafrost conditions during the Weichselian Middle Pleniglacial in the Hengelo Basin (The Netherlands)

VOLUME 69 NO 3 219	1990	69	3	219	225	Zagwijn, W.H.	Macroscopical remains of the following genera in the Early Pliocene flora found near Brunssum (The Netherlands) are described: Calamus, Hartia, Spirematospermum, Symplocos, Toddalia, Trigonobalanus, Turpinia. These genera have a subtropical character; their recent representatives occur in evergreen subtropical and tropical montane forests. Only two of them have been found in other Early pliocene deposits in Europe, but all of them have been recorded in Miocene beds in this area. The relict character of part of the Brunssum flora is discussed in relation to palaeogeographic and climatic factors. Of special interest is a comparison with a living assemblage associated with Trigonobalanus in the Andean forest of Colombia (South America).	Subtropical relicts in the Pliocene flora of Brunssum (The Netherlands)
VOLUME 69 NO 3 227	1990	69	3	227	241	Gotjé, W.; Wayjen, M.C.A. van; Geel, B. van	A peat deposit from a valley in the Hautes-Fagnes was studied palynologically. The radiocarbon-dated pollen profile spans most of the Holocene and constitutes one of the most detailed records of post-glacial vegetational changes in E. Belgium. The peat formation started near a Betula-Pinus forest and five regional pollen zones could be distinguished. The first zone is dominated by Pinus and, Betula (preboreal), the second by Corylus (Boreal) and the third by Alnus (Atlantic). The elm decline and the first signs of human influence characterize the fourth zone (Subboreal). The fifth zone (Subatlanticum) shows maxima of Fagus and Carpinus and an obvious increase of human influence (e.g., Cerealia). The peat succession in situ took place under mesotrophic conditions as a consequence of the geographical situation of the site near the rivulet Helle. Although there has been some variation in the moisture conditions at the site, the drainage in the valley was so constant that extreme fluctuations did not occur.	A palynological study of a Holocene deposits from Grand-Bongard (Hautes-Fagnes, Belgium)

VOLUME 69 NO 3 243	1990	69	3	243	251	Wijmstra, T.A.; Young, R.; Witte, H.J.L.	An analysis of the different interglacial forest phases and glacial steppe phases in the vegetation history of northern Greece, as recorded in the first 86 metres of the Tenagi Philippon core, resulted in the distinction of three forest vegetations and one steppe vegetation. From the comparison of those vegetation data with the present day occurrence of the various forest and steppe vegetations and the corresponding climatic data, an estimation of climatic conditions (temperature and precipitation) during the Late Quaternary was made. Typically, in the beginning of the interglacials an open forest vegetation characterized by Pistacia was found, indicative for warm conditions and wet summers and winters. Relatively soon summers became drier, forcing an evergreen oak forest to develop. During the second half of the interglacials deciduous forests and cool, wet conditions prevailed. At the glacial maxima a dry continental climate with cold winters accompanied a steppe vegetation. The results suggest that winter conditions are more important in determining the nature of the vegetation in the Mediterranean and that the maquis and garrigue are purely man made vegetations, as its elements occurred in different periods in the past.	An evaluation of the climatic conditions during the Late Quaternary in northern Greece by means of multivariate analysis of palynological data and comparison with recent phytosociological and climatic data
VOLUME 69 NO 3 253	1990	69	3	253	262	Kolstrup, E.	Palaeobotanical records of many Weichselian deposits indicate stands of vegetation poor in trees and with elements from a range of different environments. The scarcity of trees seems in cases to contradict the prevailing temperature regime as suggested, for example, by records deduced from beetles. Alternative explanations for the recorded combination of plant species are considered. Examples of the influence of periglacial forms and processes on vegetation are given, followed by a more speculative account of the effect of swift climatic changes during the Weichselian. Unstable environmental and climatic conditions are thought to have been particularly effective in controlling the composition of what is today considered to have been a singular combination of plant species. Unstable conditions are also thought to have played a role in hampering the development of continuous palaeobotanical records in NW-Europe. The palaeobotanical data derive from a variety of geographical environments, and as a result it is almost impossible to integrate the scattered findings into a coherent whole so as to elucidate the former ecological conditions. It is suggested that in future investigations one must look for additional possibilities of correlation, such as phases of aeolian activity, deposition of charcoal resulting from natural fires or other discernible events of restricted duration.	The puzzle of Weichselian vegetation types poor in trees

VOLUME 69 NO 3 263	1990	69	3	263	278	Lorente, M.A.	Four subenvironments (oxbow lake, back swamp/flood basin, crevasse splay, natural levee) from the Orinoco Upper Delta plain were sampled for quantitative analysis of organic matter. Each subenvironment has been characterized on the basis of two main criteria: organic matter composition and textural characteristics. The Oxbow lake model has two main subdivisions related to the influence of the dry and rainy seasons on the organic assemblages. The rainy season assemblages are rich in light-coloured organic matter, with abundant fungal and insect remains, are usually coarse grained, and have a highly variable particle shape. The dry season assemblages are relatively poor, the organic matter is darker and the finest grain size is scarcely represented. The Montrichardia backswamp/flood basin model is also related to the flood - and the dry periods of the basin. Dry periods in the flood basin are characterized by very poor organic matter assemblages consisting of fine grains of woody and humic gels. The flood stages are characterized by a very high content of organic remains of variable composition. The crevasse splay model assemblage is characterized by a strong bimodal distribution of the grain size, and by fluctuations in the amount of organic matter preserved at different levels of the fan. The natural levee model assemblage is highly variable in the organic matter content and composition, and shows a wide range of particle grain sizes varying from medium sand to clay.	Textural characteristics of organic matter Orinoco Upper Delta
VOLUME 69 NO 3 279	1990	69	3	279	290	Kroonenberg, S.B.; Bakker, J.G.M.; Wiel, A.M. van der	An analysis of published and newly obtained data on the timing of uplift in the Colombian Andes shows that some areas were already uplifted above the (present) forest line as early as 16 Ma ago. Elsewhere early uplift data (Oligocene- Mid-Miocene) have only been obtained from elevations below 3000m. Most other areas above 3000 m reached their present altitude only after 6-4 Ma ago by more recent uplift or by the formation of stratovolcanoes on dissected planation surfaces. Accretion of the Panamanian isthmus between 7-3 Ma may have been contemporaneous with the latter, most vigorous Plio-Pleistocene uplift phase in the northernmost Colombian Andes but cannot be related to the earlier phases in the whole Andean chain. The accretion enabled immigration of holarctic species into the Andes. There is no reason to suppose a topographic interruption in the Andean Chain at the Huancabamba deflection during the Tertiary, and hence immigration of australantarctic species depended only on the presence of suitable high-Andean climatic conditions along the whole of the Andean chain.	Late Cenozoic uplift and paleogeography of the Colombian Andes: constraints on the development of high-andean biota

VOLUME 69 NO 3 291	1990	69	3	291	304	Schokking, F.	Sub-glacial deformation processes of ice sheets are recorded in geotechnical and structural properties of overridden sediments. Geotechnical, structural and microstructural properties were determined of Late-Pleistocene lacustral clays in the northern Netherlands that were subjected to deformation by the Saalian ice sheet. From these properties a sub-glacial deformation model could be constructed of the clay sequence, depicting an extensively sheared upper zone and a lower zone that was folded, hydrodynamically consolidated and fissured during subsequent phases of ice sheet development. This sub-glacial deformation model can serve as a basis for a model of the distribution of geotechnical properties of the clays which has applications in engineering geology and geotechnical engineering.	A sub-glacial sediment deformation model from geotechnical and structural properties of an overconsolidated lacustral clay
VOLUME 69 NO 3 305	1990	69	3	305	312	Schokking, F.	The consolidation history of cohesive soils can be estimated on the basis of the one-dimensional consolidation theory of Terzaghi. An effective stress profile, which existed during the steady state of the Saalian ice sheet, has been reconstructed from the results of a series of oedometer consolidation tests on a vertical sequence of Pot Clay (Marum, Province of Groningen, The Netherlands). From this effective stress profile and from geotechnical and structural properties, a fossil overburden pressure of 2100 kN/m ² could be estimated, which would have required an ice cover of at least 195 m thick. A comparison of the results of this study with geotechnical data from other locations in the northern Netherlands and a comparable research in northern Germany confirmed the regional significance of the study described in this paper.	On estimating the thickness of the Saalian ice sheet from a vertical profile of preconsolidation loads of a lacustral clay
VOLUME 69 NO 3 313	1990	69	3	313	317	Westerhof, A.B.; Bosscher, H.; Reymer, J.J.G.; Meer, J.J.M. van der; Reymer, J.J.G.		Book reviews
VOLUME 69 NO 4 319	1990	69	4	319	326	Langereis, C.G.; Kars, H.	A kiln used for the burning of limestone was found in the town centre of Nijmegen (The Netherlands) and was sampled for archaeomagnetic dating purposes, since at the time of excavation archaeological dating materials were still absent. Samples taken from the kiln wall generally yield consistent characteristic remanent magnetizations. The mean direction is compared with the archaeomagnetic calibration curve for Britain. The result shows that the kiln is of Roman age rather than belonging to the Middle Ages. Combined with the few archaeological data found later, an age in the 4th century AD is most probable.	Archaeomagnetic dating of a limestone kiln at Nijmegen (The Netherlands)

VOLUME 69 NO 4 327	1990	69	4	327	340	Kasse, C.	An almost complete Early-Pleistocene sequence of the Tegelen and Kedichem Formation has been studied in the southern Netherlands and northern Belgium. Former Dutch and Belgian lithostratigraphic units are correlated and a new, more detailed lithostratigraphic framework is proposed. The provenance of the sediments was established by heavy mineral and gravel analysis. Rhine, Meuse and rivers from the Scheldt basin contributed their sediments to the southern North Sea basin during different stages of the Early-Pleistocene. The major importance of the rivers from the Scheldt basin in the upbuilding of the sedimentary sequence is emphasized.	Lithostratigraphy and provenance of the Early-Pleistocene deposits in the southern Netherlands and northern Belgium
VOLUME 69 NO 4 341	1990	69	4	341	350	Meulen, S. van der	Attention is drawn to an extraordinary type of large-scale cryoturbation in the Tjonger Valley fill (NE Netherlands). A large lateral displacement of sediments, involving sand and till intrusion, is the most conspicuous feature. Sand intrusion has been found especially in gyttja and peat, whereas till and some loam intruded into sand. In the former case elongated ridges, some 10's x 100's metres wide, exhibit dipping layers, partly with extensive folding and some thrustplanes. Till intruded from part of the valley margin into sand layers with an abundance of flow structures and some rare thrusts. Intrusion of the sand into gyttja and peat presents opportunities to date the event. The first indications point towards an early Holocene age. Major cryoturbation was previously only known from the Pleniglacial of the last ice age in the Netherlands. Density inversions over thawing permafrost, in a watersaturated environment, are thought to have induced gravity spreading in the vast, but discontinuous layers of various compositions. The type of cryoturbatic structure encountered within deposits not only strongly varies with composition, but also with the dimensions of layers of the same composition.	Major lateral sediment displacement in till-sand-peat associations of the Tjonger Valley fill (the NE Netherlands) - Holocene cryoturbation?
VOLUME 69 NO 4 351	1990	69	4	351	357	Kloprogge, J.T.; Eerden, A.M.J. van der; Jansen, J.B.H.; Geus, J.W.	Na-beidellite was hydrothermally synthesized using various starting materials at a range of P-T conditions. The best crystallized Na-beidellite was carefully investigated with XRD, SEM, TGA, MAS-NMR and IR-spectroscopy. Cell parameters are: $a = 5.18 \pm 0.005 \text{ \AA}$; $b = 8.96 \pm 0.008 \text{ \AA}$; $c = 12,54 \pm 0.011 \text{ \AA}$; $V = 581.9 \pm 0.5 \text{ \AA}^3$. Indexing is based on an orthorhombic cell. ^{29}Si MAS-NMR reveal three peak positions: - 92.7 ppm (Si-OAl); - 88.4 ppm (Si-1Al); - 82.3 ppm (Si-2Al), indicating an $\text{Al}^{\text{IV}}/\text{Si}$ ratio of 0.106 per unit cell. The presence of small amounts of F in the hydrothermal fluid causes a significant increase in crystallinity. Na-beidellite is the only crystalline product applying a starting gel of composition $\text{Na}_{0.7}\text{Al}_{4.7}\text{Si}_{7.3}\text{O}_{22}$. A $\text{Na}_{1.0}\text{Al}_{5.0}\text{Si}_{7.0}\text{O}_{22}$ gel results in Na-beidellite + paragonite and gels with higher Na content produce only paragonite.	Hydrothermal synthesis of Na-beidellite

VOLUME 69_NO 4 359	1990	69	4	359	373	Moura, M.L.; Kroonenberg, S.B.	<p>Bulk chemical analyses of Quaternary sediments in the southeastern Netherlands show that sands from the middle terraces of the Meuse in South Limburg are significantly lower in SiO₂ and higher in almost all other analysed major and minor elements than mixed Meuse and Rhine sediments in North Limburg and adjacent areas. Within individual formations in North Limburg the Sterksel and Urk formation are characterized by relatively high Al, Fe, Mg, K and Rb and low Zr contents, the Kreftenheije Formation and Nuenen Group by low Rb and high Zr contents, whereas the Veghel Formation has both low Rb and low Zr contents. Principal component analysis is used to assign well-correlated element groups to individual minerals. Factor 1 (65% of the total variance) is composed of Fe, Al, Mg, K, As, Sc, Cs, Rb, Th and the LREE and is interpreted as a muscovite/goethite factor. Factor 2 (13% of the total variance), is dominated by Na, Ca, Al, Mg, K, Th and Sr and is interpreted as a feldspar factor. Factor 3 (7% of the total variance), is composed of Zr, Nb, Cr, Ti, V and Lu, elements concentrated in some stable heavy minerals. High levels of Factor 1 elements in South-Limburg sands are interpreted to be due to admixture of large amounts of shale fragments, muscovite and goethite particles. Depletion of Rb in eolian sands is interpreted to differential winnowing of micas during deflation. The concentration of many elements is also strongly grain-size dependent. Geochemical analysis is shown to provide much additional information not normally detected in routine petrographic analysis.</p>	Geochemistry of Quaternary fluvial and eolian sediments in the southeastern Netherlands
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VOLUME 69_NO 4 375	1990	69	4	375	390	Galli, G.	<p>Three undulating, large-scale bedforms occur within a 20km wide lagoon which was probably generated by syndimentary tectonic processes in a Jurassic shallow water rimmed platform (Trento Platform, Italy). Bedform 1 resembles hummocky cross stratification and consists of domes and troughs which display a downcurrent increase in wavelength and decrease in amplitude. Bedform 2 is composed of low-angle undulating foresets whose downcurrent structural variations over 300 m of stratigraphic exposure mimic smaller-scale climbing-wave ripple lamination. Bedform 3 consists of three large-scale stacked 'giant ripples'. Internal characteristics (shell fabrics) of bedforms reflect a complex storm action that was ineffective as sediment transport mechanism but produced an 'in situ' reorientation of shells through strong shear stress and local pressure pulses on and below the lagoonal floor. These bedforms were generated by tsunamis as evidenced by: 1) the action of surface waves; 2) a great lateral extent of exposures; 3) the restriction of bedforms to the same stratigraphic horizon (correlated by means of 'event correlation'). Bedform 1 was produced by first-order impulse-generated waves progressing discontinuously along the deepest area of the lagoon; bedforms 2 and 3 reflect bottom return flows. The trajectory system has been tentatively explained by the hydrodynamic configuration of impulse waves propagating at supercritical conditions around a lateral obstacle.</p>	Origin of event beds in the Jurassic Çalçari Grigi' Formation, Venetian Alps, Italy
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VOLUME 69 NO 4 391	1990	69	4	391	406	Priem, H.N.A.	<p>Comparative planetology has brought to light some general themes in the geological evolution of planets and planetary bodies. Particularly the study of the Moon and the Earth-like planets Venus and Mars has contributed much to the understanding of the early evolution of the Earth. All have sizes and distances to the Sun of the same order of magnitude, are primarily composed of cosmically rare silicates and metals, and underwent differentiation into core, mantle and crust. The crust is basaltic on Venus and Mars, while on the Moon the crust is anorthositic in the highlands and basaltic in the maria. Earth has, besides a basaltic crust in the ocean basins, as the only planet in the Solar System a continental crust of average dioritic composition. This continental crust owes its genesis to the interaction between ocean water, basaltic crust, and mantle dynamics. All planetary bodies suffered an intense bombardment of meteoroids early in their histories. Impacting was probably the dominant geological process in that time, but on Earth virtually no traces of the early impacts are preserved because of later geological activities. The differences in environmental conditions and geological evolution between Venus, Mars and Earth are primarily determined by differences in size (cooling rate and gravity) and distance to the Sun (solar energy input). Only Earth has a hospitable environment suitable for life - conditions that are maintained by the biosphere. On Venus infernal conditions prevail, with a surface temperature of 480°C, an atmosphere almost entirely composed of CO₂, an atmospheric surface pressure of 88 bar, and no water. Very little is known about tectonic activities because of the dense sulfuric-acid cloud cover, but volcanism appears to be still active. Mars is a barren</p>	Strange relatives - Earth and her sibling neighbours
VOLUME 69 NO 4 407	1990	69	4	407	416	Davies, E.C.; Bloxam, T.W.	<p>Late Precambrian volcanic rocks near St. David's, Pembrokeshire (U.K.) constitute a bimodal basalt-rhyolite assemblage. A new structural interpretation changes the presently accepted stratigraphical succession, the main effect of which is to place the Rhosson basalts at the base rather than at the top of the sequence. The olivine bearing basalts are subaerial and are normative olivine tholeiites. They have immobile element distributions characteristic of non arc environments. Unusual types of basaltic agglomerate and lapilli tuffs are described some of which may be tuff-lavas or hot debris flows. The rhyolitic rocks comprise lavas, breccias and ash flows, the latter being reported for the first time from the Precambrian of this area. They were also subaerially erupted and the bimodal basalt-rhyolite association may be a post calcalkali phase of eruption on continental crust; possibly in an ensialic back arc environment.</p>	Petrology and geochemistry of late Precambrian volcanic rocks of the St. David's area, Pembrokeshire, South Wales (U.K.)

VOLUME 69 NO 4 417	1990	69	4	417	428	Douma, J.; Helbig, K.; Schokking, F.; Tempels, J.	Vertical seismic profiling using shear waves showed seismic anisotropy in the shallow 'Pot-Clay' sequence in the northern parts of The Netherlands. Shear-wave splitting, a key identifier for anisotropy, was observed at various depth using a multi-offset/multi-azimuth data acquisition technique. For the first time in such investigations, a three-component geophone mounted in a penetration cone was used. This technique resulted in improved data quality. A hodogram analysis of the shear wave data showed that fissures with strike and dip as specified by geological and geotechnical data cannot explain all observations of shear-wave splitting.	Shear-wave splitting in shallow clays observed in a multi-offset and walk-around VSP
VOLUME 69 NO 4 429	1990	69	4	429	433			Book reviews
VOLUME 69 NO 4 435	1990	69	4	435	438			Presentation of the Honorary Membership to Dr H.E. Rondeel
VOLUME 70 NO 1 1	1991	70	1	1	19	Chamley, H.; Müller, D.W.	X-ray diffraction and electron microscope investigations were performed on late Miocene sediments of the Fortuna Basin. Results were compared to available paleogeographic data and were interpreted in terms of terrigenous sources, climate, tectonics and sea level changes. Biostratigraphic and chronologic data allow the use of clay stratigraphy in providing paleoenvironmental information. The Western Mediterranean domain was subject to periods of strong aridification as early as late Tortonian. On the land climate was dominated by subarid conditions, favouring the development of pedogenic smectites and probably palygorskite. Tectonic activity rejuvenated the region episodically, especially after the Tortonian-Messinian boundary (lower Sanel marls), at the beginning of upper evaporites deposition (marine marl/gypsum alternations of the Rambla Salada Formation), and probably when the intra-Messinian inundation started. The sea level changes appear to have been of little importance in controlling the clay sedimentation patterns in the Eastern Betic seaway during late Miocene times.	Clay mineralogy in southeast Spain during the Late Miocene: climatic, paleoceanographic and the tectonic events in the Eastern Betic seaway

VOLUME 70 NO 1 21	1991	70	1	21	33	Dijkmans, J.W.A.; Wintle, A.G.	A thermoluminescence dating study of eolian sands was performed for methodological purposes. The twelve samples that were dated include Upper Pleniglacial and Late Glacial coversands as well as late Holocene drift sands from stratigraphically well-known, partly ¹⁴ C dated exposures, along the Dinkel river in the eastern Netherlands. A new approach was used to determine the equivalent dose (ED) after previous attempts were unsatisfactory. This approach proved promising, enabling to establish an ED value with a small uncertainty. However, the present results show that most of the TL ages of the Weichselian coversands are too low by about 20-40% compared to the radiocarbon dates, although some samples do not disagree with the geological evidence. This problem has also been encountered for coversand samples from Denmark and the reason is not yet fully understood. In spite of the problems that still exist TL proved a powerful method to distinguish between eolian sands with a relatively large age difference. It is still questionable whether TL dating enables a distinction between lithostratigraphical units of the Weichselian coversands in NW Europe.	Methodological problems in thermoluminescence dating of Weichselian coversand and late Holocene drift sand from the Lutterzand area, E. Netherlands
VOLUME 70 NO 1 35	1991	70	1	35	38	Aleva, G.J.J.		Tropical weathering, denudation and mineral accumulation
VOLUME 70 NO 1 39	1991	70	1	39	44	Okonkwo, C.T.	The Koriga iron-formation is located in the Kushaka Schist belt of north-western Nigeria. It occurs as thin intercalations in the phyllites and pelitic schists which also contain concordant bands of amphibolite. A Kibaran (ca 1100Ma) age has been suggested for the rocks of the Kushaka Schist belt which have been intruded by granitic rocks dated ca 600Ma. The iron-formation consists dominantly of silicate minerals: grunerite, spessartine-rich almandine garnet, quartz and some martite, but occasional thin, more oxide-rich bands with martite, magnetite and silicate minerals also occur. Fe ₂ O ₃ , (total iron content varies from 26.20 to 34.05% and SiO ₂ content from 46.61 to 62.51% in the silicate-rich rocks. The oxide-rich bands are richer in total iron with Fe ₂ O ₃ , contents of about 59% . High values of Al ₂ O ₃ (3.87-9.69%) and MnO (1.30 to 7.62% characterise the Koriga iron-formation.	The petrology and geochemistry of Koriga iron-formation, N.W. Nigeria
VOLUME 70 NO 1 45	1991	70	1	45	58	Shao Xusheng; Yan Qinshang; Xu Shiyuan; Chen Zhongyuan	In the nearshore area along the coast of Shanghai, from the marsh-lowland to the prodelta, a series of storm deposits is found that is relatively coarse-grained and interbedded with fine-grained fair-weather deposits. In a vertical section the proportion of storm deposits is up to 35%.The storm deposits are well preserved above normal wave base mainly due to abundant supply of sediment from the river. The storm-deposit series is characteristic of the mouth of a large river, such as the Yangtze River, having high sediment supply and accumulation rates.	Storm deposits in the coastal region of Shanghai, the Yangtze Delta, China

VOLUME 70 NO 1 59	1991	70	1	59	73	Martinius, A.W.	An oyster bed of <i>Crassostrea cf. rarilarmella</i> was preserved in life position in muddy estuarine sediments of Lower Eocene age in the Roda Formation, southern Pyrenees, Spain. Its population structure was studied by counting and measuring annual growth increments in the hinge plate of the oyster. The population structure is normal and indicates a time averaged death assemblage. The life table and survivorship curve show that <i>C. cf. rarilarmella</i> had a high juvenile mortality and constant adult mortality pattern. The mean yearly decrease of the adult population was very low, as is shown by the regression coefficient. Growth line analysis revealed slower and faster growth. The cumulative growth curve does not show a gradual decrease in inclination, which confirms the interpretation of the functional shell morphology (adaptation to a muddy substrate) of <i>C. cf. rarilarmella</i> . <i>C. cf. rarilarmella</i> shows characteristics of an equilibrium species or K-strategist, to be expected in this sedimentological setting.	Growth rates and population dynamics in <i>Crassostrea cf. rarilarmella</i> from the Lower Eocene Roda Formation (southern Pyrenees, Spain)
VOLUME 70 NO 1 75	1991	70	1	75	83	Baker, J.H.; Liati, A.	The Oligocene volcano-sedimentary sequence of the Dipotama Basin, Rhodope zone, N. Greece is found unconformably overlying the Tertiary Skaloti granite along an erosional contact. The sequence comprises a thin basal conglomerate with granite and tuff pebbles in a calcitic matrix followed by lignite-bearing tuffs and distal airfall crystal and ash tuffs, with some physical reworking, overlain by an ignimbrite series. Diagenetic alteration in the volcano-sedimentary sequence is evident as calcification, while the lower part of the ignimbrite is clay-altered. The similar ages of the granite and overlying ignimbrite means that rapid uplift and erosion of about 6 km of crust occurred before subsidence allowed the development of a basin to contain the lignite-bearing sequence. The Dipotama Basin is one of a series of continental Tertiary basins covering a large part of the eastern Mediterranean, which became isolated during uplift, followed in Pliocene times by renewed inundation and a subsequent phase of uplift to produce the current mountain chain of N. Greece. Rapid uplift of thickened continental crust exhumed the Skaloti and other granites, while subsequent extensional collapse allowed the deposition of the Tertiary volcano-sedimentary sequences.	The Oligocene volcano-sedimentary sequence of the Dipotama Basin, N. Greece: temporal relationships between Tertiary granites and volcanics, and implications for the regional tectonic evolution
VOLUME 70 NO 1 89	1991	70	1	89	90	Leeuwen, P. van; Roest, J.P.A.		In memoriam Prof. ir. P.Th. Velzeboer, 1916-1990

VOLUME 70 NO 2 93	1991	70	2	93	103	Jong, K. de; Bakker, H.	The litho-stratigraphy of the Mulhacen and Alpujarride Complex, in the eastern Sierra de los Filabres, is described in detail. Well defined litho-stratigraphic units can be traced for tens of kilometres along strike, despite the complicated tectono-metamorphic history. The Mulhacen Complex comprises three thrust-sheet units, formed by crustal-scale underthrusting. The thrust-sheets are composed of a dark-coloured series of Paleozoic age, covered by light-coloured metasediments of Triassic age. The most extensively developed unit from the Mulhacen Complex is the Nevado-Lubrin unit. The clastic base of the Triassic series is covered by a sequence dominated by carbonates. These basal clastics probably represent shelf deposits in an open marine environment. The overlying carbonate sequence marks an abrupt transition to a lagoonal environment, with reef and littoral facies. This abrupt facies shift might have been caused by regional crustal extension. The Alpujarride Complex contains two tectonic units of light-coloured metasediments of Triassic age.	The Mulhacen and Alpujarride Complex in the eastern Sierra de los Filabres, SE Spain: Litho-stratigraphy
VOLUME 70 NO 2 93	1991	70	2	93	103	Jong, K. de; Bakker, H.	Cross Sections	The Mulhacen and Alpujarride Complex in the eastern Sierra de los Filabres, SE Spain: Litho-stratigraphy
VOLUME 70 NO 2 93	1991	70	2	93	103	Jong, K. de; Bakker, H.	Geological Map	The Mulhacen and Alpujarride Complex in the eastern Sierra de los Filabres, SE Spain: Litho-stratigraphy
VOLUME 70 NO 2 105	1991	70	2	105	114	Ekwere, S.J.; Ekwueme, B.N.	The basement of the eastern Oban massif is composed of a wide range of texturally and mineralogically different types of gneissic rocks. Migmatitic gneisses are characterized by high contents of silica and related trace elements while granite and biotite-hornblende gneisses have relatively lower values of these elements. Geochemical variation diagrams suggest that the gneisses evolved from a calc-alkaline magma of quartzdiorite to granodiorite composition. This demonstrates that orthogneisses exist in the basement complex of Nigeria.	Geochemistry of precambrian gneisses in the eastern part of the Oban massif, Southeastern Nigeria
VOLUME 70 NO 2 115	1991	70	2	115	128	Stentoft, N.; Frykman, P.; Rasmussen, K.L.; Koch, C.J.W.	EDTA-insoluble residues of carbonate rock samples from the Upper Permian Ca-2 unit of the Løgumkloster-1 well have been investigated by X-ray diffraction, scanning electron microscopy, instrumental neutron activation analysis, and magnetic measurements. The sediments have undergone severe diagenesis including dolomitization and anhydrite mineralization. Two original facies types have been recognized, an oolitic shoal facies, and a lagoonal carbonate facies. The mineralogy of the inorganic insoluble residue reflects the facies type division: the lagoonal facies contains muscovite, feldspar and quartz; the shoal facies contains a non-crystalline silicate phase, quartz, and mica. It is thought that the muscovite in the lagoonal facies is derived from weathering of exposed basement highs. The non-crystalline silicate phase in the shoal facies is thought to be a diagenetic phase precipitated at a rather late stage in the diagenetic history.	EDTA-insoluble residues from the Zechstein Ca-2 unit (Late Permian), the Løgumkloster-1 Well, Denmark

VOLUME 70 NO 2 129	1991	70	2	129	142	Rappol, M.; Leeuw, B. de; Swaan, J.	The former island of Wieringen is part of a series of low ridges along the southern margin of the till plain in the northern Netherlands. Distribution and variations in thickness of Saalian till on Wieringen and in the surrounding area suggest that some of the low hills of Wieringen are ice-pushed ridges and that a major glaciotectionic basin is located to the south of Wieringen, in the northern part of the Wieringermeer. Compositional characteristics of till indicate the presence of at least two main till types, one in which both flint and smectite are absent and another in which these components are present. An intermediate type contains very little flint but appears to have no smectite in the clay fraction. The flint-poor till is of the Voorst type and belongs to the First Baltic Till as defined for the northern Netherlands. It is suggested that the present morphology of Wieringen shows features related to two phases of glacial overriding of the previously formed ice-pushed ridges. Firstly, ice moved in a southwestern direction, after formation of the ice-pushed ridges. During a later phase of glaciation, ice moved between Wieringen and Gaasterland in a south-southeastern direction towards the Gelderse Vallei in the central Netherlands. During the latter event, streamlined landforms on eastern Wieringen and western Gaasterland obtained their NNW-SSE orientation. These ice-flow phases can be correlated with ice movements in the northeastern Netherlands, where ice moved first in a southwesterly direction over the till plain and later in a southsoutheastern direction in the Hondsrug area.	Distribution and composition of till on Wieringen and in the northern part of the Wieringermeer, The Netherlands
VOLUME 70 NO 2 143	1991	70	2	143	143			Introduction - Crustal dynamics - Pathways and Records
VOLUME 70 NO 2 145	1991	70	2	145	161	Kronberg, P.	Well exposed Central Afar (Ethiopia/Djibouti) offers direct observation of a wide range of extensional structures and rift morphologies, at regional and local scale. Large Format Camera satellite photography and aerial photography was used to investigate in stereo-models phenomena of progressive extensional faulting. Representative successive fault geometries and fault evolution patterns are presented and discussed.	Geometries of extensional fault systems, observed and mapped on aerial and satellite photographs of Central Afar (Ethiopia/Djibouti)

VOLUME 70 NO 2 163	1991	70	2	163	174	Zimmerle, W.	<p>Pelites are described mainly by their macroscopic appearance, X-ray diffraction mineralogy and chemical composition. However, these conventional methods are being increasingly supplemented by thin-section analysis. Even so-called soft-cuttings aggregates can be successfully studied in thin section after appropriate impregnation. Only by integration of the various analytical methods can pelites be fully characterized in terms of original grain size and mineralogy, present mineral composition, sedimentary fabric and history of diagenetic alteration. Thin sections of pelites from various stratigraphic levels in the FRG are briefly described: Lower Carboniferous bedded cherts, siliceous shales and tuffs; Upper Jurassic marlstones; Lower Cretaceous claystones, siliceous marlstones and tuffs; Messel oil shale (Eocene) and Eocene tuffs; Oligocene clays and tuffs. In pelites diagenetic processes such as resorption diagenesis transform the original mineral composition and alter the original sedimentary grain-size distribution. The immense diagnostic value of sedimentary as well as tectonic fabric can be exploited only by means of thin-section analysis.</p>	Thin-section petrography of pelites, a promising approach in sedimentology
VOLUME 70 NO 2 175	1991	70	2	175	185	Gerretsen, J.; Breeuwsma, W.H.; Boorder, H. de; Spiers, C.J.	<p>The diagenetic change of porosity by long range solution-precipitation mass transfer in a freely convecting porous medium is investigated by numerical modelling. From the conservation of mass and energy, assuming Darcian flow and local chemical equilibrium, making the Boussinesque approximation and neglecting deformation effects, a set of dimensionless partial differential equations is derived. These are then transformed into a set of algebraic equations, using a central finite difference method. Solutions were obtained using an implicit Gauss-Seidel relaxation method as well as an explicit method employing direct matrix inversion plus time stepping. The coupling between fluid flow behaviour (determined by the Rayleigh number) and local mass balance is established through a linear relation between the relative change in permeability and relative change in porosity. The results obtained for steady state convection omitting solute transport effects are in good agreement with numerical and laboratory scale experiments reported elsewhere. When solution-phase transport is permitted the reservoir porosity shows an exponential change with time at rates twice those predicted using a simpler analytical approximation. The numerical model is used to evaluate the development of porosity in the Travis Peak Formation of East Texas. This formation consists of well-sorted, fine-grained quartz arenites deposited in the Early Cretaceous. During the early stages of diagenesis, the average porosity decreased from 25% to 10% as a result of quartz cementation. Explanations based on an influx of warm meteoric fluids are questionable because of the large fluid-to-rock ratios required. However, taking into account geological constraints on heat flux,</p>	Mass transfer in a porous medium by thermally driven fluid convection: a numerical model and its application to the Travis Peak Formation, East Texas

VOLUME 70 NO 2 187	1991	70	2	187	201	Dijk, J.P.	The structural and tectonostratigraphical Late Neogene development of the Croton Basin is presented, a foreland basin in the accretionary wedge along the external side of the Calabrian Arc (Central Mediterranean). It demonstrates the role of local tectonic activity of the thrust wedge and that of regional relative sea level fluctuations on the formation of unconformity-bound depositional sequences. The tectonostratigraphic development of the basin can be divided in 4 stages: 1. a Serravalian – early Messinian Stage, characterized by a progressive enlargement of the Basin, 2. a middle Messinian – Early Pliocene Stage, characterized by intense and complex fault movements that were overprinted by the Messinian salinity crisis, 3. an Upper Pliocene - Early Pleistocene Stage, characterized by a pulsating onlap, and 4. a Late Pleistocene - Recent Stage, characterized by strong vertical movements in conjunction with the uplift of the Sila basement Massif. At the end of Stage 2 regional compression during the Mid-Pliocene Phase inverted the basin and thrust its cover towards the margins. A kinematic model is proposed whereby the evolution of the Basin was controlled by oblique sinistral movements along two confining NW-SE trending convergent crustal shear zones. Within this concept, the Middle Miocene - Early Pliocene development (Stages 1 and 2) reflects a strike-slip cycle. The sequence boundaries that belong to the Stages 1 and 3 are of remarkably similar tectonostratigraphic significance. They reflect a 'composite tectonic event' comprising an uplift/regression pulse, followed by a rapid subsidence/onlap. Each composite tectonic event is here considered to represent one growth pulse in the progressive evolution of the accretionary wedge	Basin dynamics and sequence stratigraphy in the Calabrian Arc (Central Mediterranean); records and pathways of the Croton Basin
VOLUME 70 NO 2 203	1991	70	2	203	211	Passchier, C.W.	Shear bands in ductile shear zones have been used to determine sense of shear, but they also contain information on the flow pattern and flow history in shear zones. A simple geometric analysis of two types of shear bands, S-C fabrics and extensional crenulation cleavage (ECC) fabrics, is used to delimit possible flow patterns and flow history in shear zones where such structures develop. S-C fabrics can form in bulk simple shear during the entire active period of a shear zone. Development of ECC-fabrics as observed in nature, however, is favoured by bulk extension of the shear zone as a whole. This means that such fabrics preferentially develop in an extensional tectonic setting, or in a constrictional tectonic setting during late stages of activity on ductile shear zones, when flow in the zone develops from bulk simple shear to bulk non-coaxial extension.	Geometric constraints on the development of shear bands in rocks
VOLUME 70 NO 2 213	1991	70	2	213	214			Book reviews

VOLUME 70 NO 3 215	1991	70	3	215	234	Poel, H.M. van de	The Middle Messinian of the Nijar-Carboneras area (S.E. Spain) shows common rapid lateral transitions from thick-bedded massive gypsum to brecciated or massive limestone with voids and pseudomorphs after gypsum crystals. These 'gypsum-ghost limestones' are underlain by, and interbedded with, laminated marly sediments that contain a restricted marine microfauna attesting to oxygen-deficient conditions. Oolite-rich series of the basin margin, which include gypsiferous stromatolite and a few restricted marine fauna levels, probably constitute a lateral equivalent. Upper Messinian fine-grained laminites of the central part of the basin contain brackish fossil assemblages and numerous tongues of coarse clastic material derived from the basin margins. The gypsum-ghost limestones are interpreted to be essentially the product of two phases and types of diagenesis. Microbial sulfate-reduction during oxygen-deficient periods of the Middle Messinian first played a role in their formation. An important fresh-water diagenetic phase took place later, probably in the Late Messinian.	Messinian stratigraphy of the Nijar Basin (S.E. Spain) and the origin of its gypsum-ghost limestones
VOLUME 70 NO 3 235	1991	70	3	235	241	Cibaj, I.	The acetate peel section technique has been successfully used to the study of carbonate rocks. It also appears as a very helpful tool to the study of well-cemented siliciclastics: fine internal sedimentary features and paleocurrent data have been revealed from a series previously considered as monotonous and poor in sedimentary structures.	Application of a modified peel-section technique to the study of siliclastic rocks
VOLUME 70 NO 3 243	1991	70	3	243	252	Erren, H.; Bredewout, J.W.	An analytical solution of the simplified heat equation was calculated and applied to a 3D model of the intrusion below the Peel-Erkelenz coalfield. The calculated thermal history was converted to coal ranks with an empirical integral expression. Using a least squares fit of observed coal rank data, an initial temperature of (800 + 100) °C for the intrusion was obtained. Calculated vertical coal rank gradients are comparable with those observed in the Ibbenbüren coalfield (Bramsche intrusion, FRG). A detailed 2D finite difference calculation, using the complete heat equation on a 5-layer section in the area, confirmed the analytical results. It also proved that: 1) effects of radiogenic heat production are negligible compared to cooling magma effects; 2) if the coal is remote from the magma, latent heat effects can be simplified by adding 300 °C to the initial intrusion temperature; 3) lateral and vertical variations in rock properties have negligible influence on coalification compared to cooling magma effects; a homogeneous model is therefore a good approximation.	Model calculations on intrusive cooling and related coalification of the Peel-Erkelenz coalfield (The Netherlands and Germany)

VOLUME 70 NO 3 253	1991	70	3	253	264	Rohling, E.J.; Hilgen, F.J.	Sapropel formation in the eastern Mediterranean coincided closely with minima in the precession index. Such minima occur approximately every 21000 years. At such times perihelion falls within Northern Hemisphere summer. Minima in the precession index are characterized by intensified Indian Ocean (summer) SW monsoonal circulation, which enhanced discharge of the river Nile into the eastern Mediterranean. However, by compiling paleoclimatological data from the literature, the influence of the monsoon is shown to have reached only as far as the southern Sinai Desert. Therefore, it does not account for contemporary humid phases in the northern borderlands of the eastern Mediterranean, which seem to have been characterized mainly by increased summer precipitation. We argue that increased (summer) precipitation along the northern borderlands of the eastern Mediterranean, at times of sapropel formation, was probably due to increased activity of Mediterranean (summer) depressions. Forming predominantly in the western Mediterranean and tracking eastwards, such depressions tend to lower the excess of evaporation from the eastern Mediterranean relative to that from the western basin. Picking up additional moisture along their eastward path, such depressions also redistribute freshwater within the complex eastern Mediterranean water balance. The increase in runoff and the related flux of nutrients and continental organic matter that resulted from the increased precipitation on the northern borderlands of the eastern Mediterranean, at times of sapropel formation, presumably provided a substantial addition to that which entered the eastern Mediterranean via the Nile.	The eastern Mediterranean climate at times of sapropel formation: a review
VOLUME 70 NO 3 265	1991	70	3	265	273	Nöth, S.; Bruckschen, P.; Richter, D.K.	The conodont color alteration index (CAI) and the microdolomite composition (MC) were used to evaluate the thermal diagenesis in the Upper Muschelkalk (Middle Triassic) limestones overlying the Cretaceous intrusive body of the Vlotho Massif in the southern part of the Lower Saxony Basin in Northwest Germany. The validity of these two methods is discussed. The CAI exhibits a greater accuracy at high levels of organic metamorphism, especially above temperatures of 180°C, whereas the microdolomite composition is an excellent indicator for differentiating low-temperature diagenesis. The good positive correlation between % Rm and CAI can probably be attributed to the fact that in both cases organic matter changes during diagenesis. The maximum palaeotemperature range of 300-345°C ascertained by the CAI value of 5 in sediments directly over the Vlotho Massif, lies higher than the temperatures estimated with the help of other geothermometers.	Conodont color alteration and microdolomite composition - implications to the Muschelkalk limestones (Upper Triassic) overlying the Upper Cretaceous intrusive body of the Vlotho Massif (Weserbergland, Northwest Germany)

VOLUME 70 NO 3 275	1991	70	3	275	285	Passchier, C.W.	The Revenue granite pluton in the Mary Kathleen Zone of the Mount Isa Inlier, Queensland, has a complex internal structure due to the interference of two Early-Proterozoic phases of ductile deformation. The granite intruded into calcsilicates dated at 1780-1760Ma. A D_1 shape fabric, which is present throughout the pluton, is due to intense deformation in a low angle high strain zone, probably associated with a regional phase of crustal extension. A D_2 -event of intense E-W shortening around 1550 Ma caused folding of the early shape fabric in the granite, and tight folding of bedding in the country rock. The present dome-shape of the pluton is mainly an effect of non-cylindrical D_2 folding.	Deformation in the Revenue granite pluton, Mount Isa Inlier, Australia
VOLUME 70 NO 3 287	1991	70	3	287	298	Bakker, H.	The eastern Sierra de los Filabres is constituted of several generations of thrust sheets which were formed during entirely different tectonic events. The oldest thrust sheets are present in the Mulhacen Complex. They were formed during the first phase of penetrative Alpine deformation, D_{x-1} , which is related to Cretaceous continent-continent collision. The second phase of penetrative deformation D_x is also related to this collisional event. During the second phase of thrust sheet formation, D_{x+1} rocks from the Alpujarride Complex were placed directly on top of the Mulhacen Complex. These thrust sheets are related to a regional phase of heterogeneous extension and crustal thinning, active during the Late Oligocene to Early Miocene. At least two subsequent phases of folding and overthrusting, D_{x+2} and D_{x+3} strongly modified the original superposition of tectonic units. D_{x+2} deformation, characterized by strain partitioning, resulted in a detachment zone. In the northeastern part of the Sierra de los Filabres an imbricate stack was formed. During D_{x+3} the detachment zone was reactivated. These movements were followed by development of low-angle extensional faults, dextral tear faults and finally a foreland dipping duplex. For the D_{x+3} structures a Miocene age is suggested. D_{x+1} , D_{x+2} , and D_{x+3} . deformations have largely determined the present structure of the eastern Sierra de los Filabres.	The structural configuration of the eastern Sierra de los Filabres, SE Spain
VOLUME 70 NO 3 299	1991	70	3	299	309	Linden, W.J.M. van der; Boekschoten, G.J.; Finlow-Bates, T.; Kleverlaan, K.		Book reviews

VOLUME 70 NO 4 311	1991	70	4	311	326	Dijk, G.J. van; Berendsen, H.J.A.; Roeleveld, W.	Plotting of radiocarbon datings of samples from the base of peat layers on the flanks of fossil river dunes results in time-depth graphs that can be interpreted as curves of the local rise of the groundwater table. Combination of data from individual sites makes it possible to reconstruct groundwater gradient lines at selected moments. All gradient lines appear to consist of a steep upper part (river dominated) and a level lower part (sea level dominated). Between 6750 and 2850 BP the knickpoint between the two wandered some 10km upstream. During all of the Holocene the area east of Leerdam remained outside the direct influence of the sea. Irregularities in individual curves in the downstream area - if not caused by dating errors - may represent varying rates of MSL rise, varying tidal range and a varying floodbasin effect. For the pre-5000 BP period, assumed sea level dominance in the downstream area is not consistent with the general evidence on the position of the sea level in The Netherlands. This situation is possibly due to less tectonic subsidence in the southwestern coastal sector.	Holocene water level development in The Netherlands' river area; implications for sea-level reconstruction
VOLUME 70 NO 4 327	1991	70	4	327	337	Stokes, S.	Optical dates are presented for Quaternary aeolian coversand units which are separated by the Usselo Layer (Allerød Interstadial). The dates, which were generated using the sand-sized quartz fraction of the sediments, are in direct agreement with geological expectation and indicate considerable potential of the optical method for dating similar Weichselian coversand sequences throughout NW Europe. The intrinsic advantage of the optical dating method over conventional thermoluminescence (TL) dating of sediment lies in the rapidly sunlight-bleachable nature of the optical dating signal, namely optically-stimulated luminescence (OSL). This advantage over TL is demonstrated by an artificial bleaching experiment.	Quartz-based optical dating of Weichselian coversands from the eastern Netherlands

VOLUME 70 NO 4 339	1991	70	4	339	346	Bless, M.J.M.	The claim that the Late Cretaceous (and more specifically the Campanian-Maastrichtian) global sea level was considerably higher than that of today is partly based on the assumption that one can recognize areas which were tectonically immobile from the Cretaceous onwards. Careful examination of some of these regions in NW Europe suggests, however, that differential (inverse) warping and tilting during and/or since the Cretaceous has invalidated their use as reliable gauges for Late Cretaceous high stands. In addition, the original depth of Late Cretaceous epicontinental seas may have been much shallower than generally assumed. In the literature it is frequently suggested that the NW European flint-bearing chalk was deposited at a depth of 100 to 300 m or more. But this study shows that, for example, the Late Campanian and Maastrichtian flint-bearing chalk in the Hautes Fagnes area of NE Belgium accumulated at a depth of less than 45 to 65 m, matching the Modern deposition of coccolith ooze in the Caribbean Belize Lagoon at depths of less than 40m at places.	Eustatic sea level and depth of a Late Cretaceous epicontinental sea: an example from NW Europe
VOLUME 70 NO 4 347	1991	70	4	347	354	Burgers, W.F.J.; Mulder, G.G.	Three depth structure maps, two subcrop maps, two isopach maps and two structural cross-sections are enclosed. They illustrate the results of uplift and erosion and of subsequent subsidence and sedimentation that occurred in The Netherlands area during the Jurassic and Cretaceous. Near the end of the Middle Jurassic, rapid sedimentation began in narrow and restricted basins after a period of uplift and erosion, known as the Mid Kimmerian tectonic phase. This sedimentation was followed by another period of uplift and erosion, known as the Late Kimmerian tectonic phase, near the beginning of the Cretaceous. Subsequent Cretaceous sedimentation started in the centres of the Upper Jurassic basins and gradually spread towards the Mid to Late Kimmerian highs. These highs were the last areas covered with sediments near the end of the Cretaceous. The Mid Kimmerian Unconformity, which can be mapped in the centres of the Upper Jurassic basins, was itself eroded in the areas of the Mid to late Kimmerian highs during the Late Kimmerian phase. Sedimentation during the Cretaceous, particularly the Late Cretaceous, was more widespread than during the Late Jurassic. Near the end of the Cretaceous, inversion and erosion took place. This erosion was strongest near the centres of the Upper Jurassic basins, where a substantial package of Cretaceous, Jurassic and locally Triassic or older sediments was eroded. This explains the present decreasing thickness of the Upper Jurassic and Lower Cretaceous sequence and of the Upper Cretaceous sediments towards the centres of the former Upper Jurassic and Lower Cretaceous basins.	Aspects of the Late Jurassic and Cretaceous history of the Netherlands
VOLUME 70 NO 4 347	1991	70	4	347	354	Burgers, W.F.J.; Mulder, G.G.	Enclosure 1	Aspects of the Late Jurassic and Cretaceous history of the Netherlands

VOLUME 70 NO 4 347	1991	70	4	347	354	Burgers, W.F.J.; Mulder, G.G.	Enclosure 2	Aspects of the Late Jurassic and Cretaceous history of the Netherlands
VOLUME 70 NO 4 347	1991	70	4	347	354	Burgers, W.F.J.; Mulder, G.G.	Enclosure 3	Aspects of the Late Jurassic and Cretaceous history of the Netherlands
VOLUME 70 NO 4 347	1991	70	4	347	354	Burgers, W.F.J.; Mulder, G.G.	Enclosure 4	Aspects of the Late Jurassic and Cretaceous history of the Netherlands
VOLUME 70 NO 4 347	1991	70	4	347	354	Burgers, W.F.J.; Mulder, G.G.	Enclosure 5	Aspects of the Late Jurassic and Cretaceous history of the Netherlands
VOLUME 70 NO 4 347	1991	70	4	347	354	Burgers, W.F.J.; Mulder, G.G.	Enclosure 6	Aspects of the Late Jurassic and Cretaceous history of the Netherlands
VOLUME 70 NO 4 347	1991	70	4	347	354	Burgers, W.F.J.; Mulder, G.G.	Enclosure 7	Aspects of the Late Jurassic and Cretaceous history of the Netherlands
VOLUME 70 NO 4 347	1991	70	4	347	354	Burgers, W.F.J.; Mulder, G.G.	Enclosure 8	Aspects of the Late Jurassic and Cretaceous history of the Netherlands
VOLUME 70 NO 4 355	1991	70	4	355	371	Singh, L.; Elias Ahmed, A.; Verma, R.P.; Murthy, R.V.S.	This paper describes the importance of the braided channel environment for the entrapment of hydrocarbons, the porosity pattern, the reservoir heterogeneity, the sweep efficiency and the identification of bypassed oil areas, in the Miocene Tipam Sand-2 of the Lakwa Oilfield. The growth-faulted structure has an oil bearing area of 20 km ² . The oil gravity varies from 20.7 to 32° API. The Tipam Sand-2 oil pool is the largest among multiple pools in the Tipam Sandstone Formation. There is a marked coincidence of the structure of the field and the thickness of the sand within its depocentre. The sandstone was deposited in a composite braided channel river system. The sand member is characterised by longitudinal and transverse bars which are flanked by marginal, abandoned and slough channel facies. The bars are covered by overbank shales of flood periods. The porosity pattern is dominated by high porosity areas within the longitudinal and transverse bars. The low porosity areas along the flanks of the structure are marked by low energy deposits. Two preferential permeability trends are parallel to the E-W running bar crests, the primary trend, and to the secondary NE-SW or accretionary trend. These areas correlate well with the well production rates, advance of waterfront and areas of better sweep efficiency. The rise in oil-water contact is controlled by reservoir rock permeability trends and oil withdrawal rates. Infill drilling electrolog data indicate a significantly differential rise of the oil-water contact from the initial oil-water contact (5-8 m), as compared to the nearby wells (10-15 m). Integrating the depositional pattern. The reservoir heterogeneity and the withdrawal rates, a reservoir zoning is attempted to identify areas of	Depositional pattern and reservoir heterogeneity of Tipam Sand-2, Lakwa Field, India
VOLUME 70 NO 4 373	1991	70	4	373	376	Vandenberghe, J.; Kerp, J.H.F.; Boekschoten, G.J.; Campbell, A.E.		Book reviews
VOLUME 71 NO 1 1	1992	71	1	1	1	Priem, H.N.A.		Editorial

VOLUME 71 NO 1 3	1992	71	1	3	14	Serrano, F.	<p>The chronology of the magmatic activity in Sierra de Gata is established on the basis of the study of planktonic foraminifera in sediments related to volcanites. Data were obtained from intercalated sediments, from fillings of fissures and holes in the volcanites, as well as from deposits in nearby basins, which were weakly affected by the volcanic activity. Volcanic activity began (stage A) with small submarine flows (Ao phase) intercalated in pelagic marls containing <i>Globigerinoides bisphericus</i> but without <i>Praeorbulina glomerosa</i>, which can be located at around the boundary between the N.7 and N.8 zones of Blow (uppermost Burdigalian). More significant eruptions are observed in association with sediments containing <i>Praeorbulina glomerosa</i> (N.8 zone, Lower Langhian) and others deposited around the FAD of <i>Globorotalia praemenardii</i>, which is used as marker for the Langhian-Serravallian boundary (phases A1 and A2 respectively). As regards the most important period of generalized volcanic activity in the region (stage B), sediments are found containing the <i>Neogloboquadrina siakensis</i> group, <i>Globorotalia menardii</i> and <i>Globigerina nepenthes</i> (N.14 zone, Upper Serravallian) and the dextral-coiling <i>Neogloboquadrina acostaensis</i> group (N.16 zone, Lower Tortonian and lower part of the Upper Tortonian). New volcanic emissions took place during the Late Tortonian and the earliest Messinian, but they only affect local areas of Sierra de Gata: the group of Coastal Volcanoes arose in the littoral area during the early and/or middle part of the Late Tortonian; the Rodalquilar Group developed in the central sector within the Late Tortonian-earliest Messinian interval; finally, the Carboneras Upper Volcanites were emitted in the northern area and</p>	Biostratigraphic control of Neogene volcanism in Sierra de Gata (south-east Spain)
VOLUME 71 NO 1 15	1992	71	1	15	21	Jagt, J.W.M.; Kennedy, W.J.; Burnett, J.	<p>A specimen of the scaphitid ammonite <i>Acanthoscaphites tridens</i> (Kner, 1848) was collected in situ from the lower part of the Vijlen Member (Gulpen Formation, sensu Felder, 1975b) as exposed at a building site near the Sophianum school southwest of Gulpen, southern Limburg (The Netherlands). This species has been widely quoted as an index for the lowest ammonite zone of the Maastrichtian Stage, but its precise age was poorly known. Associated nannofossils show the Gulpen specimen to come from nannofossil zone CC 24 (Reinhardtites levis Zone). A calibration of nannofossil and belemnite zones indicates it to be no older than the Belemnella occidentalis Zone (upper part of Belemnella sumensis Zone of Schulz, 1979), which is well above the base of the Maastrichtian Stage. The Gulpen specimen is thus younger than the type occurrence in the Ukraine which is in nannofossil subzone CC 23B, equivalent to the upper part of the Belemnella lanceolata Zone (upper Belemnella lanceolata to basal Belemnella sumensis Zone of Schulz, 1979).</p>	<i>Acanthoscaphites tridens</i> (Kner, 1848) (Ammonoidea) from the Vijlen Member (Lower Maastrichtian) of Gulpen, Limburg, The Netherlands

VOLUME 71 NO 1 23	1992	71	1	23	32	Frykman, P.	Image analysis of Permian Zechstein carbonate samples has aided quantification of pore geometry parameters. Total porosity has been measured, using image analysis, from randomly selected thin sections. These porosity measurements have then been compared to core analysis measurements of the same samples. Pore surface parameters derived from the image analysis can be used to characterize mouldic porosity, and to estimate permeability. Cumulative porosity curves related to pore section size are used to group the samples in classes with different pore geometry.	Quantification of pore geometry in carbonates using image analysis; Upper Permian (Zechstein) of Denmark
VOLUME 71 NO 1 33	1992	71	1	33	37	Linthout, K.; Everts, A.J.	In the Keltiberian Massif of Nevera (SE Guadalajara, Spain) a Permian endogenous dome of flow-banded felsophyric rhyolite is recognized. Polymict, poorly-sorted, matrix-supported pyroclastica along the vent of the body indicate a gas-rich blow-out prior to its emplacement. The breccias comprise, besides fragments of paleozoic sedimentary country-rock, porphyritic phenodacite and phenoandesite, indicating the existence of less differentiated calc-alkaline subvolcanic rock in the underground.	The flow-banded rhyolite dome of San Bartolomé (Alcoroches, Guadalajara), a novelty for Spain
VOLUME 71 NO 1 39	1992	71	1	39	50	Peeters, C.; Muchez, P.; Viaene, W.	A detailed biostratigraphical subdivision of the lower Viséan (Moliniacian) in southeastern Belgium is not possible. Therefore correlations are based on the facies evolution. Based on these correlations, the paleogeographical evolution during the early Viséan can be reconstructed. During the early Moliniacian, open marine subtidal limestones were deposited. Near the coast, these sediments were subsequently dolomitized and intense karstification took place under humid conditions. Basinwards, algal laminites formed in the intertidal zone. The continental interval was followed by open marine sedimentation above wave base. At the end of the early Moliniacian, beginning of the middle Moliniacian, the depositional environment became shallower. A second continental interval occurred near the Brabant Massif and a sabkha developed further to the south (i.e. basinwards) in a semi-arid to arid climate. The subsequent transgressive trend was very gradual. Middle Moliniacian sedimentation occurred in an evaporitic lagoonal and intertidal setting. The peritidal sediments contain numerous paleosol horizons, which formed under semi-arid conditions. Upper Moliniacian limestones, were deposited on a shallow open marine shelf. The paleolatitudinal position of Euramerica during the early Viséan was close to the equator and normally a humid climate must have been present. The recognized semi-arid intervals are due to the large Gondwana landmass situated south of the equator, deflecting rains away from Euramerica.	Paleogeographic and climatic evolution of the Moliniacian (lower Viséan) in southeastern Belgium

VOLUME 71 NO 1 51	1992	71	1	51	64	Vergoossen, J.M.J.	Two specialized squamation types from the Upper Llandovery of Scotland are described in detail for the first time. One type occurs mainly as fused structures here referred to as scale sets. They probably belonged to the thelodont gents <i>Loganellia</i> . Their morphology is discussed and ideas are put forward about their generation, function and topography. The second squamation type is here called denticulated plate, type A and denticulated plate, type B. The morphology of these plates is compared with that of the scale sets, with which they share some characteristics. The type A plates were discovered in the branchial area of a <i>Loganellia</i> specimen and are possibly fragments of an internal dermal cover interpreted as a complex of gill rakers.	On complex dermal elements in <i>Loganellia</i> species (Agnatha, Thelodonti) from the Upper Llandovery of Scotland (I.G.C.P. 328 Contribution)
VOLUME 71 NO 1 65	1992	71	1	65	70	Valbracht, P.J.	Two neodymium isotopic analyses of least-altered metavolcanites from the Hjulsjö area and six analyses of albitized and actinolitized metavolcanites from Ställbergstorp farm south of Hjulsjö show variations in $\epsilon_{Nd}(T)$ values that point to two-stage mixing involving seawater- and rock-dominated fluid-rock interaction. In a first stage felsic volcanites are albitized and leached in LREE. Some of these extremely LREE leached felsic volcanites show very negative $\epsilon_{Nd}(T)$ values. Thus, leaching occurred by a fluid with a long crustal history, probably modified seawater containing Nd derived from an Archaean erosional area. In a second stage redeposition of LREE previously leached from the volcanic pile accompanies the formation of actinolite aggregates in the leached metavolcanite and results in an increase of $\epsilon_{Nd}(T)$.	$\epsilon_{Nd}(T)$ variation in an Early Proterozoic actinolite skarn, Sweden, reflecting felsic volcanite-seawater interaction
VOLUME 71 NO 1 71	1992	71	1	71	80	Konert, R.J.; Stel, H.; Reemst, P.H.M.	The progressive three-dimensional strain path of rocks during their metamorphic evolution and the relation between strain and structural elements were studied in the Somero area, SW Finland. All the methods used involve two basic steps: determination of two-dimensional strain ellipses on several planes and subsequent calculation of three-dimensional strain ellipsoids from the two-dimensional strain ellipses. Strain analyses were performed on: (1) deformed objects in agglomerates and xenoliths, providing finite strain values and (2) the spatial distribution pattern of cordierite and garnet porphyroblasts, reflecting F_2 and F_3 -strain. The two types of strain markers have not been found together in one exposure. A test of the spatial distribution pattern method in terms of shape and orientation has been applied to cordierite porphyroblasts. These blasts show deformation substructures indicative of dislocation creep and have ellipsoidal shapes. Their shapes correlate closely with the results of the spatial distribution pattern method. The methods provide the possibility of obtaining strain data in metamorphic areas.	Unravelling the progressive strain-history of rocks in metamorphic areas, the example of the Somero area, SW Finland

VOLUME 71 NO 1 81	1992	71	1	81	83	Jong, K. de		Comment on: the structural configuration of the eastern Sierra de los Filabres, SE Spain by H. Bakker: <i>Geologie en Mijnbouw</i> 70: 287-298,1991
VOLUME 71 NO 1 85	1992	71	1	85	87			Book reviews
VOLUME 71 NO 2 91	1992	71	2	91	98	Paulssen, H.; Dost, B.; Eck, T. van	The Roermond earthquake of April 13th,1992,was recorded by stations of the seismological NARS network located in The Netherlands, Germany, and Belgium. The data of this network allowed an accurate determination of epicenter, focal depth, origin time and focal mechanism of the event. By an arrival time inversion of P-wave onsets, the epicenter and focal depth were located at 51°10.2' N 5°58.3' E and 21 km, respectively. The relatively large focal depth of about 20 km is confirmed by travel time modelling of additional, later arriving, P-wave phases. The average crustal structure beneath the network was implicitly obtained by matching the travel time variations to the different stations. The earthquake mechanism, i.e. the direction of movement along the fault plane, is inferred by modeling the polarities and amplitudes of the various phases. The NARS data are best fitted by a dip-slip movement along a fault plane with a strike of 124° and a southwesterly dip of 70° or by dip-slip movement along the perpendicular plane with the same strike. The good agreement of the attitude of the first fault plane with that of the Peel Boundary Fault, combined with the fact that the hypocentral location plots on the downward extension of that fault, indicates that a downward movement of the Roer Valley Graben has taken place along the Peel Boundary Fault.	The April 13, 1992 earthquake of Roermond (The Netherlands); first interpretation of the NARS seismograms
VOLUME 71 NO 2 99	1992	71	2	99	106	Davis, R.A.	Monitoring of bedforms and depth of sediment mobility on Martens Plate in the German Wadden Sea shows that waves are more important processes than tides on a back-barrier intertidal environment subjected to tidal ranges of 3m. The tidal flat surface is wave-dominated and produces only wave or combined-flow ripples. The depth of sediment disturbance in this area is generally less than 3 cm. At the tidal channel margins, small ebb-oriented dunes are dominant. They exhibit a depth of sediment disturbance of up to 20 cm and migrate less than one wave length during a single tidal cycle. The areal extent of wave-dominated sedimentation is several times that of tide-dominated processes. Overall depth of disturbance is approximately equal to bedform height regardless of dominant processes or geomorphic location.	Dominant processes and sediment mobility on a sandy tidal flat: Martens Plate, German Wadden Sea

VOLUME 71 NO 2 107	1992	71	2	107	118	Hasselt, J.P. van	Reservoir compaction and associated surface subsidence have been the subjects of theoretical and experimental research in Shell since the 1950's. Analytical models were developed for translating reservoir compaction to surface subsidence. The validity of these models was recently confirmed by field observations and finite element studies for the Groningen gas field in The Netherlands. Experimental methods for determining the compaction coefficient on core samples in the laboratory have been developed and refined and can now closely simulate reservoir conditions. Nevertheless, data from the Groningen field show that a discrepancy remains between the compaction coefficient measured on core material and the value derived from field observations. To resolve this discrepancy, which cannot be explained by existing compaction theories, a better understanding is required of the physical mechanisms of sandstone compaction and of the way they operate under laboratory and field conditions. Current experimental and theoretical research is aimed at the formulation of a constitutive compaction law. With such a law, predictive models that use experimentally determined rock parameters as input can be formulated for reservoir compaction.	Reservoir compaction and surface subsidence resulting from oil and gas production
VOLUME 71 NO 2 119	1992	71	2	119	130	Doornhof, D.	In The Netherlands, surface subsidence as a result of hydrocarbon production has become more and more a subject of public interest because of the environmental and political aspects. The most pronounced case of this type of subsidence is demonstrated by the Groningen gas field situated in the north of The Netherlands. Since the start of gas production in 1963, the surface over the centre of the field has subsided by some 18 cm. To monitor reservoir compaction and surface subsidence in Groningen on a regular basis, an extensive monitoring programme was set up by the Nederlandse Aardolie Maatschappij BV, the operator in the Groningen concession. This programme includes yearly levelling surveys, measurements of shallow formation compaction (0 to 400m below surface) in 14 observation wells and in situ reservoir compaction measurements in 11 deep observation wells drilled specifically for this purpose. Prognoses of gas-production-induced surface subsidence, which are demanded by the State Supervision of Mines, are made using a three-dimensional grid block model to describe the gas-bearing reservoir and the associated aquifer. In the year 2050, when it is planned to abandon the gas field, the maximum subsidence (over the centre of the field) is calculated to be between 33 and 43cm.	Surface subsidence in The Netherlands: the Groningen gas field

VOLUME 71 NO 2 131	1992	71	2	131	144	Akande, S.O.; Hoffknecht, A.; Erdtmann, B.D.	Lead-zinc-fluorite-barite vein ore-bodies occur in the Benue Trough within the Lower Cretaceous (Albian) sequence of this intracontinental rift structure. The veins are distributed in a series of N/S and NW/SE fracture systems cross-cutting the Trough axis. Ore-hosting sediments range from deep marine carbonaceous shale in the lower Benue area to platform carbonates (middle Benue) and fluvial to deltaic sandstones in the upper Benue area. These sediments are invaded by mafic to felsic intrusives which are either pre or post-ore. Fluid-inclusion temperatures of vein minerals range from about 105°C to over 200°C and ore-fluid salinities vary from 14 to 25 equivalent weight % NaCl. Reflectance (Rm) of finely dispersed vitrinite in the ore-hosting sediments reaches up to 4.3% at vein centres in the lower Benue, decreasing to ca.2.6% at about 2km from known veins. In the middle Benue, Rm values vary from 0.9 to 1.7%. This suggests that ore-hosting shales in the lower Benue are slightly metamorphosed having been heated to an estimated temperature of about 240°C before the Santonian peak of tectonism. Illite-crystallinity indices on these shales in places suggest anchi to epimetamorphic contact aureoles adjacent to intrusive bodies. Our data suggest that the Benue ore-bodies were formed by hot, evaporitic, basinal brines set into motion by the high geothermal gradient accompanying continental rifting. Anchimetamorphic conditions were reached in shales of the lower Benue area where the largest ore-bodies occur.	Environment of ore formation and anchizone metamorphism in Pb-Zn-fluorite-barite deposits of the Benue Trough, Nigeria
VOLUME 71 NO 2 145	1992	71	2	145	160	Craen, M. de; Swennen, R.	The transgressive basal Zechstein conglomerate penetrated by the Bree borehole (NE Belgium) is 3.15m thick and has a polymict composition. Originally, clasts consisted predominantly of limestone, dolomite, sandstone and quartzite. Pervasive replacement by ankerite has affected the carbonate clasts, especially in the middle part of the conglomerate layer. Ankerite also forms a pore-filling cement. An origin from Fe-rich waters derived from the underlying Carboniferous clastics is indicated by the chemical and isotopic (depleted $\delta^{18}O$ and $\delta^{13}C$) characteristics of the ankerite. An evolution in fluid composition due to increasing water/rock interaction is reflected in chemical and isotope variations. The preferential precipitation of both replacive and pore-filling ankerite in the middle part of the conglomerate, reflects channeling of ankerite-bearing waters in this originally highly porous and permeable part.	Sedimentology and diagenesis of the ankeritized basal Zechstein conglomerate in the Campine Basin (Bree borehole, NE Belgium)

VOLUME 71 NO 2 161	1992	71	2	161	172	Langenaeker, V.; Duser, M.	<p>Geophysical wireline logs from recent boreholes were used to unravel the sedimentary history of the Namurian and earliest Westphalian in the western part of the Campine Basin. The study comprises 4 wells with petrophysical data (Merksplas, Poederlee, DZH14, DZH15) and 1 corehole (Turnhout). Paleogeographical cartoons are presented for the studied interval together with some examples of the log-response of the sedimentary sequence. The pendleian is missing in the Campine Basin. The Namurian sedimentary sequence starts with Arnsbergian to Alportian basinal mudstones. These are followed by two turbidite-fronted delta sequences which prograded towards the north into the basin. From the late Yeardonian onwards, four successive shallow water sheet-deltas developed. The upper part of the earliest Westphalian Ransart Member is formed by braided river deposits, situated underneath the Finefrau Nebenbank Marine Band. This succession corresponds very well to the Namurian sequence of a marginal part of the English Pennine Basin, the Gainsborough Trough, although the timing of the events is somewhat different.</p>	Subsurface facies analysis of the Namurian and earliest Westphalian in the western part of the Campine Basin (N Belgium)
VOLUME 71 NO 2 173	1992	71	2	173	188	Jong, M.G.G. de; Laker, N.	<p>The Vlieland Sandstone reservoir of the Kotter Field has significantly outperformed the original production forecast. In view of an anticipated decline of the oil production, a geological re-evaluation was carried out in 1989-1990, with the aims of contributing to increasing productivity and improving sweep efficiency. Three closely related models have been developed. The Idealised Vertical Facies Association is a sedimentological model based on core material and represents an idealised vertical sequence of genetically related sedimentary facies. The model describes an overall regressive trend, produced by the progradation of a barred shoreface sequence, which is bounded top and bottom by transgression-related erosional surfaces. Within the reservoir interval, the trend described by the Idealised Vertical Facies Association is cyclically repeated. The Field Geological Layer Model forms the synthesis of the geological knowledge to-date and presents a three-dimensional description of the reservoir resulting from the integration of core, wireline log and seismic data. It is characterized by a minimum of four stacked regressive-transgressive cycles (each representing partial development of the Vertical Facies Association) and comprises a total of thirteen, geologically distinct layers. The Field Engineering Layer Model has been developed by modification of the Geological Layer Model in order to meet the specific input requirements of a reservoir performance simulation study and to improve cost-effectiveness. Up to the end of the geological modelling study (Dec. 1990), the results of the simulation study were satisfactory.</p>	Reservoir modelling of the Vlieland Sandstone of the Kotter Field (Block K18b), offshore, The Netherlands

VOLUME 71 NO 2 189	1992	71	2	189	193	Woodside, J.M.; Meer, J.J.M. van der; Boekschoten, G.J.; Seyhan, E.; Linthout, K.		Book reviews
VOLUME 71 NO 3 195	1992	71	3	195	204	Liu, A.C.; Batist, M. de; Henriët, J.P.; Missiaen, T.	Scour hollows in the Belgian and French sectors of the North Sea have been studied from seismic records and borehole data. These hollows are thought to have formed by tidal scouring and fluvial erosion, as there is no evidence of any formed by subglacial scouring. The Murray Pit is filled by Neogene sediments and was probably eroded during the Early Pliocene. The remainder of the hollows are incised into the top of the Paleogene, and occur essentially within fluvial paleovalleys. They were most likely formed during phases of Late Pleistocene sea-level rise and most have been filled by Late Pleistocene marine sediments.	Plio-Pleistocene scour hollows in the Southern Bight of the North Sea\
VOLUME 71 NO 3 205	1992	71	3	205	225	Straaten, H.C. van der	The Abarán Basin is interpreted as a Neogene pull-apart basin that developed along an east-striking right-slip fault zone in the thin-skinned fold-and-thrust belt of the Betic foreland (External Zone). Apart from showing well known strike-slip characteristics, the fault zone is typified by drag and imbrication along subvertical faults. Considerable right-slip faulting before, during and after basin development is demonstrated by the unconformable contact between the basin and its faulted 'basement', by the formation and deformation of the basin, and by the lateral separation between basin and hinterland. The Abarán Basin shows a typical rhombic shape determined by synsedimentary faults. The fault configuration is interpreted as a releasing overstep: the northern and southern basin margin were controlled by two major right-hand stepping, east-striking right-slip faults connected by minor northwest-striking normaloblique slip faults bounding the basin in the east and the west. The progressive opening of the basin in response to the right-slip along the fault zone, generated lateral shear and extension parallel to the strike-slip basin margins throughout the sedimentation history. Right-slip led to en-echelon folds and progressive drag. Extension resulted in an overall deepening of the basin and activated normal faults. Due to movements along normal faults dipping away from the basin centre, older sediments were torn apart while being tilted. The resulting depression in the centre of the basin was subsequently filled by younger sediments that accumulated next to older deposits. Repetition of this mechanism with basinward fault progradation, generated downlapping sediment packages that step over normal faults.	Neogene strike-slip faulting in southeastern Spain: the deformation of the pull-apart basin of Abarán

VOLUME 71_NO 3_227	1992	71	3	227	237	Jong, K. de	Four phases of penetrative deformation (D_1^{vel} to D_4^{vel}) have been distinguished in the uppermost 0.5 km of the Veleta Complex, the lowest in the stack of four nappe complexes of the Betic Zone. The contact of the Veleta Complex with the overlying Mulhacen Complex is parallel to S_2 , which is the main tectonic foliation in both complexes. The rotation sense of synkinematically grown D_2^{vel} garnets and the asymmetry of preferred orientations of quartz c-axes in mylonites in the highest part of the Veleta Complex demonstrate top-to-the-west shear, pointing to a westward movement of the Mulhacen Complex. The nappe contact was folded and locally overturned during D_3^{vel} , demonstrating that the tectonic contact was formed during D_2^{vel} . During D_4^{vel} the nappe contact was reactivated as shown by concentration of extensional structures in the uppermost 20m of the Veleta Complex. It is argued that reactivation occurred during overthrusting of the Alpujarride Complex at higher structural level. Although metamorphism of the graphite-rich pelites has not resulted in characteristic mineral assemblages, the relationship between mineral growth and deformation shows that, during the early tectonic evolution, both pressure and temperature in the Veleta Complex were lower than in the overlying Mulhacen Complex.	The tectono-metamorphic evolution of the Veleta Complex and the development of the contact with the Mulhacen Complex (Betic Zone, SE Spain)
VOLUME 71_NO 3_239	1992	71	3	239	257	Bless, M.J.M.; Duser, M.; Felder, P.J.; Swennen, R.	The Molenbeersel well was drilled by the Belgian Geological Survey as a reconnaissance well in the Rur (=Roer) Valley Graben (NE Belgium). Paleocene and Upper Cretaceous (Upper Maastrichtian) carbonates were traversed between 1223--1283.17 m of which interval the major part was cored. A sedimentological and biostratigraphical analysis allows the recognition of three megasequences which correlate with thicker successions on the adjoining Brabant Massif, including the Maastrichtian type area. These megasequences testify to repeated flooding events on the inverted Rur Valley Block. Each of these is characterized by a basal conglomerate overlain by glauconite-rich deposits. In the upper two megasequences these deposits pass into pure calcareous strata. All deposits indicate shallow nearshore environments above storm wave base. Occasional emergence occurred as indicated by karstified horizons. Fossil assemblages belong to the boreal province with the exception of an immigration of Mediterranean organisms in the middle megasequence. This may be related to a period of tectonic relaxation of the Rur Valley Block during the Late Maastrichtian.	Lithology and biostratigraphy of Upper Cretaceous-Paleocene carbonates in the Molenbeersel borehole (NE Belgium)

VOLUME 71 NO 3 259	1992	71	3	259	280	Duin, J.A. van; Nieman, C.P.	The Turku granulite area forms the westernmost of several low-pressure granulite domains in the Svecofennian Schist Belt of southern Finland. The area shows a gradual transition from amphibolite to granulite facies metamorphism. Estimated peak metamorphic conditions, based on geothermobarometers applied to pelitic gneisses, metavolcanic and charnockitic rocks, are 650-680°C and 4.8 ± 0.5 kbar for the amphibolite domain, 675-725°C and 4.7 ± 0.5 kbar for the transition zone and 750 ± 50°C and 4.9 ± 0.5 kbar for the granulite domain. Prograde and retrograde mineral assemblages of pelitic gneisses indicate a 'clockwise' P-T path. On the basis of a comparison with other low-P granulite domains occurring in the same belt, namely the West Uusimaa Complex and the Sulkava area, we conclude that all three granulite domains were formed during the same thermal event in the late stage (1850-1800Ma) of the Svecofennian orogeny. The metamorphic evolution of the Svecofennides is consistent with moderate crustal thickening accompanied by additional heating through thinning of the mantle lithosphere.	Pressure and temperature history of a low-pressure transitional granulite area, Turku, SW Finland
VOLUME 71 NO 3 281	1992	71	3	281	286	Batchelor, D.A.F.		Discussion: Late Pleistocene sedimentation and landform development in western Kalimantan (Indonesian Borneo) by M.B. Thorp et al.: Geologie en Mijnbouw 69: 133-150, 1990
VOLUME 71 NO 3 287	1992	71	3	287	292	Helmers, H.; Reijers, T.J.A.; Rondeel, H.E.		Book reviews
VOLUME 71 NO 3 293	1992	71	3	293	299			Society Affairs
VOLUME 71 NO 4 301	1992	71	4	301	315	Hakstege, A.L.; Kroonenberg, S.B.; Wijck, H. van	Major and minor element geochemical analysis of Holocene clays from five borings in the Rhine and Meuse floodplains shows that Rhine deposits have less SiO ₂ , MnO, Nb and Zr and more CaO, MgO, Na ₂ O, P ₂ O ₅ , Rb and Sr than Meuse deposits. Geochemical differences between old and young floodplain clays of the Rhine are due to different granulometry and depositional regime. Multivariate statistics show that more than 70% of variance in the deposits is related to provenance and sorting during transport and deposition. Pb and Zn concentrations are correlated with organic matter content, and vegetation horizons in old floodplain deposits are naturally enriched in these heavy metals. Pb and Zn, therefore, are potential paleoclimatic indicators. Increased contents of Pb, Zn, Cr, Ba and V in young floodplain sediments dating from the last century are due to industrial pollution.	Geochemistry of Holocene clays of the Rhine and Meuse rivers in the central-eastern Netherlands

VOLUME 71 NO 4 317	1992	71	4	317	326	Jong, K. de	A new deformation scheme is presented for the Mulhacen Complex of the Betic Zone in southern Spain. This deformation scheme, which consists of six phases of superimposed penetrative deformation, is based on structural investigations in the contact zone with the overlying Alpujarride Complex. The newly obtained data imply that overthrusting by the Alpujarride Complex was the last major event in the deformational history of the Mulhacen Complex.	Redefinition of the deformation scheme of the Mulhacen Complex and implications for the relative timing of the overthrusting of the Alpujarride Complex in the Betic Zone (SE Spain)
VOLUME 71 NO 4 327	1992	71	4	327	336	Jong, K. de	This paper elucidates the large-scale polyphase deformation history of the Mulhacen Complex, the partially overprinted HP/LT metamorphic nappe complex in the Betic Zone of southeastern Spain, by tying zones of concentrated small-scale and mesoscopic deformation to large-scale structures, which could be mapped out due to excellent exposure. Small-scale structures show that progressively younger deformation was increasingly less homogeneous and became progressively more concentrated in zones. The original $D_1^{mulh} - D_2^{mulh}$ distribution of lithologic units and main tectonic units was disrupted during subsequent polyphase deformation. During a third phase of penetrative deformation (D3mulh), S-SW vergent folding and associated S-SW ward thrusting occurred; the most intense folding and cleavage development took place in the vicinity of these thrusts. During D3mulh, a level in the top of the lowest nappe of the Mulhacen Complex acted as floor thrust of the imbrications. Mapping and structural analysis showed that during subsequent deformation this zone was reactivated and that deformation was concentrated below the detachment. The last phase of deformation (D7mulh) did not result in penetrative deformation but in approximately N-S trending subvertical faults and associated similarly oriented flexures and large-scale open folds. Tortonian sediments show that D6mulh occurred before, and D7mulh, at least partly, after their deposition.	Large-scale polyphase deformation of a coherent HP/LT metamorphic unit: the Mulhacen Complex in the eastern Sierra de los Filabres (Betic Zone, SE Spain)

VOLUME 71 NO 4 337	1992	71	4	337	349	Burkhard, D.J.M.	<p>A T-fO₂ pair is the result of solving two independent equations (for biotite and its host rock) each of which relates the two unknowns, oxygen fugacity (fO₂) and temperature, with an analytically determined Fe²⁺/Fe³⁺ ratio. T- fO₂ pairs, determined for a series of rock samples from localities which are spatially distributed over an intrusive are different and plot linearly in 1/T-logfO₂ space. A comparison of such lines, estimated for granites from Australia, Japan and Portugal shows three major features: (1) magnetite-granites and magnetite-free ilmenite-granites cover distinct fields, (2) Australian granites have a lower oxidation state and higher biotite crystallization temperatures than granites from Japan, and (3) ilmenite-granites from Japan plot systematically in an oxygen-rich regime, that is above the NiNiO (NNO) buffer, implying that their mineral assemblage is not in equilibrium whereas ilmenite-granites from Australia plot in an oxygen-poor regime, i.e. below the fayalite-magnetite-quartz (FMQ) buffer. It is, of course, expected that magnetite-free ilmenite-granites with all Fe³⁺ partitioned into biotite, have an oxidation state below (FMQ). Ilmenite-granites which plot above (FMQ) must therefore have experienced oxidation upon cooling, after ilmenite and after biotite crystallization. Such an oxidation may be related to volatile water, available at temperatures below water saturation and above solidification of the rock. Because ilmenite-granites plot either below or above (FMQ) for a specific region, one may infer that this is related to a regionally low or high water content respectively. As such one can distinguish low-water regions, such as Australia and N Portugal which are recognized as non-subduction-related granites, and high-water regions, such as</p>	<p>Biotite crystallization temperatures and redox states in granitic rocks as indicator for tectonic setting</p>
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VOLUME 71 NO 4 351	1992	71	4	351	362	Mabesoone, J.M.; Alheiros, M.M.	The easternmost sedimentary basin of the NE Brazilian Atlantic margin shows special tectonic and sedimentary features due to the fact that it was the last link between South America and Africa. The basin is strongly influenced by the rotational separation of both continents and by the reactivation of Precambrian faultlines. The basin may be subdivided into seven subbasins which all have a homoclinal structure. The differential downwarp of the crystalline basement resulted in deeper and shallower parts that are bounded by faults. A crystalline basement high disrupts continuity between the three southern subbasins in Pernambuco and Paraíba States, and the four northern ones in Rio Grande do Norte State. Sedimentation in the basin started in about Santonian time with meandering, sometimes braiding fluvial sandstone systems passing seaward into calcareous littoral sandstones. In the Maastrichtian the sea advanced over the area. As a consequence, sedimentation in the southern subbasins began then with the accumulation of transgressive phosphorites and calciclastics from a South Atlantic source. Later, somewhat deeper-water limestones were deposited. A Paleocene regression is represented by detrital limestones and calcareous clays. Marine sediments of Maastrichtian age in the northern subbasins, which belong to the Equatorial Atlantic, are restricted to shallow-water shelf limestones which became strongly recrystallized and partly dolomitized. From the structural, geophysical, sedimentological and paleontological analyses of the basin we conclude that (1) the last link between South America and Africa was broken only at the end of the Cretaceous, (2) the sill tilted southward before its rupture, (3) the sedimentary fills north and	Evolution of the Pernambuco-Paraíba-Rio Grande do Norte Basin and the problem of the South Atlantic connection
VOLUME 71 NO 4 363	1992	71	4	363	368	Thorp, M.B.; Thomas, M.F.	Quaternary alluvia in Sundaland, as elsewhere, give a simplified picture of the complexity of eustatic, tectonic and bioclimatically driven episodes of erosion and sedimentation during the Quaternary Era. It is premature, therefore, to propose the Batchelor model of the off shore Upper Cainozoic Sundaland sedimentary sequence as a standard for the region. The W Malaysian 'Old Alluvium' includes discrete sedimentary bodies with confirmed upper Pleistocene dates making them co-eval with W Kalimantan alluvial fan terraces whose late Pleistocene age we uphold. We caution the use of humicretes and ferricretes as inter-regional chrono-stratigraphic markers.	Discussion: Late Pleistocene sedimentation and landform development in western Kalimantan (Indonesian Borneo). Reply by the Authors

VOLUME 72 NO 1 1	1993	72	1	1	13	Crook, T. de	This probabilistic seismic hazard analysis for The Netherlands is based on the catalogue of European earthquakes published by the Commission of the European Communities. The seismic hazard is assessed by applying a modified version of the McGuire program. This method uses for each seismotectonic zone a linear frequency-intensity relation, an upper bound of intensity, an average depth for large earthquakes and an azimuth-dependent attenuation. It assumes a Poisson process for large earthquakes. The annual probability versus intensity is calculated for sites at gridpoints with 7km spacing. Hazard intensity maps are presented for the annual probabilities of occurrence 0.02, 0.01, 0.005, 0.001, 0.0004 and 0.0001. A rough estimate of the error is approximately one half of an intensity unit for all probabilities. The highest seismic hazard in The Netherlands is found in the south-east with intensity VIII for a 0.0001 annual probability and is decreasing to the north-west in line with the seismicity.	Probabilistic seismic hazard assessment for The Netherlands
VOLUME 72 NO 1 15	1993	72	1	15	21	Middelburg, J.J.	The sedimentary record has always been affected by both diagenesis and changes through time in the input flux. It will be shown that distal turbidites, which are extremely uniform throughout upon emplacement, can be used to constrain diagenetic processes. Emplacement of turbidites causes the exposure of various labile and reduced components to oxic pelagic conditions. This initiates various diagenetic processes such as organic matter decomposition, element redistribution and carbonate dissolution. The influence of these processes on the sedimentary record can be obtained directly from depth profiles within initially homogeneous turbidites. The sedimentary record can provide strongly biased information when diagenetic alterations are not considered.	Turbidites provide a unique opportunity to study diagenetic processes

VOLUME 72_NO 1_23	1993	72	1	23	67	Hove, H.A. ten; Hurk, P. van den	Serpulidae (Polychaeta) are benthic, suspension-feeding worms, mostly marine, secreting their own calcareous habitation tubes. Serpulid 'reefs' include banks deposited on shallow parts of continental shelves, and primary frame reefs at intertidal and subtidal depths. Sheltered bays harbour the largest reefs, up to a few metres in height and kilometres in length. A review of habitats with Recent serpulid mass-occurrences allows interpretation of the palaeoenvironment in which the serpulid limestones in the 'Upper Malm' (Upper Jurassic-Lower Cretaceous) of NW Germany may have been laid down. The Lower Serpulid Limestones represent concentrations of re-deposited serpulid tubes. In the Upper Serpulid Limestones ('Serpulit') the re-deposited tubes are embedded in stromatolitic algae. Both limestones were formed in lagoons fringing an inland sea. Several records of Recent and fossil 'serpulid' buildups are erroneous and can be referred to algae, vermiform 'gastropods' or non-serpulid polychaetes. Differences and similarities between calcareous tubes of serpulids and vermetids (Gastropoda) are summarized.	A review of Recent and fossil serpulid 'reefs'; actuopalaeontology and the 'Upper Malm' serpulid limestones in NW Germany
VOLUME 72_NO 1_69	1993	72	1	69	83	Sprenger, A.; Kate, W.G. ten	The cyclicities in rhythmic limestone-marl alternations of two late Berriasian (hemi) pelagic successions are correlated. The first succession has a thickness of 42.8 m, and is situated in the northernmost Subbetic realm near Caravaca (SE Spain). It comprises the <i>Calpionellopsis simplex</i> subzone (D1). The second succession, with a thickness of 40.5 m, is located about 950 km to the northeast in the Fosse vocontienne near La Faurie (SE France). It starts 2 to 5 m above the base of subzone D1 and ends near its top. The carbonate contents of 740 samples of both successions were used to establish a visual correlation. A more refined correlation was established by cross-spectral analysis of the carbonate/clay ratios. Although the two sedimentation realms differ geographically and geologically, the power spectra show a remarkable resemblance at the eccentricity and precession frequencies, which is numerically confirmed by significant coherence at the 80% confidence level. The cyclicities of both, the Caravaca and the La Faurie succession, are, at least in part, orbitally controlled.	Cross-spectral analysis of two late Berriasian rhythmic limestone-marl successions in SE Spain and SE France favours orbital control
VOLUME 72_NO 1_85	1993	72	1	85	95	Rondeel, H.E.; Veen, A.H. van der; Silva, S. de; Hoorn, C.; Pinggen, M.; Visscher, H.; Vandenberghe, J.; Meesters, A.G.C.A.; Meer, J.J.M. van der; Boekschoten, G.J.		Book reviews
VOLUME 72_NO 2_101	1993	72	2	101	102	Vandenberghe, J.; Schwan, J.		Introduction - Periglacial Environments in relation to Climatic Change
VOLUME 72_NO 2_103	1993	72	2	103	106	Vandenberghe, J.		Recent results of Pleistocene periglacial research in the Netherlands

VOLUME 72 NO 2 107	1993	72	2	107	123	Kasse, C.	The climatic development of the Early Pleistocene Tiglian stage has been studied in the Tegelen Formation (Rijkevorsel, Beerse and Turnhout Members) in northern Belgium. The sedimentology, paleoecology and periglacial structures of the Beerse Member indicate the presence of a cold period (Beerse Glacial: Tiglian C4) within the warm Tiglian stage. The climatic deterioration led to a drop in sea level, which is reflected by a change in sediment provenance and sedimentary environments. Rhine supply was replaced by a local supply from central Belgium and the interglacial estuarine environment changed into a periglacial eolian sand sheet environment. Gleysols (H-Cg and Ah-Cg profiles) developed in the Beerse Member during phases of land surface stability. During the Beerse cold phase, vegetation was reduced to herbs and pine (tundra and boreal coniferous forest), indicating a mean summer temperature of about 10°C. The periglacial structures (involutions, frost cracks, initial ice-wedge casts) point to a mean annual temperature between -1 and -4°C, which is comparable with the temperature of the Weichselian Pleniglacial.	Periglacial environments and climatic development during the Early Pleistocene Tiglian stage (Beerse Glacial) in northern Belgium
VOLUME 72 NO 2 125	1993	72	2	125	130	Gullentops, F.; Janssen, J.; Paulissen, E.	The geomorphological analysis of the Bosbeek valley, situated in the present-day temperate climate of Belgium, establishes that in the Saalian periglacial environment snow played a major role in shaping the landscape. It is inferred that snow banks were important for a rapid and considerable retreat of the western valley side in loose deposits. Intense snowmelt in the beginning of the short summers was responsible for the formation of a periglacial pediment between the valley side and the river floodplain. By these processes the Saalian was, at least in northeastern Belgium, the most effective glacial stage in terms of erosion. During the Weichselian, the Saalian periglacial landscape was only slightly remodelled by river incision and cover sand deposition.	Saalian nivation activity in the Bosbeek valley, NE Belgium
VOLUME 72 NO 2 131	1993	72	2	131	142	Krzyszowski, D.; Balwierz, Z.; Pyszyński, W.	The basal member of the Piaski Formation in the Bechatów outcrop of central Poland was deposited between 43700 and 27000 BP. It consists mostly of lacustrine deposits. Its lower part contains several organic layers, fluvial sands and slope deposits. Radiocarbon-dating places the organic horizons in the Moershoofd and Denekamp Interstadials. The first of these interstadials was probably characterized by forest-tundra or scrubtundra conditions, but this needs to be confirmed since the analysed material may represent redeposited pollen. The Denekamp Interstadial was characterized by grass tundra (34000-31000 BP) and finally by discontinuous tundra of the subpolar desert (31000-27000 BP).	Aspects of Weichselian Middle Pleniglacial stratigraphy and vegetation in central Poland

VOLUME 72 NO 2 143	1993	72	2	143	157	Kozarsky, S.	In NW Poland, in the area of the last Scandinavian icesheet, periglacial phenomena occur mostly in outwash plains, till plains and pradolina terraces, and sporadically also in alluvial fans and inland dunes. Some of them contain indications of former permafrost and can be used in palaeoenvironmental reconstructions of the Late Pleistocene deglaciation. They include epigenetic and syngenetic ice-wedge casts, fossil sand-wedge polygons, ice-vein network casts and oriented icing depressions. The cryostratigraphic record of permafrost indicators and their geomorphic distribution testify to the presence of continuous permafrost or at least vast permafrost patches in the deglaciated area in NW Poland during the Late Plenivistulian and during cold spells of the Late Vistulian.	Late Plenivistulian deglaciation and the expansion of the periglacial zone in NW Poland
VOLUME 72 NO 2 159	1993	72	2	159	166	Kolstrup, E.	A sedimentary sequence from eastern Denmark covers the time span from somewhat before 30 ka BP until 20 ka BP, based on thermoluminescence (TL) age estimates. The sequence is composed of loess and sandloess alternating with water-laid sediments in the lower part and with slope deposits in the upper part. Pollen is present in some of the layers. Integration of the evidence from this sequence with data from other north and central European localities of the same period suggests that from 30 till 20 ka BP there was much reworking of sediments by wind. The presence of slope deposits and frost-wedge casts points to (intermittent?) permafrost between about 24 and 20 ka BP, and possibly also for a period between 27 and 24 ka BP. Although soil surface conditions were unstable, vegetation was probably present during almost the entire period; the dominant cover was herbs, grasses and sedges.	Periglacial environmental developments between 30 and 20 ka BP in Denmark

VOLUME 72 NO 2 167	1993	72	2	167	177	Manikowska, B.	<p>The Eemian and Vistulian (= Weichselian) sedimentary fill of a closed depression and the glacial Saalian substratum at Kalinko as well as the Late Vistulian (= Late Glacial) dune deposits at Zamety were studied as representative periglacial sequences for central Poland. Heavy minerals and feldspars were examined by optical methods and by coloration with cobalt nitrite of sodium. Quartz grain abrasion was investigated by applying a modified Cailleux morphoscopic method and Krygowski's mechanical granulometry. Mineralogical changes, especially a decrease in frequency of amphiboles and an increase of garnets, along with an increase of wind-abraded elements, suggest that these changes have an aeolian origin. The frequency of features which are due to aeolian activity increases progressively in Early Vistulian and Plenivistulian lake and slope deposits. The degree of transformation is highest in the sands with gravels deposited by slope wash waters and in the sands filling the Late Plenivistulian frost wedges. The degree of transformation increases markedly from about 30 000 BP onward and reaches a maximum between 20 000 and 14 000 BP. The Late Vistulian coversands and dunes consist of material that was formerly strongly transformed by wind. They do not contain more wind-abraded grains than the Late Plenivistulian non-aeolian deposits.</p>	Mineralogy and abrasion of sand grains due to Vistulian (Late Pleistocene) aeolian processes in central Poland
VOLUME 72 NO 2 179	1993	72	2	179	192	Veldkamp, A.; Kroonenberg, S.B.	<p>The Late Quaternary terrace chronology of the middle Allier basin (Limagne, Massif Central, France) has been reconstructed by means of terrace (chemo)lithostratigraphy and with Th/U disequilibrium and ¹⁴C datings. The 25 m terrace level (Wb) has a Late Saalian age. The Weichselian Terrace levels Xa and Xb (20 and 10 m) contain at least four different lithostratigraphical units: one Middle Pleniglacial, two Late Pleniglacial and one Younger Dryas. The oldest Holocene ZY terrace sediments have Atlanticum ages. Timing of Allier incision and sedimentation during the Late Pleniglacial and Late Glacial appears to be mainly climate-related. Major fluvioglacial sediment fluxes from melting glaciers on the Mt. Dore and Cantal at the end of the Late Pleniglacial caused a strong rise of the Allier river bed level. This rise of approximately 20 m in the Limagne seems to have contributed to the formation of lakes like Marais de Ravel and the Grand Marais. Fluvial dynamics in the Allier basin seem to be mainly climate controlled.</p>	Late Quaternary chronology of the Allier terrace sediments (Massif Central, France)

VOLUME 72 NO 2 193	1993	72	2	193	210	Bohncke, S.; Vandenberghe, J.; Huijzer, A.S.	The sandpit at Bosscherheide, on the east bank of the Maas (= Meuse), provides a detailed record of Late Weichselian palaeoenvironmental changes. The periglacial fluvial, and aeolian processes recorded in its sediments have been studied by means of pollen, macrobotanical and thin section analyses, sedimentological observations and radiocarbon datings. The data reveal a series of processes involving rapid environmental changes, which determined the termination of the Bølling-Allerød interstadial complex. At the transition from Allerød to Late Dryas, ca 10 800 BP, large-scale floodings and deposition of suspension load took place. Prior to these floodings, a short period with (incipient) permafrost occurred. The aeolian sedimentation, leading to the formation of parabolic dunes, took place mainly between 10 500 and 10150 BP.	Periglacial environments during the Weichselian Late Glacial in the Maas valley, the Netherlands
VOLUME 72 NO 2 211	1993	72	2	211	224	Vliet-Lanoë, B. van; Seppälä, A.; Käyhkö, J.	The inland dune field at Hietatievat (Finnish Lapland) is derived from an esker and accumulated during the early Holocene. A podsol developed in a humid climate at least until the end of the Atlantic. A generalized phase of cryoturbation occurred at that time, in the absence of permafrost and in response to a higher standing water level in autumn. As a consequence of forest fires and a lowering of the water level during the Subboreal, dunes were reactivated during the Subatlantic and are still active today. The frost susceptibility of the clean sand is related to amorphous clays and organic matter accumulated by podsolisation. Cryoturbations resulting from a negative gradient of frost susceptibility (the surface horizon is less susceptible to frost heave than the subsurface) and a high standing water table evolve into hummocks during periods with a low-standing autumn water table. These hummocks develop into pseudo-convective forms (mounds with a central injection). Features observed at Hietatievat are similar to those observed in aeolian sands at the Gåsebu site (Svalbard, continuous permafrost) and are governed by the same laws of mechanical deformation. Permafrost is not a prerequisite for the development of cryoturbation. These deformations can be used as analogs for the understanding of the Late Glacial phenomena of western Europe. Holocene changes in the hydraulic regime observed through the cryopedological approach seem consistent with the results obtained by other methods.	Dune dynamics and cryoturbation features controlled by Holocene water level change, Hietatievat, Finnish Lapland

VOLUME 72 NO 2 225	1993	72	2	225	235	Hus, J.J.; Paepe, R.; Geeraerts, R.	The palaeomagnetic investigation of an ice-wedge cast in Late Pleistocene loess deposits in Belgium demonstrated that the upturned strata adjacent to the wedge have retained a stable remanence which can be used as a marker to visualize the strain. Different wedge fillings could be differentiated and identified on the basis of their remanent magnetization and magnetic susceptibility properties. Deformations due to periglacial activities easily escape observation, particularly in cores, and hence large associated anomalous magnetization directions may be erroneously interpreted as 'excursions' of the geomagnetic field.	The influence of periglacial activity on the remanent magnetization of sediments
VOLUME 72 NO 3 237	1993	72	3	237	249	Veldkamp, A.; Dijke, J.J. van	Within the programme of investigation for suitable safe geological sites (such as salt diapirs) for long-term storage of radioactive waste (OPLA), a modelling study of long-term effects of fluvial dynamics was carried out. The model used, FLUVER, allows long-term simulations of the combined effects of climatic change, tectonism, sea level and initial relief on fluvial erosion. As an exercise, landscape development scenarios of a Rhine-Meuse type system with climate and base-level dynamics related to Milankovitch's astronomical theory, during stable, uplifting, and subsiding tectonic scenarios, are simulated and discussed. Under the assumptions that climate and base-level changes can be described with Milankovitch's theory and that tectonic activity in the Netherlands will not change considerably during the next hundred thousands of years, it can be concluded provisionally that the maximum fluvial erosion depth in the next few hundred thousand years is unlikely to exceed 100 metres and to reach a salt diapir.	Modelling of potential effects of long-term fluvial dynamics on possible geological storage facilities of nuclear waste in the Netherlands

VOLUME 72 NO 3 251	1993	72	3	251	264	Törnqvist, T.E.; Weerts, H.J.T.; Berendsen, H.J.A.	<p>The upper part of the Late Saalian to Early Holocene Kreftenheye Formation in the Netherlands usually consists of a relatively fine-grained, clastic bed (frequently referred to as 'loam bed'), which is generally regarded as an overbank deposit of incipient meandering fluvial systems. It was formed essentially in two phases, during the Allerød and the Early Holocene. The 'loam bed' is sometimes covered by eolian river dune deposits which have also been considered as part of the Kreftenheye Formation. Both sedimentary units have a large areal extent, a number of characteristic lithologic properties and a distinct stratigraphic position. It is shown that the 'loam bed' in a lithologic sense rarely consists of loam. The currently existing terminological confusion concerning the 'loam bed' and (to a lesser extent) the river dune deposits is caused by the mixing of lithologic, genetic, lithostratigraphic and chronostratigraphic criteria. In order to avoid further confusion, two formal lithostratigraphic units are introduced and lithologic descriptions are given for the holostratotypes of these units. The Wijchen Member of the Kreftenheye Formation essentially contains the 'loam bed'. The definition of the areally variable Wijchen Member is supported by a hypostratotype. The river dune deposits are incorporated in the Delwijnen Member. The Delwijnen Member is included in the Twente Formation because its lithologic characteristics and stratigraphic position are more similar to the Younger cover sands (Wierden Member) of the Twente Formation than to the fluvial coarse-grained deposits of the Kreftenheye Formation.</p>	<p>Definition of two new members in the upper Kreftenheye and Twente Formations (Quaternary, the Netherlands): a final solution to persistent confusion?</p>
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VOLUME 72 NO 3 265	1993	72	3	265	294	Alsharhan, A.S.; Nairn, A.E.M.	<p>The State of Qatar is situated in the southwestern Arabian Gulf and covers an area of about 12 000 sq km. The land portion is formed by a large, broad arch, which is part of the regional, NE-SW trending Qatar-South Fars Arch, separating two Infracambrian salt basins. The Dukhan Field on the west coast of the Qatar Peninsula, with its reservoirs in Upper Jurassic limestones, was the first oil field discovered. Since this discovery in 1940, a series of other discoveries have been made, and Qatar became a member of the Organization of Petroleum Exporting Countries (OPEC) in 1973. Hydrocarbon accumulations are widely dispersed throughout the stratigraphic column with production from Middle Jurassic to Middle Cretaceous strata. The most prolific reservoirs are in shelf carbonate sequences and minor accumulations occur in Albian clastic sediments. Seals, mainly anhydrite and shale, occur as formations of regional extent as well as intraformationally with smaller areal distributions. There are several stratigraphic intervals which contain source rocks or potential source rocks. Upper Oxfordian-middle Kimmeridgian source rocks were formed in an extensive, starved basin during a period of sea-level rise. They contain organic matter of sapropelic, liptodetrinitic and algal origin and have a total organic carbon content of 1 to 6%. Both depositional environment and tectonic evolution through geologic time have influenced sedimentary facies and stratigraphic features, which controlled reservoir, source and seal characteristics and subsequent hydrocarbon generation, migration and entrapment.</p>	Geology and hydrocarbon habitat in the Arabian Basin: the Mesozoic of the State of Qatar
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VOLUME 72 NO 3 295	1993	72	3	295	304	Liesa, M.	The Hercynian metamorphic evolution at different crustal levels of the Roc de Frausa Massif has been constrained relative to the deformation and intrusion of igneous rocks. The main deformation phase is considered to have been synchronous throughout the whole crustal section exposed. Intrusion of igneous bodies took place subsequently to deformation and overprinted the previously foliated texture of the country rocks. At shallow levels two metamorphic peaks are distinguished, viz. a regional one, synchronous with the main deformation, and a contact-metamorphic peak. At deeper levels and away from the intrusives the regional metamorphic climax is post-kinematic. Near the intrusives, the contact-metamorphic episode constituted the latest and highest temperature stage of a continuous prograde metamorphic evolution. The crustal evolution is characterized by a first compressive event at intermediate-pressure metamorphic conditions, followed by a post-tectonic event characterized by low-pressure - high-temperature metamorphism and ubiquitous magmatism. The first event is registered at shallow levels of the crust, whilst the second event is only recorded in exposures representing deeper crustal levels. The high-temperature metamorphism and magmatism could be a result of either the incorporation of mantle material into the lower crust subsequent to a thickening episode, or a subcrustal collapse of a previously thickened lithosphere.	Relations of Hercynian metamorphism with magmatism and deformation in the Eastern Pyrenees. Implications for Hercynian evolution
VOLUME 72 NO 3 305	1993	72	3	305	310	Sintubin, M.	A preliminary microfabric and texture analysis of shales, siltstones and a slate, collected in the Ordovician and Silurian of the Wépion borehole (Ardennes, Belgium), enables us to comment on the structural and paleogeographic significance of the Caledonian Sambre-et-Meuse massif as part of the Variscan front. The texture image in the massif only reflects a compaction strain, which is in accordance with the poorly evolved character of the fabric, in which no clear signs of a secondary cleavage can be distinguished. The shales and siltstones seem to have evolved within a shallow structural level under diagenetic circumstances. In this respect the Sambre-et-Meuse massif forms an exception with regard to the other Caledonian basement massifs in the Variscan fold-and-thrust belt in Belgium, which are all characterised by the development of a slaty cleavage in low-grade metamorphic circumstances. Such a secondary cleavage also occurs at the bottom of the Wépion borehole in the Brabant basement.	Structural and paleogeographic inferences from a texture analysis of Ordovician and Silurian pelites of the Wépion borehole (Ardennes, Belgium)
VOLUME 72 NO 3 311	1993	72	3	311	316	Reijers, T.J.A.; Sissingh, W.; Lankreijer, A.C.; Boekschoten, G.J.; Helmers, H.		Book reviews
VOLUME 72 NO 3 317	1993	72	3	317	319	Kroonenberg, S.		Presentation of the Van Waterschoot van der Gracht Medal to Prof. Dr. D.G. Price

VOLUME 72_NO 4 321	1993	72	4	321	330	Ruegg, G.H.J.	<p>In the Rhine-Meuse river system in the Netherlands, a combination of major tectonic movements and climatic cycles (periglacial to temperate-warm, non-arid) has resulted in different sedimentation patterns on either side of the terrace intersection. Upstream of this intersection, a vertical series of river terraces was formed by the alternating processes of erosion of the valley by meandering river action and partial refilling of the valley by braided river action. The coarse-grained gravelly deposits within these terrace units show the characteristics of a braided river (Scott-type sequential model) and reflect general aggradation during cold, i.e. glacial, stages. During interglacials, meandering rivers cut into the previously formed braided river deposits causing net sediment removal. Deposits dating from interglacials are very scarce. Downstream of the intersection, the average sedimentation rate kept up with subsidence. Sediment was supplied mostly by braided rivers during cold stages and the resulting sequences resemble the Donjek-type sequential model. During interglacial times meandering rivers mainly caused reworking and erosion of braided river deposits from the preceding glacial stage. Meandering river deposits are more widespread than upstream of the intersection; they are interbedded between braided river deposits. Further downstream, marine transgressions during interglacials caused the coast-related anastomosing river zone to shift upstream, sometimes as far as the present-day western Netherlands. As a consequence of the mechanism responsible for forming fluvial terraces upstream of the terrace intersection, fine-grained overbank and cut-off sediments from meandering rivers that potentially can be dated</p>	Alluvial architecture of the Quaternary Rhine-Meuse river system in the Netherlands
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VOLUME 72_NO 4_331	1993	72	4	331	347	Krook, L.; Schwan, J.	<p>In the lowlands of northwest Germany, Saalian (fluvio-) glacial plateaus and ice-pushed hills are surrounded by flat and low-lying terrain consisting of Weichselian fluvial to Aeolian sands. The present work refers to the Ems-Hase fluvial basin and the adjacent part of the fluvio-glacial Hümmling plateau. On the basis of heavy-mineral analyses and other data it was found that: (i) The Weichselian deposits are significantly richer in garnet and alterite than the Saalian meltwater sands which flank and underlie them in the Ems-Hase fluvial basin. It is thought that Weichselian fluvial deposition was preceded by a period of erosion related to the low sea level of the last ice age. During that phase, the ancient riversystem extended its course in upstream direction and cut down into the headwater portion of its drainage basin. As a result, the subsequent infilling of the valleys was primarily by material derived from pre-Cenozoic rocks with the share of the Saalian substrate being subordinate only. (ii) There is no significant difference in unstable-species content between fluvial and aeolian sands but for the occurrence of traces of glaucophane only in the second type. The latter feature suggests that, during the Late Weichselian Pleniglacial, deflation from the then dry part of the North Sea floor contributed to the deposition of the windborne coversands in the study area. Yet, the effect of the long-distance aeolian transport must have been slight only, and the buildup of the coversands resulted mainly from the local reworking by wind of the fluvial-sand substrate. (iii) Mineralogically, there is a distinct contrast between the fluvial sands from the northern part and those from the southern part of the study area. The pertinent heavy-mineral spectra,</p>	Sediment-petrologic characteristics of Saalian and Weichselian deposits in the Hümmling region, NW Germany
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VOLUME 72_NO 4 349	1993	72	4	349	361	Salomonsen, I.	<p>The Lower Pleistocene is well preserved in the centre of the North Sea, in contrast to the onshore sedimentary record in Denmark. In the Central Trough area the base of the Quaternary is deeper than 1000 m, and regional subsidence appears to have been uniform throughout the Early and early Middle Pleistocene. Seismic stratigraphic analysis allows subdivision of the Lower Pleistocene depositional succession in the western Danish sector into seven subunits. The seismic reflectors bounding these subunits can be correlated with seismic third-order sequence boundaries identified and mapped in the Late Tertiary and Pleistocene succession in adjacent British and German sectors. The subunits recognized in the Danish area may equal these sequences. Structure contour maps for five of the boundaries and isopach maps for three of these subunits show the position of the depocentres in the area. The main Pleistocene depocentre coincides with the axis of the central North Sea Basin. In the Early Pleistocene (Tiglian), local depocentres were also present outside this area. The sediments represented by the seismic sequences in the Dutch, British and German sectors can be related to the depositional basin of a river system draining the northwest-European continent. In addition, climatically induced changes in depositional conditions in the area have affected the sedimentation pattern.</p>	<p>A seismic stratigraphic analysis of Lower Pleistocene deposits in the western Danish sector of the North Sea</p>
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VOLUME 72_NO 4_363	1993	72	4	363	373	Assorgia, A.; Gimeno, D.	The Guardia Marina beach (Sardinia island, Western Mediterranean, Italy) contains outcrops of subalkaline basaltic pillow lava within a Miocene sedimentary sequence of shallow marine facies. The northern sector of the beach is characterized by the presence of feeder dikes terminating at their upper ends in antigravitative toothpaste-like massive pillows and lateral expansions of highly vesiculated and cupola-like hollow pillows. The central sector of the beach shows partially eroded pillows and pillowed dikes, as well as sandwiched layers of sediments between laterally expanded pillows. The southern sector of the beach contains well-developed pillows (intrusive with respect to the sedimentary sequence) with a clear development of peperitic lithofacies at the magma-sediment interface. The lateral continuity of the sedimentary beds suggests a coeval growth of pillows at the magma-water and magma-sediment interfaces, as well as a recurrent process of pillow-growth from feeder dikes. The multiple-rind structure in the pillows in the southern sector of the beach confirms the very shallow marine environment inferred from fossil fauna and sedimentary lithofacies. The early erosion of the pillows in the central and northern sector of the beach accounts for the proximal character of crystal-rich epiclastic layers within the calcarenitic sequence. The Guardia Marina outcrops show that pillow lava can correspond both to a subaqueous environment and to a growth of pillows under a thin layer of poorly lithified sediments. The generally accepted concept that pillow lava indicates a subaqueous environment must therefore be tested through an accurate study of the pillow-sediment interface.	Coeval genesis of pillow lava on the sea floor and under a thin cover of unlithified sediments (and associated formation of peperites)
VOLUME 72_NO 4_375	1993	72	4	375	391	Herngreen, G.F.W.; Hartkopf-Fröder, C.; Ruegg, G.H.J.	Major parts of the Lower Cretaceous Kuhfeld Beds as present in the Alstätte Embayment, Dutch-German border area, have a marine origin and were not exclusively deposited in a limnic-terrestrial setting as previously thought. For the first time, direct fossil evidence is available. This dates the base of the formation as transitional Ryazanian- Valanginian and indicates a late Early-Late Hauterivian age higher in the formation.	Age and depositional environment of the Kuhfeld Beds (Lower Cretaceous) in the Alstätte Embayment (W Germany, E Netherlands)
VOLUME 72_NO 4_393	1993	72	4	393	395	Boekschoten, G.J.; Zakrzewski, M.A.; Reijers, T.J.A.		Book reviews

VOLUME 73_NO 1_1	1994	73	1	1	12	Antia, E.E.	<p>This report evaluates the dynamic pattern of the subtidal, longshore-rhythmic morphology along the East Frisian barrier island coast. Analysis of high-resolution sounding charts from the shoreface of Spiekeroog Island, which span a period of 37 years, leads to the following: (a) the alongshore spacing as well as the eastward increasing shore-normal orientation of the channels of the morphology were markedly constant over time; (b) the main pattern of migration of the channels was rotational about well-defined nodal points, rather than translational; (c) four rotational patterns are distinguished, two of which are symmetric, i.e. the seaward and shoreward segments (relative to a nodal point) of the channel are characterized by a similar sense (clockwise or anti-clockwise) in rotation, whereas the two asymmetric patterns display opposite rotation at both segments; (d) the sense and degree of channel rotation showed no time-dependent progression; (e) the frequency of the clockwise angular displacement $> 20^\circ$ was higher than that of the anti-clockwise counterpart, and (f) the Mode 1 rotational pattern, in which both the seaward and shoreward segments of the channel depict a clockwise rotation, was found to be typical of, but not exclusively associated with, storm conditions in which the storm surge height exceeded 3 m. These observations are inconsistent with the dynamic behaviour of a flow-transverse (sand wave or dune) morphology. The channels of the morphology are considered to represent channels of storm rip-currents. The regularity in the alongshore spacing of the channels suggests an edge-wave control. However the quality and type of hydrodynamic data required to verify the above assertion are presently unavailable. In the rock</p>	<p>Long-term and post-storm dynamic patterns of the subtidal rhythmic morphology along the East Frisian island coast, Germany</p>
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VOLUME 73 NO 1 13	1994	73	1	13	22	Antia, E.E.	This report evaluates the vertical variation of grain-size parameters of shoreface-connected ridges off Spiekeroog Island (German Bight). It is based on eight, 1.5 to 2 m-long, vibrocores retrieved along a single transect from successive morphozones of two ridges. The ridges are situated in water depths of 12 to 18 m, have a relief of 2 to 5 m, and are 1 to 1.5 km wide. The colour and textural composition of the ridge sediments suggest a two-fold grain-size facies. The surficial facies is mainly composed of medium to coarse-grained, relatively poorly sorted, brownish to orange-brown sands, and is usually about 60 cm thick. The subsurficial facies consists of gray-coloured fine sands with discrete occurrences of coarser sand layers that are probably storm-deposited. In general, four vertical grain-size patterns are displayed in the cores: sharp (relative to facies transition), gradational, fluctuational and homogeneous. As observed for the surficial cross-ridge pattern, the subsurface sediments of the landward flank and trough of the outer ridge are in general coarser and more poorly sorted than those of the crest and seaward flank. Similarly, the subsurface sediments of the inner ridge crest are coarser and less sorted than their counterparts from the outer ridge crest. These observations suggest that ridge sedimentation processes have always been coherent in time, even prior to the deposition of the surficial facies. The latter is considered to reflect a vertical growth of the ridges. Its origin is probably related to the present-day supply of Pleistocene sediments from the inlet channels during ebb-storm-surge conditions, rather than an in-situ reworking process.	Vertical patterns of grain-size parameters of shoreface-connected ridges in the German Bight
VOLUME 73 NO 1 23	1994	73	1	23	30	Bordonau, J.; Meer, J.J.M. van der	Glacially deformed glaciolacustrine rhythmites exposed at Llavorsí in the Central Southern Pyrenees show a well-developed macroscopic crenulation lineation. Microscopic studies (thin sections and SEM) reveal a crenulation cleavage associated with very small-scale symmetrical folding and a banded extinction pattern. Combination of the thin section and SEM observations allows the reconstruction of a herringbone-like arrangement of finegrained particles or kinking microfabric. The occurrence of this microfabric can be used as a criterion for shearing, also in the absence of macroscopic observations.	An example of a kinking microfabric in Upper Pleistocene glaciolacustrine deposits from Llavorsí (Central Southern Pyrenees, Spain)
VOLUME 73 NO 1 31	1994	73	1	31	51	Poel, H.M. van de; Schlager, W.	Literature-based estimates of Mesozoic-Cenozoic shoalwater carbonate composition indicate important changes in frequency distribution of carbonate biota that translate into changes of bulk skeletal mineralogy of the original sediments. This mineralogy was strongly dominated by metastable carbonates during the Triassic (mainly aragonite) and during the Cenozoic (aragonite and magnesian calcite). [n between these periods lies an interval of reduced metastable carbonate and consequently high calcite content. This biogenic aragonite-calcite cycle parallels the one observed in (presumably inorganically precipitated) ooids and marine cements.	Variations in Mesozoic-Cenozoic skeletal carbonate mineralogy

VOLUME 73 NO 1 53	1994	73	1	53	61	Bon, A.; Eeckhout, B. van den; Janzen, E.; Klepper, C.; Moerkerken, B. van; Wees, J.D. van	A gneiss body in the Variscan Aston massif is overlain by Cambro-Ordovician metasediments that have been intruded by a granite batholith. At the gneiss-cover contact a 1.2 km-thick zone of highly strained medium-grade metasediments occurs. The batholith is surrounded by a zone where metasediments are strained and metamorphosed due to intrusion of the pluton. This contact aureole overprints the shear zone at the gneiss-cover contact, showing deformation and retrogression of the medium-grade metasediments. This relationship reveals a younger age for batholith intrusion with respect to the formation of the shear zone at the gneiss-cover contact. This observation together with regional correlation indicates that formation of the shear zone occurred between 292 and 280 Ma ago.	Timing of Variscan mid-crustal shearing and batholith intrusion in the Central Pyrenees (Ariège, France)
VOLUME 73 NO 1 63	1994	73	1	63	78	Alsharhan, A.S.	The siliciclastic lower part of the Permo-Carboniferous in the Arabian Basin represents a cyclic transgressive and regressive unit, consisting of sandstones, shales and thin beds of argillaceous limestone. This unit crops out in small exposures in central and northwest Saudi Arabia, but is widespread in the subsurface of central and eastern Arabia. It is known as the Unayzah Formation in Saudi Arabia and in the western and southern Arabian Gulf region, and as the Hausi Group in Oman. The Permo-Carboniferous clastics in the Arabian Basin proved to be prospective for hydrocarbons. Oil and gas were encountered in Saudi Arabia, Qatar, the United Arab Emirates (U.A.E.) and Oman. The Unayzah Formation in the subsurface of the U.A.E. ranges in thickness from 140 to 206 m. The relatively thin upper section consists of pyritic siltstone and terrigenous mudstone with minor sandstone, whereas the lower section is dominated by a thick sequence of very fine to coarse-grained, subangular to subrounded, moderately to poorly sorted quartzitic sandstones with minor interbeds of siltstone. Minor quantities of clay minerals, plagioclase, dolomite and pyrite occur in the sandstones. The formation is interpreted to be of fluvial origin. Six lithostratigraphic units were identified in the U.A.E. Three units have moderate to good reservoir potential, while others act as seals over these reservoirs. Porosity in the reservoir units ranges from less than 1 to 27%, and permeability from less than 1 to 75 md. The sediments in the U.A.E. are highly affected by diagenesis. The main diagenetic events include silica cementation (which occurs as quartz overgrowths), precipitation of illite and minor kaolinite, carbonate cementation (calcite and dolomite) filling pores around the quartz grains, and	Geology and hydrocarbon occurrences of the clastic Permo-Carboniferous in the central and eastern Arabian Basin
VOLUME 73 NO 1 79	1994	73	1	79	83			Presentation of the Van Waterschoot van der Gracht Medal to Prof. Dr. John A. Katili
VOLUME 73 NO 1 85	1994	73	1	85	85	Herngreen, G.F.W.; Hartkopf-Fröder, C.; Ruegg, G.H.J.		Errata: Age and depositional environment of the Kuhfeld Beds (Lower Cretaceous) in the Alstätte Embayment (W Germany, E Netherlands), Geologie en Mijnbouw 72: 375-391, 1994.

VOLUME 73_NO 2-4_91	1994	73	2-4	91	92	Eck, T. van; Davenport, C.A.		Seismotectonics and seismic hazard in the Roer Valley Graben; with emphasis on the Roermond earthquake of April 13,1992. Workshop, January 20-22, 1993, Veldhoven, the Netherlands
VOLUME 73_NO 2-4_93	1994	73	2-4	93	94	Haak, H.W.		Seismotectonics and seismic hazard in the Roer Valley Graben; with emphasis on the Roermond earthquake of April 13,1992. Workshop recommendations
VOLUME 73_NO 2-4_95	1994	73	2-4	95	98	Eck, T. van; Davenport, C.A.		Seismotectonics and seismic hazard in the Roer Valley Graben: an overview
VOLUME 73_NO 2-4_99	1994	73	2-4	99	127	Ziegler, P.A.	The Cenozoic rift system of western and central Europe extends over a distance of some 1100 km from the coast of the North Sea to the western Mediterranean; its southern prolongation is formed by the Valencia Trough and a Plio-Pleistocene volcanic chain which crosses the Alboran Sea and the Atlas ranges. Development of this mega-rift was contemporaneous with the Eocene and later phases of the Alpine and Pyrenean orogenies and with the evolution of the Red Sea-Gulf of Suez and Libyan-Pelagian Shelf rift systems. Evolution of the European Cenozoic rift system is thought to be governed by the interaction of the Eurasian and African-Arabian plates and by early phases of a plate-boundary reorganization that may ultimately lead to the break-up of the present continent assembly. In western and central Europe rifting commenced during the middle and late Eocene; 2040 Ma later major rift-related domes were uplifted, entailing subsidence reversals of the grabens transecting them. Uplift of the Rhenish Shield can be explained in terms of progressive mechanical and thermal thinning of the lithosphere. The Bohemian Massif Vosges-Black Forest and Massif Central arches, which are located in the periphery of the Alpine fold belt, are characterized by less pronounced lithospheric thinning; low-velocity mantle-lithosphere anomalies are observed under the Vosges-Black Forest and Massif Central domes; apart from thermal loads, deflection of the lithosphere in response to the build-up of intra-plate horizontal compressional stresses and/or to thrust-loading may have contributed to the uplift of these arches. Volcanic rocks associated with the Cenozoic rift system of western and central Europe were derived by mixing of partial melts from the convecting	Cenozoic rift system of western and central Europe: an overview

VOLUME 73 NO 2-4 129	1994	73	2-4	129	141	Geluk, M.C.; Duin, E.J.T.; Duser, M.; Rijkers, R.H.B.; Berg, M.W. van den; Rooijen, P. van	The Roer Valley Graben is the most prominent Cenozoic tectonic feature in the Netherlands onshore, filled with up to 2000 m of predominantly Upper Oligocene to Quaternary sediments. It forms the northwestern branch of the Rhine Graben rift system. To the northeast the graben is bordered by a major faultzone, the Peel Boundary Fault, and to the southwest by a number of downstepping faults. The Roer Valley Graben developed upon pre-existing sedimentary basins of Carboniferous, Triassic to Early Jurassic and Late Jurassic age. The Cenozoic graben is structurally closely related to the Late Jurassic basin and to the area affected by inversion tectonics at the end of the Cretaceous. Differential subsidence of the Roer Valley Graben started during the Late Oligocene. Displacements along the Peel Boundary Fault were recorded from the Late Oligocene onwards. Initially the average displacement was 0.01 mm a^{-1} , but it increased during the Quaternary to 0.8 mm a^{-1} . Fault displacements at the southwestern boundary faults of the Roer Valley Graben are smaller than at the Peel Boundary Fault.	Stratigraphy and tectonics of the Roer Valley Graben
VOLUME 73 NO 2-4 143	1994	73	2-4	143	156	Berg, M.W. van den	The Roer Valley rift system emerged since the Middle Miocene and fluvial sediments were supplied to it by the Rhine, Maas (Meuse) and local Belgian rivers. Ever since the emergence, thirty fluvial terraces of the lower Maas river have been formed due to regional uplift. Their age-altitude record shows strong evidence for an important acceleration of the tectonic activity at the end of the Pliocene (around 3 Ma), and for high-frequency oscillations superimposed on a general continuous trend. Three relaxation periods during the Quaternary were identified, the first from 1.5 to 1.2 Ma and two short ones around 5 ka BP and after 2 ka BP respectively. The reactivations, following these relaxation periods, appear to be of plate-tectonic importance. The observed accelerations in tectonic activity since the Late Pliocene through the Pleistocene to the present day, raise the question: are we at present living in a period of extremely high crustal dynamics? Floodplain positions of the rivers Rhine and Maas repeatedly changed in space and time. Strike-slip movements along the graben bounding faults explain this behaviour. The events point to punctuated changes in the stress field orientation, probably related to the interplay between Alpine and Ardennes-Rhenish Shield stress generators within the regional stress field.	Neotectonics of the Roer Valley rift system. Style and rate of crustal deformation inferred from syn-tectonic sedimentation

VOLUME 73 NO 2-4 157	1994	73	2-4	157	168	Berg, M.W. van den; Groenewoud, W.; Lorenz, G.K.; Lubbers, P.J.; Brus, D.J.; Kroonenberg, S.B.	This article presents an integration of geomorphological and geodetic data from the area of the 1992 Roermond earthquake. A dense network of lineaments is evident from major and minor terrain features, and drainage patterns also show structural control on a kilometre scale. These discontinuous terrain lineaments, often of anastomosing character, match known fault patterns and suggest that the upper crust is subdivided into many, relatively small (up to 10 km scale) wedge-shaped blocks. The lineament distribution is consistent with patterns predicted by idealized strain ellipses. It shows a right lateral component in the motion along major faults within the Lower Rhine Embayment. The wrenching component can be related to a left-lateral motion along the Variscan Front, and a subsequent right lateral offset of the edge of the London-Brabant Massif. The analysis of a 117-years-long data set of vertical movements at 2922 geodetic bench-marks evidences significant differential movements, and corroborates the sense of relative motion given by the lineaments.	Patterns and velocities of recent crustal movements in the Dutch part of the Roer Valley rift system
VOLUME 73 NO 2-4 169	1994	73	2-4	169	172	Plenefisch, T.; Bonjer, K.P.		The stress tensor in the Rhine Graben area derived from earthquake focal mechanisms (extended abstract)
VOLUME 73 NO 2-4 173	1994	73	2-4	173	180	Grünthal, G.; Stromeyer, D.	A detailed pattern of trajectories of the direction of maximum horizontal crustal stresses S_{Hmax} has been derived for Central Europe sensu lato according to actual data on fault plane solutions, in-situ stress measurements, geologic fault slip determinations and geodetic information. The generalization of this direction data on maximum compressive stress in the form of trajectories shows a bending from the well-established NW-SE direction in western parts of the study area to directions of NE-SW to E-W in the eastern part. In some regions there is evidence for a more complicated pattern, e.g. apparently differing SHmax-directions in different depth horizons, stress deflections at pronounced tectonic complexes, and radial directions around the Pannonian Basin. For studying the conditions in the brittle part of the crust steady-state elastic finite-element model calculations were carried out to explain the observed stress orientations. It is shown that the simulation according to a modern plate tectonic concept leads to a pattern of main principal stress directions that is compatible with the generalized observed stress directions. More regional features were modelled by reasonable variation of elastic parameters of different lithospheric blocks.	The recent crustal stress field in Central Europe sensu lato and its quantitative modelling

VOLUME 73 NO 2-4 181	1994	73	2-4	181	197	Camelbeeck, T.; Eck, T. van; Pelzing, R.; Ahorner, L.; Loohuis, J.; Haak, H.W.; Hoang-Trong, P.; Hollnack, D.	On April 13,1992 an $M_w = 5.4$ normal dip-slip earthquake occurred 5 km south-west of theDutch town Roermond. It was located at a depth of 17 km near the Peel Boundary Fault in the Roer Valley Graben. Belgian, Dutch, German and French seismologists installed 29 mobile seismograph stations for a period of two months after the main shock. Both the mobile and the permanent stations recorded more than 200 aftershocks. High-quality hypocentral locations were obtained for 55 aftershocks. Hypocenters that occurred in the vicinity of the main shock hypocenter coincide with one of the focal mechanism nodal planes, i.e. strike 127° , dip 70° . The Roermond earthquake also triggered seismic activity in the graben as far as 40 km to the southeast. Focal mechanisms were determined for 20 aftershocks. Out of the 14 with a predominantly normal fault solution, eight have a strike direction parallel, and six a strike perpendicular to the strike of the main event. A stress inversion using the 13 best constrained fault plane solutions of aftershocks located near the main shock hypocenter indicates a direction for the principal stress that is similar to that of the regional stress field. From our experience in analyzing the data we recommend the upgrading of the existing regional recording systems to high-dynamic range seismograph stations and the installation of a number of accelerometers in the Roer Valley Graben and its surroundings.	The 1992 Roermond earthquake, the Netherlands, and its aftershocks
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VOLUME 73_NO 2-4 199	1994	73	2-4	199	214	Ahorner, L.	The earthquake of April 13, 1992 in the border region between the Netherlands and Germany near the town of Roermond, ranges with its local magnitude of $M_L = 5.9$ among the largest seismic events observed in historical times in the Lower Rhine Embayment. Several hundred buildings in the area around the epicenter suffered light to moderate structural damage (intensity VII effects). The main shock was preceded about 0.2 seconds before by a foreshock of local magnitude $M_L = 4.8$ and followed, up to the middle of May, by more than 200 aftershocks with local magnitudes up to $M_L = 3.8$. The whole earthquake sequence has been well recorded by the dense seismic station network in the Lower Rhine Embayment and its vicinity. Based on these local and regional recordings the hypocenter locations, source parameters and focal mechanisms of the stronger events of the sequence have been determined with high precision by the Department of Earthquake Geology of the University of Cologne. The source of the main shock was located in the southwestern vicinity of Roermond, about 14 to 18 km below the surface at the depth continuation of the Peel Boundary Fault. This fault zone forms the eastern border of the Roer Valley Graben. The focal mechanism was of the extensional dip-slip type (normal fault) with the active fault plane trending in NW-SE direction (124°) and dipping steeply (at 68° to the SW). The western block (Roer Valley Graben) moved down with respect to the eastern block (Peel Horst). A diameter of the source area of 4 to 5 km has been determined from the spectral analysis of P- and SH-wave signals, using the Brune source model. The average displacement along the fault plane was approximately 21 cm, the associated static stress drop 4.4 MPa and the seismic	Fault-plane solutions and source parameters of the 1992 Roermond, the Netherlands, mainshock and its stronger aftershocks from regional seismic data
VOLUME 73_NO 2-4 215	1994	73	2-4	215	223	Pelzing, R.	The Roermond earthquake of April 13, 1992, was recorded unclipped at four of the six stations of the Geological Survey of Northrhine-Westphalia (epicentral distances between 54 and 103 km). The local magnitude values determined from these recordings are 5.9 for stations GSH, PLH and OLF, and 6.1 for station WBS. The main shock hypocenter was located at latitude $51^\circ 10.1' N$ and longitude $5^\circ 55.9' E$ at a depth of 17.6 km. The focal mechanism determined from P and SH-wave polarities and amplitude ratios is 120° for strike, 70° for dip, and -100° for rake, which corresponds to an almost pure dip-slip movement along a normal fault. The mean seismic moment, calculated from several spectra, is 5.4×10^{16} Nm, the mean dislocation is 35 cm. Until the end of May about 80 aftershocks from the Roermond area were recorded at the stations of the Geological Survey. The main shock also triggered a series of earthquakes at the southern border of the Roer Valley Graben between Geilenkirchen and Eschweiler, about 30-45 km SSE of the main shock epicenter. The largest of these events had a local magnitude of $M_L = 1.7$.	Source parameters of the 1992 Roermond earthquake, the Netherlands, and some of its aftershocks recorded at the stations of the Geological Survey of Northrhine-Westphalia
VOLUME 73_NO 2-4 225	1994	73	2-4	225	227	Braunmiller, J.; Dahm, T.; Bonjer, K.P.		Source mechanism of the 1992 Roermond, the Netherlands, earthquake from inversion of regional surface waves (extended abstract)

VOLUME 73 NO 2-4 229	1994	73	2-4	229	233	Oncescu, M.C.; Camelbeeck, T.; Martin, H.	Vertical components from 12 digital seismic stations which recorded the $M_L = 5.8$ Roermond earthquake were used to determine the position and magnitude of a foreshock using relative methods. The small shock occurred 0.19 s before and 780 m away from the main shock on its SW-dipping fault plane. The local magnitude of the foreshock is $M_L = 4.0$, which corresponds to a seismic moment of 2.8×10^{14} Nm and to a seismic energy of 4.3×10^9 J.	A note on the foreshock of the 1992 Roermond earthquake, the Netherlands
VOLUME 73 NO 2-4 235	1994	73	2-4	235	240	Prinz, D.; Hollnack, D.; Wohlenberg, J.	The seismic activity following the large Roermond earthquake of April 13, 1992, was concentrated in the area of the main shock and, surprisingly, a few kilometers northeast of Aachen. The locations and source parameters of 13 earthquakes, which occurred in the Aachen area, are presented. The evaluation is based mainly on seismograms from four mobile seismograph stations of the RWTH Aachen (Rheinisch-Westfälische Technische Hochschule) which were installed close to the epicenters. Fault-plane solutions were determined for two of these earthquakes.	The seismic activity near Aachen following the 1992 Roermond earthquake, the Netherlands
VOLUME 73 NO 2-4 241	1994	73	2-4	241	252	Scherbaum, F.	From the spatial distribution of aftershocks with respect to the regions of fault slip during the mainshock, information can be gained about the heterogeneous structure within the source volume and about the frictional properties of surrounding faults. Focal mechanisms of aftershocks reveal how stress is redistributed by large earthquakes. While analog data have mainly been used for these studies in the past, a new degree of data quality is obtained with currently available digital recording systems. In addition to the increased accuracy for the determination of purely kinematic data, waveform information can be utilized with digital data. With state-of-the-art signal processing techniques, the contributions of source, path, and site effects on the observed seismic signals can be studied. Provided these effects can be separated, aftershock signals will potentially help us to learn about the properties of fault regions in unprecedented detail. The degree of resolution which can be achieved, however will strongly depend on the number of stations and the geometry of the network employed. Depending on the special scientific problems to be addressed, optimum station geometries may vary. Modern methods in optimization theory, such as simulated annealing, have been successfully used to find optimum station distributions for aftershock monitoring. An additional aspect which has to be addressed is the problem of managing and processing aftershock data. Since high-quality digital data come at the price of huge data volumes, new strategies and concepts for data handling and signal processing have to be developed.	What can we learn from aftershocks?

VOLUME 73 NO 2-4 253	1994	73	2-4	253	263	Dost, B.; Sleeman, R.	The 1992 Roermond earthquake (location 51.16°N, 5.95°E; $M_L = 5.8$) provides a good opportunity to evaluate the current status of exchange of digital waveform data in Europe. For this purpose data are collected from broadband and short-period seismograph stations. It is the intention to publish these data on CD-ROM. The data set is evaluated on data quality, accessibility and spatial coverage of the recording stations. In order to compare signals from different stations attention has been given to the instrumentation. Evaluation shows that in contrast to broadband networks, short-period networks in north-west Europe are not prepared for an event of this magnitude. It is recommended to increase the limited dynamic range of most digital stations and to evaluate the effectiveness of the currently used bandwidth. Finally, an organized common access to the data set, as is realized for the broad-band data, is recommended for regional, short-period networks.	Exchange of digital seismological waveform data in Europe: status as illustrated by data collection for the 1992 Roermond earthquake, the Netherlands
VOLUME 73 NO 2-4 265	1994	73	2-4	265	270	Haak, H.W.; Bodegraven, J.A. van; Sleeman, R.; Verbeiren, R.; Ahorner, L.; Meidow, H.; Grünthal, G.; Hoang-Trong, P.; Musson, R.M.W.; Henni, P.; Schenková, Z.; Zimová, R.	Six countries contributed to a data base covering macroseismic observations from nine countries affected by the April 13, 1992 Roermond earthquake. Despite the diversity of data sources and variety of approaches by researchers in the countries involved, particularly concerning aspects of data acquisition and intensity assignment, a clear overall-picture of the macroseismic effects could be achieved. An acceptable estimate has been made of the following parameters: macroseismic focal depth h (= 18 km), intensity attenuation α (= 0.001), the 'theoretical' epicentral intensity I_0 (=7.4) and the macroseismic local magnitude (= 5.6). For further study the complete macroseismic data base is available as an ASCII-file on diskette.	The macroseismic map of the 1992 Roermond earthquake, the Netherlands

VOLUME 73 NO 2-4 271	1994	73	2-4	271	279	Meidow, H.; Ahorner, L.	<p>The Roermond earthquake of April 13, 1992, with a local magnitude of $M_L = 5.9$, belongs to the largest earthquakes which have been observed in the Lower Rhine Embayment in historical time. It was felt in central and western Europe over an area of about 600 000 km². The German territory forms much of the eastern part of that area. The most distant reports in Germany came from Kiel (450 km), Berlin (540 km) and Munich (520 km). The epicentral intensity is observed in the German-Netherlands border region was VII on the MSK-scale. For an $M_L = 5.9$ earthquake this I_0 is unusually low as compared to other large earthquakes in the Lower Rhine Embayment. Two factors are assumed to be mainly responsible for the low epicentral intensity: (1) the focal depth which is deeper than normal, and (2) the unusually strong absorption of seismic energy by a more than 1500 m-thick layer of soft Tertiary and Quaternary sediments within the Roer Valley Graben near the epicenter. More than 2000 macroseismic reports from 600 different localities have been interpreted, resulting in detailed isoseismal maps for Germany. The following mean isoseismal radii have been determined: $r_7 = 6$ km, $r_6 = 42$ km, $r_5 = 102$ km, $r_4 = 179$ km, $r_3 = 322$ km, $r_2 = 440$ km. Based on these isoseismal radii the macroseismic focal depth has been determined with an iterative computer program based on the method of Sponheuer (1960). The uncorrected observed $I_0 = VII$ gives a focal depth of about 26 km. However, if we correct I_0 for the influence of the sedimentary graben fill, resulting in a value of VII-VIII, the obtained depth is about 17 km. This corresponds better with the focal depth as determined instrumentally by various working groups.</p>	Macroseismic effects in Germany of the 1992 Roermond earthquake and their interpretation
VOLUME 73 NO 2-4 281	1994	73	2-4	281	281	Berz, G.		Assessment of the losses caused by the 1992 Roermond earthquake, the Netherlands (extended abstract)

VOLUME 73 NO 2-4 283	1994	73	2-4	283	289	Meidow, H.	The macroseismic field of the Roermond earthquake of April 13, 1992, has been compared with those of large historical earthquakes ($M_L \geq 5.5$) in the Lower Rhine Embayment and its vicinity: those of Düren (1755, 1756), Tollhausen (1878), North-Brabant(1932) and Euskirchen (1951). The historical earthquakes were reconstructed and analysed mainly on the basis of contemporary historical documents. All investigated earthquakes caused at least moderate damage in their epicentral regions. While the earthquakes of Düren (1756) and Tollhausen (1878) reached the epicentral intensity VIII, the others produced only epicentral intensities between VII and VII-VIII. The mean value of the absorption coefficient $\alpha = 0.002 \pm 0.001$ km ⁻¹ was calculated from the intensity attenuation curves. The macroseismic focal depths of the Tollhausen (1878), North-Brabant(1932) and Euskirchen (1951) earthquakes range from 9 to 8 km, whereas the Düren (1755,1756) and Roermond (1992) earthquakes occurred at a depth range from 14 to 18 km. The strongest event in historical time was the Düren (1756) earthquake. Its macroseismically determined local magnitude $ML = 6.1$ was slightly larger than the local magnitude of the Roermond earthquake $ML = 5.9$.	Comparison of the macroseismic field of the 1992 Roermond earthquake, the Netherlands, with those of large historical earthquakes in the Lower Rhine Embayment and its vicinity
VOLUME 73 NO 2-4 291	1994	73	2-4	291	298	Bouwkamp, J.G.	An overview of the structural damage resulting from the April 13,1992 Roermond earthquake is presented. Rather than addressing the need of code requirements to enhance the structural integrity of buildings in low-intensity seismic zones such as the Roermond region, the paper addresses the effects of the basic architectural form of buildings which can dramatically affect the seismic resistance of buildings and adversely affect the possibility of structural survival. Particularly in regions of low seismicity, considering the influence of zoning and architectural layout in building design will enhance the earthquake resistance of buildings far more than could be expected through the use of earthquake design code provisions. The paper discusses the effects of design 'errors' on the potential earthquake response of buildings and offers solutions to improve the seismic performance.	The 1992 Roermond earthquake, the Netherlands: earthquake engineering
VOLUME 73 NO 2-4 299	1994	73	2-4	299	302	Pappin, J.W.; Coburn, A.R.; Pratt, C.R.		Observations of damage ratios to buildings in the epicentral region of the 1992 Roermond earthquake, the Netherlands (extended abstract)

VOLUME 73 NO 2-4 303	1994	73	2-4	303	307	Luger, H.J.; Meijer, P.; Brinkman, J.	In order to assess the influence of the 1992 Roermond earthquake on a piled foundation, a pile and the interacting mass of the supported structure were modelled. The model represents a typical pile in the Maasniel area of Roermond, the Netherlands. Results indicate that piles are subjected to significant loading. Popular belief that wind-loading conditions in the Netherlands impose higher loads on the foundation piles than an earthquake like the one in Roermond is not correct. Especially bored (in-situ fabricated) pile types may be loaded beyond their elastic range. Recommendations for verification and improvement of the model are given.	Loading of foundation piles during the 1992 Roermond earthquake, the Netherlands
VOLUME 73 NO 2-4 309	1994	73	2-4	309	313	Berger, N.		Attenuation of seismic ground motion due to the 1992 Roermond earthquake, the Netherlands (extended abstract)
VOLUME 73 NO 2-4 315	1994	73	2-4	315	321	Gariel, J.C.; Horrent, C.; Jongmans, D.; Camelbeeck, T.	The strong earthquake ($M_L = 5.8$) on April 13, 1992 near Roermond (the Netherlands) is the largest for the area in the last 50 years and has affected a highly urbanized and industrialized region. Unfortunately, no strong motion records were retrieved in the epicentral area. However, a temporary network was installed by the Belgium Royal Observatory a few hours after the mainshock and more than 100 aftershocks were recorded by digital stations. These aftershock records are used to reconstruct the ground motion in the epicentral area during the mainshock. Two different techniques have been considered, namely the empirical Green's function method and the convolution technique. Using the former one, it is shown that, in the epicentral area, peak acceleration reached values between 0.57 and 1.75 m/s ² . Acceleration values two times larger are obtained using the deconvolution technique.	Strong ground motion computation of the 1992 Roermond earthquake, the Netherlands, from linear methods using locally recorded aftershocks
VOLUME 73 NO 2-4 323	1994	73	2-4	323	330	Horrent, C.; Jongmans, D.; Camelbeeck, T.	The Roermond earthquake of April 13, 1992 ($M_L = 5.8$) was felt in the proximity of the epicentre with different intensity in the Netherlands, Germany and Belgium. Within a few hours after the main shock, a temporary network of seven stations was installed in the epicentral area. About 200 aftershocks were recorded by these stations and also by the Belgian permanent network. The aftershock records in the graben exhibit large differences in ground motion, which may result from the source mechanism. However, significant amplifications were observed at some sites for very different earthquake locations. These results suggest that site effects have played a significant role in the ground motion. They are supported by spectral ratio computations between the signals recorded in the graben and at a reference bedrock station.	Local ground motion variations observed in the region of Roermond, the Netherlands, from aftershocks of the April 1992 earthquake

VOLUME 73_NO 2-4 331	1994	73	2-4	331	337	Helm, J.A.; Bour, M.; Hoang-Trong, P.	A telemetered digital three-station network at Soultz-sous-Forêts in NE France (280 km SE of Roermond) recorded the $M_L = 5.8$ mainshock of the Roermond earthquake on April 13, 1992 and also the $M_L = 3.6$ aftershock at 01:06 UTC, April 14, 1992. Using the empirical Green's function method the ground motions recorded during the mainshock are modelled from the recording of the aftershock. This method is used to calculate a maximum ground acceleration of 0.17 m/s ² (peak-to-peak) at a site in the Rhine Graben where the observed maximum ground acceleration was 0.18 m/s ² . The recordings from the three stations show a variation in the amplitude of peak-to-peak ground acceleration for the three sites, from 0.027 m/s ² at a rock site on the edge of the Upper Rhine Graben to 0.18 m/s ² at a station on sediments in this graben.	Accelerometer recordings of the 1992 Roermond earthquake, the Netherlands, and ground motion simulations using the empirical Green's function method
VOLUME 73_NO 2-4 339	1994	73	2-4	339	356	Davenport, C.A.	Following the 13 April 1992 Roermond earthquake, areas of the Netherlands experienced severe shaking and suffered ground failures, particularly ground cracking, sand injections, and shallow local landslips. Such phenomena are well documented in historical case histories of large earthquakes in many areas of the world: famous examples of widespread failure are reviewed and the key phenomena identified, e.g. Assam (1899) and Alaska (1964). The geotechnical conditions and consequences resulting from strong ground motions are emphasized and important applications in earthquake hazard assessment are discussed in the context of readily available literature. Liquefaction and kindred state changes leading to mass failure, settlement, and flow-slide behaviour are considered for cases of water-saturated sandy and silty deposits. A simple classification is required to facilitate discussion of strong motion domains; these being nearfield, proximal farfield, and distal farfield. Volume changes, dewatering and displacement patterns provide insights into hazard assessment applications, amongst which three are considered: (i) intensity scaling effects, with a scheme appropriate to north-west Europe, (ii) in situ measurement by Standard and Cone Penetration Tests (SPTs and CPTs), and (iii) palaeoseismology. The potential of finding palaeoliquefaction phenomena in the southern Netherlands is considered to be high in the vicinity of certain faults. The importance of palaeoseismology is evaluated with relevant world-wide research perspectives regarding palaeoliquefaction. Recommendations are given to encourage research initiatives.	Geotechnical consequences of ground motion: hazard perspectives

VOLUME 73_NO 2-4 357	1994	73	2-4	357	364	Nieuwenhuis, J.D.	<p>The scanty information available on liquefaction phenomena during the Roermond earthquake does not allow firm conclusions on the technical significance of these phenomena. However, speculations based on applied mechanics principles justify a few conclusions on what happened and what did not happen. First, the presence of fracture vents and sand boils agrees well with the estimated earthquake magnitude $M_L = 5.8-5.9$; second, the rare occurrence of sand boils and the absence of visible settlements indicate that liquefaction was not an important phenomenon during the earthquake; third, damage of farms due to liquefaction seems absent. This observation is in agreement with the theoretical analysis of responses of the farm foundations to liquefaction. If the area affected by liquefaction had exceeded some 1% of the total area, significant damage would have been detectable. The low ground water tables during the time of the earthquake have most probably prevented extensive damage.</p>	Liquefaction and the 1992 Roermond earthquake, the Netherlands
VOLUME 73_NO 2-4 365	1994	73	2-4	365	374	Davenport, C.A.; Lap, J.M.J.; Maurenbrecher, P.M.; Price, D.G.	<p>Near-surface soils in the southern Netherlands include fine sands with, in some areas, a watertable at shallow depth. A reconnaissance study undertaken in 1987 to ascertain the potential for a liquefaction hazard in areas south of Eindhoven revealed a high liquefaction potential in the area around and to the south of Roermond. The earthquake of 13 April 1992 caused sand eruptions to occur in numerous locations in the vicinity of Roermond. This study focuses on sand fissures and mounds located to the south of Herkenbosch, between the town and the River Roer. Excavations revealed extensive disturbance of clay and silt deposits down to confined saturated sand deposits at depths of several metres below the surface. Extensive ground cracking, with or without sand extrusion, occurred over an area of circa 0.5 km². Pit and trench excavations permitted detailed mapping and sampling of over 30 m of sand-injected fissures. The evidence indicates that ground cracks were injected, almost passively, by sand entrained within water, driven upwards following liquefaction of the previously confined sand. Groundwater conditions are such that sand volcanoes and spring pits developed at the bottom of the deeper excavations.</p>	Liquefaction potential and dewatering injection structures at Herkenbosch: field investigations of the effects of the 1992 Roermond earthquake, the Netherlands

VOLUME 73_NO 2-4 375	1994	73	2-4	375	379	Lindenberg, J.; Calle, E.O.F.; Vrouwenfelder, A.C.W.M.	The protection against flooding is an important topic in the Netherlands. Based on statutorily defined sea and river levels which have to be withstood, safety is expressed as an acceptable annual probability of flooding for each area protected by water-retaining structures. This hazard assessment considers primarily the basic threat of extreme high water levels alone or in combination with (specific) storm conditions. However, combinations of high water levels with unrelated damaging events may also contribute to the total flooding hazard. This paper describes the general approach for the assessment of the possible combined failure mechanism leading to the scenario 'flooding due to earthquake-induced damage'. Based on the results of simplified slope stability calculations, the conclusion is drawn that the contribution of this scenario to the total probability of flooding is exceedingly small for the lower river region of the Netherlands.	Safety of dikes and embankments in the Netherlands with special reference to earthquakes
VOLUME 73_NO 2-4 381	1994	73	2-4	381	386	Meijers, P.; Loger, H.J.; Lange, H.G. de	This paper considers the influence of the strong ground motion due to the Roermond earthquake on soil behavior and shallow foundations. As no local strong ground motion acceleration record was available, a synthetic record has been used. The procedure used to obtain this synthetic acceleration record is explained. The stratigraphy of the shallow subsoil is briefly described and results of a short literature review on densification of soils are presented. Finally, an estimate is made of the settlement of shallow foundations at one site (Maasniel area) in Roermond, due to the strong ground acceleration induced by the earthquake. From this estimate we conclude that shallow foundations, designed according to Dutch building codes, will generally not suffer excessive settlement values under earthquake loading comparable to that which occurred in Roermond on April 13,1992.	Influence of the 1992 Roermond earthquake, the Netherlands, on shallow foundations
VOLUME 73_NO 2-4 387	1994	73	2-4	387	391	Alkema, D.; Mosselman, M.; Paulussen, I.	Two landslides occurred at the Brunsummerheide during, or shortly after the main shock of the 1992 Roermond earthquake. The Brunsummerheide is located 25 km south of the epicentre. An earthquake can reduce the stability of a hillslope in three ways: firstly, the ground acceleration from seismic waves forms an additional destabilizing force; secondly, the shear strength may be reduced by an increase of the pore pressure, and thirdly, an earthquake may cause the breaking of small cohesive bonds between soil particles, thus reducing the overall cohesion. Slope stability back-analyses were carried out to reconstruct the forces and processes during the event. Peak ground accelerations as predicted by empirical attenuation relationships are insufficient to cause instability of the slopes. It is concluded that an increase of at least 100% in the pore pressures was required to destabilize the two hillslopes.	Earthquake-triggered landslides at the Brunsummerheide, Limburg, the Netherlands : preliminary studies following the 1992 Roermond earthquake

VOLUME 73_NO 2-4 393	1994	73	2-4	393	398	Maurenbrecher, P.M.; Price, D.G.; Verwaal, W.	<p>The 1992 Roermond earthquake caused two landslides in Brunssummerheide park, South Limburg, the Netherlands. The larger of the two slides is within the area of a large slide which happened in 1955. This area consists of loose, reworked, uniformly graded, fine quartz sands in overall gently sloping ground with a gradient of 1 in 5. At the foot of the slope the ground is wooded and approximately level, with groundwater almost at the surface. The severe and varied tilting of the trees in this area indicates horizontal movement and upward bulging of the soil. High water tables persist and springs in the area are the source of the Roode Beek, a tributary of the Maas River. Swampy and even quicksand conditions exist. The smaller landslide also occurred in a slope with a swampy area at its foot. Other slopes not associated with swampy areas were not affected by the earthquake. The association of loose, reworked and water-saturated sands with slope failure suggests that the slope failures may have taken place by liquefaction of these sands removing support from the toe of the slope. This paper presents a description of the failed slope; a detailed discussion of the probable cause of failure awaits further research.</p>	<p>Technical note on the 1992 Brunssummerheide landslide in Limburg, the Netherlands</p>
VOLUME 73_NO 2-4 399	1994	73	2-4	399	406	Koch, U.; Heinicke, J.	<p>The correlation between the Vogtland micro earthquakes and the fluctuations of ^{222}Rn concentration in spring water and soil air has been investigated in the Saxon State Spa of Bad Brambach for more than three years. In contrast to the soil air, spring water shows significant radon anomalies at the time of about 50% of the earthquakes or earthquake swarms ($ML < 4$, epicentral distance < 50 km). The 1992 Roermond earthquake has confirmed for the first time that it is possible to register an anomaly effect in Bad Brambach related to seismic wave motion from earthquakes with larger epicentral distances. Recent investigations have shown that CO_2 outgassing due to tectonic processes may act as a gas lift for radon. A model conception and first results of continuous radon and CO_2 measurements in spring water are presented.</p>	<p>Radon behaviour in mineral spring water of Bad Brambach (Vogtland, Germany) in the temporal vicinity of the 1992 Roermond earthquake, the Netherlands</p>

VOLUME 73 NO 2-4 407	1994	73	2-4	407	414	McGuire, R.K.	The uncertainty in seismic hazard is especially important in regions of low seismicity where empirical observations alone do not constrain the locations and characteristics of future seismicity. In these regions, subjective judgment, properly defined and documented, must be used to quantify the uncertainty in earthquake occurrences and ground motion. A project to use expert opinion to quantify uncertainties has been conducted in the eastern United States, revealing several important rules that such studies must follow. These are that the judgments and documentation must be firmly based and justified on a scientific plane, that diversity among experts must be resolved if it is caused by misunderstanding or miscommunications, and that the earth scientists themselves must be involved in the development of the procedures to quantify and document expert opinion.	Using expert opinion for assessing seismic hazard in low-seismicity areas
VOLUME 73 NO 2-4 415	1994	73	2-4	415	424	Rosenhauer, W.; Ahorner, L.	A regional probabilistic seismic hazard analysis for the Lower Rhine Embayment was published by the authors in 1975 and updated in 1984 as part of a comprehensive study for the former Federal Republic of Germany and adjacent regions. The seismic zones of the lower Rhine Embayment were found to belong to the most active in western and central Europe. This contribution presents the modifications required after the occurrence of the Roermond earthquake of April 13, 1992. New frequency-magnitude curves $\lambda(> M)$ are derived as the essential quantitative input, applying the generalized Gumbel distribution for magnitude extremes. Completion of the former data for the years 1980-1992 leads to distinct changes of $\lambda(> M)$ in the seismic zone in which the epicenter of the Roermond earthquake is situated. Revised frequency-intensity curves $\lambda(> I)$ are computed with the Monte-Carlo simulation techniques using code PSSAEL developed earlier by the authors. Only small changes are found. For example, an intensity (MSK) $I = VII$ is now expected at Roermond for future events with a probability of $4.9 \cdot 10^{-4}/\text{year}$ instead of $2.4 \cdot 10^{-4}/\text{year}$. The regional seismic risk is illustrated by two recomputed hazard maps of the Lower Rhine Embayment.	Seismic hazard assessment for the Lower Rhine Embayment before and after the 1992 Roermond earthquake
VOLUME 73 NO 2-4 425	1994	73	2-4	425	429	Crook, T. de	The frequency-intensity and the frequency-magnitude relations are calculated from the observed tectonic earthquakes in the Netherlands. The obtained mean return periods for an intensity VII and a magnitude 5.8-5.9, like the 1992 Roermond earthquake, are estimated to be 132 years and 1000 years or more respectively. The influence of the recent Roermond earthquake on the existing seismic hazard intensity maps for the Netherlands is negligible. The earthquake hazard for the town of Roermond is evaluated	Earthquake hazard for Roermond, the Netherlands

VOLUME 73_NO 2-4 431	1994	73	2-4	431	438	Alexandre, P.	The historical seismicity of eastern Belgium, Netherlands Limburg and the northern Rhineland should be entirely revised. Going back to sources contemporaneous with the events, we have been able on the one hand to eliminate the false data appearing in traditional catalogues, and on the other hand to elaborate a new critical catalogue of 22 earthquakes which occurred in this area for the period from the earliest known records up to 1525. Special attention has been paid to the large shocks of June 11, 1395 and August 23, 1504.	Historical seismicity of the lower Rhine and Meuse valleys from 600 to 1525: a new critical review
VOLUME 74_NO 1_1	1995	74	1	1	12	Andriessen, P.A.M.	Fission tracks, formed by natural fission of ^{232}Th , ^{235}U and ^{238}U , are damage zones in the crystal lattice. The decay constants of the first two isotopes are so small that, for all practical purposes, all fission tracks are derived from fission of ^{238}U . The spontaneous fission-track (FT) density is proportional to the elapsed time and the uranium content. The latter parameter is determined by irradiation of the sample with thermal neutrons, causing the ^{235}U -isotope to fission. A new set of induced fission tracks is made and the induced FT density is proportional to the amount of uranium, because the $^{235}\text{U}/^{238}\text{U}$ ratio is constant. FT dating is commonly performed on volcanic glass and accessory minerals such as apatite, zircon and sphene. Compared to other radiogenic age determinations, FT apparent ages are systematically younger, except for rocks that cooled rapidly such as volcanics and shallow-depth intrusives. Laboratory experiments show that fission tracks are not stable at high temperatures. This provides an explanation for the comparatively young FT ages and at the same time, opens a new important field of application: FT analysis as a geochrono-thermometer. Within a mineral-specific temperature range, fission tracks begin to anneal until they are completely erased at the high temperature boundary. The temperature, at which total annealing occurs, depends on the timescale of the heating event and the chemical composition of the mineral. Data from drill holes confirm the laboratory experiments over geological timescales. For apatite it is possible to establish an annealing zone for spontaneous fission tracks under geological time-temperature (T-t) conditions. Annealing is temperature-dependent and as the process progresses the length of the fission track	Fission-track analysis: principles, methodology and implications for tectono-thermal histories of sedimentary basins, orogenic belts, and continental margins*

VOLUME 74 NO 1 13	1995	74	1	13	20	Makaske, B.; Nap, R.L.	An excavation near Deest (Land van Maas en Waal, central Netherlands) offered an opportunity to study sedimentary structures near the top of the Late Weichselian Kreftenheye Formation in two point bar sequences showing different lithofacies. The sandy point bars rest on gravelly braided river deposits (facies 1). The older point bar sequence (facies 2) was formed by a small-scale channel and is characterized by clayey lateral accretion surfaces, indicated by inclined heterolithic stratification (IHS). This point bar sequence has features indicative of variable discharge during deposition during a transitional stage from a braided to a meandering channel pattern. The younger point bar sequence (facies 3) was formed by a larger channel that incised the braidplain and is thought to represent a fully developed meandering channel pattern. IHS was not found in these deposits. Point bar formation at the study location ceased during the Allerød or early Younger Dryas when the meandering channel was abandoned. The fill of this residual channel (facies 4) consists of gyttja, peat and (humic) clay. Finally, the point bars and the residual channel were covered by floodbasin deposits of Holocene meandering river systems (also facies 4) which consist predominantly of clay.	A transition from a braided to a meandering channel facies, showing inclined heterolithic stratification (Late Weichselian, central Netherlands)
VOLUME 74 NO 1 21	1995	74	1	21	33	Viseras, C.; Fernández, J.	A study is made of a Pliocene alluvial fan in the Guadix Basin (Betic Cordillera, Spain). On the basis of the characteristics of the sequences and the position of the Arroyo de Gor section within the fan, a model is proposed to explain the sequential trends, taking into account the importance of the erosional processes associated with lateral displacement according to a pendular pattern of a fluvial system made up of a trunk channel and lateral, secondary channels. Lateral migration of channels in a constant direction is a consequence of the preferential attachment of bars to one bank, as shown by recent systems. Change in the direction of migration is caused when channels reach the basin margin or the opposing slope of an adjoining fan. This can also occur if tilting towards the centre of the basin takes place. According to this model, a marginal position in a fan would be recognised by a series of fining and thinning upward (FU + ThU) sequences delimited by clear erosion surfaces. The backsets of the bars accumulated in the channels invariably dip towards the centre of the fan. A central position is characterised by a higher number of FU + ThU sequences not reaching completion at the top (and, therefore, with a lower proportion of overbank facies). The backsets dip alternately in opposite directions. This model may also be used for the evolution of the sediment supply/subsidence ratio in a particular zone of a basin.	The role of erosion and deposition in the construction of alluvial fan sequences in the Guadix Formation (SE Spain)

VOLUME 74 NO 1 35	1995	74	1	35	41	Lambers, P.H.; Boekschoten, G.J.	The remains of two fossil fishes from the Lower Aptian of the Bentheim area, north-western Germany, are described. A fragment of a large pectoral fin is identified as Pachycormidae indet. It is the first report of a Lower Cretaceous pachycormid in Europe and extends the geographic range of pachycormids to Germany. A trunk of a small teleost fish is identified as Clupeomorphaindet. This extends the range of Lower Cretaceous clupeomorphs to north-western Germany.	Fish remains from the Aptian near Bentheim, Germany
VOLUME 74 NO 1 43	1995	74	1	43	63	Meer, F. van der	During the Triassic, continental and supratidal environments prevailed in the north of the Ronda-Málaga region whereas intertidal and shallow marine environments characterize the south. From the Jurassic up to the Miocene, the Ronda-Málaga region was the scene of shallow marine environments in the north and open or deeper marine environments in the south. The Miocene reveals rapidly changing paleo-environments. During the Aquitanian a submarine fan system developed with clastic supply from an emerged area in the north. In the Burdigalian, deformation started to the south of the study area and depositional patterns completely reversed, now showing detritus supply from an emerged area in the south. The entire area emerged during Langhian and Serravallian times and several local extension basins developed in the Tortonian. Backstripping analysis reveals four phases of accelerated subsidence related to extension in the Mesozoic: Anisian-Ladinian (241-235Ma), Norian-Hettangian (223-203Ma), Callovian-Tithonian (161-146Ma), and Cenomanian-Turonian (97-89Ma). These phases can be correlated with tectonic events in the Central Atlantic Ocean. The Tertiary subsidence record shows a change from slow to rapid subsidence in the Late Oligocene and Early Miocene related to a change from extensional to compressional tectonics. Throughout the Middle and Late Miocene and the Pliocene, strike-slip tectonics resulted in local extension and compression giving rise to renewed basin development. The paleogeographic reconstructions together with subsidence analysis allow to discuss the tectonostratigraphic evolution of the Ronda-Málaga region within the framework of western Mediterranean plate tectonics.	Triassic-Miocene paleogeography and basin evolution of the Subbetic Zone between Ronda and Málaga, Spain

VOLUME 74 NO 1 65	1995	74	1	65	77	Navidad, M.; Carreras, C.	In the Eastern Pyrenees Hercynian massifs, basic and acid magmatic associations occur in metasedimentary series of probable Cambrian Late Precambrian age. Basic magmatic rocks occur in the lower part of the metasedimentary series as metagabbros and metabasalts derived from low-Ktholeiites and quartz-tholeiites. They are characterized by low niobium and thorium contents (< 5 ppm) and their multi-element and REE patterns are flat. They are interpreted as fractionated E-MORB mantle partial melts. Acid magmatic rocks are: 1) Metarhyolites and dacitic metatuffs intercalated at different levels in the series. They are characterised by low to moderate niobium and thorium contents (7 -12 ppm). Their multi-element patterns are analogous to those of crustal melts, and the REE patterns are characteristic of progressively fractionated calcalkaline magmas. These rocks are derived from aluminous calcalkaline crustal magmas. 2) Rhyolitic metaporphyries mainly in the upper part of the series, although thin sills are also present in the lower part. These rocks are highly impoverished in incompatible and REE elements and display low titanium, phosphorus and strontium contents. Their REE patterns are flat with a significant europium anomaly. The rocks represent highly differentiated aluminous calcalkaline crustal magmas. 3) A quartz-monzonitic metaporphry sill in the lowest part of the series. It represents a meta-aluminous magma with alkaline affinity and, although its incompatible element patterns are analogous to those of the metavolcanics, its REE patterns are more fractionated and exhibit a stronger impoverishment in HREE. The assemblage of acid rocks can be ascribed to a magmatic episode developed by crustal partial melting and likely also to subsequent	Pre-Hercynian magmatism in the Eastern Pyrenees (Cap de Creus and Albera Massifs) and its geodynamical setting
VOLUME 74 NO 1 79	1995	74	1	79	88	Dissanayake, C.B.; Rupasinghe, M.S.	Approximately 25% of Sri Lanka's landmass is gem-bearing. Most of the gem deposits are located in restricted zones (approximately 15000 sq km) within the area occupied by rocks of the Highland/Southwestern Complex . Over 90% of Sri Lanka's gem mining is from secondary placer deposits that can be classified as sedimentary gem deposits of residual, eluvial and alluvial types. Primary or in-situ gem occurrences are located mainly in contact-metamorphic zones comprising of skarn and calcium-rich rocks. Corundum occurrences have also been found in aluminous-rich, silica-deficient metasedimentary formations. Gem minerals that are frequently found in pegmatites within the Highland/Southwestern Complex include corundum, zircon, beryl, quartz varieties, feldspar and chrysoberyl. A special feature of many secondary gem deposits of Sri Lanka is their location on morphotectonically controlled sites.	Classification of gem deposits of Sri Lanka

VOLUME 74_NO 2_93	1995	74	2	93	104	Rull, V.	Sediments of the Tacarigua coastal lagoon in northern Venezuela are rich in organic material. The lagoon and its sediments are therefore important as a modern-day analog for the interpretation of palynofacies assemblages in clastic sediments that formed in tropical coastal environments. Samples representative of the most important subenvironments of the lagoon were collected and prepared with standard palynological methods. The organic materials were analyzed in terms of biological origin, source area and textural characteristics. The analytical results were evaluated with standard statistical techniques. Based on Principal Components Analysis (PCA) six sample groups are differentiated. Sample groups A and B are very rich in humic gels and they represent the western part of the lagoon in which sedimentation largely reflects the influence of the River Guapo. Sample group C contains both humic gels and degraded plant material. Group C represents the central part of the lagoon where sedimentation is influenced both by the River Guapo and the lagoon mouth. Sample group F contains sub-equal percentages of degraded algal and/or bacterial material, humic gels and degraded plant material. Group F is representative of the eastern part of the lagoon where autochthonous sedimentation is important. Sample groups D and E which have a high percentage of degraded algal and/or bacterial material, are representative of sediments that were laid down in close proximity to mangrove vegetation. In view of the varied character of the organic assemblages in these modern lagoonal deposits, the interpretation in environmental terms of similar fossil assemblages is complex and requires a careful consideration of all the evidence.	Organic matter assemblages from recent sediments of the Tacarigua coastal lagoon (northern Venezuela)
VOLUME 74_NO 2_105	1995	74	2	105	116	Serrano, F.; Sanz de Galdeano, C.; Delgado, F.; López-Garrido, A.C.; Martín-Algarra, A.	This paper analyses the stratigraphic disorganization of the Mesozoic and Cenozoic in the Malaguide Complex of the Málaga area and concludes that this disorganization was caused by gravitational tectonics, which arranged most of the Meso-Cenozoic in olistostrome-type chaotic masses. The deformations occurred between the Middle Eocene and the latest Oligocene. The paper also reports the presence of up to now partially unknown Eocene sediments, deposited in lagoonal environments. Finally, for the first time, the existence around Málaga of sediments belonging to the Upper Oligocene - Aquitanian Ciudad Granada Group and the Lower Burdigalian Viñuela Group is shown.	The Mesozoic and Cenozoic of the Malaguide Complex in the Málaga area: a Paleogene olistostrome-type chaotic complex (Betic Cordillera, Spain)

VOLUME 74 NO 2 117	1995	74	2	117	127	Gras, R.	The Late Cretaceous in northwest Europe is characterised by general sealevel rise, leading to extensive platform carbonate sedimentation of the Chalk Group, and by tectonic inversion, as witnessed by uplift and erosion of the Late Jurassic to Early Cretaceous basins. The Roer Valley Graben in the southern Netherlands was uplifted and eroded in the Late Cretaceous. The inversion was accomplished by the reverse rejuvenation of the graben-bounding faults. On the adjacent horst blocks northeast of the graben, the Maasbommel High and the Peel Horst, a section of the Late Cretaceous Chalk Group has been preserved. Analysis of the Late Cretaceous chronostratigraphy and facies of well Maasbommel-I on the Maasbommel High shows that the high occupied a marginal position in the basin in Cenomanian times, and a basinal position during the Turonian to Early Santonian. A pulse of clastic influx in the Late Santonian to Early Campanian marks the onset of the reverse rejuvenation of the graben-bounding Peel Boundary Fault and the uplift of the Roer Valley Graben relative to the Peel Horst and Maasbommel High. The inversion ceased in the Late Maastrichtian, when large parts of the graben were flooded and a condensed sequence of post-inversion Chalk Group sediments was deposited regionally.	Late Cretaceous sedimentation and tectonic inversion, southern Netherlands
VOLUME 74 NO 2 129	1995	74	2	129	136	Dobbe, R.T.M.; Oen, I.S.; Verdurmen, E.A.T.	Two U-Pb zircon datings of metatuffites from the lower and upper unit of the metavolcanosedimentary sequence in the Tunaberg area, SE Bergslagen, Sweden, yield an age of 1871 ± 7 Ma for the metatuffite in the lower unit and an age of 1836 ± 9 Ma for the metatuffite in the upper unit. An Older Granite in a folded, composite granite-basite sheet that is intrusive in the upper metavolcanosedimentary unit contains zircons with cores that are apparently inherited from older crust; the U-Pb zircon age of 1912 ± 29 Ma obtained for this Older Granite must be discarded as the intrusion age of this granite. The maximum age of intrusion of the pre-main folding composite sheet of Older Granite and metabasite is constrained by the 1836 ± 9 Ma age of the upper volcanosedimentary unit. The deposition of the southern Bergslagen metavolcanosedimentary sequence in the Tunaberg area occurred in the period 1.88-1.83 Ga, i.e. a somewhat later and much longer period than the deposition period of the 1.89-1.88 Ga western Bergslagen volcanosedimentary sequence.	U-Pb zircon ages of metatuffites and Older Granite from the Tunaberg area, SE Bergslagen, Sweden
VOLUME 74 NO 2 137	1995	74	2	137	137			Orogenesis, a time odyssey
VOLUME 74 NO 2 138	1995	74	2	138	138			Preface - Orogenesis, a time odyssey
VOLUME 74 NO 2 139	1995	74	2	139	139	Zwart, H.J.		Introduction - Orogenesis, a time odyssey

VOLUME 74 NO 2 141	1995	74	2	141	150	Passchier, C.W.	Identification of macro-tectonic regimes responsible for development of orogenic or mobile belts becomes increasingly difficult with age. Especially Precambrian mobile belts are difficult to interpret because of a lack of 'far-field data' such as palaeogeographic reconstructions and palaeomagnetic data from contemporaneous oceanic crust. Nevertheless, most Precambrian mobile belts can be fitted into actualistic macro-tectonic models of orogenesis involving destructive plate margins. Archaean granite-greenstone areas are an exception in that they are difficult to fit to such actualistic models. One possible explanation is that they partly developed in a setting which is different from modern macro-tectonic regimes. A granite-greenstone area in the Yilgarn Craton, Western Australia, is presented as an example of unusual geometries in such a setting.	Precambrian orogenesis: was it really different?
VOLUME 74 NO 2 151	1995	74	2	151	166	Matte, P.	The Uralides and the Variscides are two Palaeozoic orogenic belts located on the eastern and south-western borders of the East-European Precambrian craton (Russo-Baltica), respectively. Both belts have common characteristics (nappe tectonics, opposite vergences on both sides) and have been formed within roughly the same time-span (500-270 Ma for the Variscides, 500-230 Ma for the Uralides). Nevertheless they exhibit striking differences in shape, preservation of ophiolites and island arcs, grade and type of metamorphism, and erosion level, which reflect different accretionary histories. The Variscides were formed by collision of large continental blocks involving major continental stacking and thickening, which resulted in strong heat production and related high-temperature metamorphism, crustal melting and late-orogenic denudation. The Uralides were formed by accretion of island arcs and micro-continents against a large East-European continent, associated with much lower heat production, low-temperature, high-pressure metamorphism, restricted crustal melting and minor erosion.	Southern Uralides and Variscides: comparison of their anatomies and evolutions

VOLUME 74 NO 2 167	1995	74	2	167	182	Biermann, C.	The first of three main tectonic events in the orogenic evolution of the Betic Cordilleras of southern Spain involved crustal subduction during the Late Cretaceous. It included the stacking of nappes in a deep crustal environment, accompanied by HP-metamorphism and polyphase ductile deformation. It has only been recorded in the nappes of the Internal Zone of the Betic Cordilleras and took place after a Middle Jurassic initial phase of rifting and break-up of a Triassic and Early Jurassic carbonate platform. The second phase in the development of the orogenic belt starts with an important regional phase of extension in Late Oligocene-earliest Miocene time. Crustal thinning during this extensional phase and updoming of the subcrustal lithosphere in the Betic-Alboran domain resulted in heating of the extended crust. Heating has been recorded in the metamorphic nappes of the Internal Zone. Extension of the Betic-Alboran domain resulted in low-angle normal faulting in the nappe pile of the Internal Zone. In the Early Miocene an abrupt transition from regional tension to compression is responsible for the final thrusting of elements of the Betic nappe complex towards the passive continental margin of the Iberian plate. This 'final emplacement' of the nappes marks the beginning of Neogene thin-skinned deformation in the External Zone. In the Internal Zone, continuing convergence between the African and Iberian plates, resulted in strike-slip deformation from the latest Burdigalian onwards. Deformation in the eastern Internal Zone during this third tectonic phase is mainly characterised by basin subsidence and basement uplift in a strike-slip controlled regime under changing orientations of the main compressive stress. Theoretical lithospheric	The Betic Cordilleras (SB Spain). Anatomy of a dualistic collision-type orogenic belt
VOLUME 74 NO 2 183	1995	74	2	183	186	Törnqvist, T.E.		Discussion: Alluvial architecture of the Quaternary Rhine-Meuse river system in the Netherlands, by G.H.J. Ruegg, Geologie en Mijnbouw 72: 321-330,1994
VOLUME 74 NO 2 187	1995	74	2	187	190	Ruegg, G.H.J.		Discussion: Alluvial architecture of the Quaternary Rhine-Meuse river system in the Netherlands. Reply by the Author
VOLUME 74 NO 3 191	1995	74	3	191	197	Duin, E.; Rijkers, R.; Remmelts, G.	A project to study deep crustal structures was carried out by the Geological Survey of the Netherlands between 1986 and 1993. In this period deep seismic data were acquired on- and offshore the Netherlands. The data consist of stacked normal-incidence seismic lines with recording times of up to 16 s and wide-angle measurements. Interpretations show that the crust is composed of a transparent upper part and a reflective lower part. The base of the reflective zone coincides with the Moho discontinuity. The seismic lines cross several basins. The Roer Valley Graben was modelled with a pure-shear McKenzie model. The Mesozoic basins in the southern North Sea seem to have originated from pure-shear movements with an additional simple-shear component. The Moho depth map shows that the crust is thinner beneath the basins and thickens beneath the highs.	Deep seismic reflections in the Netherlands, an overview

VOLUME 74 NO 3 199	1995	74	3	199	212	Weerts, H.J.T.; Berendsen, H.J.A.	<p>During the Late Weichselian, climatic changes induced the formation of a two-fold terraced braided-river plain that was formed by precursors of the rivers Rhine and Meuse in the central Netherlands. The older (and higher) terrace is Pleniglacial. It is partly covered by river dunes and coversand of Younger Dryas age. The younger (and lower) terrace originated during the Younger Dryas. Sealevel rise during the Holocene forced the rivers to aggrade since the Early Atlantic. Since then, avulsions have led to a complicated palaeo-channel pattern in which Rhine and Meuse precursors still can be distinguished. River avulsions occurred predominantly during three periods; between 5000 and 4000 BP, around 3000 BP, and around 1800 BP. These periods of increased avulsion frequency have also been found in the northern and central parts of the delta. Rivers were essentially meandering, but in the western part of the area anastomosing rivers existed before 3000-4000 BP. Some Meuse distributaries also have an anastomosing pattern around circa 2000 BP, although they show lateral accretion, and have a rather high width/thickness ratio (40-60). Meander wavelength increased considerably in the Middle Ages. This reflects an increase in peak discharge.</p>	Late Weichselian and Holocene fluvial palaeogeography of the southern Rhine-Meuse delta (the Netherlands)
VOLUME 74 NO 3 213	1995	74	3	213	224	Tebbens, L.A.; Kroonenberg, S.B.; Berg, M.W. van den	<p>Electron microprobe analysis of detrital garnets from Quaternary Rhine, Meuse and Baltic River sediments in the Netherlands area is used to trace back the provenance and relative contributions from different source lithologies in each drainage basin. In the Late Pliocene, high-grade metamorphic almandine- and pyrope-rich garnets from the Vosges and Black Forest dominate the Rhine garnet suite. With the onset of the Pleistocene, the Alpine Foreland Molasse is connected to the Rhine drainage area, supplying grossular- and probably also spessartine-rich garnets. The connection of the Aare and other Alpine tributaries to the Rhine in the Middle Pleistocene (Menapian-Bavelian) finally introduces large amounts of almandine-rich garnets derived from high-grade regionally metamorphosed inner Alpine source lithologies. The garnet suite of the Meuse sediments almost entirely consists of spessartines and Mn-rich almandines. They are derived from Mn-rich low-grade metamorphic pelites of the Libramont anticlinal region and the Stavelot Massif in the Ardennes. A small association of Mn-poor almandines is ascribed to a Vosges supply from before the capture of the Upper Meuse by the Moselle. The Baltic River garnet assemblages are characterized by a wide compositional spectrum, indicative of a large differentiated source area. The almandine- and pyrope-rich garnets are most likely derived from the extensive Fennoscandian Shield, while the spessartine-rich specimens are thought to originate from the mid-German Variscan massifs.</p>	Compositional variation of detrital garnets in Quaternary Rhine, Meuse and Baltic River sediments in the Netherlands

VOLUME 74 NO 3 225	1995	74	3	225	234	Helsen, S.	Conodonts from selected Frasnian and Tournaisian dolomites in southern Belgium have Colour Alteration Index (CAI) values of 3.0-4.5 or 6.0-7.0. The textural alteration of these conodonts includes various features. Most striking are the subhedral apatite crystals that surround the conodont denticles. Furthermore, fields of apatite crystals, irregular apatite envelopes and apatite pseudomorphs after calcite occur on the conodont surfaces. The higher CAIs as well as the textural alteration are probably related to dolomitization processes. Phosphates may have been supplied by decomposition of organic matter or by ascending saline fluids.	Conodont alteration in Devono-Carboniferous dolomites from southern Belgium
VOLUME 74 NO 3 235	1995	74	3	235	235			Dutch Younger Dryas research
VOLUME 74 NO 3 236	1995	74	3	236	236	Troelstra, S.; Hinte, J.E. van		Introduction - Dutch Younger Dryas Research
VOLUME 74 NO 3 237	1995	74	3	237	240	Joosten, J.H.J.		Between Diluvium and Deluge: the origin of the Younger Dryas concept (extended abstract)
VOLUME 74 NO 3 241	1995	74	3	241	243	Ganssen, G.		The Younger Dryas in the marine record (extended abstract)
VOLUME 74 NO 3 245	1995	74	3	245	249	Vandenbergh, J.	The Younger Dryas is to be considered as a biostratigraphic zone which in the Netherlands started 10900 (radiocarbon) years ago and ended 10200 BP. It is subdivided in two parts. The first half (up to 10 500 BP) is characterized by severe, continental conditions which resemble those at the end of the Pleniglacial; a permafrost was present. The second half shows milder conditions as a transition to the Holocene; permafrost disappeared at about 10500 BP.	The climate of the Younger Dryas in the Netherlands (extended abstract)
VOLUME 74 NO 3 251	1995	74	3	251	256	Kasse, C.		Younger Dryas cooling and fluvial response (Maas River, the Netherlands) (extended abstract)
VOLUME 74 NO 3 257	1995	74	3	257	260	Meulen, S. van der		Younger Dryas deposits of the Tjonger Valley fill in the NE Netherlands (extended abstract)
VOLUME 74 NO 3 261	1995	74	3	261	264	Mook-Kamps, E.		Palynological investigations of Younger Dryas sediments in the northern Netherlands (extended abstract)
VOLUME 74 NO 3 265	1995	74	3	265	269	Deeben, J.		Human occupation of the southern Netherlands during the Younger Dryas (extended abstract)
VOLUME 74 NO 3 271	1995	74	3	271	273	Bottema, S.		A short review of the Younger Dryas in the Eastern Mediterranean area (extended abstract)
VOLUME 74 NO 3 275	1995	74	3	275	280	Troelstra, S.; Hinte, J.E. van		The Younger Dryas-Sapropel S1 connection in the Mediterranean Sea (extended abstract)
VOLUME 74 NO 3 281	1995	74	3	281	283	Islebe, G.A.; Borg, K. van der; Hooghiemstra, H.		The Younger Dryas climatic event in the Cordillera de Talamanca, Costa Rica (extended abstract)
VOLUME 74 NO 3 285	1995	74	3	285	286	Kaars, S. van der		Preliminary palynological results on the Pleistocene-Holocene transition, Seram Trench, offshore Irian Jaya, Indonesia (extended abstract)
VOLUME 74 NO 4 287	1995	74	4	287	300	Felder, W.M.	A historical overview is presented of the (litho)stratigraphic studies into the Upper Cretaceous deposits in southern Limburg (the Netherlands), the type area of the Maastrichtian. From 1860 onward, a workable lithostratigraphy has been available for these deposits. At present, a division including four formations and 23 members is being used.	Historical overview of lithostratigraphic research on the Upper Cretaceous of southern Limburg, the Netherlands

VOLUME 74 NO 4 301	1995	74	4	301	312	Riessen, E.D. van; Vandenberghe, N.	A prominent chocolate-coloured horizon at the top of the Kerkom Sand (Oligocene, Tongeren Group) near Pellenberg in the Leuven area (Belgium), has traditionally been interpreted as the illuvial zone of a podsol type soil. Observed features however are equally compatible with an origin as an oil-saturated reservoir sand. In fact, organic geochemical analyses indicate strongly that a fossil oil seepage is the most likely interpretation. The time of oil impregnation may be related to an important tectonic re-arrangement, which started at the very end of the Eocene, and probably triggered the leakage and migration of oil from traps in the southwest of the Netherlands. The oil migrated through porous sands up the gentle northern flank of the Brabant Massif, guided by clayey seals till it reached the surface. The presence of a fossil oil seepage in the Leuven area, means that possible traps, down-dip of the Pellenberg outcrop, may contain accumulations of oil.	An Early Oligocene oil seepage at the southern rim of the North Sea Basin, near Leuven (Belgium)
VOLUME 74 NO 4 313	1995	74	4	313	313			Introduction - Geology of gas and oil under the Netherlands
VOLUME 74 NO 4 315	1995	74	4	315	315			Synopsis: Petroleum geology of the Netherlands - 1993
VOLUME 74 NO 4 316	1995	74	4	316	316	Kroonenberg, S.B.		preface Petroleum Geology of the Netherlands 1993
VOLUME 74 NO 4 317	1995	74	4	317	334			Synopsis: Petroleum geology of the Netherlands - 1993
VOLUME 74 NO 4 335	1995	74	4	335	339	Moody-Stuart, M.		Resources and resourcefulness
VOLUME 74 NO 4 341	1995	74	4	341	344	Dessens, C.W.M.		The role of oil and gas in the Dutch energy policy
VOLUME 74 NO 4 345	1995	74	4	345	352	Halfon, J.		New oil and gas - Technology leads the way

VOLUME 74 NO 4 353	1995	74	4	353	364	Breunese, J.N.; Rispens, F.B.	The discovery in 1959 of the giant Groningen gas field with reserves of 2750 billion (10 ⁹) cubic metres (bcm) triggered a strong revival of the hydrocarbon exploration in the Netherlands. Over the last decades, the country has proven to be a very prolific hydrocarbon province, particularly for natural gas. Supported by the favourable exploration climate, exploration efforts have been generally at a high and sustained level. Well over 250 gas accumulations have been discovered throughout the stratigraphic column in various plays. Field sizes range from medium (of the order of 50 bcm) down to very small (2 bcm or less). The total initial reserves in these fields are around 1150 bcm. A mature stage of exploration has now been reached in many areas. Within a few years virtually all production acreage and large parts of the exploration acreage in the Netherlands will have been covered with 3D seismic. The introduction of 3D seismic has led to an improvement of exploration drilling efficiency and to increased technical success rates. Moreover, the application of 3D seismic has indicated additional prospectivity undetected before. It provides a major opportunity, and challenge, for finding incremental reserves. On the development side, nearly all large and medium-size gas fields have, or shortly will, come on stream. However, the majority of the relatively large number of small and marginal fields is still undeveloped. The challenge here is to reduce economic limits by further expansion of the infrastructure and application of modern marginal-field development technology.	Natural gas in the Netherlands: exploration and development in historic and future perspective
VOLUME 74 NO 4 365	1995	74	4	365	367			Book reviews
VOLUME 75 NO 1 1	1996	75	1	1	10	Broek, W.M.G.T. van den; Heilbron, H.C.; Menken, M.J.V.	Two options for permanent disposal of radioactive waste in rock salt are distinguished: the salt-mine repository and the deep boreholes and cavity combination. Of these, the salt-mine repository is treated in some detail. The results of a feasibility study of waste retrieval from a salt-mine repository are reviewed. This study was carried out in the framework of the 'OPLA' research programme of the Netherlands. Three disposal concepts have been considered: a modification of a concept for permanent disposal, a concept incorporating thick-walled overpacks and a concept which involves cased boreholes. Circumstances that may influence the retrieval operation (e.g. salt temperature, and volume and weight of overpacks) are taken into account. As a conclusion, it appears technically feasible to retrieve radioactive waste from a salt-mine repository, provided that the period between disposal and retrieval is not longer than a few hundred years.	Feasibility of retrieval of radioactive waste from a salt-mine repository: an overview

VOLUME 75 NO 1 11	1996	75	1	11	18	Crook, T. de	A zoning map for earthquake intensities and a relation between intensity and design ground acceleration are presented, conforming to Eurocode 8, the European earthquake building code. For the southeast of the Netherlands, reduced or simplified seismic design procedures may be used. For the remainder of the country, where expected intensities are very low, the provisions of Eurocode 8 need not be observed. From the Netherlands data set, the linear frequency-magnitude relation for the tectonic earthquakes is recalculated. A correlation between intensity and magnitude is determined and compared with similar relations in California and Germany. The radius of perceptibility estimated from the local magnitude is more accurate than that estimated from the maximum observed epicentral intensity. This radius is substantially greater in the Netherlands than in California for the same epicentral intensity. The maximum expected earthquake for the Netherlands is estimated at about 6 ¼ local magnitude.	A seismic zoning map conforming to Eurocode 8, and practical earthquake parameter relations for the Netherlands
VOLUME 75 NO 1 19	1996	75	1	19	31	Kasse, C.	Early Pleistocene deposits of the Dutch-Belgian border area between Breda and Turnhout have been dated with paleomagnetic methods. Two normal polarity subzones in the sedimentary sequence are identified as the Olduvai and Jaramillo subchrons. The magnetozones are compared with the early Pleistocene pollenzones which are based on ecological changes reflecting Quaternary climatic variations. The Olduvai subchron was identified in pollenzones Tiglian C4 and C5 and the Jaramillo subchron in pollenzone Bavelian Bv3b. Late Pleistocene Weichselian periglacial processes clearly influenced the remanent magnetization of the early Pleistocene deposits. Melting of the icerich topzone of the Weichselian permafrost apparently modified the original remanence and led to complete remagnetization of the upper part of early Pleistocene clay beds.	Paleomagnetic dating and effects of Weichselian periglacial processes on the magnetization of Early Pleistocene deposits (southern netherlands, northern Belgium)
VOLUME 75 NO 1 33	1996	75	1	33	42	Hooyberghs, H.J.F.	The glauconitic and fossiliferous Edegem Sands Member of the Berchem Formation (Miocene) in northern Belgium contains 25 different taxa of planktonic foraminifera. The presence of Globorotalia kugleri and Globigerinoides primordius allows to assign an Aquitanian age (Early Miocene) to the member. More accurately, this presence allows a correlation with Biozone N4, defined in tropical regions by Blow (1969,1979).	The stratigraphical position of the Edegem Sands Member (Berchem Formation, Miocene) in its type area at Wilrijk (N Belgium), based on planktonic foraminifera

VOLUME 75 NO 1 43	1996	75	1	43	55	Soriano, C.; Martí, J.; Casas, J.M.	Permo-Carboniferous rocks are located in the lower thrust sheets of the Alpine antiformal stack in the Central Pyrenees. In order to study the geometry, distribution of facies, thickness and dynamics of Permo-Carboniferous basins, a detailed knowledge of Alpine tectonics is required, which has not always been taken into account by previous authors. This paper follows a different approach to the study of these basins. The Alpine structural units bounding the Permo-Carboniferous series of the eastern part of the Erill Castell-Estac basin have been mapped in detail, as a first step in this palinspastic restoration. This procedure has allowed: 1) to define some Alpine thrusts as inverted Permo-Carboniferous normal faults, 2) to constrain the age of several Permo-Carboniferous faults, 3) to differentiate the area studied as a volcano-tectonic depression, independent of the western part of the Erill Castell-Estac basin, and 4) to establish the paleogeographic position of the Permo-Carboniferous series and the minimum dimensions for the part of the basin studied.	Palinspastic reconstruction of Permo-Carboniferous basins involved in Alpine deformation: the Erill Castell-Estac basin, Southern Pyrenees, Spain
VOLUME 75 NO 1 57	1996	75	1	57	68	Huckriede, H.	Lower Carboniferous iron-manganese ores of volcanic-sedimentary origin occur in the eastern part of the Rheinisches Schiefergebirge (Germany). Major constituents are rhodochrosite, bementite, hematite, and quartz. The ores are only weakly metamorphic and exhibit excellently preserved primary textures and fossils. Metamorphic equivalents of these ores are the manganese deposits of the Iberian Pyrite Belt. Most strikingly, the iron-manganese ores show a clearly developed zonation. Positions of former hydrothermal vents are indicated by chert mounds which are intersected by vertical pipes of coarse-grained hematite. The chert mounds are covered and surrounded by beds of fine-grained hematite. Manganese ore forms the distal part of each deposit. The formation of the ores was controlled by complex interactions of hydrothermal activity, intrusive and extrusive volcanism, formation of intramagmatic sulphide ores as well as diagenetic redistribution of certain elements: SiO ₂ , copper, nickel, and iron were mobilized due to hydrothermal alteration of basic subvolcanic intrusive rocks. Copper and nickel were mostly re-deposited as sulphides within the intrusives, whereas manganese, iron, and SiO ₂ were transported by hot convecting waters to the sea floor. Here, SiO ₂ and the dissolved metals were precipitated by mixing with oxygenated sea water. Subsequently, manganese was separated from iron by diagenetic reactions. Enrichments of cosmic spherules and conodonts indicate that this process required a long time.	Lower Carboniferous stratiform iron-manganese mineralizations (Rheinisches Schiefergebirge, Germany): products of submarine hydrothermal activity and diagenetic manganese redistribution

VOLUME 75 NO 1 69	1996	75	1	69	79	Tassinari, C.C.G.; Medina, J.; Pinto, M.S.	Rb-Sr and Sm-Nd isotopic data are reported for 27 samples of fine-grained metasediments from five different localities of the Slate Greywacke Complex of the Central Iberian Zone, Portugal. Over most of the area, Rb-Sr whole-rock isotope systematics yields a 440 to 400 Ma time interval, which is considered to correspond to an important metamorphic episode. Initial $^{87}\text{Sr}/^{86}\text{Sr}$ ratios of most Variscan granitoids from northern Portugal together with the Sr isotopic evolution curves for all studied metapelites, show that the latter are not suitable main sources for these granitoids. Sm-Nd depleted-mantle model ages and whole-rock Sm-Nd isochron ages provide values of 1.35 to 1.25 Ga, which may correspond to the average age of the mantle-extraction of the sources of the sediments. These data provide evidence that metamorphism of greenschist facies does not induce Nd isotopic rehomogenization in fine-grained sediments. The Sr and Nd isotopic signatures of the analysed metasediments ($Sr_i = 0.7090$ to 0.7170 ; and $\epsilon_{\text{Nd}}(430) = -2.6$ to -4.18) suggest derivation from young continental crust, and deposition probably in a tectonically passive setting.	Rb-Sr and Sm-Nd geochronology and isotope geochemistry of Central Iberian metasedimentary rocks (Portugal)
VOLUME 75 NO 1 81	1996	75	1	81	83	Vissers, R.L.M.		Discussion: The Betic Cordilleras (SE Spain). Anatomy of a dualistic collision-type orogenic belt, by C. Biermann, Geologie en Mijnbouw 74: 167-182, 1995
VOLUME 75 NO 1 85	1996	75	1	85	86	Biermann, C.		Discussion: The Betic Cordilleras (SE Spain). Anatomy of a dualistic collision-type orogenic belt. Reply by the Author.
VOLUME 75 NO 1 87	1996	75	1	87	90	Martín-Algarra, A.; López-Garrido, A.C.; Sanz de Galdeano, C.; Martín-Martín, M.		Discussion: Triassic-Miocene paleogeography and basin evolution of the Subbetic Zone between Ronda and Málaga, Spain, by Freek van der Meer, Geologie en Mijnbouw 74: 43-63, 1995
VOLUME 75 NO 1 91	1996	75	1	91	96	Meer, F. van der		Discussion: Triassic-Miocene paleogeography and basin evolution of the Subbetic Zone between Ronda and Málaga, Spain. Reply by the author.

VOLUME 75 NO 4 295	1996	75	4	295	307	Amorosi, A.	Lower-Middle Miocene shallow-water deposits commonly occur in the piggy-back-basins sequence of the northern Apennines thrust-belt. In contrast, such deposits are restricted to small bodies of reduced lateral extent in the adjacent foredeep succession. Lateral tracing of major unconformities across the two different structural domains allows reconstruction of a common sedimentary evolution for the study area, through the identification of three depositional sequences with an internal arrangement in systems tracts, generally showing lack or scarcity of lowstand deposits. A regional unconformity, marking the erosional truncation of the underlying turbidite deposits, constitutes the base of sequence S1 (Upper Burdigalian). Above mixed carbonate-siliciclastic, shallow-water facies (transgressive systems tract, TST), sequence S1 exhibits a progradational stacking pattern of outer-shelf to inner-shelf and nearshore facies (highstand systems tract, HST). The unconformable lower boundary of sequence S2 (Lower Langhian) is the base of transgressive, glaucony-rich, tide- and storm-influenced nearshore arenites (TST). The maximum flooding surface, showing local concentration of glaucony, records the sharp change from marginal marine arenites to highly bioturbated shelf deposits (HST). A generalized drowning of shelves during the Late Langhian-Early Serravallian is documented by rapid transition to coarse-grained siliciclastic deposits and deepwater marls (sequence S3). Tectonics appear to have exerted a major control on sedimentation, especially at the onset of sequence S1 and during deposition of sequence S3. Conversely, a possible eustatic control may apply for sequence S2.	Miocene shallow-water deposits of the northern Apennines: a stratigraphic marker across a dominantly turbidite foreland-basin succession
VOLUME 75 NO 4 309	1996	75	4	309	316	Martín-Martín, M.; El Mamoune, B.; Martín-Algarra, A.; Martín-Pérez, J.A.; Serra-Kiel, J.	New biostratigraphic data on calcareous nannoplankton and larger foraminifera of the Tertiary of the Malaguide Complex in the Sierra Espuña area show the presence of previously unknown Upper Eocene sediments. The timing of the deformation in the Malaguide Complex of the Sierra Espuña area is analysed, and a Late Oligocene to Late Aquitanian age is proposed for the main deformation	Timing of deformation in the Malaguide Complex of the Sierra Espuña (SE Spain). Geodynamic evolution of the Internal Betic Zone

VOLUME 75 NO 4 317	1996	75	4	317	340	Veeken, P.C.H.	Seismic stratigraphic study techniques allow to recognize several Cenozoic sedimentary cycles in the central and northern part of the North Sea area (UK sector), and to deduce their depositional history. Large-scale sedimentation patterns are illustrated with emphasis on Paleogene massflow deposits, forming important hydrocarbon-bearing reservoirs. Five regional unconformities form the bases of five depositional sequences (DS). These sequences can be subdivided into systems tracts in which seismic lithofacies units are outlined, calibrated by 76 wells. The base of DS-1 (Paleocene-Early Eocene) reflects the change from predominantly pelagic carbonates to clastic deposition. Within DS-1, prograding slope systems are present. Fan-delta systems supplied clastics to the shelf, whilst in the coastal area prograding deltas, swampy lakes and barrier complexes existed. Base-of-slope sand-prone sediments were laid down as slope-front fills, in submarine fan mounds and in parallel-bedded basinfloor deposits. Massflow sedimentation is dominant in the deeper parts of the basin. Axial basinfloor transport is indicated by the mound geometry and abnormal thickness of the bottom sets. A volcanic pulse is expressed by a volcano-clastic seismic marker. In DS-2 (Eocene-Early Oligocene) a slope system fringed the western margin of the basin. Massflow sedimentation continued; sources and depocentres are correlatable to those active in the Paleocene. Subordinate input sources existed in the Norwegian sector. The base of DS-3 (Late Oligocene-Middle Miocene) is overlapped by fine-grained marine deposits. Sediment thickness increases basinwards. Rapid sedimentary loading of underlying shales prevented proper dewatering, causing plastic deformation and under-compaction. In	The Cenozoic fill of the North Sea Basin (UK sector 56-62° N), a seismic stratigraphic study with emphasis on Paleogene massflow deposits
VOLUME 75 NO 4 341	1996	75	4	341	347	Keutgen, N.	Biometrical analysis of a Belemnella faunule of 264 specimens from interval 0 of the Vijlen Member as exposed at Altembroeck (NE Belgium) shows that most specimens belong to Belemnella (Pachybetemnella) sumensis Jeletzky, 1949, the belemnite index of the early part of the late Early Maastrichtian. Belemnella (Betemnella) cf. praearkhangelskii Naidin, 1964 is restricted to a single level (Bm2). In NW Germany this species is confined to a narrow interval characterizing the middle sumensis Zone. It is concluded that the Bm2 level at Altembroeck is of special importance for long-distance correlation between the Vijlen Member and the Maastrichtian in NW Germany. In the Altembroeck section, belemnite guards are enriched at certain levels. The belemnite accumulations probably developed as a result of stratigraphic condensation.	Belemnella (Belemnella) cf. praearkhangelskii Naidin, 1964 from the Member at Altembroeck (NE Belgium, Early Maastrichtian)

VOLUME 75 NO 4 349	1996	75	4	349	360	Elorza, J.; García-Garmilla, F.; Jagt, J.W.M.	Late Campanian and early Maastrichtian inoceramid bivalves and belemnite rostra from three sections in the Liège and Limburg provinces (Belgium) are analysed petrologically and geochemically. Oxygen isotope ratios indicate that the early Maastrichtian material has been more affected by diagenesis than the late Campanian specimens, but data for belemnites do support the cooling trend from the late Campanian to the early Maastrichtian. Late Campanian and early Maastrichtian mean palaeotemperatures are deduced to have been lower than 12.5 and 11.3 °C, respectively. Enrichment and depletion of elements, including rare-earth elements, and the generalised bright red-yellowish cathodoluminescence colour indicate cation-sensitive mobilisation processes during diagenesis.	Diagenesis-related differences in isotopic and elemental composition of late Campanian and early Maastrichtian inoceramids and belemnites from NE Belgium: palaeoenvironmental implications
VOLUME 75 NO 4 361	1996	75	4	361	371	Capellà I Solà, I.	The structural zonation in the Axial Zone of the Pyrenees, in which an infrastructure and a suprastructure are distinguished, can be correlated with a variation in the orientation of the principal strain axes. The deformation associated with the main foliation in the infrastructure is accommodated heterogeneously. Computed strain ellipsoids in gneisses show an apparent flattening strain ($k = 0.29$), which is in contrast to the apparent constrictional forms of pebbles in adjacent layers. Strain values in the suprastructure indicate an apparent flattening strain ($k = 0.36$) of low magnitude ($R_{xy} = 1.36$ and $R_{yz} = 2.01$), which can be taken as representative of the bulk finite strain throughout that domain. The trend of the X-axes is roughly E-W parallel to the fold axes in the infrastructure, whereas it is NW to N-plunging and at a wide angle to the ESE-WNW trending folds in the suprastructure. The Z-axes are steeply plunging in the infrastructure and almost horizontal in the suprastructure. Strain patterns in each of the two structural domains are suggested to be associated with different tectonic events. Between the infrastructure and the suprastructure, a transition zone exists where both domains grade into one another.	Strain analysis in the Axial Zone of the Variscan basement of the Pyrenees
VOLUME 75 NO 4 373	1996	75	4	373	378	Helsen, S.	The thermal alteration of Namurian conodonts of Belgium from existing stratigraphic collections has been examined and reviewed, their colour alteration indices (CAIs) being mapped. Comparisons with CAIs from Dinantian strata and with vitrinite reflectance data not only suggest little hydrocarbon potential for the Namurian in Belgium, but also indicate that the colour alteration of most Namurian conodonts has been influenced by their organic-rich host-sediments. Possible causes for this additional alteration, such as irradiation by natural radioactive decay of authigenic uranium, are discussed.	The influence of host-rock composition on the colour alteration of Namurian conodonts from Belgium
VOLUME 75 NO 4 379	1996	75	4	379	382			Book reviews
VOLUME 75 NO 2-3 101	1996	75	2-3	101	106	Brinkhuis, H.; Smit, J.		The Geulhemmerberg Cretaceous/Tertiary boundary section (Maastrichtian type area, SE Netherlands); an introduction

VOLUME 75 NO 2-3 107	1996	75	2-3	107	118	Jagt, J.W.M.; Felder, W.M.; Dortangs, R.W.; Severijns, J.	In view of the renewed interest in the Cretaceous/Tertiary (K/T) boundary in the type area of the Maastrichtian Stage, a historical account is presented of the litho- and biostratigraphy of the strata below and above this boundary, as well as the position of the boundary itself. Localities exposing uppermost Maastrichtian and lowermost Palaeocene deposits are reviewed and for some of them, including the recently discovered Geulhemmerberg site, lithologic logs are provided.	The Cretaceous/Tertiary boundary in the Maastrichtian type area (SE Netherlands, NE Belgium); a historical account
VOLUME 75 NO 2-3 119	1996	75	2-3	119	131	Roep, T.B.; Smit, J.	Traditionally, the K/T boundary in Zuid Limburg is placed at the Hardground of Vroenhoven between the Maastricht and Houthem Formations. The finding in the Curfs quarry and Geulhemmerberg of possible Paleocene microfossils below this hardground in a coarse-grained, well-bedded calcarenite unit with thin clay intercalations or clay pebbles excited new interest in the mode of deposition of this unit. The latter fills an irregular paleorelief, developed as a heavily burrowed hardground (Hardground of Berg en Terblijt), marking a hiatus at the top of the Maastrichtian calcarenites. In galleries in the Geulhemmerberg, the fill of this paleorelief consists of a thinning-up and fining-up sequence of 1) coarse-grained fossil hash with thin clay intercalations, 2) debrisflow-like coarse calcarenites, 3) well-laminated HCS-like calcarenites, and 4) alternating clay and calcarenitic flaser-bedding. The inferred process of infilling is episodic storm-wave activity in ca 20-40 m waterdepth. The scarcity of burrowing in the unit below the traditional K/T boundary in an otherwise heavily burrowed section of Maastrichtian and Paleocene calcarenites, and the preservation in the unit of delicate sedimentary structures and relatively thick clay layers point to extraordinary sedimentary circumstances. These are difficult to explain, but not incompatible with deposition shortly after the Chicxulub impact.	Sedimentological aspects of the K/T boundary at Geulhemmerberg, Zuid Limburg, the Netherlands

VOLUME 75 NO 2-3 133	1996	75	2-3	133	151	Zijlstra, J.J.P.; Brouwers, M.H.M.P.; Brinkhuis, H.; Boer, P.L.	Detailed thin-section microfacies analysis reveals the temporal and spatial variation of the depositional and early diagenetic conditions of the upper part of the Meerssen Member of the Maastricht Formation, now considered to span the Cretaceous/Tertiary (K/T) boundary, at Geulhemmerberg and Curfs (Maastrichtian type area, SE Netherlands). The precession- induced cycles of the Meerssen Member have been formed due to periodic variations of hydrodynamic energy and of deposition rate. Their genesis is similar to that of other precession-induced cycles encountered in the underlying Maastrichtian and Campanian carbonates. The microfacies distribution shows that the calcarenitic Geulhemmerberg sediment has been deposited under higher hydrodynamic energy conditions and in deeper water than the coeval sediments of quarry Curfs. The microfacies is locally characterised by dissolution features that may have been produced by percolating meteoric water during syn-sedimentary exposure. We propose that the intercalated clay layers, despite their open marine microfossil assemblage, were deposited under conditions of very low wave energy in very shallow marine depressions that were only affected during storms.	Microfacies analysis of Cretaceous/Tertiary boundary sections in the quarries Geulhemmerberg and Curfs, SE Netherlands
VOLUME 75 NO 2-3 153	1996	75	2-3	153	162	Jagt, J.W.M.	The uppermost Cretaceous and lowest Palaeocene in the type area of the Maastrichtian yield several macrofossils which can be used as index species in correlations with northern and southern Europe. For a macrofossil zonation of the uppermost Maastrichtian, coleoid and ammonoid cephalopods and inoceramid bivalves are of prime importance, while biozonations for the lowermost Palaeocene rely particularly on echinoid and asteroid species. On coleoid and ammonoid evidence, the type Maastrichtian is coeval with the uppermost Maastrichtian as interpreted in the Tethyan realm (Bay of Biscay sections in particular) and the North Temperate realm (NW and NE Europe). The occurrence in the lower part of the Geulhem Member (Houthem Formation) of distinctive, exclusively Early Danian echinoderm species suggests that the entire Lower Danian of the Danian type area is represented in the Maastricht area, and that what is considered to be the uppermost part of the underlying Meerssen Member (Maastricht Formation) represents the equivalent of the Early Danian 'Cerithium Kalk' in Denmark.	Late Maastrichtian and Early Palaeocene index macrofossils in the Maastrichtian tyoe area (SE Netherlands, NE Belgium)

VOLUME 75 NO 2-3 163	1996	75	2-3	163	172	Kuhnt, W.	Benthic foraminiferal assemblages from eight clay-layers within a relatively thick section of the lowermost Paleocene (planktonic foraminifera PO Zone) at the Geulhemmerberg, SE Netherlands, were examined for changes in abundance and species composition. The lower clay layers (A to D) are characterized by peculiar benthic foraminiferal assemblages with high numbers of small spiral forms which resemble modern epifaunal phytodetritus-feeding communities, that are well adapted to a food-limited environment in which much of the nutrient input is seasonally or erratically pulsed. Another distinct assemblage with high numbers of small, infaunal morphotypes such as <i>Tappanina selmensis</i> , <i>Reussella</i> ex gr. <i>europaea</i> , buliminids and bolivinids characterizes the upper part of the succession (clay layers E and F). This assemblage exhibits striking similarities to modern assemblages in areas with enhanced organic-matter export flux rates resulting in increased food supply for benthic organisms and slightly dysaerobic conditions at the sea floor. The occurrence of these 'high-productivity' benthic foraminiferal assemblages coincides with a marked increase in <i>Thoracosphaera</i> calcareous dinoflagellate cysts and may indicate an important phase in the recovery of the marine ecosystem after the collapse of the food web at the Cretaceous/Tertiary boundary.	Early Danian benthic foraminiferal community structures, Geulhemmerberg, SE Netherlands
VOLUME 75 NO 2-3 173	1996	75	2-3	173	185	Witte, L.; Schuurman, H.	Recently, a section comprising the Cretaceous/Tertiary boundary was discovered in an underground quarry at the Geulhemmerberg, South Limburg, the Netherlands. A series of samples collected from these strata were analysed for their calcareous benthic foraminiferal contents. Upper Maastrichtian and indifferent Upper Maastrichtian to Lower Paleocene species were found to be the most common elements throughout the sequence and no drastic faunal changes have been observed. Extremely rare inner-neritic Paleocene elements, however, enable a tentative identification of the position of the system boundary between samples G2A and G2B. Slightly higher in the section, an increase in palaeo-water-depth is inferred from the first occurrence of the mid-shelf species <i>Tappanina selmensis</i>	Calcareous benthic foraminifera across the Cretaceous/Tertiary boundary in the Geulhemmerberg (SE Netherlands)

VOLUME 75 NO 2-3 187	1996	75	2-3	187	191	Smit, J.; Zachariasse, W.J.	<p>In the Geulhemmerberg section across the Cretaceous/Tertiary (K/T) boundary, planktic foraminiferal assemblages were found only in the basal Paleocene clay layers. These layers are interpreted to correspond to the planktic foraminiferal P0 Zone because Paleocene planktic foraminifers do not occur yet, whilst Paleocene nannofossil and dinoflagellate assemblages are already present. This is consistent with the K/T boundary clays (P0 Zone) of El Kef in Tunisia and of Agost and Caravaca in Spain, in which Paleocene species are also absent. The planktic assemblages of the clay layers have a low diversity, comparable to P0 planktic assemblages from the Nye Kløv section in Denmark. <i>Heterohelix globulosa</i> (Ehrenberg) dominates the assemblages. Excellent preservation of the planktic foraminifers, and anomalously high planktic foraminifer percentages ($P/(P+B) = 53.3\%$) provide compelling arguments for survivorship of at least five generalist Cretaceous taxa into the basal Paleocene P0 Zone, as shown earlier at Caravaca, El Kef and Nye Kløv. However, due to the lack of planktic faunas in under- and overlying sediments, it is impossible to infer whether the planktic foraminiferal faunas in the P0 Zone clay-layers have changed, or are impoverished compared to Upper Maastrichtian faunas</p>	Planktic foraminifera in the Cretaceous/Tertiary boundary clays of the Geulhemmerberg (Netherlands)
VOLUME 75 NO 2-3 193	1996	75	2-3	193	213	Brinkhuis, H.; Schiøler, P.	<p>The newly found, relatively complete section across the Cretaceous/Tertiary (K/T) boundary in the Geulhemmerberg caves contains rich and well-preserved palynological assemblages. Stratigraphically diagnostic dinoflagellate cysts indicate that the lower part of the Geulhemmerberg succession represents the latest Maastrichtian and that an early Danian age may be assigned to sediments overlying the Berg en Terblijt Horizon, notably on the basis of the appearance of <i>Senoniasphaera inornata</i>. On the basis of quantitative palynological analysis, the sediments are interpreted to represent relatively marginal marine, inner neritic conditions, with nearby landmasses providing important terrestrial input. Almost all terrestrial palynological elements are most probably derived from Bryophyta (mosses). Their sudden proliferation at the K/T boundary may be associated with increased transport from the coastal plain, and/or it may reflect a major change in the terrestrial ecosystem at K/T time. Changes in the palynomorph distribution are probably mainly caused by differing hydrodynamical conditions, possibly combined with slightly varying waterdepths and/or the introduction of restricted marine conditions.</p>	Palynology of the Geulhemmerberg Cretaceous/Tertiary boundary section (Limburg, SE Netherlands)

VOLUME 75 NO 2-3 215	1996	75	2-3	215	230	Willems, H.	Calcareous dinoflagellate cyst (calcdinocyst) associations from the Cretaceous/Tertiary (K/T) boundary section of the Geulhemmerberg comprise 31 morphotypes in total. In addition, two incertae sedis organisms, morphologically related to the genus <i>Bonetocardiella</i> , occur. In the uppermost Maastrichtian and lowermost Danian, the quantitatively dominant calcdinocysts are <i>Pithonelloideae</i> , nearly exclusively <i>Pithonella sphaerica</i> , accompanied by up to 1.4% <i>Bonetocardiella</i> spp. In the uppermost Maastrichtian, <i>Pithonella</i> and <i>Bonetocardiella</i> make up the entire association. They are joined by <i>Obliquipithonelloideae</i> and <i>Orthopithonelloideae</i> in the lowermost Danian. Most calcdinocyst species (22 of the 31, species) appear to survive the IIT boundary event(s), while eight species first appear above the boundary. The distribution of the <i>Obliquipithonelloideae</i> and <i>Orthopithonelloideae</i> is related to the lithofacies. With up to 18 species, the diversity is highest in the clay layers, notably in the A, B, C and E clays. In these layers, the number of orthopithonelloids increases in comparison to the obliquipithonelloids. The cyclic diversity distribution of calcdinocyst morphotypes may possibly be attributed to sea-level changes, with maxima correlating to the diversity maxima as found in the A, B, C and E clays.	Calcareous dinocysts from the Geulhemmerberg K/T boundary section (Limburg, SE Netherlands)
VOLUME 75 NO 2-3 231	1996	75	2-3	231	238	Romein, A.J.T.; Willems, H.; Mai, H.	Light-microscopic analysis of the calcareous nannoplankton of the Geulhemmerberg section indicates the presence of the Late Maastrichtian <i>Nephrolithus frequens</i> Zone and the Early Danian <i>Biantholithus sparsus</i> Zone, separated by a hiatus encompassing the earliest Danian. SEM analysis, however, indicates the presence throughout the section of <i>Neobiscutum romeinii</i> , <i>N. parvulum</i> and small forms of <i>Cruciplacolithus primus</i> , taxa reported so far only from the Early Danian. If these are in situ, a Danian age for the whole Geulhemmerberg section cannot be excluded.	Calcareous nannoplankton of the Geulhemmerberg tk/T boundary section, Maastrichtian type area, the Netherlands
VOLUME 75 NO 2-3 239	1996	75	2-3	239	243	Langereis, C.G.	Paleomagnetic samples of six clay layers from an interval containing the Cretaceous/Tertiary (K/T) boundary in the Geulhemmerberg cave show only normal polarities, contrary to the expected reversed directions. The unique preservation of the sediment makes it unlikely that the normal polarities are an overprint through weathering or that the acquisition of the remanence has been delayed by post-depositional diagenetic formation of magnetite. Possibly, the normal polarities are the result of a relatively short relaxation time of the magnetic minerals which would cause the magnetic domains to realign with the present-day field, a process which would occur without affecting the preservation.	Paleomagnetism of the Geulhemmerberg K/T boundary section, the Netherlands

VOLUME 75_NO 2-3 245	1996	75	2-3	245	253	Schmitz, B.; Speijer, R.P.	<p>The stable isotopic ($\delta^{18}\text{O}$, $\delta^{13}\text{C}$) records for bulk samples and well-preserved, monospecific, benthic foraminiferal samples show no or only small variations across the Cretaceous/Tertiary (K/T) boundary at Geulhemmerberg, southern Netherlands. The site represents an inner shelf environment, where calcarenites and clay layers formed. Comparisons with previously established isotopic records from Danish K/T boundary sections, where significant isotopic changes (2-3 °C cooling and 1.5‰ negative $\delta^{13}\text{C}$ shift) occur in the basalmost P0 Zone, indicate a small hiatus at the base of the Danian at Geulhemmerberg. This is consistent with other data, such as absence of a strong Ir anomaly and shocked quartz. The oxygen-isotopic values of planktonic, mid-depth-dwelling <i>Heterohelix globulosa</i> foraminifera, recovered from two early Danian Geulhemmerberg clay layers, are similar to, or more positive than the benthic values from the same layers. The origin of these apparently anomalous water-column $\delta^{18}\text{O}$ gradients is enigmatic. The inverted gradient may reflect sporadic development of an unusual water-mass stratification, such as the occurrence of an upper water mass with a slightly lower (1-2‰) salinity and with a few degrees lower temperature than bottom water. Alternatively, it may reflect different provenance areas of the planktonic and benthic foraminifera during turbulent conditions, while storm and back-wash deposits formed. Overall, the whole-rock and benthic oxygen-isotopic records across the Geulhemmerberg section indicate fully marine (> 33‰) conditions throughout.</p>	<p>Stable isotope ($\delta^{18}\text{O}$, $\delta^{13}\text{C}$) records across the Cretaceous/Tertiary boundary at Geulhemmerberg, southern Netherlands</p>
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VOLUME 75 NO 2-3 255	1996	75	2-3	255	267	Yamamoto, M.; Ficken, K.; Baas, M.; Bosch, H.J.; Leeuw, J.W. de	Organic compound distributions in extracts of three selected clay samples from the lowermost Danian section at Geulhemmerberg were analysed in order to enhance the understanding of the depositional environment immediately after the Cretaceous/Tertiary (K/T) boundary. A highly dominant C _{40:2} ethyl ketone is identified. This compound is probably derived from specific, highly abundant non-coccolithophorid Prymnesiophyte algae which may already have been present in late Maastrichtian times. Fatty acids as well as their randomly oxidized hydroxy- and keto counterparts are also abundant. These compounds probably indicate bacterially transformed biochemicals of terrestrial origin, although they are probably not derived from the Bryophyte moss spores abundantly present in these sediments. Their distributions are, however, strikingly similar to those of fatty acids in Antarctic soils. ω^{16} -, ω^{17} -, and ω^{22} - keto- and hydroxy fatty acids with highly specific distribution patterns and a clear even over odd carbon number preference are thought to be of marine origin. The biochemical relationships between these compounds and the C _{40:2} ethyl ketone suggest that they may originate from the same algae. This presence of highly functionalized organic compounds demonstrates the extreme immaturity and excellent preservation of the unique Geulhemmerberg K/T boundary sediments.	Molecular palaeontology of the earliest Danian at Geulhemmerberg (the Netherlands)
VOLUME 75 NO 2-3 269	1996	75	2-3	269	274	Smit, J.; Rocchia, R.	The Geulhemmerberg K/T boundary section was analysed for (trace) elements by instrumental neutron activation analysis (INAA). Twenty-seven elements were detected in almost all of the 22 samples. Another seven elements were above detection limit in only a few samples, and four elements were below the detection limit in all samples. Anomalous Ir levels have not been found in any sample. However, when Th-normalized, there is an indication for higher concentrations of Ir (and Cr) just below the K/T boundary, possibly due to downward diffusion. The distributions of most trace elements can be explained by the alternation of layers of clay and almost pure limestone in the section, and by the lithophile, chalcophile or siderophile character of the elements. Strontium, usually correlating positively with Ca and CaCO ₃ , correlates negatively with Ca in the Geulhemmerberg section. The relatively high values of Sr in the clay-layers indicate that these layers were shielded from diagenesis. The La/Ce ratio is lower in the clay than in the limestone layers. This may reflect dysoxic conditions in seawater during the deposition of the clay layers. The La/Yb ratio is low in the uppermost Maastrichtian, and high in the basal Danian. An enrichment of Co and Fe at the Berg en Terblijt hardground can be explained by the presence of iron encrustations.	Neutron activation analysis of trace elements in the Geulhemmerberg Cretaceous/Tertiary boundary section, SE Netherlands

VOLUME 75 NO 2-3 275	1996	75	2-3	275	282	Vonhof, H.B.; Smit, J.	The comparison of a detailed $^{87}\text{Sr}/^{86}\text{Sr}$ profile through the Maastrichtian of the ENCI, Curfs and Geulhemmerberg quarries in the Maastrichtian type area with a Late Maastrichtian to Early Danian seawater $^{87}\text{Sr}/^{86}\text{Sr}$ curve of the Bidart (France) and El Kef (Tunisia) sections provides a useful chronostratigraphy for these quarries. The best fit yields an accumulation rate of ~ 10 cm/ka for the upper 30 m of the Maastrichtian in the composite Curfs and ENCI section. Apparently, despite diagenetic alteration, the fossils from the Curfs and ENCI quarries partly retained their original seawater $^{87}\text{Sr}/^{86}\text{Sr}$ values. $^{87}\text{Sr}/^{86}\text{Sr}$ analyses of well-preserved heterohelicids in the Geulhemmerberg E-clay support the suggested Early Danian age of this clay. They also support the suggestion that the planktic foraminifer <i>Heterohelix globulosa</i> survived the Cretaceous/Tertiary boundary event(s) for some 5 to 50 ka.	Strontium-isotope stratigraphy of the type Maastrichtian and the Cretaceous/Tertiary boundary in the Maastricht area (SE Netherlands)
VOLUME 75 NO 2-3 283	1996	75	2-3	283	293	Smit, J.; Brinkhuis, H.	Integration of sedimentological, biostratigraphical, geochemical and paleomagnetic analyses of the recently discovered marginal marine Cretaceous/Tertiary (K/T) boundary section in the Geulhemmerberg caves (Maastrichtian type area, Limburg, SE Netherlands) resulted in a depositional model of the succession, placing the results in a global K/T boundary perspective. The proposed depositional scenario involves 1) deposition of marginal marine Upper Maastrichtian calcarenites and formation of a paleo-relief (proto-hardground, Berg en Terblijt Horizon), 2) deposition of latest Maastrichtian calcarenites, 3) K/T storm or hypercane-related 'washing' of the paleoshelf, and removal of latest Maastrichtian and earliest Danian sediments, including removal of an Ir-bearing layer, and 4) storm-induced filling of the paleodepressions in the Late Maastrichtian paleorelief by calcarenites and K/T boundary clays during early P0 Zone times of decreasing storm intensity. Only the distributions of calcareous nannoplankton and ammonites do not fully match this scenario, since early Tertiary nannofossils have been reported from below the Berg en Terblijt Horizon and, at a nearby outcrop, ammonites from just above it. Their distribution patterns across the K/T boundary in the area require further study. We conclude that there is an unprecedented expanded earliest Tertiary succession in Limburg, containing a wealth of information about the first hundreds of years following the mass-extinction event at the K/T boundary.	The Geulhemmerberg Cretaceous/Tertiary boundary section (Maastrichtian type area, SE Netherlands); summary of results and a scenario of events

VOLUME 76 NO 3 187	1997	76	3	187	195	Sintubin, M.; Nefly, M.; Rijpens, J.; Zegbroek, B. van	At its eastern termination, the High Atlas Fault in the Western High Atlas in Morocco, consists of a splay of three faults. In the interjacent fault blocks, Neo- and Paleoproterozoic basement, forming the northernmost extremity of the NW-African Craton, is cropping out. The Precambrian basement witnesses a long history of brittle deformation starting at the end of the Pan-African Orogeny. A subsequent episode of normal faulting can be related to the development of a Hercynian basin along the northern passive margin of the cratonic promontory. With regard to the main tectonic activity in the Western High Atlas, basically two models exist: one emphasising block tectonics reflecting Mesozoic rifting followed by Alpine uplift and inversion, the other emphasising Late Paleozoic dextral wrench tectonics. The analysis of the fault activity along the splay faults reveals a predominantly Alpine history, consisting of the Triassic development of the 'Atlas Rift' along the axialzone of the orogen, followed by uplift and inversion. The Late Jurassic to Cenozoic fault activity took place in a sinistral transpressive regime and was partitioned over the three splay faults. Dextral strike-slip fault activity could not be demonstrated in the fault blocks nor along the splay faults. Therefore the faults were probably not involved in Late Paleozoic dextral wrench tectonics.	Faulting history at the eastern termination of the High Atlas Fault (Western High Atlas, Morocco)
VOLUME 76 NO 3 197	1997	76	3	197	215	Reijers, T.J.A.; Petters, S.W.	Field observations and petrographic analysis allow a sequence-stratigraphic interpretation of the intensely karstified Albian Mfamosing Limestone Formation in the Calabar Flank of the southeastern Niger Delta. Main criteria for this interpretation are the presence of siliciclastic intercalations, of prominent hardgrounds, of characteristic microfacies including stromatolites and of phreatic and vadose diagenetic patterns. These criteria enable the recognition, from bottom to top in the type section of the Mfamosing Limestone, of a late phase in the formation of a highstand systems tract and of a flooding surface followed by a lowstand systems tract in which erosional features have been developed locally. The succession is topped by a transgressive systems tract. Some of these units and key sequence-stratigraphic boundaries have been traced into other outcrops in the area. In their identification within the heavily karstified outcrops, petrography overprints and vertical sequence patterns play a significant role. A sedimentation model explains the areal differences in development. Siliciclastic shedding influenced the carbonate system. Time-equivalent carbonate bodies occur on either side of the opening South Atlantic Ocean	Sequence stratigraphy based on microfacies analysis: Mfamosing Limestone, Calabar Flank Nigeria

VOLUME 76 NO 3 217	1997	76	3	217	226	Spain, D.R.; Conrad, C.P.	Sealing characteristics of the caprock to the Main Buntsandstein reservoir sands in the P blocks in the Dutch offshore are assessed based on a core from the P15 well. The core which represents the Main Buntsandstein, Solling, Röt, and Muschelkalk interval has been analyzed using standard geologic and petrophysical techniques including mercury-injection capillary-pressure tests. The caprock to the Main Buntsandstein reservoir sands consists of anhydritic and/or dolomitic sandstone to argillaceous siltstone, silty shale, and dolostone. Early emplacement of nodular anhydrite followed by cementation and replacement by anhydrite, dolomite, and siderite has resulted in tight, submicroporous pore geometries which act as good to excellent seals. Capillary entry pressures of the best caprock lithologies are such that gas columns of the order of 300 m could potentially be trapped. The actual column height in P15 is about 1,25 m as indicated by RFT data. The presence of significant gas accumulations in the Main Buntsandstein in the P12,P14, P15, P18 and adjoining Q8 and Q16 blocks suggests that the P15 top-seal quality may be representative for that area.	Quantitative analysis of top-seal capacity: offshore Netherlands, southern North Sea
VOLUME 76 NO 3 227	1997	76	3	227	246	Geluk, M.C.; Röhlting, H.G.	Detailed log correlations of the largely fluvio-lacustrine Lower Triassic 'Buntsandstein' (Late Permian-Early Anisian), carried out on 80 wells in the Dutch onshore and offshore areas, can be linked to northwest-German high-resolution sequence stratigraphy. The correlations show that cyclic sedimentation occurred in large parts of the basin. Seven 1st-order sequences are recognised, namely the Main Claystone, Rogenstein, Volpriehausen, Detfurth, Hardeggen, Solling and Lower Röt Sequences. They are overlain by the lower part of the Upper Röt-Lower Muschelkalk Sequence. Distinct sequence boundaries have been identified at the bases of four sequences: Volpriehausen, Detfurth, Solling and Upper Röt. The higher-order sequences consist of fining-upwards cycles with a thickness of up to tens of metres. The sequences are laterally persistent and have a characteristic expression on gamma-ray and sonic logs. In the Lower Buntsandstein, they display a uniform character throughout most of the area, with only minor differences in thickness or lithology. NNE-oriented lows and swells were formed during deposition of the Volpriehausen, Detfurth and Hardeggen Sequences. Uplift prior to the deposition of the Solling Sequence caused deep erosion on the swells in the basin and minor erosion in the lows. The high-resolution sequences probably represent alternating, relatively wet and dry climatic periods, with a periodicity of about 100000 years. An analysis of the sequences suggests that their reduced thickness on the swells is mainly the effect of erosion. This is supported by analyses of the accumulation patterns and rates.	High-resolution sequence stratigraphy of the Lower Triassic 'Buntsandstein' in the Netherlands and northwestern Germany

VOLUME 76 NO 3 247	1997	76	3	247	266	Blasband, B.; Brooijmans, P.; Dirks, P.; Visser, W.; White, S.	In the late Precambrian history of the Wadi Kid area in the Sinai, Egypt, two deformation phases are clearly recognized. The first phase, D1 (pre-620 Ma), produced a steep regional foliation, axial planar to upright F1 folds, in rocks of a lower-greenschist grade. This compressional phase of deformation is interpreted in terms of subduction in an island-arc setting. The second phase, D2 (post-620 Ma), is mainly expressed by the widespread development of sub-horizontal mylonitic zones with a total thickness of 1.5 km. Shear sense indicators give a consistent regional transport direction to the northwest, with local indications of reversal to the southeast. This event is associated with regional LP/HT metamorphism, indicative of high thermal gradients. Because of the LP/HT metamorphism, the change in geochemical nature of the granitoids, and the orientation of the dykes, we interpret the mylonitic zones as low-angle normal shear zones related to core-complex development during an extensional event with the transport reversal being induced by doming. We postulate that orogenic collapse was responsible for the transition from the D1 compressional phase to the D2 extensional phase.	A Pan-African core complex in the Sinai, Egypt
VOLUME 76 NO 3 267	1997	76	3	267	270	Zhang, Y.; Muechez, P.; Hein, U.F.		Chlorite geothermometry and the temperature conditions at the Variscan thrust front in eastern Belgium
VOLUME 76 NO 3 271	1997	76	3	271	275	Lünenschloss, B.; Bayer, U.; Muechez, P.		Coalification anomalies induced by fluid flow at the Variscan thrust front: A numerical model of the palaeotemperature field
VOLUME 76 NO 1-2 1	1997	76	1-2	1	8	Dekkers, M.J.; Langereis, C.G.; Voo, R. van der		Analysis of paleomagnetic data: a tribute to Hans Zijdeveld. Introduction

VOLUME 76 NO 1-2 9	1997	76	1-2	9	19	Rochette, P.; Ben Atig, F.; Collombat, H.; Vandamme, D.; Vlag, P.	McFadden and Merrill (1995) suggested that the paleosecular variation (PSV) measured by the angular scatter of the virtual geomagnetic pole is minimal at the equator and should be smaller during a superchron than during the last 5 Myr. We revisited a key site of the 0-5 Ma database, the Galapagos archipelago, studied by Allan Cox in the early sixties. We obtained 79 sites with reliable mean directions on four islands (San Cristobal, Floreana, Santa Cruz and Pinzon), showing a larger proportion of transitional data than Cox (16 instead of 6%), because the sampling was concentrated on the Brunhes-Matuyama transition as delimited by Cox. This dataset allowed us to test the statistical method of Vandamme (1994) to separate PSV from transitional data. We obtained an angular scatter value of 11.2° (9.9-12.9°), instead of 16.8° for an a-priori rejection angle of 40°, compared with the 12.7° predicted from the global compilation (McFadden et al. 1991). Studies of sequences of lava flows are quite scarce in the Permian Kiaman Superchron, and the Esterel volcanics with their subequatorial paleolatitude are a good candidate to test the above prediction. We confirm the quality of the original data of Zijdeweld (1915) and we improved the mean direction from one site. We also used new geological and geochronological data: Ar/Ar ages point to the period 264-278 Ma for a totally reversed volcanic sequence, in agreement with an ending of the Kiaman Superchron at 262-268 Ma. The extremely low angular scatter obtained (4 to 8°, depending on data selection) confirms the prediction, but an alternative interpretation invoking a post-volcanic Permian remagnetization is discussed.	Low paleosecular variation at the equator: a paleomagnetic pilgrimage from Galapagos to Esterel with Allan Cox and Hans Zijderveld
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VOLUME 76 NO 1-2 21	1997	76	1-2	21	33	Vlag, P.; Vandamme, D.; Rochette, P.; Spinelli, C.	<p>For his PhD. thesis, Zijderveld (1975) studied the paleomagnetism of the Permian Esterel rocks (southern France). High-quality thermal and alternating-field demagnetization diagrams were interpreted to determine the direction of the characteristic natural magnetization. For the Esterel volcanics, a mean direction of $Dec = 206.5^\circ, Inc = -23^\circ, \alpha_{95} = 5.7^\circ, k = 112$ was found for this magnetization. The dispersion in this mean is remarkably low. Only the declination of the Reyran Rhyolite in the Reyran River quarry clearly deviated from this mean. This deviating direction is not found in our samples, taken at the same site. As many faults occur in this quarry, it is suggested that Zijderveld sampled this rhyolite on a small rotated block. To verify whether the small dispersion in the mean paleomagnetic direction of the Esterel rocks has a geomagnetic or a rock-magnetic origin, two conglomerate tests were carried out. One of these might be interpreted as positive. The results of the other conglomerate test (Agay Formation) are ambiguous: four of the six measured boulders show directions close to the mean paleomagnetic direction of the Esterel rocks. Rock-magnetic measurements show that the remanence is carried by a magnetite and a hematite fraction. The low dispersion in the paleomagnetic directions, the conglomerate tests, and hematite as remanence carrier suggest that the characteristic remanence in the Esterel volcanics was not instantaneously acquired during cooling, but might be affected by remagnetization due to weathering.</p>	Paleomagnetism of the Esterel rocks: a revisit 22 years after the thesis of Hans Zijderveld
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VOLUME 76 NO 1-2 35	1997	76	1-2	35	44	Giddings, J.W.; Klootwijk, C.T.; Rees, J.; Groenewoud, A.	<p>Since the early sixties, alternating field demagnetization (AFD) has been a standard laboratory technique for demagnetizing rocks to expose the multicomponent structure of their natural remanent magnetization (NRM). In the majority of AFD implementations, however, the procedure remains as labour-intensive as ever. The implementation that we have developed at the Australian Geological Survey Organisation, automates the procedure or AFD based on the static method, and results in significant productivity and efficiency gains without compromising data quality. A properly formulated procedure for static AFD may be the only method of retrieving higher-coercivity components of natural remanence in samples prone to developing gyroremanence at higher alternating fields (AFs). Our AFD environment comprises: a 2G-Enterprises through-bore, cryogenic magnetometer; 2G AF-coils and control equipment; and personal computer software, developed by us, to control all procedural aspects for a complete AFD of a sample including, importantly, a counteracting procedure to neutralize the effects of gyroremanence build-up at higher AFs. With our system, AFD of 8 samples/day, each of 20+ steps, requires only 20 min of user attention compared with a full day for conventional systems.</p>	Automated AF- de magnetization on the 2 G-Enterprises through-bore, cryogenic magnetometer
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VOLUME 76 NO 1-2 45	1997	76	1-2	45	55	Haubold, H.; Scholger, R.; Kondopoulou, D.; Mauritsch, H.J.	<p>Various Oligocene formations from NE Greece (ignimbrites from the Medousa area, rhyolites from Zagradenia, granodiorites from Elatia) show discordant paleomagnetic signatures, in each case indicating small cw (clockwise) rotation and also inclination flattening. Marls from Pithion were partly remagnetized in a present-day field. Samples that contain ancient magnetization components also indicate small cw rotation and inclination flattening. However, the magnetization of andesites from Peplos reflects a considerably larger rotation, likely owing to local tectonics. In the context of previous work in the area, these results are used to propose a subdivision of NE Greece into four structural zones of distinctive rotational behaviour (from east to west): sites in zone 1, east of the Kavala-Xanthi-Komotini fault (KXX), show various cw and ccw (counterclockwise) rotation angles owing to complex kinematics resulting from the interaction of the KXX and the north-Anatolian fault zone. However, zone 2, between the KXX and the Strymon valley, is structurally homogeneous (~10° cw rotation). The paleomagnetic signature of the Vertiskos massif (zone 3) implies a larger (> 30°) cw rotation, whereas sites in the Vardar basin (zone 4) contain a paleomagnetic signature similar to that of zone 2. This suggests a motion of the Vertiscos massif, a meta-ophiolitic nappe, relative to underlying strata. Indeed, zones 2 and 4 may be parts of the same structural unit which underlies this nappe.</p>	New paleomagnetic results from the Aegean extensional province
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VOLUME 76 NO 1-2 57	1997	76	1-2	57	71	Wensink, H.	<p>Sumba island forms part of a continental fragment, located near the transition of the Sunda Arc to the Banda Arc. It lies within the forearc region, between the active volcanic arc to the north and the Java Trench to the south. Palaeomagnetic studies of Cretaceous (late Albian-early Campanian) Lasipu sediments revealed a mean characteristic remanence (ChRM) direction with $D=42.5^\circ$, $I=-23.0^\circ$, and $\alpha_{95} = 6.1^\circ$, indicating a palaeolatitude of 12° S. This ChRM is, most likely, a secondary magnetization, possibly caused by the intrusion of the 65-Ma-old Tanadaro granodiorite. This granodiorite gave a mean ChRM direction with $D = 44.7^\circ$, $I = -16.3^\circ$, and $\alpha_{95} = 12.2^\circ$, pointing to a palaeolatitude of 8.3° S. Eastern Sundaland with Borneo, west and south Sulawesi, and Sumba formed one continental unit in the late Mesozoic, most likely attached to the southeast Asian mainland. Borneo and west and south Sulawesi underwent large counterclockwise (CCW) rotations since the Jurassic with $\sim 45^\circ$ during the Cretaceous, and $\sim 45^\circ$ during the Palaeogene. The Sumba microcontinent, most likely, became detached from eastern Sundaland soon after deposition of the Lasipu sediments. Palaeomagnetic data show that Sumba underwent subsequent clockwise (CW) rotations of up to 96°: 53° between 82 and 65 Ma, and 38° between 65 and 37 Ma. Since the late Eocene, only small rotations occurred. The data indicate that eastern Sundaland, including Sumba, remained close to the equator since the Jurassic. CW rotations occurred in Sundaland both in the north (Indochina) and in the west (Sibumasu) as a consequence of the India - Eurasia collision. The same sense of rotation is seen further east in Sulawesi's East Arm and the Philippine Sea plate. Eastern Sundaland</p>	Palaeomagnetic data of late Cretaceous rocks from Sumba, Indonesia; the rotation of the Sumba continental fragment and its relation with eastern Sundaland
VOLUME 76 NO 1-2 73	1997	76	1-2	73	82	Lemaire, M.M.; Westphal, M.; Gurevitch, E.L.; Nazarov, K.; Feinberg, H.; Pozzi, J.P.	<p>Calc-alkaline volcanic deposits from the south-west of the Turan plate, near the city of Turkmenbasi ($40^\circ 00'N$, $52^\circ 58'E$) in Turkmenistan, were studied paleomagnetically. These rocks have been affected by a greenschist-facies metamorphism, possibly of regional extent, that has been K/Ar-dated as 200 to 227 Ma old. A low-blocking temperature component ($D = 349^\circ$, $I = 64^\circ$), close to the present field direction and probably of viscous or recent chemical origin, was isolated by a negative fold test at three sites. The mean direction of a high-blocking-temperature component isolated at 15 sites, mainly carried by magnetite, is scattered before and after tectonic correction and is therefore difficult to interpret. A group of seven sites with low inclinations before and after tectonic correction was isolated. The mean inclination of these sites ($31 \pm 8^\circ$), syn-folding or post-folding, corresponds to a paleolatitude of $17 \pm 8^\circ$ which is lower than the conventional Eurasian paleolatitudes for post-Permian times. The paleomagnetic data from the Turan and Iran plates constrain this low paleolatitude to the Late Triassic and Jurassic period. This requires a shortening of at least 7° between the Turan plate and Eurasia during this time.</p>	How far between Iran and Eurasia was the Turan plate during Triassic-Jurassic times?

VOLUME 76 NO 1-2 83	1997	76	1-2	83	95	Abrahamsen, N.; Bengaard, H-J.; Friderichsen, J.D.; Voo, R. van der	Three basic dyke swarms of post-Ellesmerian (post-Early Carboniferous) age in Nansen Land (83° N, 43° W) are still not dated numerically, but cross-cutting relationships show Group 1 to be older than Group 2, while Group 3 is the freshest and likely the youngest. Group 1 (the most northerly swarm) strikes N-S; Group 2 NW-SE, and Group 3 (the most southerly swarm) E-W. From more than 200 dykes 234 specimens from 28 sites were investigated palaeomagnetically. Group 1 dykes show unexpected shallow inclinations with a cleaned mean direction of (Dm, Im) = (151°, -5.8°), N = 7, k = 18.5, α_{95} = 13.9°. They show hydrothermal alterations, some remagnetization by lightning, and the low inclination indicates a low palaeo latitude. The palaeopole is (Plat, Plon) = (8.9° S, 14.0° W) with (dp, dm) = (7°, 14°), and is close to the North American Early Carboniferous mean pole, suggesting a syn- or early late-tectonic dyke injection. The polarity is reverse. Groups 2 and 3 of presumed Cretaceous or Tertiary age show dominantly normal and reverse polarities, respectively. Their mean directions per polarity are well grouped, with (Dm, Im) = (-30.6°, 76.7°), n = 13, k = 191.4, α_{95} = 3.9°, and (Dm, Im) = (133.4°, -76.7°), n = 10, k = 87.5, α_{95} = 5.9°, respectively. They are antipodal within 95% significance, and combining both swarms gives (Dm, Im) = (-37.5°, 76.8°), n = 23, k = 124.3, α_{95} = 2.7°, corresponding to a mean pole of (Plat, Plon) = (70.0° N, 185.1° E) with (dp, dm) = (4.7°, 5.0°), for which the spline of Late Cretaceous-Tertiary poles for all Greenland indicates a palaeomagnetic age of 57 ± 10 Ma. This pole (in present-day coordinates) is very close to the Late Cretaceous North American pole, in accordance with the fact that Greenland belongs to the	Palaeomagnetism of three dyke swarms in Nansen Land, north Greenland (83° N)
VOLUME 76 NO 1-2 97	1997	76	1-2	97	104	Kadzialko-Hofmokl, M.; El-Hemaly, I.A.	The studied Carboniferous flysch and molasse sediments from the Intra-Sudetic Basin correspond to the period from Middle Visean to Early Autunian. Main magnetic minerals carrying the natural remanent magnetization (NRM) are goethite, magnetite, maghemite and hematite, all usually secondarily formed and/or remagnetized due to several tectonometamorphic events. In most samples several NRM components were isolated. One of them is usually a Jurassic-Triassic overprint. Some others define the Westphalian-Early Permian segment of the declination and inclination trajectory for the Sudetes calculated according to the reference apparent polar wander path for the Baltica plate. The Sudetic path is slightly shifted to the east compared to the reference path, suggesting the possibility of independent movements of the Sudetes during this time. The majority of isolated NRM components are secondary and related to the Sudetic orogenic phase and later tectonometamorphic activity.	Paleomagnetism of Carboniferous sediments from the West Sudetes (SW Poland)

VOLUME 76 NO 1-2 105	1997	76	1-2	105	119	Osete, M.L.; Rey, D.; Villalain, J.J.; Juárez, M.T.	A palaeomagnetic study has been carried out at 16 well-dated sites from four areas in central Spain (southeastern Iberian Massif and western Iberian Ranges) in order to constrain the Late Carboniferous to Late Triassic segment of the apparent polar wander path (APWP) of Iberia. 322 samples (218 with useful results) were collected from andesitic rocks at Atienza (287 ± 72 Ma) and from Triassic continental red beds at Molina de Aragón (Anisian-Ladinian), Afcaraz (Ladinian-Carnian), Alcázar de San Juan (Ladinian-Carnian) and Cuevas de Ayllón (Carnian-Norian). Comparison of the palaeomagnetic results from the western Iberian Ranges and from the Iberian Massif indicates that the investigated area of the Iberian Ranges forms part of Stable Iberia. The palaeomagnetic poles obtained in this study and a revision of previous palaeomagnetic data, discarding poles obtained from areas of doubtful stability, show together a gradual and consistent change in latitude and longitude resulting in a coherent segment of the APWP for the Late Carboniferous to Late Triassic time span.	The Late Carboniferous to Late Triassic segment of the apparent polar wander path of Iberia
VOLUME 76 NO 1-2 121	1997	76	1-2	121	134	Li, J.J.; Fang, X.M.; Voo, R. van der; Zhu, J.J.; Niocaill, C.M.; Cao, J.X.; Zhong, W.; Chen, H.L.; Wang, J.; Wang, J.M.; Zhang, Y.C.	A paleomagnetic study of the 510-m-thick Wangjiashan section of Late Miocene and Pliocene terrestrial sediments reveals a fairly complete reversal record with ages from 1.1 to 1.8 Ma. The magnetostratigraphy of the Dongshanding section, located nearby, reveals a partially overlapping reversal record with ages from 2.2 to 0 Ma, and facilitates correlation of the Wangjiashan section with the global polarity time scale. A new stratigraphic division of the Wangjiashan section replaces the name Linxia formation by five new formation names, based on lithologic variation and mammalian fossil finds. The new formations and their magnetostratigraphically determined ages are: Dongshan Formation (c.1.75-2.6 Ma), Jishi Fm. (c. 2.6-3.6 Ma), Hewangjia Fm. (4.5-6.0 Ma), Liushu Fm. (6.0-7.6 Ma), and Dongxiang Fm. (7.6-c. 12 Ma). The Neogene stratigraphy and fossil mammals suggest that the nearby part of the Tibetan Plateau experienced a persistent denudation during the Late Miocene and Early Pliocene, but that it was uplifted more rapidly at about 3.6 Ma.	Late Cenozoic magnetostratigraphy (11 - 0 Ma) of the Dongshanding and Wangjiashan sections in the Longzhong Basin, Western China

VOLUME 76 NO 1-2 135	1997	76	1-2	135	143	Goguitchaichvili, A.T.; Sologachvili, D.Z.; Prévot, M.; Calvo, M.; Pavlenichvili, E.S.; Maissuradze, G.M.; Schnepf, E.	Twenty-six basaltic flows were sampled for a paleomagnetic and rock-magnetic study of the Tchuntchka section in the Akhalkalaki volcanic region in southern Georgia (Caucasus). Three to five samples from each flow were subjected to thermal or alternating-field demagnetization. The upper part of the section yields normal ($D = 355.5^\circ$, $I = 54.2^\circ$, $N = 17$, $\alpha_{95} = 2.5^\circ$, $k = 226$), and the lower part reversed polarity directions ($D = 180.3^\circ$, $I = -59.4^\circ$, $N = 8$, $\alpha_{95} = 4.8^\circ$, $k = 135$). An anomalous direction was found in one flow in the upper part ($D = 118.5^\circ$, $I = -77.3^\circ$). Rock-magnetic experiments show that the remanence is carried in most cases by magnetite or low-Ti titanomagnetite. The fraction of grains with a multidomain magnetic structure does not seem to be important. The remanence carried by such grains is removed only partly by low-temperature demagnetization. A tentative magnetostratigraphic correlation between the 3.8-Ma-old Thoki and Tchuntchka sites is proposed.	Palaeomagnetic and rock-magnetic study of a Pliocene volcanic section in southern Georgia (Caucasus)
VOLUME 76 NO 1-2 145	1997	76	1-2	145	154	Gialanella, P.R.; Heller, F.; Haag, M.; Nurgaliev, D.; Borisov, A.; Burov, B.; Jasonov, P.; Khasanov, D.; Ibragimov, S.; Zharkov, I.	The Late Permian is characterized palaeomagnetically by the transition from the long-lasting Permo-Carboniferous reversed polarity superchron (PCRS; also called: Kiaman reversed superchron) to the subsequent Permo-Triassic mixed polarity superchron, often called Illawarra mixed polarity superchron. Many discussions have been devoted to the exact time of the onset of the Illawarra reversals. Apparently contradictory data have been obtained from magnetostratigraphic sediment successions formed in different environments in many regions of the world. These sediments have been dated using classical geological or palaeontological correlation methods without the possibility of absolute age control because volcanogenic materials are missing. Application of the local or regional stratigraphic schemes leads to difficulties and apparent diachronous age estimates of the end of the PCRS. This paper shows that in agreement with earlier investigations, the continental red beds of the Upper Permian Tatarian stage on the eastern Russian platform record the Kiaman/Illawarra boundary. The Illawarra reversal sequence measured in a type section at the Volga river can be correlated well with the corresponding polarity pattern found in the Tethyan realm if one assumes a longer duration of the Tatarian than previously suggested.	Late Permian magnetostratigraphy on the eastern Russian platform

VOLUME 76 NO 1-2 155	1997	76	1-2	155	162	Hoof, A.A.M. van; Langereis, C.G.; Joosten, I.; Thijssen, J.R.A.M.; Nijhof, E.; Groenendijk, H.A.; Eynde, G.R.M. van den	The palaeomagnetic directions of seven Dutch fireplaces are compared with the archaeological age estimates which range from the first to the 17 th century AD. A comparison with the British master curve of secular variation for archaeomagnetic dating results in a refinement of the archaeological age estimates in two cases, while four other archaeological age estimates can be confirmed. For one fireplace only one sample is reliable, resulting in a very poorly defined archaeomagnetic age of 2 to 3 centuries younger than the expected age (i.e. late Middle Ages). On the other hand, accepting the archaeological age estimates, the palaeomagnetic directions can contribute to the database that is used to construct the British secular-variation master curve. We applied the classification grades proposed by Tarling & Dobson (1995) which range from unreliable (grade 1) to reliable (grade 5). Three fireplaces have grades 5, one has grade 4, one grade 3, one grade 1 and for one case no grade was assigned.	Archaeomagnetic dating of seven archaeological fireplaces in the Netherlands
VOLUME 76 NO 1-2 163	1997	76	1-2	163	182	Dekkers, M.J.	In environmental magnetism, the properties of magnetic minerals are used as proxy parameters for many purposes. Examples are paleoclimate analysis, paleoceanographic studies, provenance studies of sediments, studies of anthropogenically-induced pollution, and archeological investigations. Mineral-magnetic techniques are sensitive, require little sample preparation, are rapid, often grain-size indicative, and usually non-destructive. These techniques involve 'bulk' properties which makes them complementary to geochemical micro-analytical techniques. Measurements include the field- and temperature-dependence of various types of induced and remanent magnetizations. Mineral-magnetic methods are continuously being improved. The underlying causal relations between observed mineral-magnetic properties and the processes that led to those properties, are becoming increasingly better understood, and the extended use of such properties as proxy parameters for many processes is foreseen. The following environmental magnetic applications are reviewed: the analysis of paleoclimatic variations in loess and other sediment types, the untangling of sedimentary features in piston cores, and the interpretation of the anthropogenic impact on the environment, in archeological studies and in studies of present-day pollution. The pathway between the provenance area and depositional site is shown to have a crucial impact on the magnetic properties.	Environmental magnetism: an introduction

VOLUME 76 NO 4 277	1998	76	4	277	292	Huisman, D.J.; Kiden, P.	A sediment-geochemical study was performed on unconsolidated Upper Cenozoic siliclastic sediments from an area in the south of the Netherlands. Glauconite-rich sediments (Breda Fm) show high K contents and low Ba/K ratios. Major shifts in sediment composition as a result of changes in the Rhine system and of shifts between Rhine and Scheldt provenance, as known from heavy-mineral studies, are also recorded in changes in the grain-size dependent variations between Al, Na and K. Pleistocene Rhine sediments (Tegelen Fm) show higher Na contents than Pliocene Rhine sediments (Oosterhout and Kiezeloöliet Fms) and Scheldt-derived material (Kedichem Fm), probably as a result of larger contents of sodic plagioclase. Scheldt-derived sediments show low K/Al ratios as a result of a smectite-dominated clay-mineralogical composition and low contents of micas, whereas Rhine-derived sediments have high K/Al ratios which reflect an illite-kaolinite-dominated clay mineralogy and higher contents of muscovite. The presence of siderite causes high Fe contents in the Tegelen Fm in the east of the area, suggesting a freshwater depositional environment. Increased Mg contents in the siderite-bearing sections of the Tegelen Fm and in parts of the Oosterhout and Kiezeloöliet Fms are probably caused by the presence of minor amounts of dolomite. Localized high concentrations of (pyrite-) S are not only found in the marine Oosterhout Fm and the estuarine Tegelen Fm, but also in the fluvial Kiezeloöliet and Kedichem Fms, which indicates at least minor marine transgressions during their deposition.	A geochemical record of Late Cenozoic sedimentation history in the Southern Netherlands
VOLUME 76 NO 4 293	1998	76	4	293	299	Fraaye, R.H.B.; Bakel, B.W.M. van	Three new raninid crabs, <i>Lyreidina pyriformis</i> gen. n., sp. n., <i>Raniliformis chevrona</i> sp. n., and <i>Raniliformis prebaltica</i> sp. n., are described from the Maastrichtian type area (SE Netherlands). The new genus <i>Lyreidina</i> is the third member within the subfamily Lyreidinae Guinot 1993, and the first anterolateral-spines-lacking representative from the Cretaceous. The evolutionary development of the genus <i>Raniliformis</i> Jagt, Collins & Fraaye (1993) seems to include a continuous lineage <i>occlusa</i> - <i>prebaltica</i> - <i>baltica</i> . <i>R. chevrona</i> is considered as an offshoot.	New raninid crabs (Crustacea, Decapoda, brachyura) from the late Maastrichtian of the Netherlands

VOLUME 76 NO 4 301	1998	76	4	301	310	Keer, I. van; Ondrak, R.; Mucchez, P.; Bayer, U.; Duser, M.; Viaene, W.	A 1D-modelling program has been applied to reconstruct the burial and thermal histories of two exploration boreholes, KB172 and KB174, located in the Campine Basin. The results show differences in geological histories. The coalification of the Westphalian A and B strata in KB174 (0.66-0.98% R _o) was pre-Permian. Calculated maximum temperatures, based on borehole data and vitrinite reflectance, regional thicknesses and a heat flow of 84 mW/m ² during the Late Westphalian, range from 110 °C at the top to 175 °C at the bottom of the Westphalian cored in this borehole. The high coalification (0.85-1.30%R _o) of the Westphalian C and D strata in KB172 could be the result of the deposition of ~2500 m of Upper Permian to Middle Jurassic sediments in combination with elevated heat flows (71-80 mW/m ²). Two coalification periods, i.e. Late Westphalian and Middle Jurassic, are suggested for this borehole. The simulated maximum temperatures range from 130°C at the top to 175 °C at the bottom of the investigated Westphalian C and D. The differences in the burial and thermal histories of both boreholes can be related to the activity of the transversal Donderslag Fault, a major structural element in the Campine coalfield, and the Roer Valley Graben.	Burial history and thermal evolution of Westphalian coal-bearing strata in the Campine basin (NE Belgium)
VOLUME 76 NO 4 311	1998	76	4	311	319	Jong, G. de; Rotherham, J.; Phillips, G.N.; Williams, P.J.	In Mid Proterozoic crystalline rocks of the Mount Isa Inlier, around Cloncurry, Australia, 2000 km ² of alteration and brecciation are the product of high-temperature (> 450 °C) concentrated saline solution activity. During retrogression, this fluid was locally responsible for mobility of V Y Nb and light rare-earth elements (15 x enrichment). Copper and S were leached during alteration and this may have been a significant source of components in nearby Cu-Au deposits. Similar rare-earth-element behaviour has been observed in the hematite breccias which host Cu-sulfides at the giant Olympic Dam Cu-Au deposit	Mobility of rare-earth elements and copper during shear-zone-related retrograde metamorphism

VOLUME 76 NO 4 321	1998	76	4	321	338	Dalstra, H.J.; Bloem, E.J.M.; Ridley, J.R.; Groves, D.I.	The Southern Cross Province in the Archean Yilgarn Block of Western Australia comprises large dome-shaped granitoid bodies surrounded by narrow greenstone belts. Determination of the emplacement mechanism of these domes is fundamental for understanding the tectonic history of this region. Many structures in the greenstone belts show trends which reflect their tectonic relationships with the granitoid domes. Some of these structures host large gold occurrences. The domes have concentric foliation patterns, both within the granitoids themselves, and in the neighbouring greenstone belts. The smaller domes only have radial mineral lineation patterns in their wall rocks, but the largest dome, the Ghooli Dome, has also a tangential pattern. The prevailing gentle dip of the foliation in the centre of this dome and the abundance of greenstone xenoliths suggest that the present exposures are close to its roof. Geothermometry and geobarometry on mineral assemblages in the Ghooli granitoid and its xenoliths show that its crystallisation temperature was just above 700 °C at a relatively high pressure of 4.3 to 6.2 kbar. These P-T conditions are higher than those inferred for peak metamorphism in the greenstones. Therefore, this granitoid must have been emplaced initially at crustal levels deeper than the maximum burial of the greenstones which flank the dome. The Ghooli Dome has a SHRIMP U-Pb zircon age of 2691 ± 7 Ma. Diapiric rise of the granitoid plutons taking place in a regional compressive tectonic regime is considered to be the most likely mechanism for the final emplacement of these bodies into their host rock at about 2636-2620 Ma. This concept is preferred over the alternatives because it best reconciles the calculated P-T	Diapirism synchronous with regional deformation and gold mineralisation, a new concept for granitoid emplacement in the Southern Cross Province, Western Australia
VOLUME 76 NO 4 341	1998	76	4	341	342	Priem, H.N.A.		Schürman Symposium on the Early Archean. Introduction
VOLUME 76 NO 4 343	1998	76	4	343	347	White, S.H.; Zegers, T.E.; Haafte, W.M.; Kloppenburg, A.; Wijbrans, J.		Tectonic evolution of the Eastern Pilbara, Australia (Extended abstract)
VOLUME 76 NO 4 349	1998	76	4	349	351	Nijman, W.		Archean growth structures in the Pilbara, Australia (extended abstract)
VOLUME 76 NO 4 353	1998	76	4	353	355	Zegers, T.E.; Wijbrans, J.R.; Nelson, D.R.; White, S.H.		⁴⁰ Ar/ ³⁹ Ar and U-Pb dating in the eastern Pilbara, Australia; temporal constraints on structural and metamorphic events between 3.5 and 2.8 Ga (extended abstract)
VOLUME 76 NO 4 357	1998	76	4	357	360	Passchier, C.W.		The late Archean and early Proterozoic: what happened next? (Extended abstract)
VOLUME 76 NO 4 361	1998	76	4	361	364	Kröner, A.; Jaeckel, P.; Brandl, G.; Nemchin, A.A.; Pidgeon, R.T		Evolution of the northeastern Kaapvaal craton and the central Limpopo belt, South Africa, based on single-zircon ages (extended abstract)
VOLUME 76 NO 4 365	1998	76	4	365	368	Dirks, P.H.G.M.		Accretion and stabilisation of the Archean Zimbabwe Craton (extended abstract)
VOLUME 76 NO 4 369	1998	76	4	369	373	Wit, M.J. de		Early Archean processes: evidence from the South African Kaapvaal craton and its greenstone belts (extended abstract)

VOLUME 76 NO 4 375	1998	76	4	375	378			Book reviews
VOLUME 77 NO 1 1	1999	77	1	1	15	Zieliński, T.; Loon, A.J. van	Fans formed under subaerial terminoglacial (previously called 'ice-contact') conditions have several characteristics that differ from those formed under other conditions. Twenty-five such fans in NE Poland were investigated to model the dominant genetic processes involved. These fans show, as do other types, a proximal, a middle and a distal environment. The present study deals with the proximal environment. The fans date from the last, i.e. Weichselian or Vistulian, glacial. The proximal terminoglacial fan comprises abundant gravelly sediments, resembling the glacial deposits from which they were derived. Three facies, each subdivided into two subfacies, can be distinguished; these are dominated by mass flows, unchannelised flows, and stream (= channelised) flows, respectively. The characteristics of the facies are described and illustrated. It is concluded that the irregular supply of water by the nearby ice masses dominates the sedimentary processes.	Subareal terminoglacial fans I: a semi-quantitative sedimentological analysis of the proximal environment
VOLUME 77 NO 1 17	1999	77	1	17	37	Batist, M. de; Versteeg, W.H.	This paper presents the results of high-resolution reflection seismic surveys carried out between 1989 and 1996 along rivers and canals in northern Belgium. The seismic data penetrate down to 900 m in the sedimentary cover or to the Paleozoic basement. The reflection response of the acoustic basement provides clear indications with regard to the top of the Paleozoic: crystalline basement and Lower Paleozoic metasediments and volcanics of the London-Brabant Massif and NE-dipping Devonian and Carboniferous strata. The subhorizontal Mesozoic and Cenozoic sedimentary cover comprises 20 unconformity-bound seismic units: 5 in the Cretaceous and 15 in the Cenozoic. Based on borehole information, these units are correlated with lithostratigraphically defined formations or groups. Some of the unit-bounding unconformities are of regional importance. They are attributed i) to eustatic sea-level changes causing regional flooding during the Late Cretaceous or incision of deep valleys during the Late Oligocene and Late Miocene, ii) to regional tectonic tilting between Late Eocene and Early Oligocene, or iii) to a combination of eustasy and tectonics causing valley incisions during the Lutetian. Faults of the Roer Valley Graben have offset different stratigraphic levels by sometimes considerable amounts (up to 230 m in the Oligocene to Quaternary succession). Although the main tectonic phase took place during the Miocene, the activity has varied considerably through time, and also from fault to fault. Most faults seem to have a 10 to 30-m displacement since the Late Pliocene.	Seismic stratigraphy of the Mesozoic and Cenozoic in Northern Belgium: main results of a high-resolution reflection seismic survey along rivers and canals

VOLUME 77 NO 1 39	1999	77	1	39	61	Geel, T.; Roep, T.B.	<p>The Vélez Rubio Corridor and the area northwest of the Sierra Espuña are located on the Internal-External Zone Boundary. The External Zone is represented by the Southern Subbetic, the most basinward part of the former passive margin of Iberia, the Internal Zone by its unmetamorphosed highest unit, the Malaguide Complex, tectonically underlain by the metamorphosed Alpujarride Complex. During the Oligocene and Aquitanian, the Southern Subbetic was the locus of slope deposition with northeastern provenance of detritus. In the Malaguides of the Espuña, the detritus of Lower Oligocene transgressive conglomerates and Middle Oligocene fan deltas indicates Sardinian proximity. The Upper Oligocene to lower Aquitanian Ciudad Granada and Pliego formations of the Malaguide Complex, carrying exclusively Malaguide detritus, were deposited in grabens within the Malaguide realm during an extensional rifting phase. The Malaguides, still far removed from the Subbetic, underwent major thrusting during the Aquitanian. Of the sedimentary units found between the Internal and External Zones, the oldest unit (the allochthonous Aquitanian Solana formation) was deposited in submarine fans outside the Subbetic or Malaguide realms proper, but in close connection with the latter. The Internal Zone collided with the External Zone in the early Burdigalian with concomitant disruption of the Southern Subbetic slope. On the suture, a deep basin was formed and fitted in by the Burdigalian Espejos formation carrying detritus from the Subbetic and from the Malaguide and Alpujarride Complexes. In the late Burdigalian, the Subbetic was thrust southward over the Espejos formation, thus double-sealing the collisional contact. During the latest Burdigalian</p>	<p>Oligocene to middle Miocene basin development in the Vélez Rubio Corridor - Espuña (Internal-External zone boundary; Eastern Betic Cordilleras, SE Spain)</p>
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VOLUME 77 NO 1 63	1999	77	1	63	76	Craen, M. de; Swennen, R.; Keppens, E.	<p>The septarian carbonate concretions from the Boom Clay (Belgium) consist mainly of authigenic minerals such as micrite (< 70% bulk volume) and pyrite framboids (~ 3%). These mineral phases occur between detrital grains and fossils. The septarian cracks are lined with calcite, which is sometimes covered with pyrite. The preservation of delicate sedimentological features in the concretion matrix (hardly compacted faecal pellets, burrows and uncrushed shells) points to an early origin of the concretions. Systematic geochemical variations from concretion centre to edge suggest that growth continued during shallow burial. The $\delta^{13}\text{C}$ values (-17.5 to 20.5 ‰) of the concretionary carbonate show that bacterial sulphate-reduction processes were dominant. Sulphate-reduction-derived HCO_3^- was diluted by marine-related HCO_3^-, derived from dissolved bioclasts. A slight enrichment in $\delta^{13}\text{C}$ during growth is caused by the decreasing influence of sulphate reduction because of the progressive closure of the diagenetic system due to shallow-burial compaction. The $\delta^{18}\text{O}$ values (-0.5 to +1.0‰) of the concretionary carbonate point to a marine origin. The slightly ^{18}O-depleted signature with respect to time-equivalent marine-derived carbonate relates to the incorporation of an ^{18}O-depleted component, originating from sulphate and organic matter. The slight decrease in $\delta^{18}\text{O}$ during growth relates to an increasing influence of this component and to a decreasing influence of seawater-derived oxygen during early diagenesis.</p>	Petrography and geochemistry of septarian carbonate concretions from the Boom Clay Formation (Oligocene, Belgium)
VOLUME 77 NO 1 77	1999	77	1	77	91	Sarmiento, G.N.; García-López, S.; Bastida, F.	<p>Conodont colour alteration index (CAI) data in Upper Ordovician rocks from several areas of the Variscan domain in the Iberian Peninsula indicate conditions ranging from diagenesis to low-grade metamorphism. In most of the areas, where studies using other indicators, such as illite crystallinity (IC) or vitrinite reflectance are lacking, the CAI method has permitted a preliminary estimation of the metamorphic grade. In the Almadén syncline (Central-Iberian Zone), where IC studies are available, the thermal conditions inferred from CAI data agree with those obtained by the IC method. In the Puertollano-Almuradiel syncline, the thermal interval obtained primarily from fluid inclusions (270-370°C) overlaps considerably with that obtained from CAI data (180-340°C). In general, cleavage in rocks is present in anchizonal or epizonal conditions, whereas in diagenetic conditions with $\text{CAI} \geq 2.5$, cleavage is scarce. The conodont texture changes with increasing metamorphism, and apatite recrystallization appears in general with $\text{CAI} \geq 5$. Variation of CAI values within a single sample and/or within short stratigraphic distances observed at several localities is due to hydrothermal activity.</p>	Conodont colour alteration indices (CAI) of Upper Ordovician limestones from the Iberian Peninsula

VOLUME 77 NO 1 93	1999	77	1	93	98	Buurman, P.; Jongmans, A.G.; Kasse, C.; Lagen, B. van		Discussion: Oil seepage or fossil podzol? An Early Oligocene oil seepage at the southern rim of the North Sea Basin, near Leuven (Belgium) by E.D. van Riessen & N. vandenbergh, Geologie en mijnbouw 74: 301-312 (1996)
VOLUME 77 NO 1 99	1999	77	1	99	100	Riessen, E.D. van; Vandenberghe, N.		Discussion: Oil seepage or fossil podzol? An Early Oligocene oil seepage at the southern rim of the North Sea Basin, near Leuven (Belgium). Reply by the authors
VOLUME 77 NO 1 101	1999	77	1	101	105	Pannekoek, A.J.; Touret, J.L.R.		Rpresentation of the van Waterschoot van der Gracht Medal to Prof. A.J. Pannekoek and Prof. J.L.R. Touret
VOLUME 77 NO 2 111	1999	77	2	111	112	Meer, F. van der; Kusters, E.C.; Fraikin, S.J.		Applications of remote sensing in geology. Preface
VOLUME 77 NO 2 113	1999	77	2	113	116	Reeves, C.V.	The more one considers the earth sciences these days, the more one realises that any view that falls short of global runs the risk of being short-sighted. This article sketches the position of remote sensing in geology following several points of observation: 1) Earth scientists are not blind but when it comes to geology are we not all blind? 2) We all come to whatever particular earth science problem we have to tackle with a background of scientific knowledge. 3) Interpretations are ephemeral. Our specialist windows each bring us a partial view of the hidden subsurface. If we are wise we share our fields of expertise so that the earth sciences can best deliver their potential benefits to global society.	Geological remote sensing in aerospace and time. Introduction
VOLUME 77 NO 2 117	1999	77	2	117	127	Zhang, X.M.; Cassells, C.J.S.; Genderen, J.L. van	The spontaneous combustion of coal causes widespread underground coal fires in several countries, amongst which is China. These coal fires cause serious environmental, economic and safety problems. In northern China, the coal fires occur within a wide region stretching 5000 km east-west and 750 km north-south. Remote sensing therefore provides an ideal tool for monitoring this environmental hazard over such a large and remote area. As part of a research project to detect, measure, monitor and extinguish these coal fires, this paper describes a remote-sensing based multi-sensor data-fusion methodology for detecting the underground fires. The methodology is based on fusing a variety of satellite-based image types (optical, thermal, microwave) together with airborne data (optical and thermal infrared) and ancillary data sources such as geological and topographic maps. The results of the remote-sensing data fusion are presented, using pixel-based, feature-based and decision-based fusion approaches	Multi-sensor data fusion for the detection of underground coal fires

VOLUME 77 NO 2 129	1999	77	2	129	135	Seijmonsbergen, A.C.	Bangladesh is part of the active foredeep depression south of the Himalayan collision zone, bordering the Indian plate. Seismic activity is common both in the mountain chain and in the Ganga plain reaching into the basin of the Bay of Bengal and forming the counterpart of the uplifted Himalayan chain. Erosion, sedimentation, river migration and transport within the Jamuna (Brahmaputra) river system are therefore not only controlled by processes on the Earth's surface, but are also the result of a balance between fast and continuing deposition versus geological subsidence and uplift. An attempt is made to correlate the behaviour of the Jamuna river to neo-tectonic movements, as interpreted from Landsat MSS imagery using available literature. From the imagery covering the period 1916 to 1987, supervised and unsupervised classifications of bands 5 and 7 were made. The 1978 and 1986 images revealed the most useful classifications and yielded pronounced differences in colour variation for visual interpretations of geological lineaments and terrain units. The Jamuna riverbed can be divided into compartments, limited by faults.	The influence of neo-tectonics on river patterns in Bangladesh; a preliminary study based on Landsat MSS imagery
VOLUME 77 NO 2 137	1999	77	2	137	151	Meer, F. van der	Without use of imaging spectrometry, imaging of the Earth's surface from aircraft and from spacecraft is hampered by the low spectral resolution and limited number of spectral bands, typically less than 10 bands of 100 to 200 nm width. Imaging spectrometry in remote sensing concerns the acquisition of image data in many narrow (< 40 nm wide) contiguous spectral bands with the ultimate goal of producing detailed spectral reflectance curves for each pixel in the image. Many minerals and rocks have unique spectral signatures with characteristic absorption features that are 20 to 40 nm wide. Imaging spectrometers allow to depict these narrow features and thus map surface mineralogy based on spectral image characterization. This paper gives a review of imaging spectrometry and addresses the following topics: airborne and spaceborne systems available, spectral and geometric data preprocessing, atmospheric correction, techniques for thematic data analysis, and applications in the field of geological remote sensing. In the final section a case study is described where imaging spectrometer data is used for mapping surface mineralogy in a hydrothermal alteration system, thus guiding gold exploration.	Imaging spectrometry for geological remote sensing

VOLUME 77 NO 2 153	1999	77	2	153	160	Tromp, M.; Epema, G.F.	<p>Spectral mixture analysis (SMA) is an image-processing technique used for the analysis of airborne hyperspectral remote-sensing data which consist of a large number of spectral bands, typically over 100. In this paper the possibilities are examined of using SMA for the analysis of Landsat Thematic Mapper satellite data with only six bands in the visible to shortwave-infrared wavelength. 'We use data from a semi-arid area in the Sanmatenga province of Burkina Faso, an area known to experience land-degradation problems. In SMA, we assume that pixels in an image consist of one or more homogeneous (uniform in character) or pure surfaces, the so called end-members. The endmembers were derived from the image data on the basis of specific image characteristics. Field data was collected to describe the characteristics of these end-members in terms of land cover, soil and degradation phenomena. The end-members derived from the image analysis, although statistically pure in terms of image spectral characteristics, prove to be mixtures at a field scale. This lack of purity is explained by the nature of semi-arid areas which is more heterogeneous than that of most other areas. The SMA yielded cover percentages for the end-members from which an unsupervised classification was made. Comparison of the classification with the results of SMA shows that the latter provides information on the amount and spatial distribution of land characteristics such as land degradation.</p>	Spectral mixture analysis for mapping land degradation in semi-arid areas
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VOLUME 77 NO 2 161	1999	77	2	161	176	Klees, R.; Massonnet, D.	Most applications of Synthetic Aperture Radar (SAR) make only use of the amplitude information in just one image. Interferometric SAR (InSAR) makes use mainly of the phase measurements in two or more SAR images of the same scene, acquired at two different moments and/or at two slightly different locations. By interference of the two images, very small slant-range changes of the same surface can be inferred. These slant-range changes can be related to topography and/or surface deformations. InSAR thus has the potential of mapping centimeter-scale ground displacements over a region many tens of kilometers in size at a resolution of a few meters making it one of the most promising space-geodetic techniques for monitoring Earth's surface deformations. The goal of this paper is to discuss some of the potential new applications of InSAR for the monitoring of deformations, and to show its major limitations. Some potential new applications of InSAR related to surface-change detection including earthquake and crustal studies, the monitoring of volcanoes and anthropogenic effects, and the monitoring of glaciers and ice sheets are presented. The discussion on the limitations of InSAR for surface-change detection focuses on atmospheric perturbations and the problem of temporal decorrelation.	Deformation measurements using SAR interferometry: potential and limitations
VOLUME 77 NO 2 177	1999	77	2	177	188	Kruk, J. van der; Slob, E.C.; Fokkema, J.T.	Characterization of the shallow subsurface (0.25 to 10 m) is of growing importance for engineering activities, solutions of environmental problems, and archaeological investigations. Ground-penetrating radar (GPR) is an appropriate technique considering the depth range of interest, the strength of electric and magnetic contrasts between different subsurface layers and buried objects, and the required resolution. GPR surveys can detect subsurface structures by recording electromagnetic reflections from discontinuities. The detectability of objects and the delineation of subsurface structures increases with increasing wave velocity and conductivity differences between the object and its surroundings or between adjacent layers. However, unwanted reflections from objects above the surface influence the images. Shielded antennas can be used to avoid strong reflections from these objects. The data thus obtained are, however, more difficult to interpret. The fundamentals of GPR and two different acquisition setups for a GPR system are discussed. Basic interpretation tools for travel-time and velocity estimation are described, and finally, case studies are presented, followed by conclusions.	Background of ground-penetrating radar measurements
VOLUME 77 NO 2 189	1999	77	2	189	201	Reeves, C.V.		Applications of remote sensing in geology. Appendix
VOLUME 77 NO 3-4 207	1999	77	3-4	207	208	Groot, T.A.M. de; Orford, J.D.		Climate change and coastal evolution in Europe

VOLUME 77 NO 3-4 209	1999	77	3-4	209	224	Zazo, C.; Dabrio, C.J.; Borja, F.; Goy, J.L.; Lenzine, A.M.; Lario, J.; Polo, M.D.; Hoyos, M.; Boersma, J.R.	The stratigraphic relationships, genesis and chronology, including radiocarbon dating, of the Quaternary sandy deposits forming the El Asperillo cliffs (Huelva) were studied with special emphasis on the influence of neotectonic activity, sea-level changes and climate upon the evolution of the coastal zone. The E-W trending normal fault of Torre del Loro separates two tectonic blocks. The oldest deposits occur in the upthrown block. They are Early to Middle Pleistocene fluvial deposits, probably Late Pleistocene shallow-marine deposits along an E-W trending shoreline, and Late Pleistocene and Holocene aeolian sands deposited under prevailing southerly winds. Three Pleistocene and Holocene aeolian units accumulated in the downthrown block. Of these, Unit 1, is separated from the overlying Unit 2 by a supersurface that represents the end of the Last Interglacial. Accumulation of Unit 2 took place during the Last Glacial under more arid conditions than Unit 1. The supersurface separating Units 2 and 3 was formed between the Last Glacial maximum at 18 000 ¹⁴ C yr BP and ca. 14 000 ¹⁴ C yr BP, the latter age corresponding to an acceleration of the rise of sea level. Unit 3 records wet conditions. The supersurface separating Units 3 and 4 fossilised the fault and the two fault blocks. Units 4 (deposited before the 4th millennium BC), 5 (> 2100 ¹⁴ C yr BP to 16th century) and 6 (16th century to present) record relatively arid conditions. Prevailing wind directions changed with time from W (Units 2-4) to WSW (Unit 5) and SW (Unit 6).	Pleistocene and Holocene aeolian facies along the Huelva coast (southern Spain): climatic and neotectonic implications
VOLUME 77 NO 3-4 225	1999	77	3-4	225	232	Dawson, A.G.; Smith, D.E.; Dawson, S.; Brooks, C.L.; Foster, I.D.L.; Tooley, M.J.	The geomorphic and sedimentological evidence for former sea-level changes in the exposed coastline of western Jura shows a clear coastal response to past changes in climate. In particular the rapid and high-magnitude climate changes associated with the onset and termination of the Younger Dryas appear to have been accompanied by major changes in coastal response. In western Jura, the temperate climate of the Lateglacial Interstadial was associated with beach-ridge deposition, with the earlier part of this period being associated with larger ridges than the latter. By contrast, the cold climate during the Younger Dryas appears to have been dominated by frost processes, sea-ice development and rapid rates of coastal erosion of bedrock. Cold-climate shore erosion of bedrock appears to have ended suddenly at the close of the Younger Dryas.	Lateglacial climate change and coastal evolution in western Jura, Scottish Inner Hebrides

VOLUME 77 NO 3-4 233	1999	77	3-4	233	245	Granja, H.M.	<p>The coastal zone of northwest Portugal can be subdivided into two geomorphological sectors: Sector 1, between the Minho River and the town of Espinho, where the coastal segments consist of estuaries, sandy and shingle beaches with rocky outcrops, and Holocene dune systems (foredunes and some migrating dunes with blow-outs). The estuaries and the foredunes in particular are very degraded by human activities. Sector 2, between Espinho and the Mondego Cape, where coastal lagoons and Holocene dune systems (foredunes, parabolic and transverse dunes) occur. This study deals with the macroscale, i.e. 100-1000 years, forcing by sea-level changes and neotectonic activity on the one hand, and mesoscale, i.e. 1-100 years, forcing by climate fluctuations on the other hand, on these (palaeo-)environments. It is shown in particular that sea-level changes and neotectonic activity play a dominant role in the evolution of the coastal zone since the Late Pleistocene. Sediment starvation on the shoreface is postulated to be one of the major causes for coastal erosion since at least the 15th century. The mesoscale role of climate is difficult to assess at the present stage of knowledge, mainly because of overprinting by the macroscale evolution of the coast. However, data on estuarine saltmarsh evolution in sector 1 point towards discrete changes in storminess, while the development of Medieval dune systems in sectors 1 and 2 are attributed to the Little Ice Age or, alternatively, to human occupation of the dune areas.</p>	Evidence for Late Pleistocene and Holocene sea-level, neotectonic and climate control in the coastal zone of northwest Portugal
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VOLUME 77 NO 3-4 247	1999	77	3-4	247	262	Shennan, I.; Tooley, M.; Green, F.; Innes, J.; Kennington, K.; Lloyd, J.; Rutherford, M.	Analyses of geomorphologically contrasting sites in Morar, NW Scotland, describe the forcing mechanisms of coastal change. Isolation basins (i.e. basins behind rock sills and now isolated from the sea following isostatic uplift) accumulated continuous marine and freshwater sediments from c.12 to 2 ka BP. Raised dune, marsh and wetland sites register breaching, migration and stability of dunes from c. 9 to 2 ka BP. High-resolution methods designed to address issues of macroscale and microscale sea-level changes and patterns of storminess include 1-mm sampling for pollen, dinocyst and diatom analyses, infra-red photography, X-ray photography and thin-section analysis. The data enhance the record of relative sea-level change for the area. Major phases of landward migration of the coast occurred during the period of low sea-level rise in the mid-Holocene as the rate of rise decreased from c. 3 to < 1 mm/year. Relative sea-level change controls the broad pattern of coastal evolution at each site; local site-specific factors contribute to short-term process change. There is no record of extreme events such as tsunamis. Within a system of dynamic metastable equilibrium, the Holocene records show that site-specific factors determine the exact timing of system breakdown, e.g. dune breaching, superimposed on regional sea-level rise. The global average sea-level rise of 3 to 6 mm/yr by AD 2050 predicted by IPCC would only partly be offset in the Morar area by isostatic uplift of about 1 mm/yr. A change from relative sea-level fall to sea-level rise, in areas where the regional rate of uplift no longer offsets global processes, is a critical factor in the management of coastal resources.	Sea level, climate change and coastal evolution
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VOLUME 77 NO 3-4 263	1999	77	3-4	263	281	Dabrio, C.J.; Zazo, C.; Lario, J.; Goy, J.L.; Sierro, F.J.; Borja, F.; González, J.A.; Flores, J.A.	<p>This first sedimentary interpretation of two incised-valley fills in the Gulf of Cádiz (southern Spain), which accumulated during the last fourth-order eustatic cycle in response to fluvial incision, changes of sea level, and correlative deposition, relates the filling of the estuarine basins and their barriers with four regional progradation phases, H₁ to H₄. The cases studied are the wave-dominated Guadalete, and the mixed, tide and wave-dominated Odiel-Tinto estuaries. The sequence boundary is a type-1 surface produced during the lowstand of the Last Glacial period ca. 18 000 ¹⁴C yr BP. No fluvial lowstand deposits were found in the area. Due to rapid transgression the valley fills consist of transgressive and highstand sediments. The maximum landward advance of the estuarine barriers occurred ca. 6500-6000 ¹⁴C yr BP during the maximum of the Flandrian transgression, but there is no evidence of sea level rising appreciably above the present. A large part of the estuaries was filled during H₁ (ca. 6500-4400 ¹⁴C yr BP) but ravinement by shifting tidal inlets destroyed most of the coeval barriers. During the H₂ phase (ca.4200-2550 ¹⁴C yr BP) sedimentation was favoured by arid conditions and concentrated in the axial estuarine zones and the barriers. Between H₂ and H₃ prevailing winds changed from W to WSW, increasing spit growth to the east and south-east. Progradation of bay-head deltas and flood-plains during H₃ (ca. 2300-800 ¹⁴C yr BP) and H₄ (500 yr ago to the present) further reduced the accommodation space in the largely-filled valleys, and sediment bypassed the estuaries and accumulated in the estuarine barriers as fast-growing spits. Arid conditions and increasing human activity</p>	Sequence stratigraphy of Holocene incised-valley fills and coastal evolution in the Gulf of Cádiz (southern Spain)
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VOLUME 77 NO 3-4 283	1999	77	3-4	283	293	Freitas, M.C.; Andrade, C.; Moreno, J.C.; Munhá, J.M.; Cachão, M.	The inner Tagus estuary is essentially a sedimentation basin that receives cohesive sediment from terrestrial, marine, biological and anthropogenic sources. Three short cores from one site in a marsh area of this estuary (Seixal Bay) were analysed for sedimentary, geochemical and micropalaeontological contents (benthic foraminifera and nannoplankton). The length of the cores represents about half a millennium of sedimentation. Textural analysis suggests a highly uniform mud sedimentation for most of the cores but geochemical, mineralogical and micropaleontological results indicate climatic and environmental changes and anthropogenic disturbance. Three Foraminifera zones were identified. The lower part of the lower zone indicates sedimentation in an open channel or a lower domain of an exposed high-energy sandflat. Sediments of the upper part of the lower zone and of the middle zone were deposited in a lower-energy environment, probably associated with a sheltered, vertically aggrading mudflat located within the Seixal Bay. Biological and mineralogical indicators suggest that periods of total or partial closure of this bay occurred. Clay minerals indicate that drier and colder conditions prevailed in the lower half of this zone evolving gradually to a wetter and warmer environment towards the top. The upper zone indicates persistence of low-energy sedimentation and evolution towards the present salt-marsh conditions. Anthropogenic pollution is clear in geochemical proxies at the top of the sedimentary column and was used for dating purposes.	The sedimentary record of recent (last 500 years) environmental changes in the Seixal Bay marsh, Tagus estuary, Portugal
VOLUME 77 NO 3-4 295	1999	77	3-4	295	310	Wheeler, A.J.; Orford, J.D.; Dardis, O.	The mesoscale (time) control of annual storm-surge activity on quasi-annual saltmarsh (tidal marsh) deposition is studied from two estuarine saltmarshes on the high-energy NW coast of Ireland. Both saltmarshes exhibit a cliffed edge where maximum sedimentary variation is expressed in the form of lamination. Sections were logged and characterised by lithofacies based on grain-size determinations. Sections dated using Cs and Pb determinations indicated deposition records of decadal to century scale (c. 0.5 cm a ⁻¹). Linear multiple regression explains (p < 0.05) half the variation of the deposition rate by annual coastal forcing (surge frequency and magnitude) and sediment modes (coarse silt to clay). Further variability in deposition rate is partially reflected in the non-linear response between forcing and deposition that is affected by mesoscale (30, 11 and 5-year) periodicities in forcing. Increased annual surge activity appears to be associated with a coarsening of, and reduction in annual deposition. A relationship between annual deposition rate and fractal dimension of surge timing (i.e. the clustering of surge events) is identified.	Saltmarsh deposition and its relationship to coastal forcing over the last century on the north-west coast of Ireland

VOLUME 77 NO 3-4 311	1999	77	3-4	311	321	Hindson, R.; Andrade, C.; Parish, R.	<p>The foraminifera and ostracods observed in a late Holocene sedimentary sequence within a fluvial valley at Boca do Rio in the coastal zone of the western Algarve, Portugal, reveal a general, though not smooth transition from marine to fluvial conditions. The relative influence of these two environments appears to depend on the degree of permeability of the barrier system at the coast. Optically stimulated luminescence dates and palaeoecological information obtained from the sequence suggest that barrier formation may be related to changes in climate and/or patterns of ocean current circulation. An unusual deposit rich in sand and gravel found within the otherwise mud dominated sequence has been dated at AD 1801 ± 76 years. This deposit contains foraminifera and ostracods which indicate marine conditions, and which contrast markedly with the brackish-water, estuarine assemblages found in the mud deposits. The rapid transition in the foraminifera and ostracod assemblages indicates a shortlived coastal flooding, which may represent the tsunami associated with the Lisbon earthquake of AD 1755. The variations in the foraminifera and ostracod assemblages also suggest subsidence during the earthquake, with uplift having occurred in the period since then.</p>	<p>A microfaunal and sedimentary record of environmental change within the late Holocene sediments of Boca do Rio (Algarve, Portugal)</p>
VOLUME 77 NO 3-4 323	1999	77	3-4	323	332	Regnauld, H.; Binois, S.; Fouqué, C.; Lemasson, L.	<p>In the framework of the European project 'Climate change and coastal evolution in Europe', the microscale (< 1 year) morphological evolution of beaches in Brittany (W France) has been monitored for some years and linked to immediate forcings, the first one being tides (with a 13-m tidal range), and the second storm intensity. For the same sites, a mesoscale (decades) evolution was reconstructed from air photographs and historical data. The evolution is forced first of all by human activities, and secondly by climatic shift: wind direction changes and average wind velocity evolution. These results were used to build and calibrate a model of coastal behaviour. The model is based on a simple sediment cell (input - transit - output) and simulates the movements of volumes of sands under successive morphodynamic processes. Each of these processes is modelled (in terms of volume exchanges) and parameterized by the relevant atmospheric element. Thus, the model is not deterministic but simulates different probabilities for atmospheric events and morphological response. The model runs for one year and produces realistic sediment accumulation values and coastal retreat rates. When run for half a century, results are also quite comparable to the field data. Storm frequency changes appear to be an important element for the evolution, but the main and first forcing is the availability of sediment.</p>	<p>Micro- to mesoscale evolution of beaches in response to climatic shift: observation and conceptual modelling (Brittany, France)</p>

VOLUME 77 NO 3-4 333	1999	77	3-4	333	349	Duffy, M.J.; Devoy, R.J.N.	<p>Sedimentary environments, representative of the Irish west coast, have been studied to examine their responses at the microscale (10^{-1} to 10^0 yr). This was achieved using a variety of techniques, including grain-size analysis, measurement of accretionary responses and radiometric dating. Monthly elevation monitoring of silt-dominated marshes shows an annual pattern in sediment accumulation. This reflects two processes: a) winter accretion attributable to storm events, and b) summer consolidation and contraction of the marsh sediments. Together, the results suggest that intertidal sedimentation is likely to be dominated by episodic processes, primarily storms. Examination of the tidal regime shows a weaker than expected influence of hydroperiodicity on intertidal accretion, although this influence remains distinctive, as expressed by a landward textural fining. Storms were also identified as of major importance in the functioning of higher-energy sandy coastal systems, again having a largely accretional influence, primarily through aeolian transport. Erosion at such study sites is probably controlled by the attainment of a critical threshold surface elevation, or by exceptional storm action, or a combination of both. The linking of microscale sedimentation rates with those at the meso- to macroscale, and assessment of their importance for coastal functioning, is difficult due to the geological averaging effect of the sedimentary record. Human impacts on this coast in historical times are large but difficult to quantify.</p>	Contemporary process controls on the evolution of sedimentary coasts under low to high energy regimes: Western Ireland
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VOLUME 77 NO 3-4 351	1999	77	3-4	351	361	Groot, T.A.M. de	This Special Issue deals with the impact of climate change on western European coastal systems. Notwithstanding the inherent problems of studying geological data in terms of climate shifts, the results show that on the meso and the macroscale of time, climatic forcing is a major drive for coastal change. However, its impact is largely influenced by other factors. Sediment availability plays a dominant role in the evolution of coastal systems and it can be considered one of the most important thresholds at the land-ocean interface. Sea-level changes are expected to have a significant impact on most European coasts. There is particular concern for the tidally influenced flats and marshes, and for those coastal areas known to have already a net sediment deficit and to be threatened by erosion. Areas where isostatic uplift has countered sea-level rise until now, are expected to become subject to coastal erosion in the near future under an accelerated sea-level rise scenario. The sensitivity and vulnerability of coastal systems to climate shifts is shown to be largely controlled by storm magnitude and fetch. A particular case of vulnerability is the impact of tsunamis. Finally, the consequences of human interference have been demonstrated in many cases. The implementation of geoscientific studies for rational, comprehensive and cost-effective strategies on a regional or national level of integrated coastal zone management is reviewed.	Climate shifts and coastal changes in a geological perspective. A contribution to integrated coastal zone management
VOLUME 77 NO 3-4 363	1999	77	3-4	363	369			Presentation of the Van Waterschoot van der Gracht Medal to Dr S. Jelgersma

VOLUME 78 NO 1 1	1999	78	1	1	19	Gras, R.; Geluk, M.	<p>Analysis of the Upper Cretaceous stratigraphy of the Peel Block reveals the basin development of the block to have been influenced by both the inversion of the Roer Valley Graben and Central Netherlands Basin, and the overall Late Cretaceous transgression. Sediments of Santonian to Danian age were deposited on the block. These sediments are compared with the detailed lithostratigraphy of southern Limburg, where Late Cretaceous strata are exposed. Four successions can be recognised in southern Limburg. The two oldest successions, the Santonian Oploo Formation (new name, proposed in the present contribution) and the mainly Early Campanian Vaals Formation, are restricted to the central and northern parts of the block. These siliciclastic formations were deposited under the influence of inversion of the Roer Valley Graben and the Central Netherlands Basin, as well as under the influence of a rising sea level. Towards the north, sands of the Oploo Formation grade into marls and chalks of the Ommelanden Formation. The two youngest successions comprise the largely Late Campanian to Maastrichtian Gulpen and Maastricht Formations and the Danian Houthem Formation. These chalk formations were deposited under the influence of regional subsidence during a sea-level highstand. Subsequent to deposition of the Houthem Formation, a regional regression triggered a change from shallow-marine carbonate to paralic siliciclastic deposition.</p>	Late Cretaceous - Early Tertiary sedimentation and tectonic inversion in the southern Netherlands
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VOLUME 78 NO 1 21	1999	78	1	21	30	Cleveringa, J.; Oost, A.P.	Horton's hierarchical and fractal analysis of channel circumference reveals that tidal-channel systems in the Dutch Wadden Sea have similar branching patterns. Channel systems have the same characteristics as three- to four-times branching networks. The branch lengths of these channels decrease logarithmically. The channel systems can be regarded as 'statistical self-similar fractal' networks, considering the natural variability in branch lengths and channel positions. Branching of channels does not continue below the 500 m scale. The channel-system circumference length is logarithmically related to the tidal prism and drainage area. The similarity of the channel systems, regardless of their size, relative amount of intertidal flats, and tidal amplitude, points to a self-organising nature. All processes depend on the feedback between morphology and hydrodynamics. At first sight, the channel systems can be regarded as an ebb-driven drainage network, governed by erosion. However, flood-dominated net sedimentation occurs in large parts of the drainage basins and modifies the ebb-driven network. The complex interaction of hydrodynamic and morphodynamic processes in tidal basins limits the applicability of process-based models. Behaviour-oriented modelling has a wide applicability and can be improved using the fractal geometry as the dynamical equilibrium morphology. The fractal-network geometry can also be used for stochastic reconstructions of fossil tidal-channel systems, when only limited observations are available.	The fractal geometry of tidal-channel systems in the Dutch Wadden Sea
VOLUME 78 NO 1 31	1999	78	1	31	46	Louwye, S.; Coninck, J. de; Verniers, J.	The occurrence of organic-walled dinoflagellate cysts (dinocysts) in the Diest Formation, a largely decalcified succession with a poor fossil content, and in the adjacent strata of Lower Miocene and Lower Pliocene formations, allowed a biostratigraphic evaluation of these deposits and an assessment of the hiatus between the lithostratigraphic units. The Diest Formation was deposited during Tortonian - Messinian times. Dinocyst biozones defined in the North Sea region and the U.S.A. East Coast are recognised within the Diest Formation, although environmental factors seem to have influenced the presence of some key zonal species in the shallow-marine deposits of northern Belgium. The two members of the Diest Formation studied, i.e., the Dessel Sands and the Diest Sands, appear to be strongly diachronous. The depocentre was located in the Campine area during the early Tortonian and shifted to the area north of Anwerp during late Tortonian to Messinian times. The age assessment provides a correlation of the sequence boundaries of Haq et al. (1987) at the top of the Diest Formation with SB 5.5.	Dinoflagellate cyst stratigraphy and depositional history of Miocene and Lower Pliocene formations in Northern Belgium (southern North Sea Basin)

VOLUME 78 NO 1 47	1999	78	1	47	56	Debacker, T.N.; Sintubin, M.; Verniers, J.	The presence of convergent cleavage fans in folded Silurian pelitic deposits along the southern extremity of the Brabant Massif has commonly been considered as an indication for a polyphase deformation history. Recent field work on the classic section at Ronquières shows, however, that all the structural elements can be explained by a single progressive deformation, taking place at gradually higher structural levels. This deformation is considered to have occurred at the time of the Acadian orogeny. The section under study contains a fold train of five gentle to open first-order folds, unconformably overlain by gently S-dipping Givetian rocks. Although the Silurian turbidite deposits are predominantly pelitic, the folds are characterized by convergent cleavage fans. The trend of the cleavage fan axes remains constant in the various folds throughout the section. In contrast, the trend of the fold hinge lines gradually changes along the section from a clockwise relation with the cleavage fan axis in the northern part (anticlockwise cleavage transection) towards an anticlockwise relation in the southern part (clockwise cleavage transection). Individual fault/fault intersections have a constant trend throughout the section, parallel to the cleavage fan axes and the mean fold hinge line. Small kink bands and small transverse joints reflect the same structural trend. The coaxial disposition of the structural elements seems at first sight incompatible with the presence of both clockwise and anticlockwise cleavage-transected folds. This disposition may, however, be explained by an enechelon periclinal nature of the fold train, possibly formed in a slightly constrictional deformation environment	Cleavage/fold relationships in the Silurian metapelites, southeastern Angelo-Brabant fold belt (Ronquières, Belgium)
VOLUME 78 NO 1 57	1999	78	1	57	71	McCann, T.	The Middle to lower Upper Devonian succession of the Rügen Depression in NE Germany consists of largely clastic sediments, whereas the Upper Devonian deposits are mixed carbonate and clastic. Petrographic and geochemical data suggest that the sediments were deposited in a cratonic or recycled setting. Deposition was largely confined to a fault- bounded basin, located between two structural highs. During the Devonian, the Rügen area underwent evolution from a continental and marginal marine area during the Eifelian-early Frasnian to a deeper marine environment during the late Frasnian-early Famennian. By the latest Famennian, an open-shelf carbonate facies environment was established.	Middle to late Devonian basin evolution in the Rügen area, NE Germany

VOLUME 78 NO 1 73	1999	78	1	73	85	Zieliński, T.; Loon, A.J. van	<p>Twenty-five fans in NE Poland, formed under subaerial terminoglacial (previously called 'ice-contact') conditions, were investigated to model the dominant genetic processes involved. These fans show, as do other types, a proximal, a middle and a distal subenvironment. It is found, however, that the characteristics of these subenvironments as present in subaerial terminoglacial fans differ in several respects from those in fans formed under other climatic conditions. The present study deals with the middle and distal subenvironments. These appear to be much less complex than the proximal subenvironment in this type of fan. The middle terminoglacial fan comprises two sandy facies, characterized by unchannelized transport (mainly sheet floods) and stream flows. The distal terminoglacial fan is characterized by one (sandy/silty) facies, resulting from unchannelized currents and from settling in ephemeral ponds; braided streams play a secondary part in this fan subenvironment. The characteristics of the middle and distal fan subenvironments are described and illustrated, as is the facies from the distal subenvironment. Their vertical and lateral relationships are presented in a facies model.</p>	Subareal terminoglacial fans II: a semi-quantitative sedimentological analysis of the middle and distal environments
VOLUME 78 NO 1 87	1999	78	1	87	102	Subías, I.; Yuste, A.; Fanlo, I.; Fernández-Nieto, C.; González López, J.M.	<p>Mineralogical, textural and geochemical investigations were made to determine the post-depositional evolution of Devonian and Early Carboniferous carbonates from Valle de Tena. The carbonate association is made up of low-Mg calcite, which occurs as micrite, spat cements, neomorphic patches and spar filling veinlets. Non-stoichiometric dolomite and ankerite occur as cements (dolomite also as replacements) in the Middle Devonian, post-dating calcite types. All these phases pre-date tectonic stylolites, indicating compaction after stabilization of the carbonate minerals. Strontium concentrations indicate that Early Devonian and Early Carboniferous micrites initially precipitated as aragonite; Middle and Late Devonian micrites precipitated as high-Mg calcites. Both precursors were diagenetically stabilized to low-Mg calcites through interaction with meteoric waters in phreatic environments. Trace elements in dolomite and ankerite indicate precipitation from Sr-enriched meteoric water. All studied carbonates, except Middle Devonian limestones, precipitated in reducing environments, which favoured incorporation of Fe and Mn. Late calcite generations precipitated from more saline waters than micrites. Light $\delta^{18}\text{O}$ values in micrites suggest alteration mainly in meteoric-phreatic environments. The dolomites and ankerites precipitated from more ^{18}O-depleted fluids than the calcites, suggesting a greater contribution from meteoric waters. Variations in $\delta^{13}\text{C}$ of micrites represent primary secular trends, according to published $\delta^{13}\text{C}$ variations. The $\delta^{13}\text{C}$ oscillations within each succession probably relate to sea-level oscillations. Strontium isotopes also point to a meteoric origin of diagenetic fluids. Model calculations suggest that O and Sr isotopes equilibrated</p>	Geochemical, and stable and radiogenic isotope records in Devonian and Early Carboniferous carbonates from Valle de Tena, central Pyrenees (Spain): evidence for their diagenetic environments

VOLUME 78 NO 1 103	1999	78	1	103	117	Orozco, M.; Molina, J.M.; Crespo-Blanc, A.; Alonso-Chaves, F.M.	The rauhuckles near Serón in the northern Sierra de los Filabres (S Spain), previously considered as true tectonic breccias, are reinterpreted on the basis of sedimentological, geomorphological and geometrical evidence as subaerial or nearly subaerial sedimentary deposits. Channel fills, parallel lamination, cross-lamination, graded bedding, sedimentary clastic dykes and other sedimentary structures and features occur in the rauhucke body. These sedimentary rocks correspond to continental deposits of alluvial and karstic origin deposited over a karstified erosional surface of Nevado-Filabride marbles. Although no fossils have been found in the rauhuckles, a Tortonian age for these rocks is suggested on the basis of structural arguments and lithostratigraphic data from the nearby Almanzora basin. The rauhuckles were buried by slabs of Alpujarride rocks that gravitationally slid over them during the uplifting of the Sierra de los Filabres.	Palaeokarst and rauhucke development, mountain uplift and subaerial sliding of tectonic sheets (northern Sierra de los Filabres, Betic Cordilleras, Spain)
VOLUME 78 NO 1 119	1999	78	1	119	126	Molli, G.; Heilbronner, R.	The present contribution summarizes the first results of a study focusing on microstructures from Alpi Apuane marbles. Its aim is both an analysis of the evolution of the metamorphic complex recorded in marbles and the supply of basic material for process-oriented studies on calcite microstructures due to natural deformation. Quantitative analysis of the variations of statically recrystallized microstructures suggest a relationship with the peak metamorphic temperatures. Previously unrecognized post-thermal peak shear zones, showing overprint microstructures typical of grain-boundary migration and dynamic recrystallization, are described; they document the natural deformation of Carrara marble.	Microstructures associated with static and dynamic recrystallization of Carrara marble (Alpi Apuane, NW Tuscany, Italy)
VOLUME 78 NO 2 127	1999	78	2	127	128	Vergoossen, J.M.J.; Lambers, P.H.		A tribute to Bert Boekschoten - Introduction
VOLUME 78 NO 2 129	1999	78	2	129	133	Lambers, P.H.		Bert Boekschoten: a biographical sketch
VOLUME 78 NO 2 135	1999	78	2	135	139	Marin, F.; Gillibert, M.; Westbroek, P.; Muyzer, G.; Dauphin, Y.	The dissolution of calcified invertebrate skeletons releases an elaborate mixture of proteins, glycoproteins and polysaccharides. These 'skeletal matrix' macromolecules are thought to play a major role in calcification and were widely used for phylogenetical studies. We tested the reactivity of water-soluble macromolecules from a wide range of invertebrate skeletons with two antisera raised against the shell matrix of the bivalve, <i>Pinna nobilis</i> . Projections of our results on the phylogenetical tree of Starobogatov (1992) show for the first time that, during evolution, antigenic determinants may degenerate in some stocks while they remain intact in others. The phylogenetic implications of these patterns of disjunct degeneration are discussed.	Evolution: disjunct degeneration of immunological determinants

VOLUME 78_NO 2_141	1999	78	2	141	145	Borel Best, M.	Corals are animals living in shallow seas (where they may form coral reefs) or in the deep sea. Because they fossilize well, these 'stones' inform us in detail about the geological past; not only about the history of the Earth as a whole (rotation, tectonics, sea-level changes), but also about past local environmental conditions in the sea. Joint research of marine biology and marine geology can therefore solve many questions about our changing world, and can be used to discover what factors cause deterioration of living coral reefs.	Corals as speaking stones
VOLUME 78_NO 2_147	1999	78	2	147	164	Stapert, D.; Johansen, L.	Flint implements with rounded ends, excavated at several Late Palaeolithic sites in Denmark and the Netherlands, are described and interpreted as strike-a-lights used in combination with pyrites. Experiments were carried out; the use-wear traces on the experimental pieces are similar to those occurring on the prehistoric specimens. It is concluded that the pyrite technique for fire production most probably predated wood-on-wood techniques, both in Europe and Greenland.	Making fire in the Stone Age: flint and pyrite
VOLUME 78_NO 2_165	1999	78	2	165	174	Wesselingh, F.P.; Cadée, G.C.; Renema, W.	The actual and fossil distribution patterns of the aquatic gastropod genera <i>Tryonia</i> and <i>Planorbarius</i> indicate that avian dispersal was an important dispersal mechanism in the geological past. Combining the distribution histories of these genera with ecological data on modern relatives provides insights into the process of dispersal of aquatic taxa in general. Avian dispersal of aquatic taxa is facilitated by a variety of factors, including mass occurrence in resting/foraging places of migrating birds, ways to attach to the birds and to overcome desiccation during flight, as well as easy reproduction from a single specimen when introduced into a new habitat. The uncertain taxonomical status of aquatic organisms, as well as biased preservation and sampling, provide serious drawbacks for understanding the importance of aerial dispersal.	Flying high: on the airborne dispersal of aquatic organisms as illustrated by the distribution histories of the gastropod genera <i>Tryonia</i> and <i>Planorbarius</i>
VOLUME 78_NO 2_175	1999	78	2	175	177	Bromley, R.G.	A trace fossil, <i>Centrichnus eccentricus</i> , was found beneath a saddle oyster (<i>Anomia ephippium</i>) that was preserved undisturbed on its substratum (a shell of <i>Pecten jacobaeus</i>), at the site of attachment of the calcified byssus.	Anomiid (bivalve) bioerosion on Pleistocene pectinid (bivalve) shells, Rhodes, Greece

VOLUME 78 NO 2 179	1999	78	2	179	189	Janssen, A.W.	Pteropoda (Mollusca, Gastropoda, Euthecosomata) described by Beets (1943, 1950,1953) from the alleged Late Miocene/Early Pliocene asphaltic deposits of Buton (SE Sulawesi, Indonesia) are revised. The following species are distinguished: Styliola subula (Quoy & Gaimard, 1827), Cavolinia bituminara (Beets, 1953), Cavolinia mexicana (Collins, 1934), Cavolinia vendryesiana (Guppy, 1873) and Diacria mbaensis Ladd, 1934. A comparison with the Fiji pteropod associations suggests a Miocene (Tortonian to Messinian) age for the Indonesian faunules. Pteropod species described by Ladd (1934) from Viti Levu (Fiji Islands), are revised in an appendix. Five species are distinguished, viz. Creseis acicula (Rang, 1828) (?), Cavolinia gyporum (Bellardi, 1873), C. mexicana, C. rewaensis (Ladd, 1934) and Diacria mbaensis Ladd, 1934. The presence of Cavolina gyporum dates this association as Miocene (Tortonian-Messinian).	Euthecosomatous gastropods (Mollusca: Heterobranchia) from Buton (SE Sulawesi, Indonesia), with notes on species from Viti Levu, Fiji; systematics, biostratigraphy
VOLUME 78 NO 2 191	1999	78	2	191	195	Leloux, J.	The stratigraphical occurrence of 35 known species from the Upper Cretaceous and Danian of Southern Limburg is presented based on existing collections and newly collected material. Corals are relatively rare, except in the Meerssen Member of the Maastricht Formation. Two faunas were recognised in the Meerssen Member: a fauna dominated by Cyclolites cancellata at the base of this member which coincides with the sequence boundary of the third-order sequence cycle TA1.1 of Haq et al. (1988) - and a fauna dominated by mushroom-shaped and encrusting colonies at the top of the transgressive systems tract of the same sequence cycle.	Numerical distribution of Santonian to Danian corals (Scleractinia, Octocorallia) of Southern Limburg, the Netherlands
VOLUME 78 NO 2 197	1999	78	2	197	206	Jagt, J.W.M.	With the exception of holothurians, all Late Cretaceous (Campanian-Maastrichtian) and Early Palaeogene (Danian) echinoderms from the extended type area of the Maastrichtian Stage are currently being revised. In addition to a handful of taxa described previously in the literature, many new genera and species of brittle star and basket star (Ophiuroidea) have been recognised in recent years. In fact, the study area is one of the very few regions in the world that have yielded diverse ophiuroid faunas of latest Cretaceous age. Of note also is the fact that many of the new taxa are based on more or less complete specimens, i.e., discs preserving (portions of) arms, making generic assignment much more reliable. The various ophiuroid groups recognised are briefly discussed and selected specimens are illustrated in order to document the diversity. Formal descriptions will be published elsewhere. Ophiuroid taxa described by Berry (1938), as based on poorly preserved material from the Late Maastrichtian of the area, are briefly commented upon.	Ophiuroid diversity in the type area of the Maastrichtian Stage

VOLUME 78 NO 2 207	1999	78	2	207	213	Mulder, E.W.A.; Mai, H.	A mosasaurid parietal from the Late Cretaceous of Belgium, originally described by Von Meyer (1860), turns out to be assignable to the tylosaurine <i>Hainosaurus cf. bernardi</i> Dollo 1885. A small sediment sample, extracted from the bone, was analysed for coccoliths and revealed its early Late Campanian age. This is thus the earliest record of a tylosaurine mosasaur from Belgium.	The oldest tylosaurine mosasaur (Reptilia; Lacertilia) from the Late Cretaceous of Belgium: Hermann von Meyer (1860) revisited
VOLUME 78 NO 2 215	1999	78	2	215	229	Lambers, P.H.	An overview is presented of the actinopterygian fishes from the Late Jurassic (Late Kimmeridgian and Early Tithonian) 'Plattenkalke' near Solnhofen (Solnhofen lithographic limestone), Bavaria, Germany. The fish fauna is very diverse, with the palaeonisciform <i>Coccolepis</i> , halecostomes such as <i>Lepidotes</i> , <i>Heterostrophus</i> , three genera of macrosemiids and six genera of pycnodontiforms, halecomorphs including two genera of caturids, two genera of amiids, <i>Ophiopsis</i> , 'Furo', <i>Ionoscopus</i> , <i>Brachyichthys</i> , <i>Callopterus</i> , <i>Liodesmus</i> , ? <i>Lophiurus</i> , five genera of pachycormids, three genera of pholidophorids, <i>Pleuropholis</i> , two genera of aspidorhynchids and eleven genera of basal teleosts. Although several groups have been subject of revision, most of the fauna remains poorly known. Study of this rich fauna will provide a lot of information on the phylogeny and interrelationships of halecostome fishes.	The actinopterygian fish fauna of the Late Kimmeridgian and Early Tithonian 'Plattenkalke' near Solnhofen (Bavaria, Germany): state of the art
VOLUME 78 NO 2 231	1999	78	2	231	251	Vergoossen, J.M.J.	Fish microfossils were extracted from an erratic. The taxa from the rich microvertebrate fauna of late Pridolian (latest Silurian) age (<i>P. punctatus</i> Zone) are listed. A full description is given of two new <i>Gomphonchus</i> taxa, <i>G. mediocostatus</i> and <i>G. boekschoteni</i> . On the basis of old and new material, ' <i>Gomphonchus hoppei</i> ' is redescribed, interpreted as a porosiform poracanthodid, and assigned to <i>Gomphonchoporus</i> gen. nov. This interpretation necessitates redefinition of the Poracanthodidae VERGOOSSEN 1997 to include scales without a pore-canal system. The type genus, <i>Poracanthodes</i> , is redefined to include only punctatiform poracanthodids sensu Vergoossen 1997. Discovery of previously undescribed scale forms of the type species, <i>P. punctatus</i> BROTZEN 1934, results in an extended diagnosis for this biozonal index fossil. A new poracanthodid genus, <i>Radioporacanthodes</i> , is erected for the porosiform poracanthodids sensu Vergoossen 1997, with type species <i>R. porosus</i> (BROTZEN) 1934 s.s. Brief palaeontological and distributional comments on other microvertebrate taxa from the list are included, as well as a section on the biostratigraphical and correlational implications of the present and similar faunas from erratics for the East Baltic standard succession.	Late Silurian fish microfossils from an East Baltic-derived erratic from Oosterhaule, with a description of new acanthodian taxa
VOLUME 78 NO 3-4 253	1999	78	3-4	253	253	Jagt, J.W.M.; Lambers, P.H.; Mulder, E.W.A.; Schulp, A.S.		Proceedings of the Third European Workshop on Vertebrate Palaeontology (Maastricht, May 6-9, 1998): Preface

VOLUME 78 NO 3-4 255	1999	78	3-4	255	260	Bonde, N.		Colin Patterson (1933-1998): a major vertebrate palaeontologist of this century
VOLUME 78 NO 3-4 261	1999	78	3-4	261	266	Cavin, L.; Dutheil, D.B.	A new ichthyofauna from southeastern Morocco, comprising five forms, is briefly discussed. The faunal composition differs from the Early Cenomanian Kem Kem and Early Turonian Goulmima assemblages, but is close to that from Jebel Tselfat. We propose a Late Cenomanian age for the new fauna and that from Jebel Tselfat. The evolution of these fish assemblages shows the Moroccan fish faunas to have been related to those from South America until at least the Early Turonian. Central Tethyan influence on faunas seems to have been restricted to a short period of time during the beginning of the Late Cenomanian transgressive phase.	A new Cenomanian ichthyofauna from southeastern Morocco and its relationships with other early Late Cretaceous Moroccan faunas
VOLUME 78 NO 3-4 267	1999	78	3-4	267	280	Vergoossen, J.M.J.	The fauna from a Late Silurian residue sample from Övedskloster (Skåne) is listed. It comprises scales of 'Agnatha' (rare osteostracan scales, and the thelodonts <i>Thelodus parvidens</i> , ' <i>T. traquairi</i> ', <i>T. sculptilis</i> , <i>T. admirabilis</i> , and ' <i>Loganellia cuneata</i> ') and of Gnathostomata (the acanthodians <i>Nostolepis striata</i> , <i>Gomphonchus sandelensis</i> , <i>Poracanthodes? lehmani</i> sp. nov., and <i>Poracanthodes cf. punctatus</i> , tesseræ of the head and other specialized elements of the squamation; and the osteichthyan <i>Andreolepis hedei</i>). This fauna is considered to be as old as, or slightly younger than that from the complex of sedimentary rocks along the Anglo-Central Urals margin of the Laurussian continent affected by the Ludfordian A. hedei Event. This event marks the transition between the hedei and <i>sculptilis</i> Zones of the Microvertebrate Standard Zonation and can be correlated with the <i>snajdri</i> Conodont Interval Zone. The evidence favours a simultaneous palaeogeographical appearance of the punctatiform and porosiform poracanthodid acanthodians within the Baltica region of Laurussia.	Late Silurian fish microfossils from Helvetesgraven, Skåne (southern Sweden) (I).
VOLUME 78 NO 3-4 281	1999	78	3-4	281	300	Mulder, E.W.A.	Cranial and postcranial elements of the mosasaurid reptiles <i>Mosasaurus hoffmanni</i> Mantell 1829 and <i>Plioplatecarpus marshi</i> Dollo 1882 from the Maastrichtian type area, and of <i>Mosasaurus maximus</i> Cope 1869 and <i>Plioplatecarpus depressus</i> (Cope 1869) from New Jersey are compared. Views held by previous authors are discussed. It is concluded that these European and North American taxa are conspecific.	Transatlantic latest Cretaceous mosasaurs (Reptilia, Lacertilia) from the Maastrichtian type area and New Jersey

VOLUME 78 NO 3-4 301	1999	78	3-4	301	314	Grigorescu, D.; Venczel, M.; Csiki, Z.; Limborea, R.	Late Cretaceous terrestrial ecosystems in southern Europe are relatively poorly known, although much progress has been made during the past decade, principally with regard to the microvertebrate components of these ecosystems. The Maastrichtian terrestrial deposits of the Hațeg Basin, at the easternmost end of the South European archipelago and well known for reptilian fossils (e.g., turtles, crocodylians, pterosaurs and dinosaurs), have been thoroughly screened during the past five years. Important microvertebrate assemblages, both quantitatively and qualitatively speaking, were found at Pui (Sînpetru Formation), Tuștea and, particularly, Vălioara (Densuș-Ciula Formation). Several new taxa are noted here for the first time for the Hațeg Basin, including gars, discoglossids, albanerpetontids, scincomorphan and anguimorphan lizards; dromaeosaurids and multituberculates are confirmed. Most of the microvertebrate remains are poorly preserved and precise systematic assignment has proved difficult. The Hațeg fauna appears to be primitive and endemic, with a Neopangean core composition, and suggests a composite palaeobiogeographic origin for the Late Cretaceous European ecosystems, confirming conclusions reached in studies of the larger vertebrates.	New latest Cretaceous microvertebrate fossil assemblages from the Hațeg Basin (Romania)
VOLUME 78 NO 3-4 315	1999	78	3-4	315	318	Martill, D.M.; Frey, E.	The partially articulated, distal portion of a left wing finger of a pterosaur from the Crato Formation of northeast Brazil has a T-shaped cross-section to the second and third phalanges. This cross-sectional shape is one of several characters diagnostic of the pterodactyloid pterosaur family Azhdarchidae (Unwin & Lu 1997). Until now, this family of pterosaurs was known exclusively from the Late Cretaceous. The specimen described here may be the first recorded azhdarchid from the southern hemisphere and the earliest recorded member of the family.	A possible azhdarchid pterosaur from the Crato Formation (Early Cretaceous, Aptian) of northeast Brazil
VOLUME 78 NO 3-4 319	1999	78	3-4	319	333	Company, J.; Ruiz-Omeñaca, J.I.; Pereda Suberbiola, X.	Fragmentary remains, including cervical vertebrae and limb bones, of a large pterosaur from the Upper Cretaceous of Tous, province of Valencia (Spain), are described. The material was recovered from lacustrine beds in the upper part of the Calizas y Margas de Sierra Perenchiza Formation, which is probably Maastrichtian in age. Six fragments of vertebrae allow a reconstruction of the anatomy of the mid-series cervicals of the animal. The general morphology of the cervical vertebrae is closely similar to that of the long-necked Azhdarchidae. Compared to other azhdarchids, the Valencia pterosaur shows minor differences from the genera Azhdarcho and Quetzalcoatlus, and is here provisionally referred to as Azhdarchidae indet. A wingspan of about 5.5 m is calculated by comparison with other known azhdarchids. This is the second azhdarchid pterosaur described from the Iberian peninsula. It confirms the wide distribution of this group of large pterosaurs at the end of the Cretaceous.	A long-necked pterosaur (Pterodactyloidea, Azhdarchidae) from the Upper Cretaceous of Valencia, Spain

VOLUME 78 NO 3-4 335	1999	78	3-4	335	343	Jianu, C.M.; Weishampel, D.B.	<p>Franz Baron Nopcsa recognised that the Late Cretaceous titanosaurid sauropod from Transylvania, <i>Magyarosaurus dacus</i>, was much smaller than the better known sauropods from the Upper Jurassic of the United States and even from Late Cretaceous deposits elsewhere in the world. In keeping with his biogeographic interpretations, Nopcsa viewed this difference as a consequence of body-size effects via island habitation. We present a preliminary reevaluation of Nopcsa's claims and their heterochronic consequences using two approaches, viz. (1) regression analysis of humeral data as a means of establishing patterns in body size among titanosaurids, and (2) optimization of humeral data onto titanosaurid cladograms to evaluate evolutionary trends within the clade. Our regression analysis is based on twenty species distributed among fourteen genera of neosauropods and uses length and midshaft mediolateral width of the humerus of presumed fully adult forms, and of growth samples that consist of postnatal to adult individuals. Linear regression analysis suggests that, among adult neosauropods, <i>M. dacus</i> appears to be represented by the smallest individuals; that <i>M. dacus</i> humeri appear to be more similar to those of subadults than to adults of other taxa; and that this 'juvenile' morphology may constitute dwarfing in <i>M. dacus</i> by paedomorphosis. In order for these regressions to reflect their evolutionary context more fully, we also present optimisation analyses of humeral form within Titanosauroidae. Although many aspects of the phylogeny of this clade are relatively poorly resolved, preliminary results of our analyses are consistent with the conclusion that <i>M. dacus</i> was a heterochronic dwarf.</p>	The smallest of the largest: a new look at possible dwarfing in sauropod dinosaurs
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VOLUME 78 NO 3-4 345	1999	78	3-4	345	356	Casanovas, M.L.; Pereda Superbiola, X.; Santafé, J.V.; Weishampel, D.B.	New hadrosaurid material is recorded from Fontllonga (Ager syncline, province of Lleida), in the Catalanian Pyrenees, comprising a dentary with part of the dental battery recovered from Late Maastrichtian strata (Tremp Formation), close to the presumed Cretaceous/Tertiary boundary. This hadrosaurid is more derived than is <i>Telmatosaurus transylvanicus</i> from the Hațeg Basin (Romania), but lacks a number of features that diagnose the clade Hadrosaurinae plus Lambeosaurinae. It is attributed to the Euhadrosauria on the basis of the following synapomorphies: dentary teeth not recurved distally, narrow dentary crowns, and denticles not supported by subsidiary ridges. The phylogenetic relationships of the best-known iguanodontids and hadrosauroids are evaluated using mandibular and dentary tooth characters. On the basis of a cladistic analysis, the family of Hadrosauridae is diagnosed by more than 29 dentary tooth positions, parallel-sided vertical furrows formed by dentary alveoli, and absence of caudal secondary ridges. Within Hadrosauridae, successive sister-groups of Hadrosaurinae plus Lambeosaurinae are the Fontllonga taxon and <i>Telmatosaurus</i> . The clade Hadrosaurinae plus Lambeosaurinae is characterised mainly by a coronoid process inclined rostrally and by the absence of secondary ridges on dentary crowns. The Fontllonga find suggests the diversity of European hadrosaurids at the end of the Cretaceous to have been greater than previously thought. Moreover, the primitive character of European hadrosaurids as compared to western North American and Asian relatives may be explained in terms of geographical isolation during the Late Cretaceous.	A primitive euhadrosaurian dinosaur from the uppermost Cretaceous of the Ager syncline (southern Pyrenees, Catalonia)
VOLUME 78 NO 3-4 357	1999	78	3-4	357	365	Weishampel, D.B.; Mulder, E.W.A.; Dortangs, R.W.; Jagt, J.W.M.; Jianu, C.M.; Kuypers, M.M.M.; Peeters, H.H.G.; Schulp, A.S.	Isolated cranial and post-cranial remains of hadrosaurid dinosaurs have been collected from various outcrops in the type area of the Maastrichtian stage during the last few years. In the present contribution, dentary and maxillary teeth are recorded from the area for the first time. Post-cranial elements comprise a newly collected, fragmentary, large right metatarsal III and a broken ?right humerus, recently recognised in the collections of Teylers Museum (Haarlem). Unfortunately, none of these remains can be identified to species level. The available material suggests, however, that more than one taxon of non-lambeosaurine hadrosaurid and a possible euhadrosaurian are represented. Most of the new finds are stratigraphically well documented, which means that they may be linked to the recently published sequence-stratigraphic interpretation of the type Maastrichtian. Dinosaur remains recorded previously from the Maastrichtian type area are tabulated.	Dinosaur remains from the type Maastrichtian: an update

VOLUME 78 NO 3-4 367	1999	78	3-4	367	373	Naish, D.	A robust, partial right tibia of a theropod dinosaur (Natural History Museum London collections, BMNH R9385) is described for the first time. The specimen was collected at Hastings, Sussex (England) in the last century, and is among the oldest known of English Wealden Group theropods. It represents a tetanuran theropod that may have been about 3 m in total length, and is distinct from all currently known Wealden theropods for which tibiae have been described. The present specimen is significant palaeobiologically in exhibiting a series of theropod tooth marks on its caudal surface, indicating predation or scavenging by another theropod.	Theropod dinosaur diversity and palaeobiology in the Wealden Group (Early Cretaceous) of England: evidence from a previously undescribed tibia
VOLUME 78 NO 3-4 375	1999	78	3-4	375	381	Vedding Kristoffersen, A.	An incomplete sternum and imprints of a right part pelvis and an associated left femur from the uppermost Palaeocene/lowermost Eocene (Fur Formation) of Denmark are assigned to the extinct palaeognath bird order Lithornithiformes Houde 1988, and to the single described family thereof, the Lithornithidae. Morphological features indicate that both individuals were adult birds, smaller than <i>Lithornis cf. nasi</i> , which is represented by an incomplete humerus from the largely contemporaneous, marine Olst Formation in Denmark, and corresponding in size to the smallest known lithornithid, <i>Lithornis hookeri</i> . Lithornithiformes, common in the Palaeocene and Eocene of North America and Europe, were terrestrial birds capable of flight whose remains are often found in aquatic sediments. Both the depositional environment in which the Danish lithornithids were found, and the associated faunal components suggest that the birds were not transported by rivers. Some of the lithornithid species inhabiting NW Europe may have lived and foraged along the shores of the North Sea Basin.	Lithornithid birds (Aves, Palaeognathae) from the Lower Palaeogene of Denmark
VOLUME 78 NO 3-4 383	1999	78	3-4	383	394	Raufuss, I.; Koeningswald, W. von	All remains of Pleistocene muskoxen from central and western Europe are attributable to a single species, <i>Ovibos moschatus</i> . Its occurrence was restricted mainly to the area north of the Pyrenees and Alps, covering lowlands and mountain areas up to 1600 m. In the Middle Pleistocene, <i>Ovibos</i> occurred in a cold phase, well before the Elsterian, and again during the Saalian and Weichselian. In the Late Pleistocene, <i>Ovibos</i> co-occurred with other faunal elements indicative of severe continental climatic conditions during the early and late Weichselian. During the middle Weichselian, the genus seems to have retreated. A list of European localities that have yielded <i>Ovibos moschatus</i> , inclusive of geographical references, is provided.	New remains of Pleistocene <i>Ovibos moschatus</i> from Germany and its geographic and stratigraphic occurrence in Europe
VOLUME 79 NO 1 1	2000	79	1	1	2	Smit, J.; Wong, T.E.; Kasse, C.; Loon, A.J. van		A new phase in the journal's history

VOLUME 79_NO 1 3	2000	79	1	3	16	Beets, D.J.; Spek, A.J.F. van der	<p>Flooding of the southern part of the North Sea occurred between 9000 and 8000 BP when the rate of relative sea-level rise was on the order of 0.7 cm per year for the Dover Strait Region and 1.6 cm per year for the area north of the Frisian Islands, forcing the shoreline to recede rapidly. When relative sea-level rise decelerated after 7000 BP for the Belgian coast and 6000 BP for the central Netherlands coast, sediment supply by the tidal currents balanced the creation of accommodation space in the estuaries and other back-barrier basins. Consequently, the barrier started to stabilize, and the tidal basins and their inlets silted up. Between 5500 and 4500 BP the Belgian coastal plain changed into a freshwater marsh with peat accumulation, and the same happened 500-1000 years later in the western provinces of the Netherlands. The E-W running barrier/back-barrier system of the Frisian Islands in the northern Netherlands stayed open until today, however, because of lower sediment supply. The period between 4000 and 2000 BP was relatively quiet due to the strong deceleration of the rate of sea-level rise; peat cushions developed behind the barriers, which were straightened by erosion of the headlands. Major and often catastrophic flooding occurred in the Middle Ages, when the estuaries in the southwestern part of the Netherlands formed. About $226 (\pm 15\%) \times 10^9 \text{ m}^3$ sediment, mostly sand, is stored in the barriers and back-barrier basins of the Netherlands, 70% of which was deposited prior to 5000 BP. About 10% of the stored sediment is estimated to be of alluvial origin. Most of the sediment is derived by the erosion of the Pleistocene basement during recession of the barriers, but tide-induced cross-shore transport from the North Sea forms an</p>	The Holocene evolution of the barrier and the Back-barrier basins of Belgium and the Netherlands as a function of late Weichselian morphology, relative sea-level rise and sediment supply
VOLUME 79_NO 1 17	2000	79	1	17	27	Geluk, M.C.	<p>The Late Permian Zechstein carbonates in the Southern Permian Basin were deposited under marine conditions. The carbonates form part of a largely progradational infill, with a gradual northward facies shift. The paleogeography of the Zechstein carbonate deposits has been reviewed recently on the base of well data, cores and publications. This has resulted in three updated maps of the carbonate units. These maps reflect the increase in knowledge of the palaeogeography of the Zechstein as a result of several decades of subsurface exploration. It is found that deposition of the carbonates was controlled by various factors, i.e., rifting during deposition of the basal Zechstein, sea-level fluctuations and basin subsidence. This resulted in an overall E-W orientated facies distribution in the Zechstein carbonates, and in the gradual northward shift of the various facies belts in time. Reefs in the Z1 Carbonate Member and off-platform highs and turbidites in the Z2 Carbonate Member have been identified as potential future exploration targets.</p>	Late Permian (Zechstein) carbonate-facies maps, the Netherlands

VOLUME 79_NO 1 29	2000	79	1	29	44	Balen, R.T. van; Bergen, F. van; Leeuw, C. de; Pagnier, H.; Simmelink, H.; Wees, J.D. van; Verweij, J.M.	<p>The hydrocarbon systems of the Mesozoic, inverted West Netherlands Basin have been analyzed using 2-D forward modelling. Three source rocks are considered in the modelling: Lower Jurassic oil-prone shales, Westphalian gas-prone coal deposits, and Lower Namurian oil-prone shales. The Lower Namurian hydrocarbon system of the basin is discussed for the first time. According to the modelling results of the Early Jurassic oil system, the oil accumulations were filled just after the main inversion event. Their predicted locations are in agreement with exploration results. Modelling results of the Westphalian gas system, however, show smaller and larger sized accumulations at unexplored locations. The gas reservoirs were filled during the Late Jurassic-Early Cretaceous rifting phase. Results of modelling of the Lower Namurian oil system indicate that gas formed by secondary cracking of the oils can have mixed with the Westphalian coal-derived gas. Such a mixing is inferred from geochemical analyses. The existence of a Lower Namurian hydrocarbon system in the West Netherlands Basin implies that hydrocarbons are possibly trapped in the Westphalian and Namurian successions. These potential traps in the basin have not yet been explored.</p>	Modelling the hydrocarbon generation and migration in the West Netherlands Basin, the Netherlands
VOLUME 79_NO 1 45	2000	79	1	45	57	Gauthier, B.D.M.; Franssen, R.C.W.M.; Drei, S.	<p>Fracture systems of Rotliegend gas fields in and at the margins of the northern Broad Fourteens Basin in the Dutch offshore are described in terms of orientation, frequency, origin and type, and in relation to larger-scale structures. First, fracture data collected from core and image logs have been corrected to account for the bias related to the I-D sampling. Second, these results were integrated with data on fracture cements and diagenesis in order to assess the timing of the fracture network development. On the basis of their regional extent three phases of fracturing and four orientation trends can be distinguished in the basin: (1) at Triassic times and related to early diagenesis and burial, NW-SE to NNW-SSE and NE-SW to ESE-WNW particulate shear fractures developed; (2) during the Mid-Kimmerian and related to the main burial stage, shear-related and dilational-shear-fault-related fracturing occurred parallel with larger-scale faults; (3) during the Cretaceous and related to uplift, NW-SE and NE-SW joints propagated; a regional joint system developed outside the Jurassic rift basin, preferentially oriented E-W to ESE-WNW; these joints have not been dated accurately. The fault-related shear fractures tend to compartmentalise the reservoirs, whereas the regional joints tend to enhance reservoir flow properties. These fracture systems are thought to play a negative or positive role, respectively, but only in fields with poor reservoir quality. Consequently, in such cases small-scale fractures should be taken into account in held development planning.</p>	Fracture networks in Rotliegend gas reservoirs of the Dutch offshore: implications for reservoir behaviour

VOLUME 79_NO 1_59	2000	79	1	59	71	Loef, J.J. van	<p>The chemical and mineralogical composition of rattlestones found near the main Dutch rivers has been studied by Mössbauer spectroscopy, INAA and XRD. Rattlestones are concretions of iron, formed in an environment of lateral iron accumulation, under the influence of periodical oxidation, around a fine core of ferruginous sediments, mainly clay and sand. The core has shrunk and detached itself from the mantle around it. ⁵⁷Fe Mössbauer spectroscopy was applied to identify the iron oxides, among which goethite is predominant. The goethite crystallinity was investigated by measuring its magnetic properties and its crystallinity which is poorest at the outer side of the stone. The latter is confirmed by the broadening of the different X-ray reflections. In addition, illite and vermiculite were identified by XRD; these clay minerals were found mainly in the core. The elemental composition was determined by INAA. The iron content in the mantle is about 50% by weight and gradually decreases outwards, while the core contains 2-15% Fe by weight. Differences between rattlestones from the Middle Pleistocene East of the Meuse river and those from the Late Pleistocene North of it are the absence of lepidocrocite and a richer mineralogy in the former. It is concluded that the rattlestones are formed around a fine clayey core. Groundwater supplied the iron and other (trace) elements for the genesis. It is unlikely that rattlestones are the result of oxidation of siderite.</p>	<p>Composition and genesis of rattlestones from Dutch soils as shown by Mössbauer spectroscopy, INAA and XRD</p>
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VOLUME 79_NO 1 73	2000	79	1	73	80	Hinzen, K.G.; Pietsch, S.	<p>Discrimination between quarry blasts and earthquakes has gained importance due to signature of the Comprehensive Test Ban Treaty. In this context, large chemical explosions are significant. In the routine analysis of data from local seismograph networks, discrimination between smaller blasts and micro-earthquakes is not always clear. Many quarries are in operation and blasts far outnumber natural earthquakes in the highly industrialized northern Rhine area. We compiled a list of active quarries in the Northern Rhine Area and mapped their locations. We then created a database from a questionnaire sent out to all quarries on the list. From the 33% of questionnaires that were returned, we discerned some representative values for the main blasting parameters and explosive consumption. In the study area of 72,000 km², approx. 21,000 blasts are fired per year (80 per working day). Most of the blasts (72%) have total explosive charges between 400 and 4500 kg. Shots with charges above 10 tons are rare (20-30 per year). Some 80% of the blasts are ripple-fired with a nominal firing time interval of 20 ms. Based on empirical amplitude vs. distance curves from vibration control measurements, a relation between maximum charge weight per delay time, L (kg), and a 'quarry blast' magnitude, M_{QB}, is derived: $M_{QB} = 0.6 \cdot \log_{10}(L) + 0.131$. Using this relation and extrapolating the database from the questionnaire shows that for magnitudes between 1 and 2, blasts occur 200-250 times more frequently than micro-earthquakes in the Northern Rhine area.</p>	A seismological motivated survey of blasting activity in the northern Rhine area
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VOLUME 79_NO 1 81	2000	79	1	81	91	Nieuwland, D.A.; Leutscherm, J.H.; Gast, J.	<p>Thrust tectonics are dealt with on the basis of primarily experiments focusing on the dynamics of a developing thrust belt and on understanding and predicting normal-sequence and out-of-sequence thrusting. Field examples are presented in addition to the examples of sandbox-model experiments. The results have improved the insight into thrust-belt-forming mechanisms; the validity of the conclusions is supported by natural examples. The experimental program was aimed at examining the effect of changes in a selection of key parameters in thrust tectonics on the geometry and the successive phases in the development of thrust sheets. Sandbox experiments were used to analyse the effects of basal friction, detachment lithology, basement relief and syntectonic sedimentation. Multilayer experiments were performed to simulate the effects of ductile detachment lithologies. It was found that a thrust belt's cross-sectional geometry is formed in a dynamic process during which the wedge may develop from subcritical through critical to supercritical and back to critical again. The process is illustrated with sandbox experiments, analyzed by time-lapse computed tomography scans and in-situ stress measurements. On the basis of the sandboxmodel results and the natural examples, we conclude that a critical examination of the boundary conditions of a fold-and thrust belt and of changes in these conditions during the deformation process enables predictions about the geometry and kinematics of the thrust belt.</p>	<p>Wedge equilibrium in fold-and-thrust belts: prediction of out-of-sequence thrusting based on sandbox experiments and natural examples</p>
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VOLUME 79 NO 1 93	2000	79	1	93	107	Zieliński, T.; Loon, A.J. van	A general model is presented for the small type of fans (not to be confused with sandurs) that develop subaerially in the zone immediately before an ice front. These fans have in common with other fans that a proximal, a middle and a distal subenvironment - with distinctly different sedimentary facies - can be distinguished. The characteristics of these fans differ in several respects, however, from those formed under other conditions, particularly by the high proportion of mass-flow deposits in the proximal part, by the relative scarcity of fine particles in the middle fan, and by the relatively uniform character of the sediments in the distal fan. The special character of this type of fan is ascribed to the interaction of a continuously changing distance between the ice front and the fan (as a result of alternating phases of ice advance and ice retreat), its position that may be surrounded by ice for a large part, and the irregular supply of debris-laden meltwater that comes sometimes even in the form of more or less catastrophic floods. Due to the fact that terminoglacial fans have a good preservation potential only during phases of ice retreat, these fans tend to show a slight fining-upward tendency. The slope of terminoglacial fans tends to be more gentle (rarely over 2-5°) than that of fans formed under different conditions.	Subaerial terminoglacial fans III: overview of sedimentary characteristics and depositional model
VOLUME 79 NO 1 109	2000	79	1	109	121	Linthout, K.; Troelstra, S.R.; Kuijpers, A.	The provenance of coarse-grained ice-rafted detritus has been studied, based on material collected from the SE Greenland margin. The sediment was sampled by a 1.5 m ³ video-grab from 1256 m water depth. The fraction > 1 cm was macroscopically investigated and a thin-section analysis was made. The results clearly show that East Greenland north of the Denmark Strait is the source region of the material sampled. The main provenance is from areas adjoining Kangerdlugssuaq Fjord, Blosseville Kyst, Scoresby Sund, Kong Oskar Fjord, and Kejser Franz Joseph Fjord. It can thus be demonstrated that significant ice-stream activity and iceberg calving occurred there. Present-day iceberg production is mainly concentrated to the Scoresby Sund, but the other areas apparently represent locations of larger ice-stream activity during periods prior to the Holocene. More generally, it can be concluded that southerly surface-water flow similar to the present East Greenland Current must also have occurred prior to the Holocene. Although either North America (Canada) or Scandinavia - or both - are generally referred to as important regions for the provenance of ice-rafted detritus, we conclude that (East) Greenland may have been an important source for (late) glacial North Atlantic ice-rafted detritus production as well	Provenance of coarse ice-rafted detritus near the SE Greenland margin
VOLUME 79 NO 4 371	2000	79	4	371	372	Gaans, P.F.M. van; Vriend, S.P.		Geochemical mapping in the Kingdom of the Netherlands: Introduction

VOLUME 79 NO 4 373	2000	79	4	373	380	Huisman, D.J.; Weijers, J.P.; Dijkshoorn, L.; Veldkamp, A.	We investigated the spatial variability of the heavy-mineral composition in the Early Pleistocene fluvial Kedichem Formation in the Netherlands in order to meet the demand for more information about subsurface sediment composition. We first determined the spatial extension and thickness of the sediment body, then used Fuzzy clustering techniques on a database containing approx. 2000 heavy-mineral counts from the Kedichem Formation to map the spatial extension of the various sediment provenances within the formation. Three clusters could be discerned, one representing a combined Meuse-Scheldt source, the other two representing a mixed Rhine-Baltic source. We made slice maps at several depths through the formation, and plotted the cluster memberships. The maps show an overall dominance of the Meuse-Scheldt source in the south of the Netherlands, whereas the Rhine-Baltic source occurs mainly in the central Netherlands. The methods employed show that it is possible to map and study the 3-D variation in heavy-mineral composition and hence sediment provenance in the Dutch subsurface with the use of simple statistical and visualization techniques.	Spatial prediction of the variability of Early Pleistocene subsurface sediments in the Netherlands - Part 1: Heavy minerals
VOLUME 79 NO 4 381	2000	79	4	381	390	Huisman, D.J.; Weijers, J.P.; Dijkshoorn, L.; Veldkamp, A.	We started a geochemical mapping campaign in the Early Pleistocene fluvial Kedichem Formation in the Netherlands in order to meet the demand for more information about subsurface sediment compositions. Geochemical data were collected during a sampling campaign, and about 600 samples from the Kedichem Formation were analyzed. By linking the geochemical data with lithological classifications from the TNO-NITG borehole database, we established a geochemical prediction model. Elements were divided into classes according to their geochemical behaviour in relation to lithological parameters. For each of the classes, we combined lithological groups in to groups with relevant geochemical differences. By calculating for each element the average composition in each of these groups, we were able to predict the geochemical composition of subsurface sediments by 'translating' the spatial lithological data from the TNO-NITG borehole database into geochemical data. We visualized this model by calculating and interpolating the average composition of horizontal slices of the Kedichem Formation. The model performance is fairly good, although it has a tendency to underestimate extreme values.	Spatial prediction of the variability of Early Pleistocene subsurface sediments in the Netherlands - Part 2: Geochemistry

VOLUME 79_NO 4_391	2000	79	4	391	409	Tebbens, L.A.; Veldkamp, A.; Kroonenberg, S.B.	<p>Unambiguously pristine and largely unpolluted sediments from the Late Weichselian and Holocene infillings of the Meuse residual channels in northern Limburg (the Netherlands) have been sampled to determine the natural compositional variation of the river's suspended load. Bulk geochemical and granulometric analyses demonstrate that about 70% of the variation can be ascribed to hydrodynamic mineral sorting. Clay- and fine silt-sized phyllosilicates are the most important deterministic features, hosting the bulk of Al_2O_3, TiO_2, K_2O, MgO and trace element variability (notably Ba, Cr, Ga, Rb and V). Quartz is abundant in the fine and coarse sand fractions. Na_2O and the Zr-Nb-Nd-Y quartet relate to albitic feldspars and heavy minerals, respectively, in the coarse silt fraction. The granulometry should therefore be quantified if geochemical baseline data for a particular geological unit or region are drawn up and for the evaluation of potentially polluted sediments. Although provenance has not changed, the composition of Meuse sediments cannot be considered constant over a time frame of 1000-10,000 years, due to climatic change. Weathering of phyllosilicates in both interstadial and interglacial soil environments and changing relative source-area contributions alter the detrital clay-mineral supply to raise the Al_2O_3, and lower the K_2O and MgO contents in holocene Meuse sediments. Early diagenetic siderite and vivianite formation in gyttjas causes relative accumulations of Fe_2O_3, MnO, P_2O_5, Co, Ni and notably Zn above the phyllosilicate background values. These accumulations are natural and show that sediments with elevated trace metal contents are not necessarily polluted. Very early atmospheric pollution in relation to ore mining and smelting</p>	<p>Natural compositional variation of the river Meuse (Maas) suspended load: a 13 ka bulk geochemical record from the upper Kreftenheye and Betuwe Formations in Northern Limburg</p>
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VOLUME 79_NO 4 411	2000	79	4	411	428	Middelkoop, H.	<p>The embanked floodplains of the lower Rhine river in the Netherlands contain large amounts of heavy metals, which is a result of many years of deposition of contaminated overbank sediments. The metal pollution varies greatly between the various floodplain sections as well as in vertical direction within the floodplain soil profiles. The present contribution describes the key processes producing the spatial variability of the metal pollution in floodplain soils: (1) spatial patterns of the concentrations and deposition of Cd, Cu, Pb and Zn during a single flood, which have been determined from samples collected after a high-magnitude flood event; (2) the pollution trends of the lower Rhine over the past 150 years, which were reconstructed on the basis of metal concentrations in sediments from small ponds within the floodplain area. During the flood the largest metal depositions (0.03 g/m^2 Cd, 0.7 g/m^2 Cu, 1.1 g/m^2 Pb and 5.0 g/m^2 Zn for the Rhine) occurred along the natural levees, decreasing to about one third of these values at larger distance from the river. Deposition of heavy metals occurred since the end of the nineteenth century. Periods of maximum pollution occurred in the 1930s and 1960s, when Cu, Pb and Zn concentrations were about 6-10 times as high as background values. The resulting metal distribution in the floodplain soil profiles is illustrated by means of typical examples. Maximum metal concentrations in floodplain soils vary from 30 to 130 mg/kg for Cu, from 70 to 490 mg/kg for Pb, and from 170 to 1450 mg/kg for Zn. The lowest metal pollution is found in the distal parts of floodplain sections with low flooding frequencies, where average sedimentation rates have been less than about 5 mm/a. The largest</p>	Heavy-metal pollution of the river Rhine and Meuse floodplains in the Netherlands
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VOLUME 79 NO 4 429	2000	79	4	429	440	Busink, E.R.V.; Postma, S.	<p>Since 1991, several provinces in the Netherlands have put much effort in establishing soil-quality monitoring networks. The purpose of these networks is to provide insight in the trends in (geochemical) soil quality, on which new policies for environmental protection can be based, such as restrictions in certain landuse types and cleaner production processes. The soil quality networks are yet too young to serve this goal. Monitoring efforts are concentrated on micro- and macro-elements, particularly in the top layer of the soil (mainly heavy metals and PAH) as well as phreatic groundwater (mainly nitrates and phosphates) in the various regions of a province. The regional soil-quality monitoring networks focus explicitly on diffuse environmental pollution in the rural areas, which means that sample sites influenced by soil pollution caused by local sources are excluded. Regional differences in soil quality in the rural areas are primarily caused by chemical and physical differences in the natural soil composition and by differences in deposition loads (direct and indirect). Hydrological conditions can also exert a large influence, particularly for nitrate leaching. This leads to three major criteria which the network design is based upon: (1) soil type, (2) landuse (assumed to be representative for deposition), and (3) groundwater tables. Subregions are formed by combining these criteria. Subregions are considered to be more or less homogeneous at a regional scale with respect to the criteria named. Within each region, a pre-calculated number of sites, based on variability of present concentrations, have been sampled and the sample material has been analyzed. Descriptive statistical parameters could thus be computed; they are the base for the geochemical soil mapping of the</p>	Provincial soil-quality monitoring networks in the Netherlands as an instrument for environmental protection
VOLUME 79 NO 4 441	2000	79	4	441	447	Brus, D.J.; Jansen, M.J.W.; Haan, W.F. de	<p>A method for designing efficient sampling schemes for reconnaissance surveys of contaminated bed sediments in water courses is presented. The method can be used in networks of water courses, for instance to estimate the total volume of bed sediment of a defined quality class. The water courses must be digitised as arcs in a Geographical Information System. The method comprises six steps: (1) stratifying the water courses; (2) choosing a variogram; (3) calculating the parameters of the variance model; (4) choosing a compositing scheme; (5) choosing the values for the cost-model parameters; and (6) optimizing the sampling scheme. The method is demonstrated with a survey of the main water courses in the reclaimed areas of Oostelijk Flevoland and Zuidelijk Flevoland.</p>	Designing efficient sampling schemes for reconnaissance surveys of contaminated bed sediments in water courses

VOLUME 79 NO 4 449	2000	79	4	449	457	Lienen, F. van; Frapporti, G.; Stein, A.	A soil-quality map is at present an important tool to integrate laws on soil quality with regional infrastructural works. Basic data are commonly available, but soil quality is an indicator that has to be derived from these data, including site-specific environmental standards. We propose three geostatistics-based methods for the comparison of interpolated contaminant concentrations and standards. The study is illustrated by data from a part of the Betuwe railroad transect, which extends over 12 km in the western Netherlands. As it turns out, a useful procedure is to combine interpolated contaminant concentrations with interpolated threshold values.	Construction of maps for soil recycling in regional infrastructural works integrating soil-quality laws
VOLUME 79 NO 4 459	2000	79	4	459	466	Sambeek, M.H.G. van; Eggenkamp, H.G.M.; Vissers, M.J.M.	Groundwater resources on the Caribbean Islands of Aruba, Bonaire and Curaçao are limited and of poor quality. The groundwater of the islands is brackish, due to both seawater mixing and the semi-arid climate of the islands. Two hundred and thirty water samples were collected to relate chemical variations in the groundwater of the three islands to the underlying differences in geology, and to define the natural versus anthropogenic influences. Both the chemical and isotopic ($\delta^{18}\text{O}$, δD , and $\delta^{37}\text{Cl}$) compositions of samples were determined. Several geochemical processes are recognised in the chemistry of the groundwater samples. The most important processes are calcite dissolution, cation exchange, silicate weathering and potassium fixation. In (sub)urban areas anthropogenic influences affect the groundwater quality: high nitrate concentrations were measured. Infiltrating domestic and agricultural (waste)water replenishes the aquifer, and has a desalinization effect on the groundwater quality. This phenomenon is primarily seen on Curaçao, the most populated island. Oxygen and hydrogen isotopic compositions of groundwaters from Curaçao and Bonaire show that the samples are either meteoric water, or are affected by evaporation or seawater mixing. No distinction could be made between the last two processes. Only a few samples were measured for the Cl-isotope composition; all showed that no physical processes have taken place.	The groundwater quality of Aruba, Bonaire and Curaçao: a hydrochemical study

VOLUME 79 NO 4 467	2000	79	4	467	477	Oever, F. van den	A stream-sediment survey was carried out for the island of Aruba. Concentrations in stream sediments represent the abundance of chemical elements in the drainage basins. A geochemical atlas was created from the collected data and natural background values were established. Cluster analysis and pattern recognition techniques were used to gain a better understanding of the data set. Two cluster models were selected to study the various geochemical controls on the sediments and to establish a spatial basis of environmental-quality settings for the development of future environmental policies. The first cluster model was suitable to recognize in some detail the reflection of the geology on the geochemistry of the stream sediments. The second, coarser cluster model stressed the importance to distinguish between the two main lithological units of the island when instituting natural background values. Not one uniform value per element is valid, but the value depends on the lithology.	Aruba - a geochemical baseline study
VOLUME 79 NO 4 479	2000	79	4	479	494	Vries, A.J. de	A geochemical soil survey was carried out on the island of Curaçao in October 1992 as part of an overall geochemical characterization of the three Leeward islands of the Netherlands Antilles. The aim of this soil survey was to provide systematic geochemical data of the rural soils of Curaçao for characterisation, geochemical mapping and environmental application. A total of 122 samples was collected from the topsoils (upper 0.1 m) within a rectangular grid (2 km ²). All samples were sieved to a grain size of < 2 mm and analysed for 24 elements by ICP-AES, after decomposition with hot aqua regia. A small, selected set of soil samples was subjected to a more extensive study of soil properties. It appears from statistical data interpretation of the chemical compositions with techniques like non-linear mapping and cluster analysis that the topsoils of Curaçao can be divided into six homogeneous groups (soil types) with contrasting chemical signatures. Labelled according to their dominant geology soil process or most striking characteristic, these soil types are defined as follows: sandy limestone soil type, Midden Curaçao soil type, arid/calcareous soil type, basal West soil type, agriculture-influenced soil type, and the basalt East soil type. Geochemical contour maps were made that provide a basis for environmental issues on the island. Finally, background levels (baseline data) were derived from the chemical soil composition of several elements, taking into consideration the correlation with the Fe or Al content of these soils. The defined baselines can be used to establish background values for future soil surveys.	The semi-arid environment of Curaçao: a geochemical soil survey

VOLUME 79 NO 4 497	2000	79	4	497	509	Hoek, W.Z.	The Late Glacial landscape of the Netherlands was a landscape with changing geomorphology and vegetation. Glacial, eolian and fluvial processes in the time before the Late Glacial initially had formed the main landscape types that still existed during the Late Glacial. In these landscape types, geomorphological processes persisted, particularly during intervals when the vegetation cover was discontinuous. Vegetation development initiated soil formation and stabilised the substratum. On the other hand, the abiotic landscape influenced vegetation development, and particularly vegetation patterns. The Late Glacial vegetation patterns, changing in time, have been reconstructed on the basis of a palynological database containing the data from over 250 pollen diagrams from the Netherlands. Patterns of vegetation and abiotic landscape appear to compare to each other in many instances, indicating the close interrelationship between vegetation and the abiotic landscape.	Abiotic landscape and vegetation patterns in the Netherlands during the Weichselian Late Glacial
VOLUME 79 NO 2-3 129	2000	79	2-3	129	133	Kolfschoten, T. van; Gibbard, P.L.		The Eemian - local sequences, global perspectives: introduction
VOLUME 79 NO 2-3 135	2000	79	2-3	135	145	Bosch, J.H.A.; Cleveringa, P.; Meijer, T.	A historical outline of the Eemian research in the Netherlands is presented as an introduction to recent research in the type area. At the end of the 19th and during the first part of the 20th century, Eemian sediments were recognized because of the presence of lusitanian and mediterranean mollusc species. From 1930 onwards, pollen analysis made it possible to identify also non-shell-bearing deposits and to equate them with the Eemian. At the same time this technique proved a valuable tool for understanding the vegetation development during this interglacial. Pollen zonation offered a unique possibility for the correlation of terrestrial sequences in North-West Europe. The type area of the Eemian, near Amersfoort, was described by Harting in 1874 and was comprehensively restudied by Zagwijn (1961). A pollen zonation was introduced as a standard for the Netherlands, allowing the correlation of pollen records from both marine and non-marine depositional environments. This enabled a more detailed temporal resolution, resulting in a better understanding of the distribution of the various environments in the type area. In the northern and central parts of the Netherlands, the identification of the marine sequence was, apart from the occurrence of the specific mollusc fauna, facilitated by the presence of a till of Saalian age underlying the Eemian deposits. The presence of deep glacial basins in these areas enabled the deposition and preservation of a complete Eemian record in a marine setting. Sediment accumulation in the basins began immediately following deglaciation at the end of the Saalian. The Eemian type sections at Amersfoort are situated near the margin of one of these basins. Recent research of the Eemian focused on the	The Eemian stage in the Netherlands: history, character and new research

VOLUME 79_NO 2-3_147	2000	79	2-3	147	160	Gans, W. de; Beets, D.J.; Centineo, M.C.	<p>During its maximum extension, the Saalian ice cap reached into the central Netherlands, where glacier tongues excavated over 100 m deep basins in the unconsolidated Middle and Early Pleistocene sediments. The basins are filled by relatively thick successions of Late Saalian, Eemian and Weichselian sediments. The fill of the Amsterdam glacial basin is among the best known and studied in the Netherlands. The Late Saalian sediments consist mainly of varves and ill-bedded clays and silts with, along its southern margin, influxes of sands from the surrounding ice-pushed ridges. During deposition of these sediments, the Amsterdam basin formed part of a large lake extending into the present North Sea. Draining of this lake at the end of the Late Saalian left small, shallow pools at the site of the glacial basins. Late Saalian and Eemian sediments are probably separated by a short break, although sedimentation may have been continuous in the deepest part of the basin. The Eemian deposits consist in main lines of a thin, diatom-rich sapropel at the base, overlain by an up to 30 m thick clay-rich sequence covered by a wedge of sand that measures more than 20 m in the northern part of the basin and that tapers out southwards. As appears from the fauna, most of the clays were deposited in a lagoonal setting shielded behind a threshold and/or barrier. The rate of sediment supply was low so that lagoonal conditions were maintained over a long timespan. Sands derived from the surrounding ice-pushed ridges and transported by longshore drift and tidal currents formed a spit at the northern margin of the basin, which moved southward after eustatic sea-level rise stabilized and the lagoon was filled by clay. Loading of this clay-rich sequence by the spit and its washover</p>	Late Saalian and Eemian deposits in the Amsterdam glacial basin
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VOLUME 79_NO 2-3_161	2000	79	2-3	161	196	Leeuwen, R.J.W. van; Beets, D.J.; Bosch, J.H.A.; Burger, A.W.; Cleveringa, P.; Harten, D. van; Hengreen, G.F.W.; Kruk, R.W.; Langereis, C.G.; Meijer, T.; Pouwer, R.; Wolf, H. de	<p>The Amsterdam glacial basin was a major sedimentary sink from late Saalian until late Eemian (<i>Picea</i> zone, E6) times. The basin's exemplary record makes it a potential reference area for the last interglacial stage. The cored Amsterdam-Terminal borehole was drilled in 1997 to provide a record throughout the Eemian interglacial. Integrated facies analysis has resulted in a detailed reconstruction of the sedimentary history. After the Saalian ice mass had disappeared from the area, a large, deep lake had come into being, fed by the Rhine river. At the end of the glacial, the lake became smaller because it was cut off from the river-water supply and eventually only a number of shallow pools remained in the Amsterdam basin. During the early Eemian (<i>Betula</i> zone, E1), a seepage lake existed at the site. The lake deepened under the influence of a steadily rising sea level and finally evolved into a silled lagoon (late <i>Quercus</i> zone, E3). Initially, the lagoon water had fairly stable stratification, but as the sea level continued to rise the sill lost its significance, the lagoon becoming well mixed by the middle of the <i>Corylus/Taxus</i> zone (E4b). The phase of free exchange with the open sea ended in the early <i>Carpinus</i> zone (E5), when barriers developed in the sill area causing the lagoon to become stratified again. During the Late Eemian (late E5), a more dynamic system developed. The sandy barriers that had obstructed exchange with the open sea were no longer effective, and a tidally-influenced coastal lagoon formed. The Eemian sedimentary history shown in the Amsterdam-Terminal borehole is intimately connected with the sea-level history. Because the site includes both a high-resolution pollen signal and a record of sea-level change, it has potential for correlation on various scales.</p>	Stratigraphy and integrated facies analysis of the Saalian and Eemian sediments in the Amsterdam-Terminal boderhole, the Netherlands
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VOLUME 79_NO 2-3_197	2000	79	2-3	197	216	Cleveringa, P.; Meijer, T.; Leeuwen, R.J.W. van; Wolf, H. de; Pouwer, R.; Lissenberg, T.; Burger, A.W.	In order to obtain a better understanding of the infilling of the Saalian glacial basins during the Eemian, particularly following the recent research in the Amsterdam Basin (Terminal borehole), it was necessary to re-investigate the type locality of the Eemian at Amersfoort. Both published and unpublished data from various biota (diatoms, foraminifers, molluscs, ostracods, pollen) provide new information on the changing sedimentary environments during the Eemian. Although the organic and clastic sediments of the infilling represent nearly all the pollen zones, the sedimentary sequence at Amersfoort is discontinuous: four breaks at least are recognised at the type locality. The successive sedimentary environments and the breaks in the record are linked with the transgression of the Eemian sea, the topographic position at the margin of an ice-pushed ridge, and the changes in hydrodynamic conditions. Local conditions, such as a sandy sea bed, shallow water and a reduced water exchange near the North Sea margin, influenced the salinity of the basin. Rib counts of <i>Cerastoderma edule</i> shells indicate a higher salinity at the end of the <i>Taxus</i> (E4b) and the beginning of the <i>Carpinus</i> (E5) zones than that present in the modern North Sea. Local conditions were responsible for the higher salinity following the climate optimum. During the <i>Abies</i> phase (the later part of regional pollen zone E5), the sea level had already fallen. The change from eutrophic peat growth (with <i>Alnus</i> and <i>Salix</i>) to an oligotrophic <i>Ericaceae/sphagnum</i> community at the end of the Eemian resulted from the change from a marine to a fresh-water environment, probably coherent with a deterioration of the climate.	The Eemian stratotype locality at Amersfoort in the central Netherlands: a re-evaluation of old and new data
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VOLUME 79_NO 2-3 217	2000	79	2-3	217	231	Turner, C.	Many small deposits of Eemian age, including the stratotype, are found right across the North European plain. In adjacent areas, this interglacial is known by local names such as Ipswichian (Britain), Luhe or Ribains (France), Riss-Würm interglacial (Alps) and Mikulinian (Poland and Russia). It correlates primarily with MIS 5e of the deep-sea stratigraphy, though boundaries may not be exactly the same. Basins containing Eemian sediments rest directly on morainic deposits of all three Saalian ice advances, which must all, therefore, fall within MIS 6. Indicator species of both plants and animals suggest that mean July temperatures in the early-temperate part of the interglacial were warmer than during the Holocene. For many years, palynologists have recognised a very uniform succession of temperate tree acme pollen zones and a substantial late-temperate expansion of <i>Carpinus</i> as hallmarks of this interglacial across much of northern Europe. In southern England, however, deposits with a similar pollen signature are being recognised on stratigraphic and palaeontological grounds as characterising not only the Ipswichian but also the previously poorly-defined interglacial stage correlating with MIS 7. High <i>Carpinus</i> values are known from these latter sites and from the Le Bouchet interglacial of the French Massif Central, also clearly correlated with MIS 7. Thus stratigraphic confusion and misinterpretations may have occurred at supposedly Eemian/Ipswichian sites unrelated to the glacial stratigraphy or to deep continuous records. The uniformity and rapid development of Eemian vegetational successions may be ascribed to (1) rapid warming and the lack of any late-glacial climatic oscillation on the scale of the Younger Dryas, (2) the development of an open marine	The Eemian interglacial in the North European plain and adjacent areas
VOLUME 79_NO 2-3 233	2000	79	2-3	233	239	Drescher-Schneider, R.	The vegetational and climatic developments during the Riss-Würm interglacial in the area on the northern flank of the Alps are reviewed. Reforestation seems to have begun over the whole region with a dwarf-shrub and ensuing shrub phase, leading to birch and/or pine woodland. The rise in summer temperatures, which $\delta^{18}\text{O}$ values suggest to have been a two-stage event, permitted the immigration and expansion of more demanding trees (elm, oak, lime, ash, ivy, hazel, yew, etc.). Following the thermal maximum, which took place during the hazel and yew biozones, hornbeam dominated the forests in the alpine foreland, whilst fir/spruce forests formed the dominant vegetation at sites closer to the Alps or at a higher altitude. A marked climatic deterioration can only be recognised towards the end of the interglacial, which led to extensive spruce/pine and, finally, almost pure pine forests.	The Riss-Würm interglacial from West to East in the Alps: an overview of the vegetational succession and climatic development

VOLUME 79 NO 2-3 241	2000	79	2-3	241	255	Meijer, T.; Preece, R.C.	Shells belonging to the bivalve genus <i>Corbicula</i> occur commonly in Pleistocene interglacial deposits in NW Europe. These have usually been identified as <i>C.fluminalis</i> , a modern species described from the Euphrates river, although the veracity of this specific attribution remains equivocal. <i>Corbicula</i> has nowadays a southern distribution, and laboratory studies indicate that it is thermophilous. It is also tolerant of brackish water, one of several attributes that make this an effective colonizer. In NW Europe, <i>Corbicula</i> is known from the Lower Pleistocene but is absent from the Cromerian Complex, occurring again in the three interglacials following the Anglian/Elsterian. It appears to be unknown from the last interglacial, except as derived fossils.	A review of the occurrence of <i>Corbicula</i> in the Pleistocene of North-West Europe
VOLUME 79 NO 2-3 257	2000	79	2-3	257	267	Coope, G.R.	Assemblages of fossil coleoptera (beetles) have been obtained from eight sites in southern England that date from the early phase (<i>Pinus - Quercetum mixtum - Corylus</i> pollen assemblage zone) of the Eemian (Ipswichian) interglacial Stage. Altogether 294 different species have been identified from these sites. They represent a wide spectrum of habitat requirements; terrestrial, aquatic, carnivorous and phytophagous species and many more with subtle dependences of specialist biotopes. Almost all of them live today in central and southern Europe and some are restricted to regions well south of the British Isles. By using mutual climatic range methods, the thermal climate of the early phase of the Eemian Interglacial has been estimated quantitatively, showing that mean July temperatures were about 4°C above those of southern England today. Mean winter temperatures were not much different from those nowadays. This phase was probably the thermal maximum of the Eemian Interglacial. Precipitation levels are difficult to quantify but were adequate to maintain flowing rivers in England throughout the year. These results are in agreement with the presence of other fossils, both plants and animals, in the same deposits.	The climatic significance of coleopteran assemblages from the Eemian deposits in southern England

VOLUME 79 NO 2-3 269	2000	79	2-3	269	281	Kolfshoten, T. van	<p>The knowledge of the Eemian fauna of central Europe is based on the fossil record from a number of sites located in the eastern part of Germany. The faunas with different deer species as well as <i>Sus scrofa</i>, <i>Palaeoloxodon antiquus</i>, <i>Stephanorhinus kirchbergensis</i> and <i>Glis glis</i> indicate a forested environment alternating during the climatic optimum of the Eemian s.s. with areas with a more open environment inhabited by species such as <i>Cricetus cricetus</i>, <i>Equus sp.</i> (or <i>Equus taubachensis</i>), <i>Equus hydruntinus</i> and <i>Stephanorhinus hemitoechus</i>. Characteristic for the Rhine valley fauna are <i>Hippopotamus amphibius</i> and the water buffalo (<i>Bubalus murrensis</i>); both species are absent in the eastern German faunas with an Eemian age. Taking into account the short period of time covered by the Eemian s.s., the amount of data on the Eemian mammalian fauna is remarkably large. There is, however, still an ongoing debate on whether the stratigraphical position of a number of faunas are of Eemian or 'intra-saalian' age. Furthermore, there are faunal assemblages or stratigraphically isolated finds referred to the Eemian without indisputable evidence. This is particularly the case in the Rhine valley, where most of the so-called Eemian fossils come from dredged assemblages. The picture of the evolution of the Eemian fauna and its geographical variation is consequently still incomplete.</p>	The Eemian mammal fauna of central Europe
VOLUME 79 NO 2-3 283	2000	79	2-3	283	291	Speleers, B.	<p>The relevance of a study of the Eemian occupation of Europe lies largely in the discussion on the environmental tolerances of early humans and in the limits encountered during the reconstruction of Palaeolithic habitats. The traditional vision is reviewed; then follows a discussion of Gamble's studies (1986, 1987) in which he postulated an absence of human occupation in North-Western Europe during the Eemian. Gamble's explanatory models and the reactions to his work are presented. Finally, the relation is considered between the distribution pattern of sites, the former dispersal of early humans across the European landscape, and the implications of this evidence for hypotheses of environmental tolerances of Palaeolithic humans.</p>	The relevance of the Eemian for the study of the Palaeolithic occupation of Europe

VOLUME 79_NO 2-3 293	2000	79	2-3	293	301	Markova, A.K.	During the last decades a considerable amount of data on mammals from Mikulino (=Eemian) deposits of the central and southern parts of the Russian Plain has been produced. <i>Mammuthus primigenius</i> (the early type), <i>Palaeoloxodon antiquus</i> (the advanced form), <i>Arvicola</i> ex gr. <i>terrestris</i> , <i>Eolagurus</i> cf. <i>luteus</i> and <i>Lagurus</i> cf. <i>lagurus</i> characterize this period. The so-called 'Shkurlatian mammal assemblage' was distinguished on the basis of a number of Eemian faunas. The age of the mammal localities was established by using various geological and palaeontological evidence, together with the results of palaeomagnetic studies and absolute dating. The evolutionary level of the diagnostic species allows correlations between localities from different parts of the Russian Plain that have varying taphonomical conditions. The mammal- and malacofauna of the Mikulino Interglacial can also be used as a basis for correlations between the Karangat marine strata of the Black Sea and the continental deposits (alluvial sediments of the second terrace of the Sudost' River and the Salyn phase of the Mezin fossil pedocomplex (see Dodonov et al., this volume). Forest, forest-steppe and steppe zone landscapes have been reconstructed for the central and southern parts of the Russian Plain on the basis of the Eemian faunas.	The Mikulino (= Eemian) mammal faunas of the Russian Plain and Crimea
VOLUME 79_NO 2-3 303	2000	79	2-3	303	311	Dodonov, A.E.; Tchepalyga, A.L.; Mihailescu, C.D.; Zhou, L.P.; Markova, A.K.; Trubikhin, V.M.; Simakova, A.N.; Konikov, E.G.	The records of the last interglacial in several palaeogeographical zones and various sedimentary environments from Central Asia to the Black Sea shoreline are presented. The last interglacial is characterized in the study areas by a two- or three-unit stratigraphical complex with both terrestrial and marine formations. Finds of significant small mammalian remains, together with a characteristic mollusc fauna in the Karangatian marine sediments, provide key levels for biostratigraphical correlation between the marine and continental deposits. New U/Th dates allow the correlation of the Karangatian transgression with $\delta^{18}O$ substage 5e.	Last-interglacial record from central Asia to the northern Black Sea shoreline: stratigraphy and correlation

VOLUME 79_NO 2-3 313	2000	79	2-3	313	324	Haesaerts, P.; Mesrdagh, H.	<p>For more than one century, the textural B-horizon of the last interglacial soil and its cover deposits have been standing out in Europe as an important pedostratigraphic marker. The complexity of this horizon was well illustrated since the seventies, though its pedological and stratigraphic significance remained doubtful. Macro-, meso- and micromorphological data gathered by the authors at various key-sites in Europe and the sequential correlation principle have resulted in a better understanding of the high complexity of the pedosedimentary and stratigraphical evolution of the last interglacial and early glacial loess succession. The present study identifies four megacyclic pedosedimentary intervals that show a general trend towards dry and continental climatic conditions. A consistent correlation exists between pedosedimentary evolution and vegetation, as recorded in the Grande Pile pollen record. The picture obtained in the present study is similar for both the Western and the Eastern European loess palaeosol successions. The so-called 'last interglacial soil', with three major soil-forming processes, belongs to the Eemian and Saint- Germain I (MIS substages 5e and 5c), whereas the humiferous sediments and soils on top are linked to Melisey II, Saint-Germain II and Ognon I (MIS substages 5b and 5a). The overlying loess, colluvial sediments and humiferous soils that end the palaeosol succession belong to the Ognon II and III interstadials; they record the onset of the early Pleniglacial (MIS stage 4) characterized by a significant increase in aeolian sedimentation.</p>	<p>Pedosedimentary evolution of the last interglacial and early glacial sequence in the European loess belt from Belgium to central Russia</p>
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VOLUME 79_NO 2-3 325	2000	79	2-3	325	333	Robertsson, A.	The current status of knowledge concerning the Eemian interglacial in Sweden is surveyed, and comparisons are made with northern and western Finland. The course of shore displacement is fragmentarily known for Sweden, since brackish-marine sediments have been identified, on the basis of diatom analysis, at only few sites. In Finland, on the other hand, a shore displacement curve has been constructed for the Eemian Baltic Sea in Ostrobothnia, central western Finland. The vegetation history is summarised for the southernmost part of Sweden, and can be correlated with that documented in Denmark. For the central part of Sweden, information is sparse, but the composition of the forests has been outlined for most of the interglacial, although information on regional pollen assemblage zones E3 and E4 (early-temperate substage) are mainly missing. A more complete picture of the interglacial vegetational history is known from Ostrobothnia in Finland. The thermophilous indicators <i>Viscum</i> , <i>Ilex</i> , <i>Hedera</i> and <i>Osmunda</i> grew far North during the Eemian. <i>Corylus</i> and <i>Carpinus</i> expanded much further to the North than during the Holocene. In Swedish and Finnish Lapland, the vegetation history is similar except that <i>Larix</i> was common in Finland during the Eemian, but its presence has so far not been confirmed in Sweden. Eemian deposits relocated during the Weichselian glaciation contain pollen and diatoms that can be used for reconstruction of the Eemian environment. No clear indication of a rapid climatic deterioration during the Eemian has been found so far in either Swedish or Finnish sequences.	The Eemian interglacial in Sweden, and comparison with Finland
VOLUME 79_NO 2-3 335	2000	79	2-3	335	343	Seidenkrantz, M.; Knudsen, K.L.; Kristensen, P.	The marine Eemian (marine oxygen-isotope substage 5e: MIS 5e) is represented by shallow-water deposits in southern and western Denmark, while relatively deep-water environments occurred to the north and north-east, where complete interglacial successions seem to be present. We present an overview of the marine Eemian deposits in Denmark, and discuss in more detail indications of climate variability, both for the late Saalian and within the Eemian.	Marine late Saalian to Eemian environments and climatic variability in the Danish shelf area

VOLUME 79 NO 2-3 345	2000	79	2-3	345	354	Sánchez Goñi, M.F.; Turon, J.L.; Eynaud, F.; Shackleton, N.J.; Cayre, O.	High-resolution pollen, dinocyst and isotopic profiles covering the marine isotope stage 5 (MIS 5) are presented from core MD952042 (Tagus abyssal plain, 37°47'N, 10°09'W). Both marine and terrestrial proxies indicate the occurrence of a Bølling-Allerød-Younger Dryas-like event at the beginning of MI substage 5e. The terrestrial Eemian stage coincides with both the lightest oxygen isotope values of substage 5e and the heavier ones approaching the 5e/5d transition. Accordingly, the Eemian is not equivalent to MI substage 5e, as the Holocene is not equivalent to MIS 1. Remarkably, both pollen and dinocyst data reflect the same climatic pattern on land and ocean, and they evidence a succession of climatic events that the isotope signal does not identify. The Eemian began with a Mediterranean vegetation that was gradually replaced by Eurosiberian formations indicating a change from Mediterranean to oceanic climates. In the middle of the Eemian, warming conditions were interrupted by an event corresponding to a slight cooling resulting from an increase in precipitation over land and ocean. Finally, a warming trend characterised the last phase of the Eemian. The occurrence of small climatic changes during this interglacial is inconsistent with the dramatic variability suggested by the GRIP ice-core record	Direct land/sea correlation of the Eemian, and its comparison with the Holocene: a high-resolution palynological record off the Iberian margin\
VOLUME 79 NO 2-3 355	2000	79	2-3	355	367	Tzedakis, P.C.	The extent of regional variability in vegetation development in mainland Greece during the last interglacial is considered. Three pollen sequences - Ioannina (northwest Greece), Tenaghi Philippon (northeast Greece) and Kopais (central Greece) - all located in different environmental settings, extend into the last interglacial. Examination of the vegetation histories of the three sites during the last interglacial reveals the influence of local climatic conditions with closed mixed forests in the northwest, becoming progressively more open and less diverse farther to the east and south. All three sequences contain a number of similar trends, however, in the expansion of certain taxa. In addition, they also show the presence of a two-step late glacial interval, a short episode of forest reduction in the second part of the interglacial and a final small expansion of tree populations at the very end of the interglacial. Comparison with other European records shows a number of common features, but also suggests differences consistent with the particular environmental setting of the Greek sites.	Vegetation variability in Greece during the last interglacial
VOLUME 80 NO 1 3	2001	80	1	3	4	Graaff, W.J.E. van de		Preface Groningen 40 years special issue
VOLUME 80 NO 1 5	2001	80	1	5	6	Dronkert, H.		Groningen, 40 years, a special issue

VOLUME 80 NO 1 7	2001	80	1	7	9	Oele, J.A.		Groningen, 40 years, a special issue. Dinner Speech and conference wrap-up
VOLUME 80 NO 1 11	2001	80	1	11	11	Jorritsma-Lebbink, A.		Gas: source of prosperity
VOLUME 80 NO 1 12	2001	80	1	12	14	Roels, H.J.M.		Groningen field, past, present and future
VOLUME 80 NO 1 15	2001	80	1	15	15	Verberg, G.H.B.		Groningen, Gasunie and the gas market
VOLUME 80 NO 1 16	2001	80	1	16	16	Mellbye, P.		Non-Groningen gas supplies for Western Europe
VOLUME 80 NO 1 17	2001	80	1	17	17	Quinn, A.C.		Past, present and future of the gas market in the North Sea region
VOLUME 80 NO 1 18	2001	80	1	18	18	Burgos, C.		Groningen in the European context
VOLUME 80 NO 1 19	2001	80	1	19	19	Hulst, N. van		Gas: government and market
VOLUME 80 NO 1 20	2001	80	1	20	21	Lubbers, R.F.M.		Groningen - its impact on European society
VOLUME 80 NO 1 23	2001	80	1	23	32	Alblas, L.D.	The setting and possible future of the petroleum industry in the Netherlands is briefly discussed. The result of a risk assessment shows, that the Dutch hydrocarbon province can be divided in low, medium, high and very high-risk areas for new capital investments. The assets of operators in the Netherlands have been evaluated on exploration, production, storage and pipeline potential, now and in the future. Despite the presence of potential new plays, exploration activities are expected to decrease in the near future. Despite the possible development of marginal fields, which will be not adding major reserves, the production reserves will decrease in the next 10 - 15 years and many fields will be abandoned. However storage, pipeline infrastructure and gas marketing are expected to increase in the future, mainly because of the liberalisation of the Dutch gas market.	The petroleum industry in the Netherlands - its setting and possible future

VOLUME 80 NO 1 33	2001	80	1	33	52	Glennie, K.W.	<p>Once the great size of the Groningen Field was fully realized late in 1963, exploration in the southern North Sea was a natural development as the reservoir bedding dipped westward. The origin of that bedding was not certain, one possibility, dune sands, led immediately to a program of desert studies. Licensing regulations for Netherlands waters were not finalized until 1967, offshore exploration beginning with the award of First Round licenses in March 1968. In the UK area, the Continental Shelf Act came into force in May 1964, paving the way for offshore seismic, the first well being spudded late in that year. The first two wells were drilled on the large Mid North Sea High; both were dry, the targeted Rotliegend sandstones being absent. Then followed a series of Rotliegend gas discoveries, large and small, west of Groningen, so that by the time exploration began in Netherlands waters the UK monopoly market was saturated and exploration companies were already looking north for other targets including possible oil. The Rotliegend was targeted in the earliest wells of the UK central North Sea even though there had already been a series of intriguing oil shows in Chalk and Paleocene reservoirs in Danish and Norwegian waters. These were followed early in 1968 by the discovery of gas in Paleocene turbidites at Cod, near the UK-Norway median line. The first major discovery was Ekofisk in 1969, a billion-barrel Maastrichtian to Danian Chalk field. Forties (1970) confirmed the potential of the Paleocene sands as another billion barrel find, while the small Auk Field extended the oil-bearing stratigraphy down to the Permian. In 1971, discovery of the billion-barrel Brent field in a rotated fault block started a virtual 'stampede' to prove-up acreage</p>	Exploration activities in the Netherlands and North-West Europe since Groningen
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VOLUME 80 NO 1 53	2001	80	1	53	70	Hern, C.; Nordlund, U.; Zwan, K. van der; Ladipo, K.	<p>Aeolian sands are the main reservoir rock in some of the largest gas fields, such as the Shell-Exxon Groningen Field, operated by NAM. Although aeolian reservoirs have been studied for many years, there is still room for improvement in the predictive modeling of such reservoirs. A pilot project with this objective was initiated by SIEP B.V. in 1997, together with Heriot-Watt University in Edinburgh, UK and with Uppsala University, Sweden, to evaluate the factors influencing aeolian systems, and to formulate a forward model using 'fuzzy logic'. The project was initiated to develop a fuzzy system for generic modeling of Aeolian architectures. The key aims were to be able to predict the type, amount and distribution of major facies in generic aeolian systems and specifically to model regional-scale architecture in the sub-surface. Fuzzy rules and sets, which defined the behaviour of aeolian systems, were constructed and used to modify the pre-existing fuzzy modeling software which had been designed for shallow and deep marine systems. The modeling procedure used input data appropriate to the Rotliegend climate, and was validated by comparing the resulting models, in terms of thickness and spatial distribution of facies types, to well data from the Upper Rotliegend interval of the Lauwerszee Trough area, NE Netherlands (Figures 1 & 2).</p>	Forward prediction of aeolian systems using Fuzzy logic, constrained by data from recent and ancient analogues.
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VOLUME 80 NO 1 71	2001	80	1	71	84	Hoffmann, N.; Jödicke, H.; Gerling, P.	<p>For the first time this project attempts to directly correlate magnetotelluric and geochemical data with the aim of creating a model on the regional distribution of potential pre-Westphalian source rocks deposited in marine environments in the North German basin. Analysis of the magnetotelluric data shows, that there is a deep good conductor at the north-eastern fringe of the North German basin around the islands of Rügen and Usedom and on the mainland north east of the Anklam Fault. Through integration with seismic data and the offshore well G14 the conductor can be correlated with the Cambro-Ordovician Scandinavian Alum shales. To the south an adjoining area approximately corresponding to the depo-centre of the Rotliegend basin lacks a deep good conductor. Therefore it can be assumed that a regional distribution of comparable source rocks is unlikely. Another excellent and important conductor starts to the south west of the Lower Elbe Line extending along the Dutch-German border into the North Sea, and into the Münsterland. Its place in the local stratigraphy has not been adequately established. It is most likely that this good conductor corresponds to the black shales of the Early Namurian and the Dinantian, which is the case in the boreholes Münsterland 1 and Pröttlin 1 for example. In this paper they are collectively called Rhenohercynian Alum shales. On the Dutch-German border a transition into the "Bowland Shale" facies or equivalents is to be expected. It cannot be ruled out that even stratigraphically older black shales, possibly from the Cambro-Ordovician could contribute to the high integrated conductivity of the deep good conductor. The evidence of highly conductive layers in the deep subsurface poses</p>	The distribution of the Pre-Westphalian source rocks in the North German Basin - Evidence from magnetotelluric and geochemical data
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VOLUME 80 NO 1 85	2001	80	1	85	94	Wong, T.E.; Parker, N.; Horst, P.	<p>The Broad Fourteens Basin is a NW-SE trending Mesozoic structural element that was affected by inversion movements during the Late Cretaceous (Subhercynian Phase) and Early Tertiary (Laramide Phase). Since the overlying Tertiary section of this area is relatively little studied, a multi-disciplinary investigation was initiated using both seismic and well data. The present study is the first phase of that project and deals exclusively with the stratigraphical framework and sedimentary development based on well logs from approximately forty wells. The Tertiary sedimentary section in this area (maximum thickness up to approximately 800 m) consists of siliciclastic rocks that generally correlate well with the established lithostratigraphical framework of the Netherlands. However, the highly variable thickness of these lithological units, illustrated by isopach maps for all units, reflect the intricate pattern of sea level movements, differential vertical movements and the ensuing erosion, that took place in this tectonically active area. Well P06-02, one of the most complete sections in the center of the area, was selected for detailed biostratigraphical analysis to support further stratigraphical subdivision and correlation. This yielded information on both the distribution pattern of various lithological units and the influence of large, partly global, events during basin development. It is concluded that application of detailed sequence stratigraphy in the study area is very problematic and only 2nd and some 3rd order cycles could be recognized.</p>	Tertiary sedimentary development of the Broad Fourteens area, the Netherlands
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VOLUME 80 NO 1 95	2001	80	1	95	102	Hollman, F.J.	In contrast to oil field development, gas field development requires tight integration of subsurface, surface and economic issues due to the difficulty of storing surplus produced gas and the large effect of the back-pressures in a surface network on the individual well performance. As a major gas supplier the Shell Group, and in particular NAM, has extensive experience in this field. The gas production from onshore fields in the North Friesland area is a recent NAM development. A 10 million cubic meter per day LTS gas treatment installation located near the village of Anjum came on stream in 1997 . Production initially started from 3 wells in 2 fields to deliver gas to the Gasunie grid at Grijpskerk. The total area comprises 10 fields and 4 remaining prospects and is planned to be fully developed by the year 2001, using wet gas pipelines to route the production to either the Anjum LTS installation or the Grijpskerk SilicaGel installation. The Rotliegend reservoirs in this part of the Netherlands are very heterogeneous and require a more detailed subsurface simulation than feasible with the standard NAM tool for gas field development (GENREM). In addition, the area is close to the Waddenzee and based on extensive ecological research, NAM uses a stringent, self-imposed ecological constraint, whilst evaluating the development plans for this area. Detailed subsidence studies have been run using subsidence-modeling tools, which run under a software user-interface called FrontEnd, an in-house development by the Shell Group. Also running under this interface is an application for gas field development called Gas Field Planning Tool (GFPT). GFPT combines a detailed subsurface simulator with a surface simulator using a development planning module, which	Integrated gas field development: The Anjum story
VOLUME 80 NO 1 103	2001	80	1	103	105	Berkel, J. van; Kaymak, U.; Kulawksi, G.; Weisenborn, T.; White, M.	Gas Field Planning Tool (GFPT) was developed in 1990 by the Shell Group of Companies to fill the need for a tool for gas field planning and development using deterministic subsurface and surface models. Main initiators were Shell Canada, NAM (the Netherlands), Shell Expro (UK) and BSP (Shell Brunei), as these companies are major gas producers. Shell Companies now have several years experience with using the GFPT. Application ranges from simple single field models to corporate-level models with a large number of gas reservoirs and wells. Shell companies now using GFPT models are Shell Expro (UK), BSP (Brunei), SSB (Malaysia), Shell Canada, SPDC (Nigeria), SDA (Australia), Woodside (Australia), PDO (Oman), NAM (the Netherlands), New Business Development (e.g. Lunar Project) and in future also Shell Egypt. NAM currently has a GFPT model for the Anjum field in Friesland and for the Ten Arlo field in the north of Holland. GFPT is currently being migrated to an HFPT (Hydrocarbon Field PlanningTool), which can also be used for planning of condensate, oil and water developments and for control of hydrocarbon compositions in the network using PVT de-lumping at the well head (e.g. for LNG plants) and optimisation techniques (linear, non-linear or based on bean-back lists).	Gas field planning tool

VOLUME 80 NO 1 107	2001	80	1	107	111	Schans, E. van der; Lijssel, J.W.N. van; Steenderen, P. van	Value Analysis is a powerful tool to increase the value of a capital investment project and to capture cost saving opportunities. It is a method conceived during WorldWar II and frequently used on infrastructure projects, especially in the USA. The Value Analysis process typically consists of a well prepared 3 to 5 day workshop with focus on generating ideas to improve the current engineering concept. Emphasis is on screening all proposals in order to identify the most promising ideas. The workshop results in a number of proposals to modify the existing engineering concept. Stork Engineers & Contractors have used the Value Analysis method on several projects as well as in proposals for Engineering, Procurement and Construction (EPC) projects in the Exploration and Production (EP) industry. Typical results of Value Analysis led to a decrease of Total Cost of Ownership by some 10 to 30%. A well facilitated Value Analysis workshop also leads to mutual trust and understanding between the parties involved. A key element in a Value Analysis is (re)definition of the proposed functionality of a project. This is done through challenging the existing technical concept by increasing this functionality or by meeting this functionality at a lower cost.	Value Analysis: Capturing Total Cost of Ownership reduction opportunities in E&P projects
VOLUME 80 NO 1 113	2001	80	1	113	119	Taverne, B.G.	The discovery in 1959 of natural gas in a well drilled by the Nederlandse Aardolie Maatschappij (NAM) near Hoogezand, Gemeente Slochteren, a town in the Province of Groningen, led to the development and establishment of major natural gas production in the Netherlands. This important industrial development could not have started and the necessary investments would not have been made by the industry if not in accordance with the then applicable Napoleonic Mining Law of 1810 a concession had been applied for and granted allowing to exploit this discovery. From this point of view, admittedly a lawyer's view, the award of the concession, which was named Groningen, should be considered to be the actual starting point for the aforesaid development. On 1 July 1961 NAM submitted its application for a concession based on its Slochteren discovery and with this submission the negotiations started between the Netherlands government on the one side and NAM and its two shareholders, viz. Shell and Exxon, on the other side, on the terms and conditions to be incorporated in the applied for concession. On the government's side attention was focused on two aspects: how to integrate the natural gas discovered into the economy of the country and how to involve the State in the production and disposal thereof. From the outset the government intended, that the State's interests should be represented by the Staatsmijnen in Limburg (State Mines) in order to give this coal mining enterprise a future outside and independent from its ailing coal mining business in the Province of Limburg. To this end the government arranged for State Mines to enter into a maatschap (partnership) with NAM. In this partnership State Mines would get a 40% participating interest,	The concession Groningen: A lawyer's view

VOLUME 80 NO 1 121	2001	80	1	121	136	Gussinklo, H.J.; Haak, H.W.; Quadvlieg, R.C.H.; Schutjens, P.M.F.M.; Vogelaar, L.	The province of Groningen is flat and level, lying at an elevation close to sea level. The area is intensely cultivated and water table levels are a matter of concern. When the size of the Groningen gasfield was recognized in the sixties, it was realized, that substantial subsidence might occur at the surface affecting a large area. Intensive studies were performed over time to predict future subsidence. These studies are supported by theoretical and experimental research in Shell since the 1950's concerning reservoir compaction and related surface subsidence. To monitor reservoir compaction and surface subsidence on a regular basis, an extensive monitoring program was set up by NAM. The program comprises leveling surveys, GPS measurements, measurements of shallow formation compaction and in-situ reservoir compaction. In Groningen weak earthquakes have occurred since 1991 at irregular intervals. A multidisciplinary study from 1991-1993 on the relationship between gas production and earthquakes in the northern part of the Netherlands, combined with further studies concluded, that under certain circumstances these earthquakes may result from gas production. Monitoring is carried out through a seismic observation network with borehole sensors and locally installed accelerometers. Because of the expected impact of subsidence induced by gas production on surface water management, an Agreement was concluded between the Province of Groningen and NAM. In line with the 1983 Agreement the 'Commissie Bodemdaling' was founded, in which both NAM and the Province of Groningen are represented. On the basis of NAM predictions and actual measurements this Committee determines,	Subsidence, tremors and society
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VOLUME 80 NO 1 137	2001	80	1	137	144	Correljé, A.F.; Odell, P.R.	This paper deals with production and pricing policies for the Groningen gasfield. It will provide an evaluation of the past and a view to its future in a liberalized European gas market. The lifelong production potential and high productivity of the Groningen gasfield is unique. The extremely low-cost field is also unique in the sub-optimal manner in which it has been exploited over the whole of its forty year life to date. Its initial monopolistic situation in the West European energy economy created an opportunity for its development to be limited to production levels, whereby super-normal profits were generated on high value sales at the cost of consumers' welfare. The breach in the monopoly, through competition from Soviet gas, readily able to undercut Groningen prices, posed a serious threat both to unit values and market expansion. Fortunately the fortuitous 1973/4 international oil supplies and pricing crisis restored Groningen's fortunes. Following the upward price adjustments for foreign sales, the stage was set for achieving high company profits and massive government revenues. Dutch society in a broader sense benefited only indirectly through government tax expenditures. Again, energy consumers' welfare gains were ignored. This remains the essence of the situation, pending agreement on the introduction of the liberalized market to meet EU directives. Currently the Dutch gas regime and policy objectives are being adjusted to the requirements of operating in a liberalized market. These changes recognize: first, the invalidity of the government's long-held fears for gas scarcity in such a way, that the earlier steps to restrict both foreign and national sales have been abandoned, and second, the need to reinstate Gasunie as an active,	Four decades of Groningen production and pricing policies
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VOLUME 80 NO 2 1	2001	80	2	1	18	Huissteden, K.J. van; Schwan, J.C.G.; Bateman, M.D.	<p>The Late Weichselian Pleniglacial wind regime in the eastern Netherlands is reconstructed by means of landform and sedimentological analysis. This analysis involves aeolian and fluvial landforms in the Dinkel river valley in the Twente region. The aeolian deposits considered here date from the Last Glacial Maximum (approximately 22 ka) to the start of the Bølling Interstadial at 14.7 ka. A major event in this period is the formation of a cryoturbation level caused by permafrost degradation, overlain by an erosional hiatus dated between 21 and 17 ka. Both features are attributed to a period of warmer and moister climate, causing permafrost degradation and erosion by surficial runoff. Thereafter aeolian activity prevailed under relatively arid conditions. A deflation surface was formed, the Beuningen Gravel Bed. This deflation surface is present in many Weichselian sections in the Netherlands and the adjacent parts of Belgium and Germany. The deflation occurred concurrently with deposition of coversand at other places. The morphology of the coversand-landscape in the Dinkel valley was controlled by the relief of the pre-existing floodplain and the wind pattern. Coversand ridges consisting of low dunes accumulated near the margins of the active channel belt. Relatively thick sand sheets occur in the leesides of the ridges, thin sand sheets are found at greater distance. Mainly westerly sand-transporting winds operated during winter and summer. In winter aeolian deposition occurred by frequent and strong easterly winds also. On the smallest, local scale, the pattern of deposition was determined by the topography and moisture of the receiving surface. Coversand deposition came to an end with the formation of a sand sheet under relatively warm and</p>	<p>Environmental conditions and paleowind directions at the end of the Weichselian Late pleniglacial recorded in aeolian sediments and geomorphology (Twente, Eastern Netherlands)</p>
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VOLUME 80 NO 2 19	2001	80	2	19	30	Renssen, H.	<p>The shift from the cold Younger Dryas phase to the relatively warm Pre-boreal at ~11.5 thousand years BP occurred within 50 calendar years and represents a clear example of rapid climate warming. Geologists and palaeo-ecologists have extensively studied the impact of this shift on the environment in The Netherlands. The global atmospheric general circulation model of the Max-Planck-Institute for Meteorology is applied to perform simulations of the Younger Dryas and Pre-boreal climates. Here detailed results are presented for the grid-cell representing The Netherlands, providing quantified estimates of climatic means and extremes for both periods. The results suggest that the Younger Dryas climate was characterised by cold winters (temperatures regularly below -20°C) and cool summers (13-14°C), with a high inter-annual variability, strong fluctuations in temperature, frequent storms and snowfall from September to May. The Pre-boreal climate was a 'continental' version of present-day climate, with cooler winters, warmer summers (-2°C difference) and more snowfall, but lower wind speeds. Also, the Pre-boreal climate was wetter than the present and Younger Dryas climates. The main driving factors were the low temperatures of the partly sea-ice covered N Atlantic Ocean and the insolation that was very different from today, with more incoming solar radiation during summer (+30 W/m²) and less during winter (-10 W/m²). The presented detailed results could be valuable for interpreting palaeo-environmental records and for modelling studies on sedimentological processes during the Late Quaternary.</p>	<p>The climate in The Netherlands during the Younger Dryas and Preboreal: means and extremes obtained with an atmospheric general circulation model</p>
VOLUME 80 NO 2 31	2001	80	2	31	39	Diedrich, C.	<p>The 35.5 m thick Anisian section of the Winterswijkse Steen- en Kalkgroeve (Eastern Netherlands) comprises the Upper Röt (Upper Röt Claystone Member) to the basal Lower Muschelkalk (Oolith Member). In the section 15 terrestrial or marine influenced parasequences are recognized. A fourth order sequence shows the increasing marine influence. New marker beds, ten vertebrate track beds, three bone beds and cephalopod remains have been documented. This enabled correlation to other sections in NSI Germany. The tracks found in the Winterswijkse Steen- en Kalkgroeve at the boundary Röt/Lower Muschelkalk are linked to the oldest known vertebrate skeleton remains of the Germanic Basin. It is the first time that the exact stratigraphic position of these vertebrate remains has been established. In the terrestrial influenced section of the Winterswijkse Steen- en Kalkgroeve, the well preserved vertebrate track ways and vertebrate fauna will be of international importance and will provide new data of the Triassic carbonate tidal flat megatracksite concept and reptiles living in this environment.</p>	<p>Vertebrate track bed stratigraphy of the Röt and basal Lower Muschelkalk (Anisian) of Winterswijk (East Netherlands)</p>

VOLUME 80 NO 2 41	2001	80	2	41	47	Kloprogge, J.T.; Ruan, H.; Duong, L.V.; Frost, R.L.	This paper describes the Raman and infrared spectroscopy of SrSO ₄ or celestine from the Muschelkalk of Winterswijk, The Netherlands. The infrared absorption spectrum is characterised by the SO ₄ ²⁻ modes ν_1 at 991 cm ⁻¹ , ν_3 at 1201, 1138 and 1091 cm ⁻¹ , and ν_4 at 643 and 611 cm ⁻¹ . An unidentified band is observed at 1248 cm ⁻¹ . In the Raman spectrum at 293 K the ν_1 mode is found at 1000 cm ⁻¹ and is split in two bands at 1001 and 1003 cm ⁻¹ upon cooling to 77 K. The ν_2 mode, not observed in the infrared spectrum, is observed as a doublet at 460 and 453 cm ⁻¹ . The ν_3 mode is represented by four bands in the Raman spectrum at 1187, 1158, 1110 and 1093 cm ⁻¹ and the ν_4 mode as three bands at 656, 638 and 620 cm ⁻¹ . Cooling to 77 K results in a general decrease in bandwidth and a minor shift in frequencies. A decrease in intensities is observed upon cooling to 77 K due to movement of the Sr atom towards one or more of the oxygen atoms in the sulfate group.	FT-IR and Raman microscopic study at 293 K and 77 K of celestine, SrSO ₄ , from the middle triassic limestone (Muschelkalk) in Winterswijk, The Netherlands
VOLUME 80 NO 2 49	2001	80	2	49	57	Buurman, P.; Pape, T.; Reijneveld, J.A.; Jong, F. de; Gelder, E. van	To evaluate correlations between silt and clay fractions determined by pipette method and laser diffraction, samples from Dutch fine marine, fluvial, and loess deposits were analysed by both methods. For fluvial deposits, correlations for fractions <2 and >50 μm were excellent ($R^2 > 0.95$), those for 2-4, 4-8, 16-32 and 32-50 μm were satisfactory ($R^2 = 0.80 - 0.95$), while that for the fraction 8-16 μm had an R^2 of only 0.68. For marine deposits, correlations for <2 and >50 μm were in the same range, but those of all other fractions except 8-16 μm were lower. In the loess samples, correlations for all but the 8-16 μm fraction were unsatisfactory. Laser diffraction gave 42% of pipette clay in marine samples, and 62% in fluvial and loess samples if regressions are forced through 0. Sand fractions detected by laser diffraction were 107% of the sieve fraction in marine samples, and, 99% in the fluvial samples. Correlations for fractions smaller than reference size are generally better than those for individual size fractions. Both the 2 μm and the 50 μm boundary cause problems in the comparison. The first because of platy shape of clay minerals, and the second due to both a change in method in the pipette/sieving procedure, and to non-sphericity of particles. Apparently, correlations for clay- and silt-size fractions obtained by pipette method and laser diffraction will be different for each type of sediment.	Laser-diffraction and pipette-method grain sizing of Dutch sediments: correlations for fine fractions of marine, fluvial, and loess samples
VOLUME 80 NO 2 59	2001	80	2	59	60	Nieuwland, D.A.; Nijman, M.		The atlas of structural geometry: a digital collection of 25 years of analogue modelling
VOLUME 80 NO 3-4 67	2001	80	3-4	67	68	Camelbeeck, T.; Galadini, F.; Meghraoui, M.; Berg, M. van den		Preface Evaluation of the potential for large earthquakes in regions of present day low seismic activity in Europe

VOLUME 80 NO 3-4 69	2001	80	3-4	69	78	Sintubin, M.	The Bree Uplift is a particular structure in the direct footwall of the southwestern graben boundary fault system of the Roer Valley Graben, which has been firstly recognized at the base of the Cretaceous. To date fault activity around the Bree Uplift has been confined to the Subhercynian (late Cretaceous) inversion event or considered fading out during Tertiary times. The revision of the existing geological data reveals that the Bree Uplift can still be recognized on the top-Tertiary map. This infers at least a late Tertiary activity, suggesting continuous fault activity in the graben boundary fault system not only on the major boundary faults but also on different splay faults, bounding individual fault blocks.	Late Tertiary fault activity in the southwestern boundary fault system of the Roer Valley Graben
VOLUME 80 NO 3-4 79	2001	80	3-4	79	93	Dusar, M.; Rijpens, J.; Sintubin, M.; Wouters, L.	A high-resolution reflection seismic survey was carried out in 1999 over the Feldbiss fault system, the southern border of the Roer Valley graben, in Belgium. Six profile-lines with total length of. 13982 m provided information on the 40-600 m depth range, covering Lower Pleistocene to Miocene strata with special emphasis on the Plio-Pleistocene Kieseloolite formation. Data quality depends on near-surface conditions and on degree of deformation in some fault zones, with better results for seismic detonator sources compared to vibroseis sources. The new data confirm the segmented character of the fault system with occurrence of fault bends, relay ramps and branching of overlapping fault sequences, testifying of the strong tectonic activity during the lower Pleistocene. Antiform structures along the Bichterweerd scarp, relaying the Feldbiss to the Geleen fault in the Meuse valley, are presented as a model for the Tertiary evolution of the Bree Uplift.	Plio-Pleistocene fault pattern of the Feldbiss fault system (southern border of the Roer Valley Graben, Belgium) based on high resolution reflection seismic data

VOLUME 80 NO 3-4 95	2001	80	3-4	95	107	Camelbeeck, T.; Martin, H.; Vanneste, K.; Verbeeck, K.; Meghraoui, M.	We studied the applicability of classical scarp degradation modelling to active normal faults in the Lower Rhine Embayment. Our quantitative analysis was conducted on the frontal Bree fault scarp (Feldbiss fault) in Belgium and the Peel fault scarp near the city of Neer in the Netherlands. Vertical offset and diffusion age of these scarps have been modelled from elevation profiles across the studied faults using the diffusion equation. For that purposer a computer-program (profil2000) has been written, providing a sensitivity analysis of the determined parameters in function of the spatial repartition of the elevation measurements along the considered profiles. The results of this morphometric analysis have been validated by a comparison with the geologic record of the tectonic activity observed in the trenches excavated at the sites where the measurements have been conducted. We conclude that the modelling can only be applied to study tectonic activity since the Last Glacial Maximum ($\pm 14-19$ kyr BP) because the surface expression of older paleoearthquakes in unconsolidated Late Pleistocene sediments has been erased by the strong erosive phase that occurred at the end of this glacial period. Even for Holocene scarps, morphologic dating seems very difficult because man-made perturbations destroyed surface evidence of the very recent fault activity in many sites. Nevertheless, we estimate that an appropriate value for the mass diffusivity constant for ~ 1 -m-high scarps in the investigated region is 0.002 to 0.010 m ² /yr. On the other hand, vertical offsets can be determined with a good precision. These amount to respectively ~ 1 m and 1,3 m since the Last Glacial Maximum on the Feldbiss fault in Belgium and the Peel fault near	Morphometric analysis of active normal faulting in slow-deformation areas: examples in the Lower Rhine Embayment
VOLUME 80 NO 3-4 109	2001	80	3-4	109	117	Hinzen, K.G.; Reamer, K.; Rose, T.	Topographic and morphologic models based on detailed Digital Elevation Models (DEM) of the Rur Graben, in particular a 33 km section of the Rurrand Fault, proved to be essential in preliminary investigations for the site selection of a trench for detailed paleoseismological investrgations. The entire DEM in the 33 km Jülich-Düren area displayed as a color-shaded terrain map clearly illustrates the main features of the eastern border fault of the Rur Graben. As investigations concentrated on the 8 x 6 km Stetternich-Hambach section of the Rurrand fault, the use of contoured topographic, gray-shaded terrain and terrain slope maps helped delineate the main features of the surface fault expression. On the basis of topographic profiles constructed from the DEM, no fault scarp could b	Results of Analysis of Digital Elevation Models Used Site Selection for Paleoseismological Investigations at the Rurrand Fault

VOLUME 80 NO 3-4 119	2001	80	3-4	119	127	Demagnet, D.; Evers, L.G.; Teerlynck, H.; Dost, B.; Jongmans, D.	In preparation of the first paleoseismic trenching in the NE border of the Roer graben (the Netherlands), site selection was carried out. Combining geological and seismological information and using existing aerial photographs, seismic reflection and geodetic levelling data, it was decided to focus on the Peel boundary fault near the village of Neer. Detailed information on the exact location of the fault was obtained through geophysical techniques, mainly ground penetrating radar (GPR) and resistivity measurements. GPR data unambiguously showed the flexuring and offset of reflectors affected by the fault. Performing eleven GPR profiles along strike allowed to obtain a 3D picture of the fault, laterally extending the information given in the trench.	Geophysical investigations across the Peel boundary fault (The Netherlands) for a paleoseismological study
VOLUME 80 NO 3-4 129	2001	80	3-4	129	138	Reicherter, K.R.; Reiss, S.	The Carboneras Fault Zone (CFZ) represents an active set of sinistral strike-slip faults in the Betic Cordilleras of southeastern Spain. It constitutes a major segment of the 'Trans-Alboran shear zone' during the Cenozoic, striking NE-SW. The CFZ separates the Cabo de Gata Block (Neogene volcanics) against Neogene basinal sediments and the metamorphic basement of the Alpujarride Complex. Three sites along the CFZ were examined with Ground Penetrating Radar techniques. Radar surveying was complemented by structural studies. Shallow-depth high-resolution imaging of Tyrrhenian beach terraces exhibited both vertical and minor horizontal offsets in the Rambla Morales site in the south. A sinistral strike-slip fault associated with minor thrust faults in a positive flower structure was detected in the middle segment along the La Serrata ridge, sealed by a caliche of late Pleistocene age (> 10 ka). The Playa de Bolmayor section yielded sub-surface evidence for several faults probably related to recent activity of individual fault strands. Our results suggest a distributed tectonic activity of the CFZ during the Late Quaternary.	The Carboneras Fault Zone (southeastern Spain) revisited with Ground Penetrating Radar - Quaternary structural styles from high-resolution images

VOLUME 80 NO 3-4 139	2001	80	3-4	139	154	Lehmann, K.; Klostermann, J.; Pelzing, R.	<p>From 1998 to 2000, we have studied the evidence for large paleoearthquakes at the Rurrand Fault. This fault represents the eastern border of the Roer Valley Graben, which is the tectonically most active region in the Lower Rhine Embayment. The purpose of our paleoseismological studies is to enlarge the seismicity data base for this region beyond instrumental records and historical reports using indications of surface-faulting events from stratigraphic conditions at active faults. Larger time spans considered in the earthquake catalogue will enable a more reliable statistical analysis which is required for seismic hazard assessment. Based on analyses of geological data and geomorphologic investigations, detailed geophysical surveying was carried out along the southern Rurrand Fault segment for the selection of a site appropriate to paleoseismological studies. Mapping of physical parameter contrasts with seismic reflection, VES, ERT, and GPR measurements along fault-crossing profiles inferred position and near-surface structure of the fault. At the site promising the best conditions, a trench was excavated across the fault near the city of Jülich, Germany. Within a depth of about 4 m, the Rurrand Fault was exposed in an about 50 m-wide system of faults and fault zones, affecting the stratigraphic sequence with various displacement characteristics and amounts of throw. According to heavy mineral analyses, the deposition time of most the exposed sediment strata was assigned to Pliocene and Lower Pleistocene time. These geological units are covered by loess layers deposited through solifluction processes during the Weichselian glacial, i.e. some tens of ka B.P., or - with lower probability - during the Saalian glacial. Several faults which had also</p>	Paleoseismological investigations at the Rurrand fault, Lower Rhine Embayment
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VOLUME 80 NO 3-4 155	2001	80	3-4	155	169	Vanneste, K.; Verbeeck, K.	<p>A first trench has been excavated for paleoseismological analysis in the German part of the RoerValley graben, which has experienced several historical earthquakes with a maximum intensity up to VIII on the MSK-scale. The trench has exposed the Rurrand fault as a complex fault zone with at least five separate, SW-dipping, normal fault strands displacing an early Pleistocene terrace of the Rhine river by more than 7 m. The major part of the observed deformation was produced during or after deposition of an overlying unit of stratified loess of middle Weichselian to probably Saalian age. The faulting history is shown to be episodic, with different fault strands active at different times. Growth faulting that would be indicative of continuous, aseismic fault motion has not been observed. Our stratigraphic control is not sufficient to constrain the timing and to provide evidence of the coseismic nature for each observed fault displacement. However, two units of structureless, gravelly loess are interpreted as the result of extensive solifluction triggered by two large surface-rupturing events. This is suggested by the position of these units, which is controlled by the main faults, and by their remarkably young age (< 400 cal. BC), indicated by radiocarbon and OSL datings and by the presence of historic brick fragments. At least two faults show moderate activity that is even younger. Our interpretation is not in agreement with earlier hypotheses that ongoing vertical movements of circa 1 mm/a in the German part of the Lower Rhine graben are the result of aseismic fault creep, but is in line with the results of similar investigations on the southwestern border fault of the Roer Valley Graben in Belgium, which demonstrates the need for further paleoseismological research in</p>	Paleoseismological analysis of the Rurrand fault near Jülich, Roer Valley graben, Germany: Coseismic or aseismic faulting history
VOLUME 80 NO 3-4 171	2001	80	3-4	171	185	Frechen, M.; Vanneste, K.; Verbeeck, K.; Paulissen, E.; Camelbeeck, T.	<p>The coversands along the Bree fault escarpment, NE Belgium, were investigated by a combined dating approach including infrared optically stimulated luminescence (IRSL), thermoluminescence (TL) and radiocarbon methods. Four trenches were excavated cutting the fault scarp near the village of Bree in northeast Belgium. Altogether 17 luminescence samples and seven radiocarbon samples were investigated in order to set up a more reliable and precise chronological frame for the local coversand stratigraphy and the timing of Late Quaternary earthquake events. The chronological results indicate at least five accumulation periods for the coversand units in the area of interest. The oldest coversands were deposited during Saalian or Early Weichselian followed by coversands deposited during the Early and/or Middle Weichselian. At least three coversand units can be distinguished for the time span of the Late Weichselian to Holocene. Significant TL age underestimation of more than 20% compared to IRSL was found for samples from Trench 4. Most of the IRSL age estimates are in agreement with radiocarbon dates from the same section.</p>	The Deposition History of the Coversands along the Bree Fault Escarpment, NE Belgium

VOLUME 80 NO 3-4 187	2001	80	3-4	187	208	Galadini, F.; Galli, P.; Cittadini, A.; Giaccio, B.	Paleoseismological investigations have been performed at Mt. Baldo and in the Lessini Mts. in order to collect quantitative data on the activity of minor faults showing geomorphic evidence of recent activation. The 4.5-km-long, NNE-SSW trending Naole fault was responsible for the formation of a narrow depression at the top of Mt. Baldo, bordered by a continuous bedrock (carbonate) fault scarp to the west. The extensional activity along this minor fault is probably due to gravitational deformations (lateral spreading) in response to the warping of the Mt. Baldo anticline. A 1.5-km-long graben is instead related to the 2.5-km-long, NNW-SSE trending Orsara fault (Lessini Mts.) which was responsible for the formation of bedrock (carbonate) fault scarps. This minor fault is part of a complex structural framework made of few-km-long faults which show evidence of Quaternary activity. Two trenches have been excavated across the Naole fault which showed the occurrence of displacement events subsequent to 17435-16385 BP (cal. age) and probably prior to 5455-5385/5330-5295 BP (cal. age). Two other trenches have been excavated across the Orsara fault whose analysis indicated that the most recent displacement event occurred between 20630-19795 BP and 765-675 BP (cal. age). The upper chronological limits of the displacements give some indications about the minimum elapsed time since the last fault activation (about 5,300 years for the Naole fault and 5-8 centuries for the Orsara fault). Both 1) the maximum expected magnitude of the earthquakes which may originate along the Mt. Baldo thrust and 2) the identification of a main fault responsible for the displacements along the complex net of minor faults affecting the Lessini Mts. are	Late Quaternary fault movements in the Mt. Baldo-Lessini Mts. Sector of the Southalpine area (northern Italy)
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VOLUME 80 NO 3-4 209	2001	80	3-4	209	227	Onida, M.; Galadini, F.; Forcella, F.	<p>Paleoseismological techniques have been used to investigate gravitational deformations at the Mortirolo Pass (Valtellina region, central Alps), in order to improve the knowledge on the activation mechanisms and the evolution of deep-seated gravitational slope movements. The deformation has been responsible for mass sliding towards the Valtellina depression through the activation of several-hundred-metre-long shear planes. Minor shear planes dipping towards the mountain played the role of antithetic structures. Four trenches were excavated across scarps representing the surficial expression of shear planes affecting the bedrock and Late Pleistocene-Holocene deposits. The excavations enabled to investigate the stratigraphy of Quaternary deposits and the geometry and kinematics of the shear planes affecting them. Radiocarbon analyses on organic material contained in sediments and paleosols enabled to define a succession of displacement events which occurred during the Late Pleistocene-Holocene. Collected data indicate the persistence of the activity until recent times (last movement related to 1810-1540 cal. BP). A sudden movement has been detected along one of the main shear surfaces (dipping towards the valley) with a vertical displacement of several metres. In contrast, numerous displacements (with lower vertical offset) have been detected along the antithetic shear planes. Different hypotheses have been proposed in the past to define the origin of huge gravitational movements (glacial retreat, uplift of the Alpine chain, fault activity). However, the Late Pleistocene cycles of glacial loading and unloading on the mountain slopes seem to be the most probable factors causing deep-seated gravitational movements in</p>	<p>Application of paleoseismological techniques to the study of Late Pleistocene-Holocene deep-seated gravitational movements at the Montirolo Pass (central Alps, Italy)</p>
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VOLUME 80 NO 3-4 229	2001	80	3-4	229	241	Masana, E.; Villamarin, J.A.; Sánchez Cabañero, J.; Plaza, J.; Santanach, P.	Given that earthquakes do not occur only along high slip-rate faults, slow moving seismogenic faults should be characterized in order to minimize seismic hazard uncertainties. Although no historical earthquakes related to the El Camp fault have been documented, earlier regional geological analysis and the presence of a fault scarp provide evidence of its activity. A paleoseismological study on the southern part of the fault was performed in accordance with the following steps: 1) geological and geomorphologic analysis focussing on the detection of evidence for the seismogenic behavior of the fault, 2) near fault analysis to select the best trenching sites, and 3) trenching to establish and characterize the paleoseismic events. Different dating procedures were used in regional and trenching analyses (Thermoluminescence, U/Th, Radiocarbon, Pollen analysis). The seismogenic nature of the fault was established by the presence of liquefaction features related to the fault, and by the presence of colluvial wedges composed of large angular blocks. We identified a segment boundary to the north of the Porquerola creek and we focussed our attention on the southern segment, which was active after 125000 yr. The slip rate in this southern segment is 0.02 mm/yr. A minimum of three seismic events were detected, from young to old: the last event Z took place some time prior to 1195 yr AD, the penultimate event Y between event X and the Holocene, and, finally, event X occurred after 125000 yr and prior to 60000 yr. The recurrence period is between 25000 and 35000 yr, the elapsed time is estimated to be no longer than 3000 yr; and the maximum estimated earthquake considering both the onshore and the offshore part of the fault is Mw 6.7 +/- 0,5.	Seismogenic faulting in an area of low
VOLUME 80 NO 3-4 243	2001	80	3-4	243	253	Fleta, J.; Santanach, P.; Goula, X.; Martínez, P.; Grellet, B.; Masana, E.	The Amer fault is a 30 km long normal fault, which generated the damaging earthquakes of March and May 1427. Triangular facets, wine glass drainage basins, alluvial fans and scarps along the Amer fault mountain front provide evidence of its recent activity. Topographic profiling, electrical logging, tomographic and high-resolution seismic profiling along the northern segment of the Amer fault showed the following: i) no evidence of surface deformation in recent deposits; ii) fault scarps produced by the Amer fault located only on old alluvial fans, probably Pleistocene in age, and iii) Amer fault related deformation reaching upper Quaternary levels, but not the uppermost horizons. The high sedimentation rate (nearly one order of magnitude greater than the fault slip rate) due to the filling of the lake, which resulted from the damming of the Fluvià river by the Bosc de Tosca lava flow (17,000 yr BP), can account for the absence of surface deformation on Holocene sediments.	Preliminary geologic, geomorphologic and geophysical studies for the paleoseismological analysis of the Amer fault (NE Spain)

VOLUME 80 NO 3-4 255	2001	80	3-4	255	272	Larroque, C.; Béthoux, N.; Calais, E.; Courboulex, F.; Deschamps, A.; Déverchère, J.; Stéphan, J.F.; Ritz, J.F.; Gilli, E.	<p>The Southern Alps-Ligurian basin junction is one of the most active seismic areas in Western Europe countries. The topographic and the structural setting of this region is complex because of (i) its position between the high topography of the Southern Alps and the deep, narrow Ligurian oceanic basin, and (ii) the large number of structures inherited from the Alpine orogeny. Historical seismicity reveals about twenty moderate-size earthquakes (up to M=6.0), mostly distributed along the Ligurian coast and the Vésubie valley. A recent geodetic experiment shows a significant strain rare during the last 50 years in the area between the Argentera massif and the Mediterranean coastline. Results of this experiment suggest a N-S shortening of about 2-4 mm/yr over the network, this shortening direction is consistent with the seismological (P-axes of earthquakes) and the microtectonic data. The Pennic front (E-NE of the Argentera massif) and the northern Ligurian margin are the most seismically active areas. In the Nice arc and in the Argentera massif, some seismic lineaments correspond to faults identified in the field (such as the Täggia-Saorge fault or the Monaco-Sospel fault). In the western part of the Alpes Maritimes, no seismic activity is recorded in the Castellane arc. In the field, geological evidence, such as offsets of recent alluvial sediments, recent fault breccia, speleothem deformations, radon anomalies and others indicates recent deformation along these faults. Nevertheless, to this date active fault scarps have not been identified: this probably results from a relatively high erosion rate versus deformation rate and from the lack of Quaternary markers. We also suspect the presence of two hidden active faults, one in the lower Var valley (Nice city area) and</p>	Active and recent deformation at the Southern Alps-Ligurian basin junction
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VOLUME 80 NO 3-4 273	2001	80	3-4	273	296	Galadini, F.; Meletti, C.; Vittori, E.	<p>An inventory of the available surficial data on active faults in Italy has been compiled by gathering all the available information on peninsular Italy (project by CNR, National Group for the Defense against Earthquakes), the central-eastern Alps and the Po Plain (EC 'PALEOSIS' project). Such information has been summarised in maps (reporting surficial expressions of faults with length $l > 11$ km) and in a table where fault parameters relevant for seismic hazard assessment (e.g. slip rates, recurrence intervals for surface faulting events, etc.) have been reported. Based on the geological characteristics of the Italian territory, a fault has been considered as active if it shows evidence of Late Pleistocene-Holocene displacements. Active faults in Italy are distributed throughout the entire Apennine chain, in the Sicilian and Calabrian regions and in some Alpine sectors, but knowledge is not homogeneously distributed through the territory. The largest amount of data is related to the central Apennines. In contrast, fault geometries and parameters are less well defined in the southern Apennines, Sicily and Calabria, where investigations have started more recently. knowledge is sparse in the northern Apennines, where data necessary to define fault parameters are lacking and also the chronology of the activity has to be considered cautiously. Abundant blind faulting in the Po Plain hinders the detection of active faults by means of the classical surficial investigations and therefore the present knowledge is limited to the Mantova fault. Blind faults and the peculiar recent geological history of the Alpine areas, which is strongly conditioned by the erosional and depositional activity during and after the last glacial maximum, also hinder the</p>	Major active faults In Italy: available surficial data
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VOLUME 80 NO 3-4 297	2001	80	3-4	297	304	Vandycke, S.; Quinif, Y.	<p>This paper presents observations of recent faulting activity in the karstic network of the Rochefort Cave (Namur Province, Belgium, Europe). The principal recent tectonic features are bedding planes reactivated as normal faults, neo-formatted normal faults in calcite flowstone, fresh scaling, extensional features, fallen blocks and displacement of karstic tube. The seismotectonic aspect is expanded by the presence of fallen blocks where normally the cavity must be very stable and in equilibrium. Three main N 070° fault planes and a minor one affect, at a decimetre scale, the karst features and morphology. The faults are still active because recent fresh scaling and fallen blocks are observable. The breaking of Holocene soda straw stalactites and displacements of artificial features observed since the beginning of the tourist activity, in the last century, also suggest very recent reactivation of these faults. This recent faulting can be correlated to present-day tectonic activity, already evidenced by earthquakes in the neighbouring area. Therefore, karstic caves are favourable sites for the observation and the quantification of recent tectonic activity because they constitute a 3-D framework, protected from erosion. Fault planes with this recent faulting present slickensides. Thus a quantitative analysis in term of stress inversion, with the help of striated faults, has permitted to reconstruct the stress tensor responsible for the brittle deformation. The principal NW-SE extension (σ_3 horizontal) is nearly perpendicular to that of the present regional stress as illustrated by the analysis of the last strong regional earthquake (Roermond, The Netherlands) in 1992. During the Meso-Cenozoic, the main stress tectonics recorded in this part of the European platform is similar to the present one</p>	Recent active faults in Belgian Ardenne revealed in Rochefort Karstic network (Namur Province, Belgium)
VOLUME 80 NO 3-4 305	2001	80	3-4	305	314	Atakan, K.; Ojeda, A.; Camelbeeck, T.; Meghraoui, M.	<p>Seismic hazard in low seismicity areas of Europe has traditionally been considered insignificant. However, in the light of the recently conducted paleoseismic studies along the Rhine Graben, a revision is required. Previously applied standard probabilistic seismic hazard assessment (PSHA) methods, using Poissonian approach for the earthquake occurrence, can now be substituted by renewal models where fault parameters such as the maximum magnitude, recurrence interval and the elapsed time since the last occurrence of a large earthquake, can be utilized. In this study, the application and the influence of the available paleoseismic data in the Lower Rhine Graben to seismic hazard analysis is demonstrated. The resulting hazard, maps, when compared to the standard PSHA using Poissonian approach, indicate a more precise geographical distribution of the estimated seismic hazard levels. The influence of the paleoseismic data seem to be less important for return periods less than a 1000 years. Among the different input models, the highest values reach to 170 cm/sec² for a 1000 year return period using a combination of Poissonian and renewal models.</p>	Seismic hazard analysis results for the Lower Rhine Graben and the importance of paleoseismic data

VOLUME 80 NO 3-4 315	2001	80	3-4	315	321	Cadorin, J.F.; Jongmans, D.; Plumier, A.; Camelbeeck, T.; Delaby, S.; Quinif, Y.	To provide quantitative information on the ground acceleration necessary to break speleothems, laboratory measurements on samples of stalagmite have been performed to study their failure in bending. Due to their high natural frequencies, speleothems can be considered as rigid bodies to seismic strong ground motion. Using this simple hypothesis and the determined mechanical properties (a minimum value of 0.4 MPa for the tensile failure stress has been considered), modelling indicates that horizontal acceleration ranging from 0.3 m/s ² to 100 m/s ² (0.03 to 10g) are necessary to break 35 broken speleothems of the Hotton cave for which the geometrical parameters have been determined. Thus, at the present time, a strong discrepancy exists between the peak accelerations observed during earthquakes and most of the calculated values necessary to break speleothems. One of the future research efforts will be to understand the reasons of the defined behaviour. It appears fundamental to perform measurements on in situ speleothems.	Modelling of speleothems failure in the Hotton cave (Belgium). Is the failure earthquake induced?
VOLUME 80 NO 3-4 323	2001	80	3-4	323	332	Delaby, S.	In some karstic caves, the observation of numerous broken stalagmites may provide potential secondary evidence for intense palaeoearthquakes during recent past times. We have named these morpho-sedimentologic features seismothems. A methodology has been developed to discriminate broken speleothems due to earthquake-induced effects or caused by other mechanisms. A study has been carried out in the Belgian karst areas. In the Vesdre Valley, it seems difficult to find evidence of the well-known Verviers earthquake, probably the most destructive historical earthquake known in Belgium which occurred in 1692 AD. The most important concentration of broken stalagmites was discovered in the caves between Hotton and Han-sur-Lesse. The observations in the cave of Hotton suggest a seismic origin, the other origins can not be the cause of the speleothem break. This result implies a strong earthquake situated close to the cave. A preliminary AMS ¹⁴ C age suggests a minimum age of 10100 ± 1200 cal ¹⁴ C yr BP. for one stalagmite rupture in the Hotton cave.	Palaeoseismic investigations in Belgian caves
VOLUME 81 NO 1 1	2002	81	1	1	8	Dortangs, R.W.; Schulp, A.S.; Mulder, E.W.A.; Jagt, J.W.M.; Peeters, H.H.G.; Graaf, D.T. de	We report the discovery of a new species of marine reptile, a mosasaur, from the Upper Cretaceous (Maastrichtian) of The Netherlands. Prognathodon saturator sp. nov. is represented by an almost complete skull and much of the postcranial skeleton, and is one of the largest mosasaurs discovered to date. The stout skull and extremely massive jaws are more powerfully built than in any other known mosasaur. Bite marks, the partial disarticulation and scattering of the skeleton, and the presence of associated teeth of Squalicorax and Plicatoscyllium suggest extensive scavenging by sharks.	A large new mosasaur from the Upper Cretaceous of The Netherlands

VOLUME 81 NO 1 9	2002	81	1	9	17	Moorlock, B.S.P.; Riding, J.B.; Hamblin, R.J.O.; Allen, P.; Rose, J.	The Pleistocene College Farm Silty Clay Member of the Creting Formation at Great Blakenham, Suffolk, south-east England is shown to contain indigenous and recycled dinoflagellate cysts and other derived palynomorphs. The indigenous dinoflagellate cysts indicate a marine influence during deposition of the clay, whilst the other palynomorphs demonstrate derivation of sediment from a wide catchment of Carboniferous, Jurassic and Cretaceous bedrocks. It is argued, by comparison with palynological data from the Chillesford Clay Member of the Norwich Crag Formation some 25km to the east, that these sediments were eroded from western, south-central and south-eastern Britain, and transported by the early River Thames to its estuary, where they were redeposited at the western margin of the Crag Basin, during the Early Pleistocene Tiglian TC3 Substage. This interpretation refines earlier research which concluded the College Farm Silty Clay was deposited in a predominantly freshwater environment, such as a lagoon, without any direct access to the sea or major river.	The Pleistocene College Farm Silty Clay at Great Blakenham, Suffolk, England - additional information on the course of the early River Thames
VOLUME 81 NO 1 19	2002	81	1	19	26	Balen, R.T. van; Verweij, J.M.; Wees, J.D. van; Simmelink, H.; Bergen, F. van; Pagnier, H.	The deep subsurface temperature data of the Roer Valley Graben have been re-analysed and combined with new temperature data from hydrocarbon exploration wells. The results show that the deep subsurface temperature distribution in the Roer Valley Graben is essentially the same as in the relatively stable high bordering the Roer Valley Graben to the southwest. Thus, the Cenozoic tectonic evolution of the Roer Valley Graben, which is characterized by uplift and denudation during the Late Eocene and subsidence due to rifting starting from Late Oligocene, has hardly affected the temperatures in the graben, which is probably due to the slow subsidence and sedimentation rates. In contrast to what is suggested on previously published temperature maps, the Roer Valley Graben is probably not a relatively cold area in the Netherlands.	Deep subsurface temperatures in the Roer Valley Graben and the Peelblock, the Netherlands - new results

VOLUME 81 NO 1 27	2002	81	1	27	37	Dam, R.L. van	Ground-penetrating radar data from a regular grid are used to study the internal structure and development of a 9-m high aeolian river dune in the Dutch Rhine-Meuse delta. The purpose of this investigation was to image the internal sedimentary structures to better understand the development of these aeolian river dunes. Three radar facies can be recognised in the GPR sections. Radar facies 1 has a maximum thickness of 5 to 6 m and is characterised by dipping, parallel reflections with a maximum length of at least 20 m. The reflections from perpendicular sections, analysed using closed-loop correlation in 3-D-interpretation software, form eastward dipping (14° maximum) surfaces. Radar facies 2 is one continuous, sub-horizontal reflection. This high amplitude reflection is most probably caused by a thin organic horizon. Radar facies 3 has a thickness of 3 to 4 m and is made up of sets of short, predominantly eastward to north-eastward dipping reflections separated by rather continuous, sub-horizontal reflections. The eastward dipping surfaces in radar facies 1 are foresets of a dune that was deposited by prevailing westerly winds in the Younger Dryas, the last cold period in the Pleistocene. During the Early Holocene, an increasing vegetation cover stabilised the dune and formed a thin organic horizon. Subsequent resumption of dune forming processes led to the formation of radar facies 3 on top of the vegetated Pleistocene dune. Sedimentation by small dunes, partly eroding each other, led to sets of cross-stratification separated by bounding surfaces. The results suggest a small change in palaeo wind direction.	Internal structure and development of an aeolian river dune in The Netherlands, using 3-D interpretation of ground-penetrating radar data
VOLUME 81 NO 1 39	2002	81	1	39	60	Berg, M. van den; Vanneste, K.; Dost, B.; Lokhorst, A.; Eijk, M. van; Verbeeck, K.	On the basis of a multidisciplinary approach we have unraveled the palaeo-earthquake history of a trenched section across the Peel Boundary Fault. The area shows at present one of the largest contrasts in relative motion on both sides of the fault on the basis of repeated levelling. The geological record for the last 25 thousand years, recovered in the trench, shows evidence of two heavy earthquakes (moment magnitude between 6.0 and 6.6), that occurred in a relatively short timespan around 15 thousands years ago. A third less severe event occurred somewhere in the mid Holocene. The time interval between the two large events is in the order of 1500 years, an interval comparable to that between the last volcanic explosions in the nearby Eifel area. Both records together seem to suggest a relation between large-scale faulting and volcanic activity in the nearby Eifel area, but this interpretation is based on one trench only and should be tested by opening more trenches in the zone that is assumed to be affected by these large events.	Paleoseismic investigations along the Peel Boundary Fault: geological setting, site selection and trenching results

VOLUME 81 NO 1 61	2002	81	1	61	70	Frechen, M.; Berg, M.W. van den	The coversands along the Peel Boundary Fault in the Netherlands were investigated by a luminescence dating approach combining Infrared Optically Stimulated Luminescence (IRSL) and Thermoluminescence (TL) methods. At the Neer trench, ten samples were collected and investigated in order to set up an independent chronological framework for the deposition history of the fluvio-aeolian and aeolian sediments and hence the timing of Late Weichselian and Holocene earthquake events. Five sedimentary units could be distinguished by this chronological approach. The oldest fluvio-aeolian unit yielded a mean deposition age of 35.9 ± 0.4 ka and is designated to correlate with the Middle Weichselian. An IRSL age estimate of 20.1 ± 2.9 ka was determined for the sediment that most likely represents the Older Coversands I, and a mean luminescence age of 15.1 ± 1.2 ka for deposits just below the Beuningen gravel bed. The aeolian sediment from above the Beuningen horizon yielded an IRSL age estimate of 9.4 ± 1.0 ka. The youngest deposits from the colluvial wedge yielded $<6.9 \pm 0.7$ ka BP, and so an earthquake event was likely to occur during the Middle or Late Holocene, as evidenced by the luminescence age estimates.	The coversands and timing of Late Quaternary earthquake events along the Peel Boundary Fault in the Netherlands
VOLUME 81 NO 1 71	2002	81	1	71	81	Miedema, R.; Jongmans, T.	Micromorphological studies relating the soil formation history (processes and timing) to activity events of the Peel Boundary Fault (PBF) showed rotation features (circular distribution pattern of sand grains) in mechanically displaced rounded fragments of Bt bands. These features are interpreted as being caused by 'mudflow' during active faulting event (PBF event F2). The micromorphological interpretation of Late Weichselian soil formation (clay illuviation, degradation features and offsetting of Bt bands) agrees with the hypothesized 3 PBF periods of fault activity events (F1, F2 and F3).	Soil formation in Late Glacial Meuse sediments related to the Peel Boundary Fault activity
VOLUME 81 NO 1 83	2002	81	1	83	83	Hooghiemstra, H.		Introduction to Pages Symposium, Amsterdam, 3 November 2000
VOLUME 81 NO 1 85	2002	81	1	85	96	Plicht, J. van der	Radiocarbon calibration based on dendro-chronology and U-series dated corals yield a calibration curve (INTCAL98) well into the Late Glacial, back to ca. 15,600 calendar years ago. Beyond this limit, various calibration curves are produced, mainly based on laminated sediments and various carbonates dated by U-series isotopes. Such calibration curves now cover the complete ^{14}C dating range of about 45,000 years, but are not consistent with each other. Each calibration method (other than dendro-chronology) has its own assumptions and pitfalls. Thus far, the calibration curve obtained from Lake Suigetsu laminated sediments is the only terrestrial (atmospheric) one.	Calibration of the ^{14}C time scale: towards the complete dating range

VOLUME 81 NO 1 97	2002	81	1	97	112	Berendsen, H.J.A.; Stouthamer, E.	<p>Approximately 200,000 lithological borehole descriptions, 1200 ¹⁴C dates, 36,000 dated archaeological artifacts, and gradients of palaeochannels were used to reconstruct the Holocene evolution of the fluvial part of the Rhine-Meuse delta. Ages of all Holocene channel belts were stored in a Geographical Information System database that enables generation of palaeogeographic maps for any time during the Holocene. The time resolution of the palaeogeographic reconstruction is about 200 years. During the Holocene, avulsion was an important process, resulting in frequent shifts of areas of clastic sedimentation. Palaeogeographic evolution and avulsion history of the Rhine-Meuse delta are governed by complex interactions among several factors. These are: (1) Location and shape of the Late Weichselian palaeovalley. In the Early Holocene, rivers were confined to the Late Weichselian valley. When aggradation shifted upstream) the margins of the valley were crossed by newly formed channel belts. (2) Sealevel rise, which resulted in back-filling of the palaeovalley. (3) River channel pattern. In the central-western part of the delta, a straight anastomosed channel pattern with large-scale crevassing developed as a result of sealevel rise and the associated decrease of stream power. (4) Neotectonics. Differential tectonic movements of the Peel Horst and Roer Valley Graben seem to have influenced river behaviour (formation of an asymmetrical meander belt, location of avulsion nodes in fault zones), especially from 4500-2800 ¹⁴C yr BP when the rate of sealevel rise had decreased. After 2800 ¹⁴C yr BP sealevel rise further decreased, and tectonic influence still may have influenced avulsions, but from then on other factors became dominant. (5)</p>	Paleogeographic evolution and avulsion history of the Holocene Rhine-Meuse delta, The Netherlands
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VOLUME 81 NO 1 113	2002	81	1	113	122	Renssen, H.; Isarin, R.F.B.; Vandenberghe, J.	Temperature profiles along east-west and north-south transects in Europe are presented for four time-slices covering the two most prominent warming phases of the last glacial-interglacial transition: Late Pleniglacial (LP), early Bølling (BL), Younger Dryas (YD), and Preboreal (PB). These temperature profiles are based on two methods: 1) simulation experiments with an atmospheric general circulation model, 2) reconstructions based on terrestrial geological and palaeoecological data. The profiles have The Netherlands as intersection point (52°N, 5°E). During the cold phases (LP and YD), the simulated and reconstructed temperature gradients are very steep in a north-south direction, ranging in January from -25°C in northern Europe (56-60°N) to at least 5°C near the Mediterranean, and in July from 0°C to 20°C. The east-west profiles along 52°N for LP and YD show that temperatures in Eastern Europe were similar to the Atlantic coast (i.e. between -15°C and -25°C). During the warm phases (BL and PB), the temperature regimes resembled present-day thermal conditions, although steeper north-south and east-west temperature gradients were present during BL and PB. The model simulations suggest that continental Europe was a few degrees warmer during PB and BL than today in July under influence of the relatively high summer insolation. Considering the change of climate through time, the profiles show that in The Netherlands the warming during the two transitions (LP-BL, YD-PB) was relatively small compared to regions to the West and North, whereas in Eastern and Southern Europe the temperature increase is even smaller. This reflects the dominant influence of latitudinal movements of the North Atlantic polar front and associated sea-ice margin.	Thermal gradients in Europe during the last glacial-interglacial transition
VOLUME 81 NO 1 123	2002	81	1	123	137	Hoek, W.Z.; Bohncke, S.J.P.	The Last Termination, or Weichselian Lateglacial (ca 15-10 ka cal. BP), is a time period with rapid changes in climate and environment. The oxygen-isotope records of the Greenland ice-cores are regarded as the most complete climate proxy for the North Atlantic region. In The Netherlands several other proxies have been investigated and dated in great detail over the last few decades. However, changes registered in the different records are not by definition causally related to climate changes. Comparison of the different records on a common time-scale permits evaluation of the interrelationships and correlations to the Greenland ice-cores. Some events are the result of the complex interplay of different environmental variables and have no causal relationship with climate changes at all. By comparing the different records on a common time-scale and examining spatial patterns, the links between the proxies become evident	Climatic and environmental events over the Last Termination, as recorded in The Netherlands: a review
VOLUME 81 NO 2 145	2002	81	2	145	147	Schäfer, A.; Siehl, A.		Preface: Rift tectonics and syngenetic sedimentation - the Cenozoic Lower Rhine Basin and related structures

VOLUME 81 NO 2 149	2002	81	2	149	158	Kockel, F.	Since the beginning of the development of the North German Basin in Stephanian to Early Rotliegendes times, rifting played a major role. Nearly all structures in NW-Germany and the German North Sea - (more than 800) - salt diapirs, grabens, inverted grabens and inversion structures - are genetically related to rifting. Today, the rifting periods are well dated. We find signs of dilatation at all times except from the Late Aptian to the end of the Türonian. To the contrary, the period of the Coniacian and Santonian, lasting only five million years was a time of compression, transpression, crustal shortening and inversion. Rifting activities decreased notably after inversion in Late Cretaceous times. Tertiary movements concentrated on a limited number of major, long existing lineaments. Seismically today NW-Germany and the German North Sea sector is one of the quietest regions in Central Europe.	Rifting processes in NW-Germany and the German North Sea Sector
VOLUME 81 NO 2 159	2002	81	2	159	166	Verbeek, J.W.; Leeuw, C.S. de; Parker, N.; Wong, T.E.	Within the Cenozoic sedimentary section of the Roer Valley Graben ten seismostratigraphic units have been identified. They are closely related to the lithological framework which makes it possible to recognize them also on well logs in this region. The Lower Tertiary seismic units, representing mainly marine sediments, have a uniform development that can be correlated over large distances into the German part of the Roer Valley Graben. The marine to continental Upper Tertiary and Quaternary seismic units display a more complex development due to lateral facies changes (including prograding delta systems) and rift tectonics	Characterisation and correlation of Tertiary seismostratigraphic units in the Roer Valley Graben
VOLUME 81 NO 2 167	2002	81	2	167	176	Klett, M.; Eichhorst, F.; Schäfer, A.	The Cenozoic fill of the Lower Rhine Basin is investigated with data from industry wells and open-cast mines on lignite coal. The geophysical logs of digitised well data are used to calculate lithofacies logs with a newly developed technique. The lithofacies logs allow the interpretation of shallow marine and continental environments in a sequence stratigraphic approach. In addition, base level analysis with both the lithofacies logs and the geophysical logs provide a stratigraphical frame for environment interpretation, modelling, and simulation.	Facies interpretation from well logs applied to the Tertiary Lower Rhine Basin fill

VOLUME 81 NO 2 177	2002	81	2	177	183	Mörs, T.	<p>This paper discusses the faunal content, the mammal biostratigraphy, and the environmental ecology of three important continental Tertiary vertebrate faunas from the Lower Rhine Embayment. The sites investigated are Rott (MP 30, Late Oligocene), Hambach 6C (MN 5, Middle Miocene), Frechen and Hambach 11 (both MN 16, Late Pliocene). Comparative analysis of the entire faunas shows the assemblages to exhibit many conformities in their general composition, presumably resulting from their preference for wet lowlands. It appears that very similar environmental conditions for vertebrates reoccurred during at least 20 Ma although the sites are located in a tectonically active region with high subsidence rates. Differences in the faunal composition are partly due to local differences in the depositional environment of the sites: lake deposits at the margin of the embayment (Rott), coal swamp and estuarine conditions in the centre of the embayment (Hambach 6C), and flood plain environments with small rivulets (Frechen and Hambach 11). The composition of the faunal assemblages (diversity and taxonomy) also documents faunal turnovers with extinctions and immigrations (Oligocene/Miocene and post-Middle Miocene), as a result of changing climate conditions. Additional vertebrate faunal data were retrieved from two new assemblages collected from younger strata at the Hambach mine (Hambach 11C and 14). They are important for the understanding of the Plio-Pleistocene transition in the southern part of the Lower Rhine Embayment and for correlating depositional sequences in the Dutch/German borderland.</p>	Biostratigraphy and paleoecology of continental Tertiary vertebrate faunas in the Lower Rhine Embayment (NW-Germany)
VOLUME 81 NO 2 185	2002	81	2	185	191	Utescher, T.; Mosbrugger, V.; Ashraf, A.R.	<p>Based on recent studies, the impact of global sea-level and climate change on the paleogeographic and sedimentary evolution of the Tertiary of the Lower Rhine Basin is analysed. It is shown that major changes in global climate and sea-level, such as the high-stand during the Middle Miocene climate optimum, the extreme low-stands near the base of the Tortonian and within the Messinian, are clearly reflected in the sedimentary succession. Continental climate curves, as reconstructed from Tertiary macrofloras of the Lower Rhine Basin, can be correlated with the marine, long-term isotope record. As shown by the analyses, a warm and humid climate with mean annual temperatures above 13°C and mean annual precipitation not below 1000 mm, persisted throughout the Late Miocene to Early Pliocene. Continental, high-resolution, climate data show that Late Miocene alternations of lignites and clastics are rather caused by tectonic and sedimentary processes (such as the repeated migration of the river system) than by major climate changes.</p>	Facies and paleogeography of the Tertiary of the Lower Rhine Basin - sedimentary versus climatic control

VOLUME 81 NO 2 193	2002	81	2	193	199	Heumann, G.; Litt, T.	More than 400 samples for paleobotanical and sedimentological investigations were collected from Late Pliocene and earliest Pleistocene beds in the open-cast lignite mine Hambach. They were analysed to obtain information about the paleoecology and paleoclimate of this time interval. The sedimentation type changed from a high-energy meandering fluvial system to floodplain, swamp and oxbow lake sedimentation. The typical Tertiary floral elements decreased with the onset of increasingly cooler climatic conditions and disappeared at the beginning of the Pleistocene to be substituted by a impoverished and cold-adapted flora. These combined litho- and biostratigraphic investigations led to an improved and reproducible separation of Late Pliocene from Early Pleistocene deposits.	Stratigraphy and paleoecology of the Late Pliocene and Early Pleistocene in the open-cast mine Hambach (Lower Rhine Basin)
VOLUME 81 NO 2 201	2002	81	2	201	209	Boenigk, W.	During the Pleistocene the drainage pattern in the Lower Rhine Basin changed twice, from a flooding of the whole basin by the river Rhine from SW to NE to an influence restricted to the NE only. The first dominance of the river Rhine is documented from the Reuverian to the Tiglian, the second one in the Cromerian. In between this time, the Meuse River drained the central Lower Rhine Basin in NE direction. For the sediments of that river, the term 'Holzweiler Formation' is introduced. Since the Late Cromerian, the influence of the Rhine is again restricted to the NE of the Lower Rhine Basin. The central part of the basin is drained by small local rivers.	The Pleistocene drainage pattern in the Lower Rhine Basin
VOLUME 81 NO 2 211	2002	81	2	211	215	Balen, R.T. van; Houtgast, R.F.; Wateren, F.M. van der; Vandenberghe, J.	Using marine planation surfaces, fluvial terraces and a digital terrain model, the amount of eroded rock volume versus time for the Meuse catchment has been computed. A comparison of the amount of eroded volume with the volume of sediment preserved in the Roer Valley Rift System shows that 12% of the eroded volume is trapped in this rift. The neotectonic uplift evolution of the Ardennes is inferred from the incision history of the Meuse River system and compared to the subsidence characteristics of the Roer Valley Rift System. Both areas are characterized by an early Middle Pleistocene uplift event.	Neotectonic evolution and sediment budget of the Meuse catchment in the Ardennes and the Roer Valley Rift System

VOLUME 81 NO 2 217	2002	81	2	217	221	Meyer, W.; Stets, J.	Uplift of the Rhenish Massif can be demonstrated by means of the stream-made river terrace system that accompanies the Rhine river and its tributaries along their way through or within this part of the Variscan fold and thrust belt. The height difference between a former valley floor, especially that of the Younger 'Hauptterrasse' (Main Terrace), and the recent one allows to quantify the uplift by the amount of downcutting erosion. The uplift velocity increased just after the BRUNHES / MATUYAMA boundary, i.e. about 0.8 Ma B.P. Since that time, a domal uplift of more than 250 m is documented in the eastern Hunsrück and in the south-eastern Eifel. The area of this maximum height anomaly is situated just between the East and West-Eifel Quaternary volcanic districts. Thus, causal connections are supposed. The domal uplift is affected by normal faulting partly inherited since Tertiary rifting.	Pleistocene to Recent tectonics in the Rhenish Massif (Germany)
VOLUME 81 NO 2 223	2002	81	2	223	230	Campbell, J.; Kümpel, H.J.; Fabian, M.; Fischer, D.; Görres, B.; Keyzers, C.J.; Lehmann, K.	As part of the activities of the Collaborative Research Centre 'SFB 350', measurements of geodetic and geodynamic changes in the area of the Lower Rhine Embayment and the Rhenish Shield are being performed at different scales in space and time. Continuous borehole tilt measurements and repeated microgravimetric surveys yield information on the local stability of the ground and changes in horizontal gravity gradients that are both dominated by seasonal fluctuations. Results of more than seven years of regular GPS campaigns are discussed in terms of vertical and horizontal point motions. The most prominent motions are man-induced effects occurring in or near the browncoal mining areas, where groundwater withdrawal produces subsidence of up to 2.2 cm/y in the area under investigation. Horizontal and vertical motions at other GPS points are smaller by one order of magnitude and in most cases are only marginally detectable. The eastward motion of two points in the Bergisches Land and the westward motion of two points in the Eifel near the Belgian border may be interpreted as a result of the ongoing extension of the Cenozoic rift system in the western part of the Eurasian plate.	Recent movement pattern of the Lower Rhine Embayment from tilt, gravity and GPS data

VOLUME 81 NO 2 231	2002	81	2	231	239	Jentzsch, T.; Siehl, A.	Kinematic geological models can greatly enhance our understanding of the interaction and timing of processes involved in the formation of sedimentary basins. The prototype tool for the calculation and visualisation of such models presented here is aimed at studying subsidence rates and patterns at basin scale: A backstripping algorithm is applied to a geometrical 3Dmodel consisting of prismatic volumes, constructed from an initial set of stacked triangulated surfaces. As a result, we obtain a collection of palinspastically restored volumes for each timestep of basin evolution. The backstripped volumes of each layer are then arranged within a timescene, and the set of timescenes collected as a hierarchical timetree. By interpolating between succeeding key-frames, the subsidence history of the basin can be viewed as an interactive, continuous animation. The approach is illustrated using a high-resolution dataset from the German part of the Cenozoic Lower Rhine Basin.	Kinematic subsidence modelling of the Lower Rhine Basin
VOLUME 81 NO 2 241	2002	81	2	241	250	Thomsen, A.; Siehl, A.	In the context of the investigation of the sedimentary and structural evolution of the Cenozoic Lower Rhine Basin, the construction of a volume-balanced kinematic model of a small faulted domain with detailed spatial information on strata and fault geometry from a set of parallel geological sections is under development. A 3D geometry model is built that allows for relative movements of blocks at fault surfaces. Rouby's method of restoration in the map plane is used to determine horizontal displacement fields. The 3D and 3D(t) geometry models are supported by the object-oriented geometry database tool Geo-ToolKit for storage and retrieval of selected parts of the model using queries referring to spatial and temporal criteria, while visualization is based on key frame technique	Towards a balanced 3D kinematic model of a faulted domain - the Bergheim open pit mine, Lower Rhine Basin

VOLUME 81 NO 2 251	2002	81	2	251	256	Breunig, M.; Balovnev, O.; Cremers, A.B.; Shumilov, S.	Within the collaborative research centre SFB350 at the University of Bonn a component software called GeoToolKit has been developed, which is intended to facilitate the design and implementation of 3D/4D geological applications. It provides a range of geo-oriented software building blocks for application developers involving database management system based spatial and temporal data maintenance, support for efficient spatial and temporal retrieval, communication, visualization and graphical interfaces which the user could assemble in a ready-to-use application. As such, GeoToolKit is not a GIS-in-a-box package - rather it is a library of C++ classes that allows the incorporation of spatial functionality within an application under development. It is primarily oriented towards software engineers with the C++ experience involved in the development of special-purpose geological applications, which can hardly be modelled within standard GISs. We present applications using GeoToolKit, which have been developed to support the geological reconstruction of the Lower Rhine Basin.	Spatial and Temporal Database Support for Geologists - An Example from the Lower Rhine Basin
VOLUME 81 NO 3-4 263	2002	81	3-4	263	264	Bridgland, D.R.; Sirocko, F.		Preface: Special Issue arising from the meeting in Mainz, Germany, of the Fluvial Archive Group
VOLUME 81 NO 3-4 265	2002	81	3-4	265	281	Bridgland, D.R.; Maddy, D.	Fluvial sequences, particularly major terrace staircases, represent potential archives of palaeoclimatic fluctuation during the Quaternary. Such sequences can span much if not all of the Quaternary and, provided that dating is possible, can serve as stratigraphical frameworks for correlation with evidence from other depositional environments. In particular, they can provide a terrestrial lithostratigraphical framework that can be correlated with the global marine oxygen isotope record. Fluvial lithostratigraphical frameworks also provide important contexts for records of faunal evolution and human occupation, the latter largely determined from the occurrence of artefacts in fluvial sediments. This paper announces a new project within the International Geological Correlation Programme, devoted to fluvial sequences (IGCP 449 'Global Correlation of Late Cenozoic fluvial deposits'). It attempts to summarize existing baseline knowledge at the outset of the project and outlines the proposed methods and criteria for establishing a database of fluvial sequences.	Global correlation of long Quaternary fluvial sequences: a review of baseline knowledge and possible methods and criteria for establishing a database

VOLUME 81 NO 3-4 283	2002	81	3-4	283	303	Westaway, R.	Effects of flow in the lower continental crust have often been ignored in the geomorphological literature on the growth of topography during the Quaternary. However, the ability of the lower crust to flow in response to horizontal pressure gradients, caused by lateral variations in the depth of the base of the brittle upper crust, results in two mechanisms for the growth of topography, which can occur either separately or in combination. First, an increase in the rate of erosion in a region will result in a progressive reduction in the depth of the base of the brittle layer, which will drive inflow of lower crust to beneath the region, which will increase the crustal thickness and thus the altitude of the Earth's surface. It is important to note that this mechanism can increase the mean altitude of the Earth's surface, not just the altitude of summits formed of erosion-resistant rock or other features that are not eroding, which will rise faster than the surrounding eroding landscape. Second, repeated cyclic surface loading by ice sheets or fluctuations in global sea-level will cause net flow from areas of relatively cool lower crust to beneath areas of warmer crust. This process will thus usually result in net flow of lower crust from beneath offshore areas to beneath land areas, thinning the crust and increasing the bathymetry offshore but adding to the crustal thickness and so uplifting the land surface onshore. Although these two processes have different mechanisms, the time scale over which both operate is governed by the time required for heat diffusion, resulting from lower-crustal flow (which is concentrated near the Moho), to affect the position of the base of the brittle layer. As a result, the uplift responses for both processes can be very similar. This means that to resolve the physical cause of	Geomorphological consequences of weak lower continental crust, and its significance for studies of uplift, landscape evolution, and the interpretation of river terrace sequences
VOLUME 81 NO 3-4 305	2002	81	3-4	305	328	Westaway, R.	Long-term river terrace sequences reveal that many regions have uplifted by several hundred metres since the Middle Pliocene. They indeed provide evidence of a global increase in uplift rates in the Late Pliocene, followed by a calm period then a renewed increase around the Early-Middle Pleistocene boundary. It is suggested that this uplift pattern has resulted from thickening of the continental crust caused by flow in the lower crust which has been induced by cyclic surface loading caused by growth and decay of ice sheets and the associated global sealevel fluctuations. Observed uplift histories are modelled using a technique which incorporates increases in the strength of forcing of this process caused by step changes in the intensity of glaciations starting at ~3.1, ~2.5, ~1.2, and ~0.9 Ma.	Long-term river terrace sequences: Evidence for global increases in surface uplift rates in the Late Pliocene and early Middle Pleistocene caused by flow in the lower continental crust induced by surface processes

VOLUME 81 NO 3-4 329	2002	81	3-4	329	338	Maddy, D.	<p>The Pleistocene development of the lower Severn valley is recorded in the fluvial sediments of the Mathon and Severn Valley Formations and their relationship to the glacial Wolston (Oxygen Isotope Stage 12), Ridgacre (OIS 6) and Stockport (OIS 2) Formations. The most complete stratigraphical record is that of the Severn Valley Formation, which post-dates the Anglian Wolston Formation and comprises a flight of river terraces, the highest of which is c.50 m above the present river. The terrace staircase indicates that the Severn has progressively incised its valley during the post-Anglian period. The terrace sediments are predominantly composed of fluvially deposited sands and gravels, largely the result of deposition in high-energy rivers under cold-climate conditions. Occasionally towards the base of these terrace deposits low-energy fluvial facies are preserved which contain faunal remains and yield geochronology which support their correlation with interglacial conditions. This simple stratigraphy supports a climate-driven model for the timing of terrace aggradation and incision, with the incision mode at its most effective during the cold-warm transitions and the aggradational mode at its most effective during warm-cold climate transitions. The chronology of terrace aggradation in the lower Severn seems to correspond with the Milankovitch 100ka climate cycles. The timing of incision events suggests that base level (eustatic sea-level) changes do not play a significant role i.e. incision occurs as sea-level is rising. Although climate change is significant in governing the timing of incision, the long-term incision of the River Severn appears to be driven by crustal uplift. A long-term incision rate of 0.15 m ka^{-1}, calculated using the base of the terrace deposits, is believed to</p>	<p>An evaluation of climate, crustal movement and base level controls on the Middle-Late Pleistocene development of the River Severn, UK.</p>
VOLUME 81 NO 3-4 339	2002	81	3-4	339	355	Matoshko, A.V.; Gozhik, P.F.; Ivchenko, A.S.	<p>Information about the morphology and alluvial sediments of the Dnieper Valley is reviewed. The Dnieper Valley originated in the Late Miocene. The Middle Dnieper Valley is an intercontinental alluvial basin and the Lower Dnieper Valley is a shallow canyon that ends with a delta. Identification of the alluvial dynamic facies (channel, overbank, abandoned channel) is crucial for stratigraphical analysis. The dynamic facies form regular sequences - alluvial suites that combine into series. Individual suites and series are characterized by their mode of occurrence, facies composition, lithological features and expression in the modern landscape. Their stratigraphic position is established with reference to index beds and palaeontological, geochronological and archaeological research, allowing them to be correlated along the valley. Correlation between different parts of the Dnieper system uses a combination of facies and geomorphological analyses, whereas correlation with other river systems makes use of mammalian and molluscan biostratigraphy. Global events (marine regressions and glaciations) that brought about similar reactions in different fluvial systems can be also used for correlation.</p>	<p>The fluvial archive of the Middle and Lower Dnieper (a review)</p>

VOLUME 81 NO 3-4 357	2002	81	3-4	357	373	Schreve, D.C.; Bridgland. D.R.	<p>In this paper interglacial mammalian assemblages from key Middle Pleistocene fluvial sites in Germany are compared to Mammal Assemblage-Zones (MAZs) recently established in the post-Anglian/Elsterian sequence of the Lower Thames, UK. It is believed that four separate interglacials are represented by the Lower Thames MAZs, correlated with oxygen isotope stages (OIS) 11, 9, 7 and substage 5e (although the last of these is Late Pleistocene). Nowhere in Germany can a full sequence of these interglacials be identified from mammalian evidence in a single terrace staircase, as is the case in the Lower Thames, although further research on the Wipper terraces at Bilzingsleben may identify such a sequence. It is also possible that the sequence of overlapping fluvial channels in the lignite mine at Schöningen will eventually produce a comparable mammalian story. Excellent correspondence has been recognized between the mammalian assemblages at Steinheim an der Murr and Bilzingsleben II and the Swanscombe MAZ from the Thames. These three sites are attributed to the Hoxnian/Holsteinian interglacial and are thought to correlate with OIS 11. Close comparison can also be made between the mammalian sequence from the celebrated travertine locality at Weimar-Ehringsdorf and two separate MAZs from Aveley, in the Thames, attributed to separate substages of OIS 7. An equivalent to the Purfleet MAZ of the Thames, which is believed to correlate with OIS 9, has yet to be identified in Germany.</p>	Correlation of English and German Middle Pleistocene fluvial sequences based on mammalian biostratigraphy
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VOLUME 81 NO 3-4 375	2002	81	3-4	375	388	Veldkamp, A.; Berg, M.W. van den; Dijke, J.J. van; Berg van Saparoea, R.M. van den	The morpho-genetic evolution of the upper Aller valley (7eser basin, North Germany) was reconstructed using geological and geomorphologic data integrated within a numerical process model framework (FLUVER-2). The current relief was shaped by Pre-Elsterian fluvial processes, Elsterian and Saalian ice sheets, followed by Weichselian fluvial processes. Structural analysis based on subsurface data and morphological interpretations were used to reconstruct uplift/subsidence rates. A detailed analysis led to the hypothesis that we are dealing with either a NNW-SSE or a WSW-ENE oriented compression leading to uplift in the upper Aller valley. It is also hypothesised that the NNW-SSE compression might have caused strike-slip deformation leading to differential block movement and tilt. Two different uplift rate scenarios were reconstructed and used as a variable parameter in numerical modelling scenarios simulating the Late Quaternary longitudinal dynamics of the Aller. Each different scenario was run for 150.000 years and calibrated to the actual setting. The resulting model settings were consequently evaluated for their plausibility and validity. Subsequently, regional semi-3D simulations of valley development were made to test the two tectonic stress hypotheses. Differential tectonic uplift and regional tilt seems to have played an important role in shaping the current valley morphology in the upper Aller. Unfortunately, due to the uncertainties involved, we were unable to discriminate between the two postulated tectonic stress scenarios.	Reconstructing Late Quaternary fluvial process controls in the upper Aller Valley (North Germany) by means of numerical modeling.
VOLUME 81 NO 3-4 389	2002	81	3-4	389	405	Cohen, K.M.; Stouthamer, E.; Berendsen, H.J.A.	Neotectonic movements have caused differential subsidence in the Lower Rhine Embayment during the Quaternary. The Late Weichselian and Holocene Rhine-Meuse fluvial archive in the central Netherlands was used to quantify neotectonic movements in a setting that was primarily controlled by sealevel rise and climate change. Evidence for neotectonic activity in the central Netherlands is reviewed. Sedimentary evidence shows that fluvial deposits of Late Weichselian and Holocene Rhine and Meuse (Maas) distributaries are vertically displaced along the northern shoulder of the Roer Valley Graben system. Elevation differences in the longitudinal profiles of Late Weichselian terrace deposits were used to quantify tectonic displacements. New results for the southeastern Rhine-Meuse delta (Maaskant area) show that displacements in the top of the Pleniglacial terrace along the Peel Boundary Fault are up to 1.4 m. The maximum displacement between the Peel Horst and the Roer Valley Graben is 2.3 m. This is equivalent to relative tectonic movement rates of 0.09-0.15 mm/yr, averaged over the last 15,000 years.	Fluvial deposits as a record for Late Quaternary neotectonic activity in the Rhine-Meuse delta, The Netherlands

VOLUME 81_NO 3-4 407	2002	81	3-4	407	416	Gaigalas, A.; Dvareckas, V.	<p>Generalized analysis of geological geomorphological structures of river valleys in Lithuania has been carried-out. Lithuania's fluvial topography results from the retreat of the Scandinavian Nemunas (=Vistulian and/or Valdaian) Glaciation, as is shown by the study of geomorphological structures in the recent river valleys (representing the last 15,000 years), which were formed as the ice sheets progressively retreated and ice-barrier lakes were drained. Oxbows in the river valleys are most often located on the floodplain itself and on the first terrace above the floodplain. The oxbow lakes are subdivided into two groups: (1) formed in the near-river stage and (2) formed in the lake-bog stage. Separate development phases can be recognized within both groups of oxbow lakes. The more organic components of oxbow deposits provide specific information for palaeoecological reconstructions. Anthropogenic changes to the natural landscapes of Lithuania have resulted in considerable geological transformation of rivers. Increased sediment volume, shallowing, silting and overgrowing of channels, lateral erosion of floodplains and the spread of ravine erosion on valley-side slopes are all phenomena characteristic of all the valleys in Lithuania. At present the natural components of river valleys and their ecosystems are being changed, mainly with negative consequences for humans.</p>	<p>The evolution of river valleys in Lithuania from deglaciation to recent changes and data from the sediment infill of oxbow lakes</p>
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VOLUME 81_NO 3-4 417	2002	81	3-4	417	430	Straffin, E.C.; Blum, M.D.	<p>Alluvial deposits of the Loire/Arroux trunk/tributary system record distinct, synchronous episodes of regional fluvial adjustment. Changes in facies and depositional style through time can be interpreted with a modern analogue model that relates vegetative cover/human influence with sediment supply and modes of atmospheric circulation with the paths and styles of storms that drive variable discharge regimes across western Europe. Zonal atmospheric circulation results in a Mediterranean style climate over southern Burgundy producing dry conditions punctuated by infrequent, large floods. Episodic overbank sedimentation and the burial of thin paleosols in sandy overbank facies is indicative of this style of fluvial activity, ca 1300 years BP. Humans may have increased the available volume of fine grained sediment at this times through increased agricultural activity along valley axes, however facies match that expected from a 'flashy' discharge regime. In contrast, meridional circulation patterns result in a maritime style climate over southern Burgundy with the intrusion of storms, moist conditions and frequent, moderate magnitude discharges. Wide, deep channels, thick channel facies and thin overbank facies are indicative of this style of fluvial activity, recorded in deposits dating to ca 4050 to 3200 years BP. Strong meridional conditions and extreme climatic variability during the Little Ice Age resulted in very large discharges that straightened and widened channels, while scouring and obscuring older terraces (ca 500 years BP). Deposition over the last two centuries is related to increasingly zonal circulation and infrequent, large (over-bank floods. Changes in fluvial dynamics over the last 300 years can be attributed primarily to climatic</p>	Holocene fluvial response to climate change and human activities; Burgundy, France.
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VOLUME 81 NO 3-4 431	2002	81	3-4	431	441	Sirocko, F.; Szeder, T.; Seelos, C.; Lehne, R.; Rein, B.; Schneider, W.M.; Dimke, M.	Field mapping of fluvial terraces, aerial photographs, ground penetrating radar and seismic data from gas and oil exploration were used at four different locations to detect young tectonic and halokinetic movements in the North-German-Basin. i) The course of the Rivers Weser and Aller follow precisely a shallow Tertiary graben on the northwestern flank of the Verden salt diapir. Recent local depressions and vegetation anomalies on the alluvial plain have the same orientation as the strike direction of the faults at subsurface depth. Apparently, the river follows tectonic lines, and thus the river sediments can be used for the interpretation of recent crustal movements. ii) The Wedehof diapir, in contrast, is topped by a local topographic high which follows exactly the shape of the underlying salt. Either the diapir formed an obstacle for the advance of the continental glaciers or one has to assume halokinetic uplift of more than 50 m during the post-Saalian Pleistocene. Either way, the Wedehof diapir shows control of the modern surface morphology by halokinesis. iii) The course of the river Hunte, in contrast, outside the area of salt diapirism, shows anomalies of incision and terrace width over a local updoming caused by tectonic inversion of distinct blocks in the basin. The confluence of several tributaries of the Hunte lies exactly over the updoming of Barnstorf. Thus, the rivers do not avoid the local high, but focus in this area, which is characterised by a graben on top of the dome structure, as visible in seismic profiles. Again, tectonism controls river development. iv) The last case study is from Lake Plön, where seismic profiles reveal that linear shorelines of the lake parallel the flanks of two local graben structures of Tertiary age. It is apparent that the Weichselian glaciers that formed	Young tectonic and halokinetic movements in the North-German-Basin: its effect on formation of modern rivers and surface morphology
VOLUME 82 NO 1 1	2003	82	1	1	3	Verweij, J.M.		Geofluids in the Netherlands: introduction

VOLUME 82_NO 1_5	2003	82	1	5	18	Regnier, P.; Jourabchi, P.; Slomp, C.P.	<p>Reactive-transport models contribute significantly to the field of modern geosciences. A general mathematical approach to solving models of complex biogeochemical systems is introduced. It is argued that even though mathematical models for reactive-transport simulations can be developed at various levels of approximation, the approach for their construction and application to the various compartments of the hydrosphere is fundamentally the same. The workings of coupled transport-reaction systems are described in more detail by means of examples, which demonstrate the similarities in the approach. Three models of the carbon dynamics in redox-stratified environments are compared: porous media flow problems in a coastal sediment and in a contaminated groundwater system; and a surface flow problem in a eutrophic estuary. Considering the interdisciplinary nature of such models, a Knowledge Base System for biogeochemical processes is proposed. Incorporation of the proposed knowledge base in an appropriate modeling framework, such as the Biogeochemical Reaction Network Simulator, proves an effective approach to the modeling of complex natural systems. This methodology allows for construction of multicomponent reactive-transport models applicable to a wide range of problems of interest to the geoscientist.</p>	<p>Reactive-Transport modeling as a technique for understanding coupled biochemical processes in surface and subsurface environments</p>
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VOLUME 82 NO 1 19	2003	82	1	19	30	Wildenborg, A.F.B.; Orlic, B.; Thimus, J.F.; Lange, G. de; Cock, S. de; Leeuw, C.S. de; Veling, E.J.M.	The Dutch national research programme into the feasibility of retrievable storage of radioactive waste (CORA Programme Phase I; CORA: Comité Opslag Radioactief Afval = Committee on Radioactive Waste Disposal) examined the suitability of Tertiary clay deposits for such storage. Long-term isolation - up to 1 million years - of high Level radioactive waste under varying conditions is essential. A key concern is the hydro-mechanical response of the clay deposits in which radioactive waste might possibly be stored, in particular during glacial climate conditions as has happened repeatedly in the Netherlands during the Pleistocene. To evaluate this possibility hydro-mechanical computer simulations and mechanical laboratory experiments have been performed to analyse the effects of glacial loading by a thousand-metre-thick ice sheet on the permeability characteristics, fluid flow rates and the associated migration of radio-nuclides both within and out of Tertiary clays. Glacial loading causes the expulsion of pore water from deeply buried clay deposits into adjoining aquifers. The rates and duration of the consolidation-driven outflow of water from the clay deposit, are very sensitive to the permeability of the clay and the dynamics of the advancing ice sheet. The maximum outflow rate of pore water is 1 mm per year. This rate is approximately three times faster than the flow rate of water in clay prior to ice loading. These preliminary simulation studies also indicate that cyclic loading can result in more rapid migration of radio-nuclides in clays. In clay deposits that are covered by a thick ice sheet, the contribution of dispersed transport relative to the total transport by diffusion amounts to 14%, assuming that there is no absorption of radio-nuclides by the clays and a	Radionuclide transport in clay during climate change
VOLUME 82 NO 1 31	2003	82	1	31	40	Kooij, H.; Groen, J.	In this contribution, a case is made for the significance of sedimentation and sea-level change for groundwater management of coastal areas. In groundwater practice these geological processes are rarely considered. The role of sediment loading in causing anomalous fluid pressures and flow fields in relatively shallow aquifer systems is discussed and illustrated via both case studies and generic modelling studies. The role of sea-level changes in controlling current salinity distributions is discussed likewise. Central in the discussion is the concept of memory of groundwater systems, which provides the basic reason why processes that were operative in the geological past are still of relevance today. It is argued and shown that awareness and knowledge of the influence of sediment loading and sea level change on current hydrological conditions can lead to improved characterization of the distribution of hydraulic parameters and of the distribution of water quality in coastal areas. This improved characterization, in turn, serves to enhance the validity of impact assessment studies for the long-term development and management of those areas.	Geological processes and the management of groundwater resources in coastal areas

VOLUME 82 NO 1 41	2003	82	1	41	54	Bense, V.F.; Balen, R.T. van; Vries, J.J. de	<p>The hydrogeology of the Roer Valley Rift System is strongly influenced by the hydraulic properties of faults. The hydrogeological impact of faults is illustrated by examples from the SE Netherlands and the adjacent lignite mining areas within the Roer Valley Rift System, near Bonn in Germany. Hydraulic head discontinuities over the main faults in the latter area can be up to tens of meters as a result of extremely large groundwater extractions in combination with the relatively low conductivity of the main faults. Within the Netherlands, outside the mining areas, such large groundwater extractions do not take place, and groundwater fluxes are smaller. In this situation natural hydraulic head differences over the main faults are limited to several meters. Hydraulic head profiles over faults provide a first estimate of fault hydraulic properties that can be quantified using simple analytical solutions. The impact of faults on near surface processes is reflected in vegetation patterns and the structure of drainage networks, aquifer structure and hydraulic head patterns. Faults can thus be of great influence on transport processes in the subsurface as well as on water-related phenomena at the surface, and should accordingly be taken into consideration in studies related to water-management) contamination and environmental impact. Faults that have an enhanced vertical permeability are difficult to detect when horizontal groundwater flow is studied, which is probably the main reason why they are rarely described. Though, these faults may form important preferential paths to vertical groundwater flow.</p>	The impact of faults on the hydrogeological conditions in the Roer Valley Rift System: an overview
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VOLUME 82_NO 1 55	2003	82	1	55	69	Bouw, L.; Oude Essink, G.H.P.	<p>A basin-scale hydrogeological study of the inverted northern Broad Fourteens Basin, Netherlands offshore, has resulted in a reconstruction of geological evolution, an estimate of Late Cretaceous topography and model scenarios of syn-inversion meteoric water infiltration. This study was performed in the scope of a basin-scale analysis of the hydrogeological setting and hydrodynamic evolution of the Broad Fourteens Basin. This analysis is aimed at obtaining quantitative knowledge of depositional history and hydrogeological parameters, and qualitative knowledge of hydrodynamic evolution of the Broad Fourteens Basin from Carboniferous to present-day. We present an overview of the tectonic and depositional history the most likely hydrogeological setting and model scenarios of Late Cretaceous meteoric water infiltration in the northern Broad Fourteens area. We constructed a detailed south-west north-east geological cross-section of the present-day northern Broad Fourteens Basin, and reconstructed Late Cretaceous basin geometry and topography. Using this geometry in a numerical model of density-dependent topography-driven fluid flow, we modelled several scenarios of meteoric water infiltration with estimated ranges of basin-scale permeabilities and water table head. Results indicate that a deep freshwater lens was developed during Late Cretaceous inversion, if the basin-scale hydraulic conductivity of the Rijnland and Altena Groups was at least $1 \cdot 10^{-9}$ to $1 \cdot 10^{-10}$ m/s, which is in general the highest value for claystones.</p>	Fluid flow in the northern Broad Fourteens Basin during Late Cretaceous inversion
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VOLUME 82 NO 1 71	2003	82	1	71	90	Verweij, J.M.; Simmelink, H.J.; Balen, R.T. van; David, P.	2D Basin modelling was used to evaluate the response of source rock maturation, and of petroleum expulsion, migration, accumulation and preservation to the evolution of the southern part of the inverted Broad Fourteens Basin. Modelling results show that the temperature, maturation and petroleum generation history as well as migration characteristics of both the Jurassic oil systems and the Carboniferous gas systems vary over short distances relative to the differences in burial history of the basin. Model results indicate that no major gas accumulations are preserved in the Slochteren Formation along the cross-section at present-day. Gas accumulations are predicted in sandstone-dominated Triassic units in the southern part of the section. Present-day oil accumulations predicted in the Vlieland Sandstone Formation sealed by the Vlieland Claystone Formation (in P9 and Q1 crestal structures) are in accordance with known oil accumulations. Additional oil accumulations are predicted in the sandstone-dominated Middle Werkendam Member, and in sandstones of the Delfland Subgroup. The modelling offers an explanation for the different geochemical compositions of the accumulated oils in the P9 and Q1 areas. Modelling implies, that the oils in the Q1 oil field were sourced by remigrated oils expelled over time, from early mature to mature source rocks of the Posidonia Shale Formation. The biodegraded and water-washed nature of the Q1 oil is explained by the concentrated topography-induced groundwater flow through the Vlieland Sandstone Formation during the Late Cretaceous inversion of the basin. The oils accumulated in the P9 area were sourced from an early mature part of the Posidonia Shale Formation and were	History of petroleum systems in the southern part of the Broad Fourteens Basin
VOLUME 82 NO 1 91	2003	82	1	91	105	Schroot, B.M.; Schüttenhelm, R.T.E.	Surface and sub-surface expressions of shallow gas in the Netherlands part of the southern North Sea are described, using standard E&P 2D and 3D seismic surveys, as well as higher frequency acoustic surveys. Surface expressions observed are pockmarks, which are geomorphologic features at the seabed indicative for venting of gas, and cemented sandstones. The subsurface expressions found comprise both phenomena indicating efficient trapping of gas in reservoir sands, such as shallow bright spots and flat spots, and phenomena, which are indications of migration or leakage to the seabed. We refer to the latter as 'seismic anomalies indicating leakage'. These anomalies include gas chimneys or seismic chimneys. All chimneys found in the area have in common, that they belong to a seepage style, which is called 'small and localised'. Much of this seepage is situated over salt domes, with the accompanying normal fault above the domes acting as pathways for the gas or fluids. Although there is admixture of biogenic gas, it is believed that many of the features observed relate to thermo-genic gas.	Expressions of shallow gas in the Netherlands North Sea
VOLUME 82 NO 2 113	2003	82	2	113	113			Editorial Netherlands Journal of Geosciences

VOLUME 82 NO 2 115	2003	82	2	115	131	Makaske, B.; Smeerdijk, D.G. van; Peeters, H.; Mulder, J.R.; Spek, T.	<p>The rise of Holocene (ground)water level as a function of relative sea-level rise has been extensively investigated in the western Netherlands, whereas few studies focused on the Flevo lagoon in the central Netherlands. In this study, all available ^{14}C dates from the base of basal peat overlying the top of compaction-free Pleistocene sand in the former Flevo lagoon were evaluated in order to reconstruct water-level rise for the period 5300-2000 cal. yr BC. The present basal peat ^{14}C data set from Flevoland consists of two subsets: (1) the largely new Almere data (41 dates) representing the southern part of the former Flevo lagoon, with 26 dates especially carried out for this study and (2) the existing Schokland data (21 dates) representing the eastern part of the lagoon. The Schokland area is located about 50 km from the Almere area. The quality of all basal peat time-depth data was palaeo-ecologically and geologically evaluated, all ^{14}C dates were calibrated to the same standards, and error margins of age and altitude determination were estimated. After plotting the data as error boxes in time-depth graphs, lower limit curves for water-level rise were constructed for both data sets. Comparison with the mean sea-level curve for The Netherlands (Van de Plassche, 1982) suggests that water-level rise in the Almere area between 5300 and 2000 cal. yr BC corresponded closely to the rise in mean sea level. The same holds for the Schokland area for the period 5000-4200 cal. yr BC. For the period 4200-2000 cal. yr BC, however, the Schokland data suggest water-level rise to have been slower than mean sea-level rise, leading to local water levels apparently below mean sea level, which is virtually impossible. Hypothetical explanations for this discrepancy include: errors and uncertainties in</p>	Relative water-level rise in the Flevo lagoon (The Netherlands), 5300-2000 cal. yr BC: an evaluation of new and existing basal peat time-depth data
VOLUME 82 NO 2 133	2003	82	2	133	147	Post, V.E.A.; Plicht, H. van der; Meijer, H.A.J.	<p>An explanation is presented for the origin of brackish to saline groundwater in the coastal area of the Netherlands based on geological, chemical (chlorinity), isotopic and geophysical data. A critical review of all possible salinization mechanisms shows that the origin of the brackish water is related to former transgressions. Both the vertical salinity distribution and the carbon-14 activity of the groundwater indicate that connate sea water from the Pliocene to Early Pleistocene is not the source of the brackish to saline waters in the overlying Pleistocene fluvial aquifers. Instead, it derives from Holocene transgressions. The salinization mechanism is discussed in relation to the paleogeographical development during the Holocene and the occurrence of low-permeability strata. Finally, freshening of the aquifers following retreat of the sea is briefly considered.</p>	The origin of brackish and saline groundwater in the coastal area of the Netherlands

VOLUME 82 NO 2 149	2003	82	2	149	159	Herreweghe, S. van; Deckers, S.; DeConick, F.; Merckx, R.; Gullentops, F.	In an area east of Leuven (central Belgium), a buried sandy estuarine deposit of Oligocene age contains a dark colored organic layer of about 4 m thick. Our results suggests that the organic matter is an illuvial horizon, therefore warranting the hypothesis that the layer may qualify for a giant buried spodic horizon rather than a remainder of a Tertiary oil seepage as suggested by Van Riessen and Vandenberghe (1996). Of particular importance is the micro-morphological evidence, which reveals that the mainly monomorphous organic matter is present as ubiquitous coatings and concentrations around the quartz grains. These coatings show the for Podzols very typical polygonal cracked patterns. The geochemical signature (stable carbon isotope analysis) also gives strong indications for a continental origin of the organic carbon and therefore support the pedogenetic origin of the horizon. The paleopedological scene into which this soil has developed is inferred from the data.	The paleosol in the Kerkom Sands near Pellenberg (Belgium) revisited
VOLUME 82 NO 2 161	2003	82	2	161	167	Diedrich, C.; Hirayama, R.	Turtle remains ascribed to the family Cheloniidae (Testudines, Cryptodira, Chelonioidae), collected from the <i>lamarcki</i> zone (Middle Turonian) at Wüllen (NW Germany) are described. The material consists of a right humerus, a scapula, a complete costalia, and costalia fragments of a single individual with the humerus indicating a primitive cheloniid of the 'toxocheilyd grade'. The present material, as well as previously recorded chelonioid humeri from the Cenomanian and Turonian of Germany illustrate a progressive diversification of chelonioids during the early Late Cretaceous	Turtle remains (Testudines, Chelonioidae) from the Middle Turonian of northwest Germany
VOLUME 82 NO 2 169	2003	82	2	169	176	Hartmann H. von	The article tries to answer the question of the origin and structural development of the deformation of the pre-Permian units southwest of Bremen. An interpretation of a 3D-seismic survey was made to resolve the structural style of the Upper Carboniferous with the aim to get some clues for the Variscan deformation of the Variscan foreland. The area is suitable for the evaluation because of the existence of a 3D-seismic survey. Moreover, the depth of the Zechstein at 4500 m is not too deep for imaging deeper reflections and there is not a severe distortion of the reflection pattern by later tectonic developments. Because of the 3D insight into the complex and deep seated structures, other 2D-seismic investigations which image similar parts can be better understood and interpretation errors can be avoided. It is concluded that only 3D-seismic measurements can resolve the complex structural development at this site.	Deformation of the Carboniferous of the Oldenburg High and the Location of the Variscan Front in Northwest Germany

VOLUME 82 NO 2 177	2003	82	2	177	196	Houtgast, R.F.; Balen, R.T. van; Kasse, C.; Vandenberghe, J.	In northwest Europe the pattern of earthquake distribution is correlated with known Quaternary faults. Excavation of fault scarps revealed that these fault zones have been active during the Late Pleistocene. In this paper we present the results, of an exploratory trenching study across the Geleen Fault, part of the Feldbiss Fault Zone, the Netherlands. Middle Saalian fluvial deposits of the Meuse, overlain by local slope deposits, were excavated. The Geleen Fault has displaced the fluvial deposits by at least 5 meters. The upper layers of local slope deposits could be correlated across the fault and were all dated at approximately 15 ka B.P. This gives the opportunity to reconstruct the sequence of events that occurred about 15 ka ago. Liquefactions provide evidence for an earthquake event. However, the main offset along the Geleen Fault is not stratigraphically related to the liquefactions. The liquefactions and the fault offset are stratigraphically separated by a period of erosion. We therefore propose a sequence of events starting with an earthquake accompanied by liquefaction, followed by a period of postseismic displacement with high rates compared to the long-term average. After this period normal displacement rates occurred, comparable to the long-term average. The duration of the period of high displacement rates could not be determined.	Late Quaternary tectonic evolution and postseismic near surface fault displacements along the Geleen Fault (Feldbiss Fault Zone – Roer Valley Rift System, the Netherlands), based on trenching
VOLUME 82 NO 2 197	2003	82	2	197	208	Corteel, C.; Paepe, P. de	New petrographical and geochemical evidence of tourmalinite pebbles from two Lower and three Middle Devonian formations from Belgium is presented. Petrography, REE, transition metal and microprobe data of the studied rocks suggest it are (meta)sediment-derived tourmalinites formed by boron metasomatism (and hydrothermal brecciation) in an intrusive setting. Tourmaline mineralizations within eastern Avalonia are known in south-east Ireland, the English Lake District and East Anglia. Based on previously suggested relations between Early Palaeozoic igneous activity in last two mentioned regions and the Brabant Massif, it is presumed that the Brabant Massif also underwent granite-related tourmalinization and that this was the source of the studied pebbles. Petrologic differences between pebbles found in Middle Devonian formations and pebbles from Lower Devonian formations, suggest that fluid circulation occurred on a regional scale, possibly extending into the Stavelot massif.	Boron metasomatism in the Brabant Massif (Belgium): Geochemical and petrographical evidence of Devonian tourmalinite pebbles

VOLUME 82 NO 2 209	2003	82	2	209	214	Klopprogge, J.T.; Visser, D.; Martens, W.N.; Duong, L.V.; Frost, R.L.	The presence of a magnesian vivianite ($(\text{Fe}^{2+})_{2.5}(\text{Mg},\text{Mn},\text{Ca})_{0.5}(\text{PO}_4)_2 \cdot 8\text{H}_2\text{O}$, has been identified in a soil sample from a Roman camp near Fort Vechten, The Netherlands, using a combination of Raman microscopy and scanning electron microscopy. An unsubstituted vivianite and baricite were characterised for comparative reasons. The split phosphate-stretching mode is recognised around 1115,1062 and 1015 cm^{-1} , while the corresponding bending modes are found around 591,519, 471 and 422 cm^{-1} . The substitution of Mg and Mn for Fe^{2+} in the crystal structure causes a shift towards higher wavenumbers compared to pure vivianite. As shown by the baricite sample substitution causes a broadening of the bands. The observed broadening however is larger than can be explained by substitution alone. The low intensity of the water bands, especially in the OH-stretching region between 2700 and 3700 cm^{-1} indicates that the magnesian vivianite is partially dehydrated, which explains the much larger broadening than the observed broadening caused by substitution of Mg and Mn in vivianite and baricite.	Identification by RAMAN Microscopy of magnesian vivianite formed from Fe^{2+} , Mg, Mn^{2+} and PO_4^{3-} in a Roman camp near fort Vechten, Utrecht, The Netherlands
VOLUME 82 NO 2 215	2003	82	2	215	218	Bongaerts, H.	Epigenetic mineralisations occurring in the former coal-mining district of Limburg predominantly consist of sphalerite, galena, chalcopyrite, quartz, Fe-dolomite/ankerite and calcite. The present note describes siegenite which was collected for the first time from this paragenesis some years ago.	The first record of siegenite ($(\text{Ni},\text{Co})_3\text{S}_4$) from the Netherlands
VOLUME 82 NO 3 223	2003	82	3	223	224	Jagt, J.W.M.; Schulp, A.S.; Graaf, D.T. de		The 150th anniversary of the Maastrichtian Stage - a celebratory conference: Introduction
VOLUME 82 NO 3 225	2003	82	3	225	231	Gallagher, W.B.	The inner Atlantic Coastal Plain of New Jersey reveals exposures of fossiliferous Maastrichtian and Danian deposits. Recent fossil discoveries in this interval are here reported, and placed in the context of Cretaceous/Tertiary (K/T) faunal changes. The exposure at the Inversand Pit at Sewell (New Jersey) is the last active marl mine in the region, and stands as an important reference section for the many significant discoveries of vertebrate fossils produced by the marl mining industry at its zenith. Changes in planktonic populations across the I/JT boundary are related to Maastrichtian/Danian marine ecosystem community reorganisation, by demonstrating changes in abundance of dominant marine invertebrates in successive fossil assemblages. Marine invertebrates with non-planktotrophic larval stages were briefly the commonest fossils preserved in the Danian sediments of this region. Late surviving examples of Cretaceous fauna now restricted to the Indo-Pacific region may imply biogeographic changes linked to the K/T mass extinction event.	Oligotrophic oceans and minimalist organisms: collapse of the Maastrichtian marine ecosystem and Paleocene recovery in the Cretaceous-Tertiary sequence of New Jersey

VOLUME 82 NO 3 233	2003	82	3	233	245	Hart, M.; Swiecicki, T.	Onshore Maastrichtian strata in the United Kingdom are limited to a few small, isolated blocks of chalk floating within glacial sediments on the Norfolk coast. Isolated outcrops of Campanian and Maastrichtian chalks used to be available around Norwich but the majority of these exposures are now badly degraded. Offshore, in the North Sea Basin, there are complete chalk successions that range throughout the Upper Cretaceous and Lower Cenozoic. There is a limited succession of Maastrichtian chalks exposed on the north coast of Northern Ireland below the Cenozoic flood basalts. In the Western Approaches Basin, Maastrichtian and Danian chalks are known from exploration wells and core samples. West of the United Kingdom a number of DSDP/ODP boreholes have penetrated the Upper Cretaceous succession. Beginning in the Cenomanian, in southeast England, the whole of the Upper Cretaceous is within the chalk facies, possibly one of the longest intervals of relatively stable environment in the geological record. The Foraminiferida of the chalk have been studied for more than a hundred years and therefore the fauna is exceptionally well known and fully documented. Fifty years ago, the benthonic Foraminiferida were identified as having the potential to provide a viable zonation of the chalk facies and we now have precise, cross-basinal correlation using these taxa. The planktonic fauna is restricted by both palaeolatitude and water depth. The latter appears to be the most influential as the faunas from onshore are more limited than those recorded from the deeper waters of the North Sea Basin and the Atlantic Margin. Even with this restricted fauna, however, it is still possible to develop a general correlation with the standard Tethyan zonation based on	Stratigraphy of Maastrichtian Foraminiferida from the United Kingdom; the Maastrichtian of Norfolk
VOLUME 82 NO 3 247	2003	82	3	247	260	Ham, R. van der; Birgelen, M. van	The Late Cretaceous echinoid genus <i>Echinogalerus</i> König, 1825 is remarkably diverse in the Maastrichtian type area (SE Netherlands and adjacent parts of NE Belgium and western Germany). So far, five species have been recognised, namely. <i>E. belgicus</i> (Lambert, 1898), <i>E. minutus</i> (Smiser, 1935), <i>E. muelleri</i> (Schlüter, 1902), <i>E. pusillus</i> Lambert, 1911 and <i>E. vetschauensis</i> (Schlüter, 1902), which occur from the base of the Lower Maastrichtian (<i>E. belgicus</i> , <i>E. pusillus</i> , <i>E. muelleri</i> up to the K/T boundary (<i>E. minutus</i>). <i>Echinogalerus muelleri</i> , which has the longest stratigraphical range, is the most diverse, while <i>E. pusillus</i> is the smallest echinoid in the area, reaching maximum lengths of 4.5 mm. Comparisons with other species of <i>Echinogalerus</i> described in the literature have now led to the recognition of three tentative infrageneric alliances. It is argued that the ordinal position of <i>Echinogalerus</i> (<i>Holectypoida</i> or <i>Cassiduloida</i>) cannot be evaluated as long as many species are still insufficiently known and two genera, from the Maastrichtian of northern Germany and Denmark, intermediate between the two orders, remain undescribed.	The echinoid genus <i>Echinogalerus</i> in the Maastrichtian type area

VOLUME 82 NO 3 261	2003	82	3	261	268	Jagt, J.W.M.; Felder, W.M.	In the extended type area of the Maastrichtian Stage (southern Limburg, the Netherlands; provinces of Limburg and Liège, Belgium; Aachen area, Germany), the pachydiscid <i>Pachydiscus</i> (<i>P.</i>) <i>neubergicus</i> (von Hauer, 1858) ranks amongst the rarer species of Campanian-Maastrichtian ammonites. To date, just four specimens are known, which show <i>P. (P.) Neubergicus</i> in this area to have been confined to the Vijlen Member (Intervals 0-6, Gulpen Formation). This would correspond to the basal <i>sumensis</i> Zone to the lower <i>cimbrica</i> Zone, or <i>tegulatus/junior</i> Zone, depending on placement of the Lower/Upper Maastrichtian boundary. Material available has been collected in recent years at the CBR-Lixhe (Liège, Belgium) and ENCI-Maastricht by (Maastricht) quarries as well as from outcrop 62D-26 at Vijlenerbosch (Vijlen, the Netherlands). Records of <i>P. (P.) Neubergicus</i> , the proposed index for the base of the Maastrichtian Stage, from elsewhere in Europe (northern Spain, SW France, Austria, Denmark, Bulgaria), suggest it to have been fairly long-ranging and show local first occurrences to have been diachronous.	The stratigraphic range of the index ammonite <i>Pachydiscus Neubergicus</i> (von Hauer, 1858) in the type area of the Maastrichtian Stage ¹
VOLUME 82 NO 3 269	2003	82	3	269	273	Mulder, E.W.A.	The presence of <i>Halisaurus</i> (Squamata, Mosasauridae) in the uppermost Cretaceous of the Maastrichtian type area, suggested by Lingham-Soliar (1996) on the strength of two partial vertebrae, is questioned. The anatomy of these elements suggests that they pertain not to <i>Halisaurus</i> , but more probably to <i>Plioplatecarpus marshi</i> Dollo, 1882.	On the alleged presence of <i>Halisaurus</i> (Squamata, Mosasauridae) in the latest Cretaceous of the Maastrichtian type area,

VOLUME 82 NO 3 275	2003	82	3	275	281	Felder, P.J.; Keppens, E.; Declercq, B.; Normand, S.; Streel, M.	Two sections, just below the Nivelles Horizon in the upper Gulpen Formation (Upper Maastrichtian), and seven kilometres apart (CBR-Lixhe and ENCI-Maastricht by quarries) have been analysed (samples every 5 cm) for dinocyst, pollen grains and bioclast contents as well as for carbon and oxygen isotopic composition, to obtain better insight into the influence of weathering on these sediments. The CBR section lies above groundwater level, while that at the ENCI quarry is some metres below. At the former quarry we recognised the influences of weathering (karst) nearby. At ENCI, palynological, bioclast and stable isotope results of the carbonate phase (mainly consisting of coccoliths) co-vary remarkably displaying two cycles which may be interpreted tentatively as climatic fluctuations. The $\delta^{18}\text{O}$ curve varies roughly between -1.6‰ and -1.1‰ (on PDB scale), corresponding to a temperature change of about 2°C. Less negative values (i.e. cooler seawater) coincide with larger amounts of pollen of Normapolles and Triporates type assumed to represent temperate forest elements of a vegetation also containing tropical elements such as palms. Assuming the 5 cm sample intervals at ENCI to correspond to 1 ka, climatic maxima (and minima) may be 20-25 ka apart, obviously recalling Milankovitch precession cycles. These are independent of a sharp sedimentological change noted in the upper part of the lowest cycle (samples 42 to 24). Upwards of sample 2, bioclast contents increase and dinocysts, Spiniferites in particular, decrease significantly, corresponding to a marked shallowing. This turning point is also recorded in the $\delta^{13}\text{C}$ curve at ENCI. Bioclast percentages appear to follow composite trends that are influenced by both climatic and sedimentological conditions.	Faunal/floral and isotopic responses to Milankovitch precession cycles and environmental changes in the upper Gulpen Formation (Upper Maastrichtian) at the CBR-Lixhe and ENCI-Maastricht by quarries
VOLUME 82 NO 3 283	2003	82	3	283	288	Wagreich, M.; Küchler, T.; Summesberger, H.	The first occurrence (FO) of the ammonite <i>Pachydiscus neubergicus</i> (von Hauer, 1858) has been correlated to calcareous nannofossil zonations in several European sections along the northern margin of the Tethyan palaeobiogeographic realm. Both the proposed stratotype section of Tercis (SW France) and complete, ammonite-bearing sections in northern Spain document the FO of <i>P. neubergicus</i> within standard nannofossil zone CC23a (UC16), below the LO of <i>Broinsonia parca constricta</i> . Other sections such as the type locality Neuberg (Austria), Nagoriani (the Ukraine) and Bjala (Bulgaria) indicate considerable diachroneity of local FOs and show <i>P. neubergicus</i> to range up to nannofossil zone CC25b/c (UC20; Late Maastrichtian).	Correlation of calcareous nannofossil zones to the local first occurrence of <i>Pachydiscus neubergicus</i> (von Flauer, 1858) (Ammonoidea) in European Upper Cretaceous sections

VOLUME 82 NO 3 289	2003	82	3	289	301	Gómez-Alday, J.J.; Elzora, J.	Inoceramid bivalve shells from outcrops of mid-Maastrichtian deep-water carbonate, hemipelagic beds in the Bay of Biscay exhibit post-depositional diagenetic alteration. New data from isotopic analysis (carbon and oxygen), together with observations of the inoceramid shells and carbonate host-rock using cathodoluminescence (CL) and scanning electron microscopy (SEM), confirm a lateral, westerly increase in the degree of diagenesis, without any substantial textural changes in the alternating dark and clear growth lines of the shell microstructure. Under CL, a bright yellowish to red colour is observed in the most diagenetically altered inoceramid samples. Non-luminescent areas are restricted to the central parts of the less altered shells. A detailed geochemical analysis by electron microprobe, along intrashell profiles of the non-luminescent and luminescent zones has revealed that Mg/Ca, Sr/Ca, Na/Ca, Fe/Ca and Mn/Ca ratios show oscillatory curves but behave differently. Fe/Ca, Mn/Ca and Na/Ca ratios are well correlated but usually show an opposite relationship when compared with the Mg/Ca and Sr/Ca ratios of both luminescent and non-luminescent shell areas. Our findings have palaeoenvironmental implications in that the geochemistry of the regular, alternating dark and clear growth lines seems to be related to the input of seasonally controlled phytodetritus to the basin floor.	Diagenesis, regular growth and records of seasonality in inoceramid bivalve shells from mid-Maastrichtian hemipelagic beds of the Bay of Biscay
VOLUME 82 NO 3 303	2003	82	3	303	307	Jagt, J.W.M.; Kennedy, W.J.	Two specimens of a pachydiscid ammonite, a fragmentary silicified phragmocone from the Kunrade Limestone facies at Kunrade (Schunck), and a partial external mould preserved in flint from the Nekum Member (both Maastricht Formation, <i>Belemnitella junior</i> Zone of authors) at the former Blom quarry (Berg en Terblijt), are identified as <i>Pachydiscus (P) noetlingi</i> Kennedy, 1999, a species previously known only from the Upper Maastrichtian of Baluchistan (Pakistan). This new record underscores the proposal of incursions of Tethyan biota into the type area of the Maastrichtian Stage, previously documented for other groups, including echinoderms and bivalves, as well.	First record of <i>Pachydiscus noetlingi</i> Kennedy, 1999 (Ammonoidea) from the Maastrichtian type area (the Netherlands)
VOLUME 82 NO 3 309	2003	82	3	309	312	Hergreen, G.F.W.	This contribution deals with the dual spelling of the terminal Cretaceous Stage, the Maastrichtian or Maestrichtian. From a historical point of view and in agreement with the recommendations of the International Stratigraphic Guide (1st and 2nd editions) only Maestrichtian is justified. Nevertheless, the spelling Maastrichtian is proposed, or equivalents in other languages, because stratigraphic names should employ the spelling of place names in the country of their origin and, to be realistic, because Maastrichtian has been well established by its use in an overwhelming majority of the publications which have appeared during the last decades.	Maastrichtian or Maestrichtian? A proposal to the Subcommittee on Cretaceous Stratigraphy (IUGS, International Commission on Stratigraphy)

VOLUME 82 NO 4 313	2003	82	4	313	324	Alberts, L.J.H.; Geel, C.R.; Klasen, J.J.	Petroleum geologists always need to deal with large gaps in data resolution and coverage during reservoir characterisation. Seismic data show only large geological structures, whereas small-scale structures and reservoir properties can be observed only at well locations. In the area between wells, these properties are often estimated by means of geostatistics. Numerical simulation of sedimentary processes offers an alternative method to predict these properties and can improve the understanding of the controls on reservoir heterogeneity. Although this kind of modelling is widely used on basin scale in exploration geology, its application on field scale in production geology is virtually non-existent. We have assessed whether the recent developments in numerical modelling can also aid petroleum geologists in the interpretation of the reservoir geology. Seismic data, well data and a process-response model for coastal environments were used to characterise the Lower Cretaceous oil-bearing Rijn Field. Interpretation of seismic and well data led to a definition of the structural setting and the depositional model of the Rijn Member in the area. From the sedimentological interpretation the sea-level history could be estimated, which is the one of the most important input parameters for the process-response model. Application of the process-response simulator to the Rijn Field resulted in approval of the depositional model. The output was presented in a 2-dimensional north-south profile, which corresponds very well to the well logs along this section. The results demonstrate that numerical simulations of geological processes can be very useful as a tool to explore many likely geological scenarios. While it cannot be used to supply a unique solution in many cases, it	Reservoir characterisation using process-response simulations: the Lower Cretaceous Rijn Field, West Netherlands Basin
VOLUME 82 NO 4 325	2003	82	4	325	332	Bos, R. van den	Drained coastal peatlands are a source of greenhouse gas (GHG) through abundant CO ₂ release caused by aerobic peat degradation. Published rates of CO ₂ fixation and CH ₄ release for natural peatlands suggest that areas of peat formation are a (small) net source of GHG emission because the radiative effect of emitted CH ₄ exceeds the CO ₂ uptake by the vegetation. It is shown here that wetland restoration of reclaimed peat areas in the western Netherlands leads to a reduction of GHG emission because the expected increase in anaerobically generated CH ₄ release is much smaller than the decrease in aerobically produced CO ₂ .	Restoration of former wetlands in the Netherlands; effect on the balance between CO ₂ sink and CH ₄ source

VOLUME 82 NO 4 349	2003	82	4	349	354	Rider, M.; Kroon, D.	A widespread, slumped, redeposited, uppermost Cretaceous chalk interval, up to 60m thick, immediately below the Cretaceous-Tertiary (K-T) boundary recognised in oil company boreholes across the central North Sea and a major hydrocarbon reservoir, were interpreted as the result of a single, catastrophic event caused by secondary effects related to the bolide impact at Chicxulub. A thin, dark clay bed immediately above the redeposited chalks, we suggest correlates to the outcropping, Iridium rich, Danish 'Fish Clay', rapidly deposited after the impact. Physical effects on sea-floor sediments, caused by the K-T bolide impact, have not previously been interpreted in the North Sea.	Redeposited chalk hydrocarbon reservoirs of the North Sea caused by the Chicxulub K-T bolide impact
VOLUME 82 NO 4 355	2003	82	4	355	366	Jager, J. de	All Dutch rift basins that formed during Jurassic and Early Cretaceous extension have been inverted during the Late Cretaceous and Early Tertiary. Several inversion pulses occurred more or less simultaneously in all basins. Analysis of vitrinite reflectance data, in combination with fission track and fluid inclusion data show that the magnitude of uplift and erosion generally did not exceed 2 km. Inversion was strongest in the Broad Fourteens, Central Netherlands and West Netherlands basins. The direction of maximum compressive stress was generally not at right angles to the pre-existing fault trends, and resulted in transpressional movements. Within the NW-SE striking basins, dextral strike-slip movements can often be interpreted, which is consistent with a general N-S to NNW-SSE direction of maximum compression related to Alpine structural events. Where no Zechstein salt is present, trends of flower structures formed through reverse reactivation of pre-existing faults. Where the Zechstein salt is thick, re-activated faults could not breach the salt, and a broad uplift of the post-salt succession resulted, while faulting below the salt caused acceleration of halokinesis. In areas where the Zechstein salt was thin, and where the offsets of reverse faults exceeded the thickness of the salt, impressive thrusts with the Zechstein salt as detachment horizon developed. The later Tertiary inversion pulses did not affect all basins, and caused broad basin uplift in the West and Central Netherlands basins while individual faults were no longer reactivated. It appears that due to crustal thickening during the first inversion pulses the crust could become stabilised such that further compression could only be accommodated by broad basin uplift.	Inverted basins in the Netherlands, similarities and differences

VOLUME 82 NO 4 367	2003	82	4	367	382	Kockel, F.	The diversity of morphological features of Mesozoic inversion structures in NW Germany as representatives of inversion structures in northern Europe is presented and their origin analysed and geologically dated. The particular role of salt in inverted basins and the re-shaping of pre-existing salt structures during the inversion act is demonstrated and the term 'salt wedge', a Zechstein salt intrusion into salt layers within the Triassic sedimentary pile, introduced. The leading theories on inversion (continent-continent collision, re-activation Variscan features) are discussed and discarded, but no new comprehensive theory was developed. The impact of inversion on HC prospectivity of sedimentary basins is debated and proposals for future interdisciplinary research are made.	Inversion structures in Central Europe - Expressions and reasons, an open discussion
VOLUME 83 NO 1 1	2004	83	1	1	16	Pöppelreiter, M.C.; Simone, A.; Hoetz, G.	The Upper Muschelkalk is an unusual reservoir in NW Europe, producing only in the Coevorden Muschelkalk field, onshore the Netherlands. Origin and nature of the gas producing intervals were poorly known. The objective of the paper is to provide a comprehensive description of facies, cyclicity and petrophysical characteristics. From this description a depositional and sequence stratigraphic model is proposed, which explains why there is gas production only from certain intervals of the sequence. Our investigation is based on seismic, core and open hole log data. It indicates that the reservoir consists of dolomites, which are either muddy lagoonal to sabkha, or grainy backshoal deposits. The best reservoir quality is encountered in peloidal-oolitic packstones to grainstones. These represent storm-dominated backshoal deposits and constitute the inner part of a homoclinal carbonate ramp. The succession shows a conspicuous hierarchical cyclicity. Porous backshoal deposits form during maximum transgression and early regression. However permeable, gas producing backshoal deposits only occur in the upper 15 to 20 m, which forms the large-scale regressive hemi-cycle of the Upper Muschelkalk. Better reservoir quality in the upper hemi-cycle is due to changes in grain type and early diagenesis. The investigation might serve as calibration point for further exploring the Upper Muschelkalk reservoir and its facies pattern in the N'W European basin.	Reservoir characteristics of intracontinental carbonate ramp deposits- Upper Muschelkalk, Middle Triassic, NE Netherlands

VOLUME 83 NO 1 17	2004	83	1	17	38	Abbink, O.A.; Konijnenburg-Van Cittert, J.H.A. van; Visscher, H.	Based on recent vegetation distribution and an integration of macropalaeobotanical and palynological information, a palaeocommunity model is explored that may permit detailed interpretations of quantitative sporomorph distribution patterns in the Jurassic and Early Cretaceous of NW-Europe in terms of changes in palaeoenvironment (sea-level, climate). The conceptual model is based on the recognition of Sporomorph Ecogroups (SEGs) that reflect broad co-existing plant communities, viz. upland, lowland, river, pioneer, coastal, and tidally-influenced SEGs. In successive palynological assemblages, shifts in the relative abundance of SEGs are thought to be indicators of sea-level changes. Climatic changes may be recognised through significant shifts within the quantitative composition of individual SEGs.	A sporomorph ecogroup model for the Northwest European Jurassic - Lower Cretaceous: concepts and framework
VOLUME 83 NO 1 39	2004	83	1	39	46	Hooyberghs, H.; Wouters, K.; Spiegler, D.	A micropalaeontological analysis (foraminifera, ostracoda and bolboforma) has been undertaken for the interval between 299.7 and 201.5m of the Maaseik borehole. This interval includes marine glauconitic sands, which are generally not or not strongly decalcified. Independent from each other, the observed taxa of the different microfossil groups indicate a Late (range down to Middle) Miocene age for the interval. On the base of the biozonations of the various microfossil groups, some correlations can be presented with Late Miocene deposits of other areas in Belgium (Antwerp and Campine area), and of other places in NW Europe	Marine Miocene deposits in the Maaseik well 49W/220 in eastern Belgium: biostratigraphy by means of various microfossil groups
VOLUME 83 NO 1 47	2004	83	1	47	54	Jansen, H.S.M.; Huizer, J.; Dijkmans, J.W.A.; Hinte, J.E. van	$^{87}\text{Sr}/^{86}\text{Sr}$ (Strontium) ratio analyses of shell material (mainly <i>Arctica islandica</i>) from 24 levels in the Maassluis Formation of boreholes Noordwijk, Zegveld and Terschelling suggest that the age of the formation ranges from 0.82 to 2.34 Ma (± 0.5 Ma), and that the Oosterhout Formation at Noordwijk could be as much as 2.5 Ma older than hitherto assumed.	Strontium ($^{87}\text{Sr}/^{86}\text{Sr}$) dating of marine shells from Pliocene and Pleistocene shallow marine deposits in The Netherlands

VOLUME 83 NO 1 55	2004	83	1	55	72	Debacker, T.N.; Herbosch, A.; Verbiere, J.; Sintubin, M.	The literature suggests that the Asquempont fault, a supposedly important reverse fault forming the limit between the Lower to lower Middle Cambrian and the Ordovician in the Sennette valley is poorly understood. Nevertheless, this fault is commonly equated with a pronounced NW-SE-trending aeromagnetic lineament, the Asquempont lineament, and both the geometry of the Asquempont lineament and the supposed reverse movement of the Asquempont fault are used to develop large-scale tectonic models of the Brabant Massif. New outcrop observations in the Asquempont area, the "the locality" of the Asquempont fault, in combination with outcrop and borehole data from surrounding areas, show that the Asquempont fault is not an important reverse fault, but instead represents a pre-cleavage, low-angle extensional detachment. This detachment formed between the Caradoc and the timing of folding and cleavage development and is not related to the aeromagnetic Asquempont lineament. The Asquempont area also contains several relatively important, steep, post-cleavage normal faults. Apparently, these occur in WNW-ESE-trending zone between Asquempont and Fauquez, extending westward over Quenast towards Bierghes. This zone coincides with the eastern part of the WNW-ESE-trending Nieuwpoort-Asquempont fault zone, for which, on the basis of indirect observations, previously a strike-slip movement has been proposed. Our outcrop observations question this presumed strike-slip movement. The Asquempont fault may be related to the progressive unroofing of the core of the Brabant Massif from the Silurian onwards. Possibly, other low-angle extensional detachments similar to the Asquempont fault occur in other parts of the massif.	Faults in the Asquempont area, southern Brabant Massif, Belgium
VOLUME 83 NO 1 73	2004	83	1	73	78	Diedrich, C.; Mulder, E.W.A.	From Upper Campanian turbiditic marls at Beckum in the Münster Basin (NW Germany) the anterior portion of a mosasaurid premaxilla with abutting fragments of the left and right maxilla is described and referred to the genus <i>Clidastes</i> . It shows the process of tooth replacement very well. This taxon is recorded for the first time from Germany. <i>Clidastes</i> co-existed in central Europe with other mosasaurids such as representatives of the genus <i>Leiodon</i> and Mosasauridae <i>indet.</i>	A new record of <i>Clidastes</i> (Squamata, Mosasauridae) from the Upper Campanian of the Münster Basin (NW Germany)

VOLUME 83 NO 1 49	2004	83	1	49	65	Debacker, T.N.; Herbosch, A.; Verbiere, J.; Sintubin, M.	The literature suggests that the Asquempont fault, a supposedly important reverse fault forming the limit between the Lower to lower Middle Cambrian and the Ordovician in the Sennette valley, is poorly understood. Nevertheless, this fault is commonly equated with a pronounced NW-SE-trending aeromagnetic lineament, the Asquempont lineament, and both the geometry of the Asquempont lineament and the supposed reverse movement of the Asquempont fault are used to develop large-scale tectonic models of the Brabant Massif. New outcrop observations in the Asquempont area, the "type locality" of the Asquempont fault, in combination with outcrop and borehole data from surrounding areas, show that the Asquempont fault is not an important reverse fault, but instead represents a pre-cleavage, low-angle extensional detachment. This detachment formed between the Caradoc and the timing of folding and cleavage development and is not related to the aeromagnetic Asquempont lineament. The Asquempont area also contains several relatively important, steep, post-cleavage normal faults. Apparently, these occur in a WNW-ESE-trending zone between Asquempont and Fauquez, extending westward over Quenast towards Bierghes. This zone coincides with the eastern part of the WNW-ESE-trending Nieuwpoort-Asquempont fault zone, for which, on the basis of indirect observations, previously a strike-slip movement has been proposed. Our outcrop observations question this presumed strike-slip movement. The Asquempont fault may be related to the progressive unroofing of the core of the Brabant Massif from the Silurian onwards. Possibly, other low-angle extensional detachments similar to the Asquempont fault occur in other parts of the massif.	Faults in the Asquempont area, southern Brabant Massif, Belgium
VOLUME 83 NO 2 79	2004	83	2	79	79	Wong, T.E.	Editorial Netherlands Journal of Geosciences	

VOLUME 83 NO 2 81	2004	83	2	81	92	Abbink, O.A.; Konijnenburg-Van Cittert, J.H.A. van; Zwan, C.J. van der; Visscher, H.	Jurassic shallow marine to non-marine depositional sequences are among the most important economic targets in the North Sea. Detailed, 'high resolution' stratigraphy of these sequences has become a necessity in both predictive geological exploration models as well as in production reservoir models. In these paralic sequences, palynomorphs are the most abundant (micro) fossil group. Palynology is increasingly challenged to improve the biostratigraphic control, and to support the sequence stratigraphical framework. Based on a recently developed, conceptual Sporomorph EcoGroup model, the quantitative distribution patterns of terrestrial palynomorphs are grouped in six Sporomorph EcoGroups (SEGs), viz. Upland, Lowland, River, Pioneer, Coastal, and Tidally-influenced SEG. Application of the SEG model to data from a marginal marine, uppermost Callovian - Middle Oxfordian section of NAM well F17-4 from the southern part of the Central North Sea Graben allows the recognition of sea-level fluctuations and climate changes. A marked palaeoclimatic shift occurred in the earliest Middle Oxfordian. The relatively cool-subtropical, humid climate changed into a warmer, subtropical-tropical, drier climate. The sea-level reconstructions based on the SEG model are validated against a latest Callovian - Earliest Oxfordian depositional sequence.	A sporomorph ecogroup model for the Northwest European Jurassic - Lower Cretaceous II : Application to an exploration well from the Dutch North Sea
VOLUME 83 NO 2 93	2004	83	2	93	100	Jansen, H.S.M.; Huizer, J.; Dijkmans, J.W.A.; Mesdag, C.; Hinte, J.E.	The geometry and depositional history of the Maassluis Formation is described from an East-West oriented transect located in the west-central Netherlands and P- and Q-blocks in the Dutch offshore area. The Late Pliocene to Early Pleistocene Maassluis Formation was deposited under near coastal marine conditions. Two distinct facies are distinguished: (1) medium grained sands with a blocky GR/SP-log pattern that were deposited under intertidal and aeolian conditions and (2) medium to coarse grained sands deposited in a subtidal environment showing a clear coarsening upward trend. The lower part of the Maassluis Formation is laterally equivalent to the shallow marine Oosterhout Formation and gets progressively younger towards the West. The upper part is lateral equivalent to estuarine and mudflat deposits (Balk Member, c.q. Peize Formation) in the central part of The Netherlands and to river deposits (Peize Formation) further to the East.	The geometry and stratigraphic position of the Maassluis Formation (western Netherlands and southeastern North Sea)

VOLUME 83 NO 2 101	2004	83	2	101	112	Gaus, I.; Vande Castele, K.	<p>The risk of five pesticides (atrazine, simazine, bentazone, mecoprop and MCPA) contaminating a Quaternary phreatic aquifer (the water supply area of Sint-Jansteen, the Netherlands) is assessed based on laboratory experiments and solute transport modelling (MODFLOW-MT3D). Batch experiments either show long half-lives (at least 1500 days) or no degradation at all for bentazone, atrazine and simazine while mecoprop and especially MCPA degrade much faster (half-lives down to 4.1 days). Column experiments show significant sorption to the aquifer sediment only for atrazine and simazine under certain circumstances. A series of experiments were conducted during which the type of the sediment, the grain size, the content of the organic matter and the acidity of the groundwater were varied. These experimental results were subsequently incorporated in a solute transport model for the aquifer resulting in the following ranking of the contamination risk for the selected pesticides (from low to high): MCPA, mecoprop, simazine, atrazine, bentazone. This ranking was confirmed by observed pesticide concentrations in samples taken from piezometers and extraction wells from the aquifer.</p>	<p>Assessing the contamination risk of five pesticides in a phreatic aquifer based on microcosm experiments and transport modelling at Sint-Jansteen (Zeeland,, the Netherlands)</p>
VOLUME 83 NO 2 113	2004	83	2	113	134	Sissingh, W.	<p>To date, igneous rocks, either intrusive or extrusive, have been encountered in the Palaeozoic-Mesozoic sedimentary series of the Netherlands in some 65 exploration and production wells. Following 17 new isotopic K/Ar age determinations of the recovered rock material (amounting to a total of 28 isotopic ages from 21 different wells), analysis of the stratigraphic distribution of the penetrated igneous rock bodies showed that the timing of their emplacement was importantly controlled by orogenic phases involving intra-plate wrench and rift tectonics. Magmatism coincided with the Acadian (Late Devonian), Sudetian (early Late Carboniferous), Saalian (Early Permian), Early Kimmerian (late Late Triassic), Mid-Kimmerian (Late Jurassic), Late Kimmerian (earliest Cretaceous) and Austrian (latest Early Cretaceous) tectonic phases. This synchronicity presumably reflects (broadly) coeval structural reorganizations of respectively the Baltica/Fennoscandia-Laurentia/Greenland, Laurussia-Gondwana, African-Eurasia and Greenland/Rockall-Eurasia plate assemblies. Through their concomitant changes of the intra-plate tectonic stress regime, inter-plate motions induced intra-plate tectonism and magmatism. These plate-tectonics related events determined the tectonomagmatic history of the Dutch realm by inducing the formation of localized centres, as well as isolated spot occurrences, of igneous activity. Some of these centres were active at (about) the same time. At a number of centres igneous activity re-occurred after a long period of time.</p>	<p>Palaeozoic and Mesozoic igneous activity in the Netherlands: a tectonomagmatic review</p>

VOLUME 83 NO 2 135	2004	83	2	135	146	Karg, H.; Bücken, C.; Schellschmidt, R.	The regional subsurface temperature field at the transition between the Palaeozoic Variscan Basement and the Cenozoic Lower Rhine Basin in Dutch, German and Belgium territories was mapped up to a depth of 1000 m. Temperature data from 66 wells and 11 coal mine subcrops were available. In 46 wells, temperature logs, covering a cumulative depth interval of 6600m, were measured for this study.	New subsurface temperature maps for the Tertiary Lower Rhine Basin and the adjacent Variscan Basement – Germany, The Netherlands, Belgium
VOLUME 83 NO 2 147	2004	83	2	147	151	Meulen, M.J. van der; Kleine, M.P.E. de; Veldkamp, J.G.; Dubelaar, C.W.; Pietersen, H.S.	In the Netherlands, mineral extraction by means of dredging or quarrying meets with considerable societal resistance. Land surface lowering prior to large land reconstruction projects may raise fewer objections. We have calculated the potential yields of sand and gravel from land surface lowering embedded in planned building and construction projects, and in nature, farmland and recreation area development. Our primary data sets were a compilation of spatial plans for the period 1995 – 2005 and about 95,000 borehole descriptions. Even if embedded consistently, land surface lowering would contribute modestly (up to 5.4 Mio m ³ /a) to the filling sand provision (annual demand 45 - 50 Mio m ³ /a).	The sand extraction potential of embedded land surface lowering in the Netherlands
VOLUME 83 NO 3 153	2004	83	3	153	153	Vandenberghe, N.		Introduction Symposium On the Paleogene Preparing for Modern Life and Climate', held in Leuven, Belgium, August 2003
VOLUME 83 NO 3 155	2004	83	3	155	171	Vandenberghe, N.; Simaëys, S. van; Steurbaut, E.; Jagt, J.W.M.; Felder, P.J.	The Late Cretaceous and Cenozoic sedimentary record in the Campine Basin along the southern border of the North Sea Basin is analysed in terms of sequence stratigraphy. All available biostratigraphic, and in some cases, magnetostratigraphic data are used to constrain the sequence chronostratigraphy. The relative geographic extent of the strata is used as an indication of the relative sea level. Tectonic and eustatic components could be distinguished in several cases using regional geological information. Generally, sequences consist of transgressive and highstand systems tracts only and have flat, abrasion type lower boundaries. Lowstand deposits are only identified as infill of erosional space, which generally implies marked tectonic uplift. Several eustatic and tectonic events can be correlated with similar events known elsewhere in the North Sea Basin. The time intervals spanned by the different sequences vary considerably, pointing out different control mechanisms.	Stratigraphic architecture of the Upper Cretaceous and Cenozoic along the southern border of the North Sea Basin in Belgium

VOLUME 83 NO 3 173	2004	83	3	173	178	Eetvelde, Y. van; Dupuis, C.; Cornet, C.	Assemblages of brackish and marine diatoms have been examined from Upper Paleocene-Lower Eocene strata of the Belgian Basin (Knokke well) and the Dieppe-Hampshire Basin (Saint-Josse borehole and Ailly sections). The diatoms observed are invariably preserved in pyrite as internal moulds and their siliceous skeletons are completely replaced by pyrite by epigenesis. Three major diatom assemblages have been observed which can be used to approximate the position of the recently defined Paleocene-Eocene boundary (defined by the Carbon Isotope Excursion). This isotope excursion occurs just below the strong increase in the abundance of <i>Fenestrella antiqua</i> and in the vicinity of the abundance peak of <i>Coscinodiscus morsianus</i> var. <i>moelleri</i> . They also allow correlations of the lithostratigraphic units of the Belgian Basin with the formations of the Dieppe-Hampshire and central North Sea Basins. For instance, investigations of diatoms recorded in the Knokke Clay Member of the Knokke well indicate that this unit corresponds to the lower units of the 'Sparnacian facies' of the Dieppe-Hampshire Basin and to the Sele Formation of the North Sea Basin.	Pyritized diatoms: a good fossil marker in the Upper Paleocene-Lower Eocene sediments from the Belgian and Dieppe-Hampshire Basins
VOLUME 83 NO 3 179	2004	83	3	179	185	Saeyns, R.; Verheyen, A.; Vandenberghe, N.	In the Eocene to Oligocene transitional strata in Belgium, clay mineral associations vary in response to the climatic evolution and to tectonic pulses. Decreasing smectite to illite ratios and the systematic occurrence of illite-smectite irregular interlayers are consequences of a cooling climate. A marked increase in kaolinite content occurs just after a major unconformity formed at the Bartonian/Priabonian boundary and consequently is interpreted as resulting from the breakdown of uplifted saprolites.	A rapid clay-mineral change in the earliest Priabonian of the North Sea Basin?
VOLUME 83 NO 3 187	2004	83	3	187	192	Smith, R.	Insectivore remains are not common in the Lower Oligocene of Europe. For this reason, the study of the earliest Oligocene insectivore fauna (MP 21) from Boutersem and Hoogbutsel, all together yielding nine species, representing five families, constitutes an important progress in the knowledge of the Late Eocene and Early Oligocene insectivore evolution. Some of the genera discovered in Belgium are known from upper Eocene sites (<i>Saturninia</i> , <i>Amphidozotherium</i> , <i>Euronyctia</i> , <i>Eotalpa</i>), whereas others are not known before the Oligocene (<i>Butselia</i> , <i>Tetracus</i> , <i>Heterosoricinae</i> ind.). The co-occurrence of primitive species of Nyctitheriidae with modern forms belonging to the Plesiosoricidae, Talpidae and Erinaceidae at the Eocene-Oligocene boundary suggests a transition fauna. Between the Priabonian (Late Eocene) and the Rupelian (Early Oligocene), the endemic European insectivores were in competition with the new immigrants. This faunal turnover is generally accepted as the 'Grande Coupure' event (the MP 21 event).	Insectivores (Mammalia) from the earliest Oligocene (MP 21) of Belgium

VOLUME 83 NO 3 193	2004	83	3	193	197	De Man, E.; Ivany, L.; Vandenberghe, N.	Preliminary stable oxygen isotope data are presented from the southern North Sea Basin successions, ranging from the Lutetian to Rupelian. Analyses were performed on fish otoliths, nuculid bivalves and benthic foraminifera and are presented as bulk $\delta^{18}\text{O}$ values relative to a well established regional sequence stratigraphic framework. The most significant positive shift in $\delta^{18}\text{O}$ values clearly falls at the top of the regionally recognized Bassevelde 3 sequence, which base corresponds to the Eocene-Oligocene GSSP boundary. The here documented $\delta^{18}\text{O}$ shift is closely associated with the base of the traditional Rupelian unit-stratotype and is tentatively correlated to the globally recognised Oi-1 event.	Stable oxygen isotope record of the Eocene-Oligocene transition in the southern North Sea Basin: positioning the Oi-1 event
VOLUME 83 NO 3 199	2004	83	3	199	208	Gürs, K.; Janssen, A.W.	Spacio-temporal distribution patterns of North Sea Basin Early Oligocene (Rupelian) pteropoda (holoplanktonic gastropods: Mollusca, Gastropoda, Euthecosomata) are studied. These patterns indicate three short term invasions of a single pteropod species during the Rupelian. These invasions are indicated here as <i>Clio blinkae</i> Event, <i>Praehyalocylis laxeannulata</i> Event and <i>Clio jacobae</i> Event. The conspicuously short occurrences of the species, their abundances and some lithological features of the pteropod bearing strata lead to the conclusion that these plankton events are linked to sea level high-stands allowing currents from the worlds oceans to enter into the North Sea Basin	Sea-level related molluscan plankton events (Gastropoda, Euthecosomata) during the Rupelian (Early Oligocene) of the North Sea Basin
VOLUME 83 NO 3 209	2004	83	3	209	225	Lagrou, D.; Vandenberghe, N.; Van Simaëys, S.; Hus, J.	This paper presents the results of a detailed rock magnetic and magnetostratigraphic study of the Lower Oligocene Rupelian unit-stratotype. Notwithstanding the relatively low intensity of the natural remanent magnetisation and the diverse and often unstable behaviour during demagnetisation, close-spaced sampling and accurate polarity determinations allowed us to determine the magnetic polarity zonation. The recognition of the characteristic magnetic polarity and the correlation with the standard magnetobiochronologic time scale yields an accurate chronostratigraphic dating of the Boom Clay Formation. The boundary between the geomagnetic chrons C12n and C12r nearly coincides with the lithostratigraphic boundary between the Terhagen and Putte Members. Rock magnetic techniques point to magnetite and probably also iron sulphides as the main magnetic remanence carriers. These magnetic minerals could, however, not be identified with classical mineralogical techniques performed on magnetic extractions. The failure to detect them may be due to the low concentration of these minerals, the small grain size, and the close physical relation with pyrite.	Magnetostratigraphy and rock magnetism of the Boom Clay (Rupelian stratotype) in Belgium

VOLUME 83 NO 3 227	2004	83	3	227	239	De Man, E.; Van Simaëys, S.	The investigation of foraminiferal assemblages from a series of Oligocene borehole sections allowed paleoenvironment and paleoclimate reconstructions for the Rupelian and Chattian (Lower and Upper Oligocene) Stages in their type region, the southern North Sea Basin. A striking feature coinciding with the Rupelian-Chattian (R-C) unconformity is the major change in paleotemperature and paleobathymetry. The shallow marine to restricted marine subtropical fauna at the base of the Chattian is in strong contrast with the deeper marine and cooler upper Rupelian assemblages. This study suggests that the early Chattian transgression is genetically related to a widespread major warming pulse, known as the Late Oligocene Warming Event.	Late Oligocene Warming Event in the southern North Sea Basin: benthic foraminifera as paleotemperature proxies
VOLUME 83 NO 3 241	2004	83	3	241	248	Van Simaëys, S.	The classical problem of the nature and age of the Rupelian-Chattian (Early-Late Oligocene) unconformity in its type region is here approached using organic walled dinoflagellate cyst (dinocyst) correlations between the North Sea Basin and well calibrated central Italian (Tethyan Ocean) sections. Useful Oligocene dinocyst events are the last occurrence of <i>Enneadocysta pectiniformis</i> (~29.3 Ma), and the first occurrences of <i>Saturnodinium pansum</i> (~29.4 Ma), <i>Distatodinium biffii</i> (~27.9 Ma) and <i>Artemisiocysta cladodichotoma</i> (~26.7 Ma). The latter event marks the earliest Chattian. The improved correlations indicate that the Rupelian-Chattian (R-C) boundary is associated with the so-called 'Oligocene Glacial Maximum'. This phase of important global cooling and glacio-eustatic sea level fall is genetically related to the unconformity between the classic Oligocene stages. Subsequent global warming (so-called 'Late Oligocene Warming Event'), induced a major sea level rise, leading e.g. to the time-transgressive deposition of the typical basal Chattian glauconitic sands. The oldest of the Chattian units have a GPTS age of ~26.7 Ma. It further appears that a hiatus of ~500 kyrs spans the classic Rupelian-Chattian unconformity.	The Rupelian-Chattian boundary in the North Sea Basin and its calibration to the international time-scale
VOLUME 83 NO 4 251	2004	83	4	251	254	Schulp, A.S.; Walenkamp, G.H.I.M.; Hofman, P.A.M.; Rothschild, B.M.; Jagt, J.W.M.	Two unusual bumps occur on the internal surface of a rib of the marine reptile <i>Prognathodon saturator</i> from the Upper Cretaceous (Maastrichtian) of Maastricht, The Netherlands. These bumps are interpreted as stress fractures, possibly related to agonistic behaviour.	Rib fracture in <i>Prognathodon saturator</i> (Mosasauridae, Late Cretaceous)

VOLUME 83 NO 4 255	2004	83	4	255	265	Rhebergen, F.	Until now hemispherical astylospongiid sponges were invariably referred to as <i>Caryospongia juglans</i> var. <i>basiplana</i> Rauff. Renewed investigations have now shown that part of the material should be assigned to a new genus and species, <i>Tympanospongia vankempeni</i> , which is characterised by a system of very irregular canals. These flat-based sponges originate from the Baltic region and occur in two assemblages of silicified Late Ordovician sponges known exclusively as erratics from The Netherlands and northern Germany. These fossils were transported by the River Eridanos, a former drainage system from the Baltic region that filled the North European Basin during the Miocene to Early Pleistocene. Specimens of <i>Tympanospongia vankempeni</i> gen. et sp. nov. also occur in the Upper Pleistocene of Gotland, Sweden. The new sponge described herein principally differs from other genera of the Astylospongiidae found frequently in the erratic sponge assemblages by its irregular system of apochetes which ramify and anastomose commonly.	A new Ordovician astylospongiid sponge (Porifera) as an erratic from Baltica
VOLUME 83 NO 4 267	2004	83	4	267	285	Munsterman, D.K.; Brinkhuis, H.	An integrated stratigraphical analysis emphasizing organic-walled dinoflagellate cyst (dinocyst) distribution has been carried out on multiple boreholes penetrating the Miocene in the subsurface of the Netherlands (southern North Sea Basin). The bulk of the investigated successions is attributed to the Breda Formation, a regional lithostatigraphical unit most complete in the south-eastern part of the Netherlands. In concert with a first regional integrated bio (chrono) sequence-stratigraphical framework, fourteen informal dinocyst zones for the southern North Sea Miocene (SNSM), and three subzones are proposed for the Breda Formation. By also integrating (chrono)stratigraphic information from Mediterranean and North Atlantic dinocyst studies a first ever detailed age-model is here proposed for the Miocene in the subsurface of the Netherlands.	A southern North Sea Miocene dinoflagellate cyst zonation

VOLUME 83_NO 4 287	2004	83	4	287	291	Seijmonsbergen, A.C.; Biewinga, D.T.; Pruissers, A.P.	The apparent electrical conductivity of the subsurface along the Dutch coast between 'Wassenaarse Slag' (beach post 92.250) and north of Noordwijk aan Zee (beach post 77.750) reflects the spatial distribution of Holocene coastal deposits. Using a Geonics EM-34 a threefold division based on the mean electrical conductivity could be made in the outlet area of the River Old Rhine. 1) A section showing a sequence of sandy deposits that resembles the Schoorl Member of the Naaldwijk Formation on top of the Zandvoort Member of the Naaldwijk Formation. 2) A section underlain by a shallow clay/peat layer of varying thickness belonging to the Naaldwijk Formation (Walcheren Member) / Nieuwkoop Formation (Hollandveen Member), intercalated within the Schoorl Member and Zandvoort Member of the Naaldwijk Formation. South of the Old Rhine locally Wormer Member deposits of the Naaldwijk Formation underlie these clay/peat layers. 3) A section characterized by channel fill deposits of the former Rhine reaching to -20 m below Normaal Amsterdam Peil (N.A.P.), and belonging to deposits of the Wormer Member of the Naaldwijk Formation, and to two facies of the Naaldwijk Formation (Walcheren Member). The geophysical transect was calibrated using existing nearby drill hole data, so that a continuous snapshot of the subsurface was gained. Therefore this research also contributes to the recent genesis of this part of the Dutch coast.	A geophysical profile at the foot of the Dutch coastal dunes near the former outlet of the 'Old Rhine'
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