# Commission Internationale de Microflore du Paleozoique

## NEWSLETTER 39

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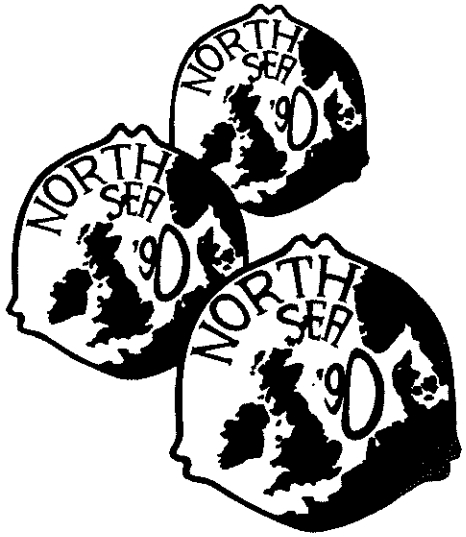

# THE AMERICAN ASSOCIATION OF STRATIGRAPHIC PALYNOLOGISTS, INC.

## October 18- 21, 1989

## Tulsa, Oklahoma

## Abstracts

### DINOFLAGELLATE CYSTS FROM THE UPPER JURASSIC NAKNEK FORMATION, SOUTHERN ALASKA

Nairn R. Albert

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Excellently preserved dinoflagellate cyst assemblages have been recovered from three measured sections in the Upper Jurassic Naknek Formation of southern Alaska. Thirty-two dinoflagellate cyst taxa are recognized, including four new species and four new forms (as cf.) that for various reasons do not warrant new species names at this time. In addition, the presence of well-preserved and abundant specimens of *Gonyaulacysta dualis* and *Leptodinium mirabile* permit new detailed and complete morphological descriptions. Dinoflagellate cyst assemblages from these measured sections are characterized by very low diversity and high abundances of one to several species. Numerous samples contain extremely high abundances of one or two species that may reflect ancient plankton blooms. Most of the dominant taxa identified in the Upper Jurassic Naknek Formation have also been noted by Wharton (1988) in the underlying Middle Jurassic Chinitna and Bowser Formations; the Middle Jurassic assemblages, however, can be readily distinguished by their high diversity and by numerous distinctive taxa that are absent from the Late Jurassic assemblages. Although the dinoflagellate cyst taxa identified in the three measured sections of the Naknek Formation do not provide better age constraints than the pelecypod, *Buchia* (late middle Oxfordian through early Tithonian), they do provide a reliable means by which the Naknek Formation can be easily identified in wells.

### A NEW MIOSPORE FROM THE BONNER SPRINGS SHALE (PENNSYLVANIAN) OF KANSAS, U.S.A.

Gary W. Barker (1), Clinton B. Foster (2), John A. Clendening (1)

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Clendening and Nygreen (1976) described *Nanoxanthiopollenites mcmurrayi* from the Bonner Springs Shale, Kansas City Group, Upper Pennsylvanian Series from Johnson County, Kansas. Re-examination of additional slides prepared from the sample from which *Nanoxanthiopollenites* was described has revealed the presence of an additional new miospore genus.

The essential features of the new genus are: striate and laesurate proximal surface; distal colpus; and, development of exoexine into saccus-like structures. *Marsupipollenites* Balme & Hennelly emend. Balme 1970 is proximally trilete and monosulcate but lacks saccus-like structures. *Colpisaccites* Archangelsky & Camerro 1979 is proximally trilete and distally colpate with hemispherical saccus-like structures but is not striate. It is notable that *Marsupipollenites* and *Colpisaccites* first appear in Early Permian Gondwanan assemblages. The new genus described here is from a considerably older Missourian (Late Pennsylvanian) Euramerican assemblage.

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## SIMPLE PALYNOLOGICAL METHODS CAN PRODUCE A MORE PRECISE SEQUENCE STRATIGRAPHY

Virgil D. Wiggins

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The detailed analysis of a stratigraphic sequence, particularly one bounded by major unconformities, is well suited to current methodology available in the field of palynology. Of special interest are two simple graphic methods for time and facies correlation called a Modified Shaw Plot and Ecological Shift Plot respectively.

The Shaw Method of graphic time correlation (Shaw, 1964, and others) is not readily applicable to most of the complex problems of sequence stratigraphy studied in well sections because it uses *in situ* rock materials and all of the fossil material available. In the Shaw Method, the principal component and "essence" of the method is the rate of rock accumulation line called the Line Of Correlation (LOC) which graphically facilitates time correlations between two geological sections.

In well sections, using ditch cuttings, the LOC can be established solely on fossil extinctions or other criteria which forms a ubiquitous, basinwide time plane (ash bed, etc.). This method is called a "Modified Shaw Plot," and uses relevant time planes provided by any fossil discipline (forams, radiolaria, calcareous nannoplankton, palynology, etc.)

As fossil distribution ranges are not relevant in this modified method, the only constraint is being able to separate time dependent from facies dependent extinctions. The axis of this graphic method is the basal unconformity which bounds the stratigraphic sequence being investigated. Once the LOC is established, the biostratigrapher can extend it and predict subsequent index fossil "tops," and can test the validity of all other data encountered. The geologist can pick any increment of time from an established LOC and determine instantly if the contained lithology is time-transgressive, time-regressive, or nonexistent between wells in the correlated sequence with confidence. He can also evaluate faults and minor unconformities suggested by LOC patterns within the sequence being investigated.

The second method of graphic correlation is called an Ecological Shift Plot (Wiggins and Hill, 1987). This statistical method takes a ratio value of floristic extremes in the land flora, and depicts the results on a semi-log display. Any particular ratio value or base line are unimportant in this method because the overall curve generated and its periodicity are the basic results being interpreted. It can be demonstrated in Alaska that the terminal Paleogene curve and Neogene curve generated by this method can emulate a global sea level curve produced by Vail and others, but utilizes nonmarine data only. This suggests that global climate is a major factor. This Ecological Shift Plot does necessitate sufficient data for a valid statistical analysis, and some additional fossil analysis to time calibrate the curve generated.



## DEPOSITIONAL SEQUENCES AND THE INTERPRETATION OF BIOLOGICAL DATA IN STRATIGRAPHY

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The sequence stratigraphy model provides a powerful means with which to interpret biological data sets. The model is based on eustatic controls of depositional patterns, including sequences and systems tracts, sequence boundaries, facies distribution, and intra-sequence stratal discontinuities. The model represents something of a unifying concept in stratigraphy because it provides a means to measure the spatial and temporal distribution of a wide variety of data types against an independent physical framework.

Sequence stratigraphy involves the characterization of depositional sequences. Reflection seismic, well log and outcrop data are used to construct a physical framework for a basin. Lithofacies and biofacies data are combined with the physical framework to delineate sequence boundaries and systems tracts, and to establish a time framework. Although both the causal mechanism and global synchroneity of sequences are the topics of considerable debate, we can still use the model to interpret many aspects of the paleontological record from an entirely new perspective, and this can have a profound impact upon our current thinking of stratigraphic correlation, evolutionary models, and paleoecology. The "ecostratigraphic unit" is a conceptual device to interpret paleontologic data in terms which are different from the more traditional (event, zone, assemblage, diversity) methods applied to sequence characterization.

Formalization of the empirical relationship between biofacies and depositional sequence architecture at a "seismic" scale is fundamental to the future credibility and utility of biostratigraphy in sequence stratigraphic applications. This approach relies on the definition of "biotic analogs" of depositional sequences (ecostratigraphic units) using data from the major planktonic microfossil groups. Preliminary results suggest that most of the structure observed in the stratigraphic distribution of fossils may be attributed to sequence architecture, and that these patterns can be statistically delineated in terms of a hierarchy which is independent of the fossil group and of geological age (i.e., at a basic level, all biological systems act about the same). This approach can reduce the apparent complexity of biological data to one of a set of generic "conditions" both within sequences (static, monotonic, random, or oscillatory trends) and at stratal discontinuities (equilibrium, or direction and magnitude of axis translation). These terms are analogous in scale and application to internal character (parallel, divergent, chaotic) and boundary conditions (downlap, onlap, truncation) used by seismic stratigraphers to characterize depositional sequences.

Palynomorphs have the potential to provide fundamental data for refinement of the sequence model. They are abundant in the neritic and upper bathyal environments that are impoverished with regard to the more oceanic calcareous and siliceous microfossils. They are therefore among the most common and ecologically sensitive microfossils in depositional settings whose dynamics are fundamental to understanding the model. Palynomorphs should therefore play a central role for age calibration, correlation, and paleoecology in sequence stratigraphic applications.

## ORGANIC-WALLED MICROFOSSILS FROM THE CAMBRIAN DAVIS SHALE AND BONNETERRE FORMATION, MID-CONTINENT UNITED STATES: INTEGRATION OF PALYNOLOGICAL, GEOLOGICAL AND GEOPHYSICAL DISCIPLINES IN THE EXPLORATION OF THE REELFOOT RIFT AREA

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The Reelfoot Rift province of Missouri and Arkansas is a frontier hydrocarbon area. Although geologically famous for its Lead-Zinc districts (e.g., The "Old Lead District" and "Viburnam Trend") associated with the algal stromatolite bioherms of the Bonneterre Formation, little exploration has been attempted in the downdip shelf-edge and basinal sequences. Deep seismic data revealed that this sparsely drilled province contains structural and stratigraphic anomalies similar to productive traps found in other rift basins. The lack of deep wells in this area and the lithological changes evident in an updip-downdip transect of the Davis Shale and Bonneterre Formation required a biostratigraphic-paleoenvironmental framework to help define genetic reflection packages and interpret geological structures.

Samples from six Cambrian surface exposures in the St. Francois Mountains area of Missouri, four mineral cores from southeastern Missouri and four deep wells from southeastern Missouri-Northeastern Arkansas were analyzed for organic-walled microfossils.

All productive samples were dominated by clusters, filaments, and "sheets" tentatively considered algal in origin. Acritarchs recovered can be assigned to *Elektoriskos*, *Granomarginata*, *Leiosphaeridia*, *Lophosphaeridium*, *Micrhystridium*, *Timofeevia*, *Vulcanisphaera* and several new forms. This assemblage is the first record of *Granomarginata squamacea* Volkova 1968, *Timofeevia phosphoritica* Vanguestaine 1978, and *Vulcanisphaera turbata* Martin *in* Martin and Dean 1981 from the Upper Cambrian warm-water provincial realm. In the cold-water provincial realm (e.g., Newfoundland, Norway), these forms are biostratigraphically useful, and their occurrence can be correlated to Acado-Baltic trilobite zones. Synchronous sequence boundaries were established using palynological "extinctions." These horizons were quite successful for correlating age-equivalent strata from shelf to basin. In a few instances where biostratigraphic data did not fully agree, geophysical and geological evidence (in association with graphic correlation techniques) aided in recognizing suppressed or expanded "tops."

"Palynofacies" analyses were implemented in a general manner because of the absence of "unquestionable" terrestrial organic input. In general, there is a slight increase in the abundance and diversity of organic-walled microphytoplankton from nearshore to offshore environments. Nonetheless, all productive samples are dominated by clusters, filaments, and sheets of probable algal origin. Anomalies in palynological distribution trends can be explained using geological and geophysical evidence.

A visual determination of thermal maturity and its relationship to dip location and burial history was also assessed using organic-walled microfossils. For example, the color of *Timofeevia phosphoritica* recovered from outcrop samples (shallow cratonic environments) is colorless-to-light yellow. In mineral cores (shelf environments), this species is yellow-to-light brown and in samples from deep penetrations (shelf edge and rift basin) dark brown-to-black. Other organic-walled microfossils (e.g., algal clusters, filaments, etc.) also show this color trend.

Palynology, in combination with geophysical and geological information, was an integral entity in evaluating the initial hydrocarbon potential of the Reelfoot Rift area. Implementation of palynology to delineate stratigraphic packages, and interpreting the thermal history of the basin was important in the process of high grading prospective targets. Palynology is also an important tool in recognizing paleoenvironments ("palynofacies") and predicting horizons to be penetrated in wildcat wells.

## JURASSIC PALYNOLOGY OF THE ISLE OF SKYE, WESTERN SCOTLAND

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The Jurassic outcrops of the Inner Hebrides, western Scotland comprise 1000m of sediments of varied lithology deposited in a half graben (the Minch Basin).

The Bearreraig Sandstone Formation (late Toarcian to Bajocian) yielded relative low diversity dinoflagellate cyst assemblages which were consistently dominated by the genus *Nannoceratopsis*.

Of the seven formations of the overlying Great Estuarine Group (Bathonian) only the Duntulm Formation yielded marine palynomorphs. *Ctenidodinium sellwoodii* was encountered in large proportions throughout. This abundance and the occurrence of *Rhynchodiniopsis*? *regalis* and *Valvaeodinium spinosum* confirms the Bathonian age of the Duntulm Formation.

The early Callovian Staff in Bay Formation and the mid Callovian to early Kimmeridgian Staffin Shale Formation produced diverse and well preserved dinoflagellate cyst associations. Generally these are similar in content, relative proportions and stratigraphic distribution to coeval floras from elsewhere in Europe. Several species, however, (e.g., *Tubotuberella dentata*) appear endemic to Scotland and higher latitudes.

## THE ROLE OF PALYNOMORPHS IN THE INTERPRETATION OF THE PALEOECOLOGY OF THE LOWER SILURIAN TUSCARORA FORMATION

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Previous sedimentological and ichnological studies of the Lower Silurian Tuscarora Formation in Pennsylvania have focused on features associated with the coarser sandy lithofacies. The paleoecological conclusions based on these data sets have varied greatly, but most recently have favored a shallow shelf depositional setting. Palynomorphs extracted from interbedded shales indicate a terrestrial depositional source given the likelihood that spore tetrads and associated spore-like microfossils are of terrestrial origin. The validity of this conclusion is strengthened by the ability to ascertain a slight marine trend within the sequence based on the assumption that *Comasphaeridium* and *Moyeria* are marine indicators. The absence of normal marine body fossils (including acritarchs) coupled with the nonmarine palynological component indicate either a mixed source of sediment origin or paralic deposition with limited access to open marine waters.

## ORGANIC THERMAL MATURITY APPLICATIONS TO SOURCE ROCK POTENTIAL ANALYSIS AT PHILLIPS PETROLEUM COMPANY

Dennis R. Logan, Phillips Petroleum Company, 254 Geoscience Bldg., Bartlesville, OK 74004

The importance of determining accurate organic thermal maturity levels in potential hydrocarbon source rocks cannot be overstated. As important as organic quantity and quality is, sufficient thermal alteration of the host rock must occur to convert the organics to hydrocarbons.

In our laboratories, the two most important criteria for determining the thermal alteration level of a rock sample are by measuring its mean random vitrinite reflectance and also estimating the spore coloration index (i.e. thermal alteration index or TAI) of plant spores and pollen present. An additional thermal maturity indicator used is the fluorescence intensity of the oil prone kerogen present. These three maturity criteria are microscopically derived measurements made on the concentrated kerogen (insoluble organics) recovered from rock samples after acidification. Source rock analysts have generally accepted a scale for relating vitrinite Ro (reflectance in immersion oil) and TAI to four thermal maturity stages; 1) immature for oil generation, 2) early oil generation phase, 3) peak oil generation phase, and 4) dry gas to over mature for hydrocarbon generation. When these maturity data are combined with the kerogen type and relative abundance, and then merged with the quantitative TOC and pyrolysis results, it constitutes Phillips' basic hydrocarbon source rock potential technique. This procedure is considered to be an accurate measure of source rock potential, and is further enhanced when all the data (as many as 24 values) are evaluated by our licensed artificial intelligence program "Source Rock Advisor." This PC driven computer program generates a totally standardized and reproducible source rock evaluation.

## TREMADOCIAN (LOWER ORDOVICIAN) ACRITARCHS FROM THE SUBSURFACE OF WEST TEXAS

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Thermally altered, but identifiable, Early Ordovician (Tremadoc) acritarchs were recovered from argillaceous limestones and shales penetrated by a stratigraphic test well, the Amoco No. 1 Kothman Ranch, Terrell County, Texas. This well was drilled in the structurally complicated Marathon thrust zone.

The acritarch assemblage is dominated by sphaeromorphic and acanthomorphic acritarchs. It contains representatives of the genera *Aryballomorpha*, *Athabascaella*, and *Lua*. Neither diacrodian acritarchs nor chitinozoans are present in the samples. Assemblages containing these genera have been reported from Lower Ordovician strata from Alberta, Canada, northeastern China, Canning Basin, Western Australia, and Öland, Sweden. With the exception of the Öland occurrence, all of the occurrences of this assemblage are in a warm-water, low latitude, "province," which is based on paleomagnetic and paleobiogeographic reconstructions. Latitudinally, Öland, during the Early Ordovician, is in an intermediate position between warm- and cold-water "provinces." Of the five occurrences of the *Aryballomorpha/Athabascaella* assemblage now known, only it has diacrodian acritarchs. Tremadoc acritarch assemblages from the cold-water "province" (e.g., North Africa and England) contain diverse diacrodian acritarchs.

## TOWARDS A PLANT FOSSIL RECORD DATA-BASE

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The International Organization of Palaeobotany is attempting to organize a structure to create and maintain a PC data-base of the plant fossil record. This would be according to an agreed international standard, would allow others as well as palaeontologists to use it, would allow free retrieval by all scientists, and would encourage high standards of taxonomic description.

This distinctly taxonomic project would cooperate constructively with other data-base managers, such as *Palynodata*, and with nomenclature projects, such as *Names in Common Use*.

Examples of retrieval by field and content searches will be demonstrated and examples of field titles within each record will be suggested.

## A GEOLOGICAL APPROACH TO PALYNOFACIES ANALYSIS AND ITS APPLICATION TO PALAEOENVIRONMENTAL INTERPRETATION AND STRATIGRAPHICAL CORRELATION IN THE JURASSIC AND CARBONIFEROUS INTERVALS

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The purpose of this paper is to provide an illustrated basis for a geological approach to palynofacies analysis. Palyno-constituents are sub-divided broadly into woody debris, microplankton, sporomorphs and structureless (sapropelic) organic matter. Woody debris is further subdivided into four palynomaceral types according to degradation and buoyancy characteristics. Sixteen palynofacies types from marine and nonmarine settings are described. Their occurrence in Jurassic and Carboniferous strata are discussed together with their environmental significance. A system of palynofacies nomenclature is proposed which allows the basic constituent proportions and their characteristics to be indicated whilst also conveying the likely depositional environment.

Two illustrated examples of usage include the palaeoenvironmental modelling of three wells from the Brent Group of the East Shetland Basin together with a stratigraphical correlation of four well sequences of Carboniferous age from the southern North Sea.

## AN ARTIFICAL CLASSIFICATION OF SPORE-LIKE MICROFOSSILS (CRYPTOSPORES) OF LOWER PALEOZOIC AGE

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The construction of an informal taxon Anteturma *Cryptosporites* for nonmarine Silurian tetrads, dyads and monads which lack haptotypic features found in most embryophytic spores appears to be a useful concept. These palynomorphs are considered spore-like, yet they may also have features which point toward algal affinities. A possible subdivision of the Anteturma *Cryptosporites* based on strictly morphological criteria is presented. The interplay between this artifical classification and possible phylogenetic trends within the cryptospores is examined. One example of such a trend is a lineage of tetrahedral tetrads which has at its base a new species of *Tetrahedraletes* from the Ashgillian of Illinois. If this palynomorph lineage derives only from the streptophytes, then its stratigraphic record documents the primary adaptive radiation of the embryophytic plants.

## EXPLORATION APPLICATIONS OF THE GRAPHIC CORRELATION - COMPOSITE STANDARD METHODOLOGY

F. X. Miller

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The graphic correlation method proposed by Shaw (1964) represents a unique paleontologic technique that determines and uses the total (composite) stratigraphic ranges of fossils in order to produce precise chronostratigraphic correlations of rock units. Composite ranges can be developed for a small interval of geologic time, an era, or the entire Phanerozoic. By including all types of fossils - nonmarine and marine, planktonic and benthonic - in the composite range development, regional correlations can be made in all types of paleoenvironments. A brief overview of the philosophy and methodology of Shaw's technique is presented.

The chronostratigraphic correlations developed by graphic correlation using composite ranges are reproducible on a local or regional scale, in any basin, foreign or domestic, enabling the stratigrapher to reconstruct basin history in thin, time-slice intervals. Used in conjunction with lithologic and seismic data, this technique will produce high resolution correlations which expand the explorationists ability to predict, find and exploit subtle stratigraphic traps and to discover ancestral structural features masked by overlying unconformities and flat lying beds. Examples from the Tertiary of southeastern United States and from the Gulf of Suez, Egypt, are used to illustrate results of the graphic correlation method.

# PALAEONTOLOGICIAL ASSOCIATION

## Annual Conference

## Liverpool 1989

# ABSTRACTS

### AN INTEGRATED MICROPALAEONTOLOGICAL STUDY OF THE DEVONIAN SEQUENCE OF NORTH DEVON

Richard Knight (Southampton)

The interdigitated marine/non-marine Devonian sediments of North Devon are widely regarded as impoverished of fossils. An integrated micropalaeontological study of some 3km of sediment has been undertaken, encompassing the Lynton Formation through to the Morte Slates. Subsequent biostratigraphical evaluations are based exclusively upon the miospores and conodonts documented.

Terrestrial and marine palynomorphs were recovered from virtually all those samples representative of the marine sequence. High diversity and prolific miospore assemblages predominate, with rare acritarchs, chitinozoans and scolecodonts sporadically recovered in association. A number of palynomorph taxa previously unrecorded from the British Isles have been detailed. Low diversity, icriodid-dominated, conodont faunas were extracted from the Lynton Formation and the Ilfracombe Slates.

The palynoflora recovered from the lowest Lynton and Hollowbrook Formations suggests a late Emsian/early Eifelian age. The main body of the Hangman Sandstone Group has proved barren. Towards the top of this group, the collective character of the miospore assemblages compares favourably with documented late Eifelian to earliest Givetian palyniferous sediments. Within the lower Ilfracombe Slates the inception of Geminospora lemurata, coupled with the recovery of conodont elements referable to the Polygnathus varcus group, diagnose a Givetian age. Late Givetian/early Frasnian miospore assemblages were isolated from the top of the Ilfracombe Slates. The overlying Morte Slates yielded a sparse flora of somewhat problematical age, which in its youngest parts may feasibly be ?earliest Famennian.

### THE PALYNOLOGY OF THE STONEHAVEN GROUP, NORTH EAST SCOTLAND AND ITS STRATIGRAPHICAL IMPLICATIONS

J.E.A. Marshall (Southampton)

The Stonehaven Group is the basal unit of the Old Red Sandstone in the north eastern Midland Valley of Scotland and hitherto has been poorly age constrained on limited evidence. Detailed sampling has revealed the presence of rare, sparse but relatively diverse and well preserved palynomorphs which show the age to be clearly Silurian, but predating the currently accepted Pridoli assignment. The assemblage contains abundant spore tetrads such as Tetrahedraletes medinensis together with smooth alete and trilete spores. Spores with proximal ribs or rudimentary sculpture are present but rare. This demonstrates a Mid Silurian age, probably Late Wenlock.



The material which includes abundant cuticle and tubal debris provides a rare unequivocally terrestrial, Silurian-age, land plant assemblage. The age suggests a stratigraphic hiatus between the Stonehaven Group and succeeding units of the Midland Valley Old Red Sandstone and shows it to be clearly older than supposed correlations in Lorne, Argyll. This succession contains important early terrestrial arthropods. The Stonehaven Group is however a correlative of the Silurian inliers of the southern Midland Valley.

The thermal maturity of the material, as evidenced by spore colour and vitrinite reflectivity, also shows the succession to be 'under-mature' as understood from the stratigraphy and burial history of the Midland Valley.

## ORGANISATION FRANCAISE de PALEOBOTANIQUE

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**A TOUS LES MEMBRES O.P.P.**

L'A.P.L.F. (Association des Palynologues de Langue Française) nous propose pour 1991 (septembre ou octobre) d'organiser un symposium conjoint avec notre association sur le thème "Biogéographie et Paléobiogéographie".

Avant de prendre une décision, nous souhaitons avoir votre avis à ce sujet. Aussi vous est-il demandé de bien vouloir répondre le plus rapidement possible au questionnaire ci-joint.

- Pensez-vous participer à ce colloque ? oui - non*
- Etes-vous d'accord sur le thème proposé ? oui - non*
- Voyez-vous un autre thème, lequel (à préciser) ?
- Lieu du colloque souhaité (à préciser) ?

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Questionnaire à renvoyer à :

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G. BARALE
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Laboratoire de Paléobotanique
43, bd du 11 Novembre 1918
F - 69622 VILLEURBANNE

*Barrer la réponse qui ne vous convient pas

STUIFMAIL, Vol. 7, N° 1-2, page 66

MIDDLE TRIASSIC MUSCHELKALK ACRITARCHS
- some preliminary thoughts

Hugh Grenfell
Laboratory of Palaeobotany and Palynology
State Universitay of Utrecht

I came to the Laboratory from New Zealand at the end of 1988 and was invited to make a study of Muschelkalk Acritarchs. In what has been a busy, interesting year so far, experiencing all kinds of things, I have made some progress towards understanding these enigmatic microfossils. The study of Acritarchs, especially from the Late Palaeozoic and Mesezoic, are not exactly trendy. However, since I had already studied Late Permian Acritarchs from Western Australia and seen their potential I was crazy enough to say yes. Certainly becoming entangled in literature was no problem because useful publications dealing with Permian and Triassic Acritarchs can probably be counted on the fingers of both hands. This has its advantages and disadvantages.
Acritarchs are best known from Early Palaeozoic rocks and these palynomorphs of "uncertain origin" are probably the resting cyst stage of phytoplankton. Some are almost certainly what I like to call 'closet' dinoflagellate cysts. Genera such as Micrhystridium, Veryhachium, Baltisphaeridium and Multiplicisphaeridium may be familiar to you. In recent years some genera previously considered to be Acritarchs have been confidently identified as belonging to extant algal groups such as the Prasinophyte and Zygnemataceae. Although Early Palaeozoic Acritarchs have been relatively well studied, their apparent decline at the end of the Devonian and the increased importance given to other palynomorphs and microfossils have led to a lack of study of Late Palaeozoic and Mesozoic Acritarchs. The reasons for a reduction from the Late Palaeozoic until the Middle Jurassic of cyst-producing phytoplankton genera remains a palynological enigma. Once the dinoflagellate cysts *sensu stricto* finally arrive in the latest Triassic, Acritarchs are almost completely ignored. This is generally realistic since most Late Palaeozoic and Mesozoic Acritarchs lack morphologic complexity and are dificult to study with the transmitted light microscope. When a Silurian Micrhystridium species looks identical to your Triassic form you begin to wonder if they have any potential at all! However, hopefully the Scanning Electron Microscope (SEM) will come galloping to the rescue - more on that later.
The Acritarchs being studied are from the classic Middle Triassic Muschelkalk of the Germanic Basin. The samples come from a quarry at Gundelsheim (see Figure 1) where some 40m of the Upper Muschelkalk is exposed. Thirty-six samples of varying palynomorph content and poor to moderately good preservation are being studied.
The Muschelkalk carbonates are part of the threefold lithologic development of the so-called Germanic Facies (i.e. Buntsandstein, Muschelkalk and Keuper) which is recognised in Germany, Poland, north-eastern France, Switzerland and the Netherlands. The Germanic Muschelkalk represents a partially enclosed shallow marine intracratonic basin, separated from the open Tethys Sea by the Vindelician High. During the Early Anisian a relative sea-level rise induced the Lower Muschelkalk transgression and the renewal of free communications between the Tethys and the southern Permo-Triassic Basin. The

STUIFMAIL, Vol. 7, N° 1-2, page 67

open marine conditions are reflected in an accumulation of Lower Muschelkalk carbonates which contain a rich Tethyan fauna. During the Middle to Late Anisian connections with the Tethys again became restricted as reflected in the deposition of the Middle Muschelkalk evaporites. But in the latest Anisian-Early Ladinian the Upper Muschelkalk carbonates were deposited and free communication was re-established via the southern parts of the Polish Trough and the Burgundy Trough. The Muschelkalk sequence attains a thickness of 500m in Poland and 300-500m in northern Germany (Kozur 1974, Ziegler 1982, Aigner 1985).
The Gundelsheim locality was rather distant (± 120km) from sources of terrestrial palynomorphs during the Late Anisian. This is reflected in the palynofloras which are dominated by Acritarchs and Prasinophytes while the sparse spore/pollen content consists predominately of bisaccate species. At first sight the Muschelkalk Acritarchs are impressive in their numbers but to the casual observer they would probably appear to lack diversity and useful morphologic characters. I think such inaccurate perceptions are responsible for the lack of Late Palaeozoic and Mesozoic Acritarch studies. One often sees statements such as "abundant spinose Acritarchs observed", but that's all you get, which is hardly surprising since the author probably thinks they are all the same anyway!
While it is true that they are generally of small size (some < 10µ) and are restricted to a limited number of genera it is still possible to differentiate taxa in the Upper Muschelkalk using the transmitted light microscope (TLM). Using simple characters such as wall thickness, process lenght, process lenght to vesicle diameter ratio and process density, shape or construction I have so far been able to distinguish some 45 Acritarch and Prasinophyte species. Most belong to genera such as Filisphaeridium, Lophosphaeridium, Micrhystridium and Veryhachium. There is a gradation between some species 'end members'. Since the discrimination of taxa is rather subjective when using so few characters other morphologic characters are needed. My previous work and studies such as Habib and Knapp (1982) have shown that the SEM is useful in exposing microsculptural detail. With the SEM small, apparently smooth-walled Acritarchs often suddenly exhibit distinctive types and distributions of microsculpture. Unfortunately, preliminary studies of Muschelkalk samples with the SEM have been disappointing. Thus far species examined either have no microsculpture or are too poorly preserved. More samples will be examined.
If it is possible to differentiate these Triassic Acritarchs from their Early Palaeozoic cousins they will have biostratigraphic potential. In a limited way they are also useful once you know that you are dealing with Triassic sediments, i.e. they can be used to correlate distal facies which may lack terrestrial palynomorphs. However, their biostratigraphic potential outside the Germanic Basin may be restricted if like the Muschelkalk ammonites they turn out to be rather endemic.
Although their primary appeal is for biostratigraphic correlation, Acritarchs also have great potential as a palaeoenvironmental tool. It will be particularly interesting to see if they can be used to detect sea-level fluctuations. So far semi-quantitative study shows significant abundance and diversity fluctuations occur which, not surprisingly, correspond with sedimentologic changes. But often within a single bed there are significant, as yet inexplicible, changes in the Acritarch assemblages. Quantitative work

to be done will hopefully provide some clues and then palaeoenvironmental models can be considered.
Obviously I still have a lot of work to do but I hope these rather preliminary ideas have given some idea of the potential Acritarchs have. I would be very interested to hear from other people trying to use Late Plaeozoic and Mesozoic Acritarchs. To date the Laboratory's work in Triassic palynology has concentrated on spores and pollen. It is perhaps a measure of their expertise in the Triassic that the Acritarchs are now receiving some attention after the spores and pollen have been largely conquered.

## L P P FOUNDATION

In recent years there has been an expanding need for accurate, academically grounded palynostratigraphic and organic matter studies. As a result the LPP Foundation was founded in December 1988 at the Laboratory of Palaeobotany and Palynology, one of the very few training centres for stratigraphic palynology.

The LPP Foundation provides broad practical expertise combined with up to date academic knowledge to assist universities, government agencies and exploration companies in their geological research.

The LPP Foundation has undertaken projects for major companies and institutions such as SHELL, AGIP, BP, Norsk Hydro, Pennzoil and Unocal. Furthermore, cooperation with consultants like Tectostrat BV Amsterdam is well established.

The LPP Foundation guarantees confidentiality of client material and results generated from them. The LPP Foundation operates outside academic projects of the Laboratory of Palaeobotany and Palynology.

**Funds raised by the LPP Foundation are used exclusively to support the various educational and research activities of the Laboratory of Palaeobotany and Palynology.**

The LPP Foundation's present activities include:

I Research
II Training
III Applications



### *RESEARCH*

Research activities may include special projects pertaining to local, regional and inter-regional pollen/spore, acritarch and/or dinocyst distribution, as well as palynofacies and/or organic matter studies. Results may include integrated biostratigraphy, age-determinations, correlations, maturity studies and source-rock evaluation (Thermal Alteration Index and Non-Quantitative Fluorescence), basin analysis and detailed palaeoenvironmental interpretations.

Literature studies, written and/or computerised indexes and determination keys, compilation or reference material and palynostratigraphic manuals are other options.

### *TRAINING*

A standard package includes detailed practical courses in various aspects of palynostratigraphy, covering pollen and spores, dinocysts, acritarchs, as well as palynofacies and/or organic petrology.

Specialists' courses may include:

I Triassic-Recent dinoflagellate cysts: their organisation, distribution and palaeoenvironmental interpretation
II Devonian-Carboniferous spore/pollen stratigraphy
III Permian-Triassic spore/pollen stratigraphy
IV Lower Cretaceous spore/pollen stratigraphy
V Sedimentary organic matter

or combinations of the latter on special request.

Courses may be given in English or Dutch to individuals or groups, either in The Netherlands or abroad.

On special request MSc and/or PhD programmes may be arranged.

### *APPLICATIONS*

The applications programme is closely related to our research activities, and is part of the **Special Services programme**. This programme is especially designed for the client's demanding the use of applied palynostratigraphy on a routine basis, including hot-shot service.

Collaboration with various geoscience colleagues enables interdisciplinary surveys including e.g. calcareous microfossil distribution, sedimentology, magnetostratigraphy, field studies, remote sensing, and organic geochemistry. Options can be arranged on request.

The programme is directed towards efficient evaluation of the available Palaeozoic-Recent palynomorph assemblages and remaining organic matter.

For more information please contact:

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c/o Laboratory of Palaeobotany and Palynology
Heidelberglaan 2, 3584 CS Utrecht
The Netherlands

II EUROPEAN PALAEOBOTANICAL CONFERENCE

Madrid, September 1989

* * * * * *

Contributed papers and poster sessions

ABSTRACTS

## NEW CYCADALES AND BENNETTITALES FROM THE MIDDLE JURASSIC OF NORTH YORKSHIRE

C.R. HILL. Department of Palaeontology, British Museum of Natural History, London SW7 5BD, England.

Recent collecting has yielded new material of the rare male cycad cone Androstrobus szei Harris in intimate association with the leaf Ctenis sulcicaulis and with a new species of the scale-leaf Deltolepis. This indicates critically, for the first time, that the widespread Mesozoic leaf genus Ctenis was cycadelean; and the peculiarities of the leaf are consistent with the distinctive, rather Ginkgo-like, sculpture of A. szei pollen.

New material of Bennettitales includes a Williamsoniella "flower" which is identical in gynoecial details to Bennetticarpus diodon Harris.

## PREMIERES DONNEES SUR LA FLORE CRETACE INFERIEURE DE HUNDIDAS DE ARMALLONES (GUADALAJARA, ESPAGNE).

Denise PONS. Paléobotanique et palynologie évolutives. Université Pierre et Marie Curie, 12 rue Cuvier, 75005 Paris.France. Rocío JIMENEZ et Lourdes REY. Departamento de Estratigrafía y Geología Histórica. Facultad de Ciencias Geológicas. UCM. Madrid 28040. España.

L'étude d'une flore découverte à Hundidas de Armallones (Province de Guadalajara, Espagne), a permis aux auteurs de mettre en évidence une association floristique caractéristique du Crétacé Inférieur de la province nordtéthysienne. Les échantillons proviennent de calcaires lacustres d'âge probablement Aptien supérieur-Albien de l'état actuel de nos connaissances.

Les empreintes, magnifiquement conservées, appartiennent essentiellement à des Gymnospermes Coniférales (Araucariaceae, Cheirolepidiaceae, Podozamitaceae) et à une Fougère (Weichselia reticulata). En revanche la microflore est beaucoup plus variée. A coté d'un fond Ptéridophytique important comprenant des spores trilètes lisses (Cyathidites, Matonisporites, Gleicheniidites), verruqueuses (Converrucosisporites, Muerrigerisporites, Rotverrusporites), cicatricosées (Cicatricosisporites, Plicatella), on observe de très nombreuses Coniférales (Alisporites, Callialasporites, Cedripites, Cerebropollenites, Clasopollis, Podocarpidites). Le pollen à affinités angiospermiennes est présent, mais encore rare (Afropollis proche du groupe A. jardinus et aff. jardinus, Retimonocolpites sp., Stellatopollis sp. ( sensu Doyle et al., 1977). Afropollis, déjà connu au Portugal et en France, est signalé pour la première fois en Espagne.

## PALEOFLORA DEL TRIASICO INFERIOR DE MALLORCA

C. ALVAREZ RAMIS. Depto Paleontología, Fac. Geología, Universidad Complutense, Madrid. N. SOLE DE PORTA, Depto. G.D.G.P., Fac. Geología, Universidad de Barcelona. F. CALAFAT COLOM, Depto. G.D.G.P., Fac. Geología. Universidad de Barcelona.

La presencia de restos de macroflora y microflora encontrados en el Triásico Inferior de Mallorca de facies Buntsandstein, en sus dos unidades más superiores, ha permitido la datación de estas como Anisiense, posiblemente Medio.

Entre esta flora abundan las Gimnospermas representadas por restos de sus aparatos vegetativos y sobre todo por sus órganos reproductores y granos de polen correspondientes.

## THE LOWER LIASSIC FLORA FROM ODROWAZ IN POLAND: PRELIMINARY COMPARISON OF MICROFLORA WITH MEGAFLORA.

Jadwiga ZIAJA. Wladyslaw Szafer Institute of Botany, Polish Academy of Sciences, 31-512 Krakow, Lubicz 46. Poland.

Both the microflora and megaflora from the Lower Liassic in Odrowaz consist of a small number of taxa. In the microflora from 14 samples were so far determined 20 species and genera, while a few taxa were assigned only to a palnt group. In the megaflora were determined 10 species and genera and four taxa were assigned only to a plant group. The comparison of the microflora determined by the author with the megaflora determined by Reymanowna and Wcislo-Luraniec does not suggest great differences in composition. E.G. the microflora is dominated by Classopollis cfr. torosus, while the megaflora is dominated by shoots and cones of Hirmerella cfr. muensteri. In the microflora occur about 10 taxa of ferns and about 5 in the megaflora. Here the dispersed spores Matonisporites correspond with leaves of Phlebopteris angustiloba (Matoniaceae). Of gymnosperms, dispersed Monosulcites pollen grains may correspond with bennettitalean leaves. For dispersed Vitreisporites pallidus (Caytoniales) no corresponding megafossils were found.

The megaflora seems to indicate that in Odrowaz there occurred a local plant community, probably a forest dominated by Hirmerella and Podozamites (Reymanowna, Wcislo-Luraniec, Ichas-Ziaja 1987). It is tempting to assume that the sporomorphs were probably transported a short distance from their parent plants and reflect the local plant community.

## AN INTERESTING FRUCTIFICATION SIMILAR TO STACHYOPITYS PRESLII FROM THE LOWER JURASSIC OF POLAND

Elzbieta WCISLO-LURANIEC. Wladyslaw Szafer Institute of Botany Polish Academy of Sciences, 31-512 Kraków, Lubicz 46. Poland.

In the Lower Jurassic shales of Odrowaz was found a 42 mm long fragment of a fructification preserved as compression. The maceration in $HNO_3$ is difficult anddid not give good results.

The fructification consists of a main axis with helically arranged short lateral appendages anding with one cupule 3 mm long and 2 mm wide. In the cupules were not found seeds nor pollen grains.

The cupules from Odrowaz seem identical with entire cupules of Stachyopithys preslii from the Rhaeto-Liassic of Franconia (Schenk 1867, Gothan 1914). In some respects they resemble also those of the pteridosperm fructification Ktalenia circularis from the Lower Cretaceous of Argentina (Taylor, Archangelsky 1985). Cupules of Ktalenia, however, contain one or two seeds and on the fertile axis there are clusters of bracts which are not present on the axis of Stachyopitys from Odrowaz. The Strachyopitys cupules differ in several characters from cupules of Caytonia.

## INDIAN SEED-COMPRESSIONS FROM TRIASSIC OF NIDPUR IN EVOLUTIONARY PERSPECTIVE

Shyam C. Srivastava* & S.R. Manik
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ABSTRACT

Advent of Dicroidium - bearing bed at Nidpur in the Triassics of India has broughtforth the richest haul of compressed fertile organs associated with the vegetative remains. Of these fertile structures, occurrence of detached seeds is fairly frequent.

Extensive study of these seeds depict variety of morphological forms that have played a vital role in plant-group differentiation. The different morphological entities of seeds are represented by cuticular membranes which is well differentiated and that points towards the fully developed nature of seed. Presence of well developed membrane is the result of tissue maturation and therefore, represents the advanced stage in ovule ontogeny.

As such the botanical affinities of these seed-taxa have been based upon their adnation of integument with nucellus, extent of cutinization, presence or absence of distinct pollen chamber and occurrence of megaspore. The other morphological factors like thickness of cuticle, superficial features like papillae, trichomes, cutinization of anticlinal walls, cellshape, frequency of stomata, intensive or feeble cutinization of nucellar membrane, varied micropylar holes whether depressed or sunken or lobed or flat and micropylar canal long or short have all been taken into consideration. Their significant impact in taxonomy, ontogeny, environment and climate has also been interpreted as far as possible.

## AVANCE DEL ESTUDIO MACROPALEOBOTANICO DE DOS AFLORAMIENTOS TRIASICOS DE LA CORDILLERA BETICA.

A. Perez Lopez(*) Dep.de Estratigrafía y Paleontología de la Universidad de Granada y C. Alvarez Ramis Dep.de paleontología de la Facultad de C. Geológicas(U.C.M.) 28040 Madrid.

Se dan a conocer los primeros resultados del estudio de los macrorrestos vegetales hallados en dos afloramientos triásicos de la Cordillera Bética durante las prospecciones de campo efectuadas por uno de los autores(A.P.L.) con motivo de la preparación de su Memoria de doctorado.

Los fósiles,por hallarse en niveles de areniscas están en deficiente estado de conservación y muchos de ellos son simples moldes. Este hecho no permite,o hace poco precisa,la clasificación por lo que no obstante la densidad de restos que se pueden apreciar en las muestras,son escasas las especies reconocidas y no nos permiten precisar su posición estratigráfica.El que no aparezcan frondes de tipo helecho y la cantidad de pequeños foliolos de morfología de "Otozamites" conecta más bien con niveles del Keuper.

La ecología queda mejor definida por la bundancia de restos de equisetos que corresponden a la facies"Grés a roseaux" que definelos bordes de las lagunas del Keuper,formadas por la transgrsión más extensa del Triásico.

## MACROFLORA DEL TRANSITO CARBONIFERO-PERMICO DE LA CUENCA ARAGONESA DE FOMBUENA.

J. FERRER. Paleontologia. Universidad de Zaragoza. 50009-Zaragoza. y J. BROUTIN. Paléobotanique et Palynologie évolutives. Université de Paris VI.75005. Paris.

La Cuenca de Fombuena se sitúa en la Rama Aragonesa de las Cadenas Ibéricas. Está formada por materiales sedimentarios y volcanoclásticos que rellenan una fosa tectónica incluida en la Unidad de Herrera. Estos afloramientos han sido estudiados, desde un punto de vista estratigráfico y petrográfico, por CONTE et al (1987), que publican, además, una primera lista de plantas fósiles.

En nuestro estudio hemos recogido un abundante material paleobotánico (impresiones foliares y maderas fósiles silicificadas). El conjunto de las plantas recolectadas, en particular Taeniopteris multinervis-abnormis (muy frecuente), asociado a Reticulopteris germari, Alethopteris pennsylvanica var. pyrenaica y numerosos Pecopteris y Esfenofitas, permiten atribuir estos estratos al tránsito Carbonífero- Pérmico. El estudio de los troncos silicificados, Dadoxylon (Araucarioxylon) sp., Dadoxylon (Cordaioxylon) sp., Artopitys sp., confirman esta atribución. No hemos encontrado, hasta este momento, Callipteris conferta, señalado en el trabajo citado anteriormente.

La Cuenca de Fombuena parece, pués, contemporánea de la Unidad de Tránsito,definida por J. Gisbert en los Pirineos.

## A NEW TYPE OF GYMNOSPERMOUS WOOD FROM THE LOWER PERMIAN OF GERMANY

Kurt GOTH* Forschungsinstitut Senckenberg, Senckenberganlage 25, D-6000 Frankfurt/M, FRG. and Volker WILDE, Institut und Museum für Geologie und Paläontologie, Goldschmidtstr. 3, D-3400 Göttingen, FRG.

A number of permineralized stems with both pith and primary structures preserved have been excavated near Frankfurt am Main. The architecture of these axis are not comparable with, either recent, or fossil structures.

A dense secondary xylem of the Dadoxylon-type surrounds a conspicuous large pith. The primary xylem is mesarch. Within the pith there are additional secondary tissues. Remarkably, the xylem of these unusual structures developed centrifugally.

Due to the pycnoxylic wood, these plants should be classified as gymnosperms. None of the taxa known from the Upper Paleozoic exhibits the same combination of anatomical features, but regarding distinct characteristics there are affinities to several. Consequently we suggest that this could be a hitherto unknown group of gymnospermous plants, and may provide one more example for the heterobathmic evolution of plants.

## STRATIGRAPHICAL PROBLEMS OF THE SAAR CARBONIFEROUS

Helga HENGEL, Steinstr. 14, D-6632 Reisbach

During the last 10 years new investigations about palynology and coal petrology gave reason again to believe that the stratigraphical position of the Stefanian of the Saar carboniferous is not a clear as it seemed all over the years.

But it was already in 1956 when DOUBINGER thought that the Stefanian is the basal layer of the Autunian.

In 1968 GERMER, KNEUPER & WAGNER found a hiatus under the basal layers of the Conglomerate of Holz.

Today we know more about the hiatus and the floral change during the Westfalian D and the Stefanian.

A NEW LOWER CARBONIFEROUS PLANT ASSEMBLAGE FROM LA SERRE,MONTAGNE NOIRE, FRANCE.

Nick ROWE. Lehr and Forsch. für Geologie und Paläontologie, RWTH, Lochnerstrasse 420, D 5100 Aachen, West Germany. Jean GALTIER. Laboratoire de Paléobotanique, Université des Sciences et Techniques, 34060, Montpellier, France.

The Tournaisian plant assemblage from la Serre, Montagne Noire, contains plants preserved as compressions and permineralizations and is currently believed to be of Tn2a-Tn2b age. Over thirty different elements have been identified with representatives of lycophytes, sphenophytes, ferns and gymnosperms. Although many of the elements have been previously described from other localities in the Montagne Noire such as members ofthecalamo -pityaceae and the cladoxylales, others are undoubtedly new. Of significance among the new elements are some compressions of cupulate structures which we assign to the gymnosperms and some compressions and permineralized material which are possibly referable to the foliage of the cladoxylaleans.

The variation in facies and the abundance of plant fragments at La Serre compared with those of other plant localities in the Montagne Noire, suggest that the new locality represents a depositional sequence which was more in-shore than elsewhere in the region.

A NEW PRIMITIVE SEED-LIKE STRUCTURE FROM THE BASALMOST CARBONIFEROUS OF FRANCE: IMPLICATIONS ON EARLY GYMNOSPERM EVOLUTION.

Jean GALTIER. Lab. de Paléobotanique. Université des Sciences et Techniques, 34060 Montpellier, France. Nick ROWE. Lehr and Forsch. für Geologie und Paläontologie, RWTH, Lochnerstrasse 420, D 5100 Aachen, West Germany.

A unique anatomically preserved seed-like structure has been discovered in the basalmost Carboniferous Lydiennes Formation of the Montagne Noire, southern France. It is described as an integumented sporangium bearing one functional megaspore and an endosporic gametophyte. However the occurrence of a massive parenchyma-filled nucellar tip and the unequivocal absence of a pollen chamber indicate a more primitive organuzation than that known from any other late Devonian or early Carboniferous seed.

We suggest that the unmodified megasporangial apex may have persisted in this plant under wet ecological conditions as suggested by anatomical features of the integument lobes. This plant represents new fossil evidence of an evolutionary stage between ptreridophytic and gymnospermous reproduction and could be interpreted as a very primitive gymnosperm, which contradicts current theories of monophyletic gymnosperm origins.

DATOS MICROPALEONTOLOGICOS PRELIMINARES EN LAS PIZARRAS CAMBRICAS DE ZAFRA (BADAJOZ).

Dolores GIL CID. Instituto de Geología Económica (C.S.I.C.-U.C.M.) y Dpto. de Paleontología . Facultad de Ciencias Geológicas. U.C.M. 28040 Madrid. Gonzalo BERNAL BARREIRO. Dpto de Paleontología de la Facultad de Ciencias Geológicas. U.C.M. 28040 Madrid. Graciela Noemi SARMIENTO. Dpto. de Geología Básica de la Facultad de Ciencias Exactas, Físicas y Naturales. U.N.C. 5000 Córdoba (Argentina).

Se da a conocer información preliminar a cerca del contenido micropaleontológico (Acritarcos) en los materiales siliciclásticos del Cámbrico medio de Zafra (Badajoz). El material estudiado proviene de los afloramientos situados entre los puntos kilométricos 4 y 7 de la carretera que une las localidades de Zafra y La Lapa. El principal interés de este trabajo reside en que se amplía la información sobre el contenido paleontológico de estos materiales cámbricos que hasta ahora se centraba en invertebrados (trilobites, braquiópodos, equinodermos y moluscos).

STUDIES ON Minarodendron cathaysiense (Gen. et com. nov), A LYCOPOD FROM THE MIDDLE DEVONIAN OF YUNNAN, CHINA.

Cheng-Sen LI. Institute of Botany, Academia Sinica, Beijing, China.

Minarodendron cathaysiense is a herbaceous lycopod with slender and dichotomous stems. Leaves are planate with a single vein, and spiral, 15 to 18 per gire. Leaf cushions are fusiform to lanceolate, containing a log fusiform leaf trace mark. Leaf top is trifurcate, forming 3 tips. Two of them grow adaxially upwards and the third stretches abaxially and slightly downwards. Leaf margin has tooth-like emergences. Isomorphic sporophylls do not form a strobilus, and bear a single sporangium adaxially. Sporangia are sessile, globose to elliptical, and longitudinally dehiscent. Stem possesses a solid strand of primary xylem, with 15-18 protoxylem ridges. Maturation of xylem is exarch. Tracheids are annular and spiral in proxylem and with scalariform bordered pits in metaxylem. These bordered pits are characterized by a pit aperture sheet, which connects the scalariform bars and has one or two rows of pitlets (=small pit-like opening), up to 24 per row. This sheet belongs to secondary wall material. This kind of bordered pit is referred to as multiperforate bordered pit, and found also on the tracheids of such lycopods: Barsostrobus of Upper Devonian, Eskdalia and Selaginellites of Lower Carboniferous, and the Early Devonian psilopsida Psilophyton. The pit with aperture sheet and the pit with Williamson's striations, the famous configuration on the tracheids of some Carboniferous lycopods, have a posible relationship in evolution. This Chinese lycopod was described as Protolepidodendron scharianum by Halle (1936) and as P. cathaysiense by Schweitzer and Cai (1987). As a result of the recent research this lycopod is more avanced than the species of Protolepidodendron and assigned to a new genus, Minarodendron. A new combination, Minarodendron cathaysiense, is also established. This new genus belongs to Family Protolepidodendraceae.

THE ROLE OF FUNGI IN THE PALEOZOIC AND MESOZOIC ECOSYSTEM

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Although fossil fungi were some of the first organisms to be studied by paleobiologists, paleomycology as a discipline has generally been a rather neglected area of investigation. One of the reasons for this neglect has been the belief that fungi were too fragile to be adequately preserved. A second reason is the fact that most paleobotanists are trained to study vascular plants. In recent years, however, there has been an increased awareness of the importance of fossil fungi in addressing a wide range of questions that relate to the biological interrelationships that existed in the paleoecosystem. Several levels of interactions that existed between fungi and plants, animals and the geologic environment will be examined. Saprophytism, mutualism and parasitism are levels of biological activity that can be documented from the fossil record. The fossil record of fungal groups and their biological activities constitute a major source of information necessary to properly interpret the structure, diversity and evolution of the paleoecosystem.

UNIVERSITÀ DI BOLOGNA
Dipartimento di Scienze Geologiche

UNIVERSITÄT INNSBRUCK
Institüt für Geologie und Paläontologie

MUSEO FRIULANO
DI STORIA NATURALE

INTERNATIONAL FIELD WORKSHOP
on

# CARBONIFEROUS TO PERMIAN SEQUENCE OF THE PRAMOLLO-NASSFELD BASIN (CARNIC ALPS)

September 3-7(8), 1990

## AIM OF THE WORKSHOP

The Workshop has been intended to stimulate discussion and cooperation among the numerous researchers engaged on the well-known Carboniferous to Permian sequence of the Carnic Alps and the tectonic framework of its Hercynian non-to-low metamorphic basement. After three years we intend to present now the results of the multidisciplinar studies carried out by an international working group of about fifteen persons.
Results refer to:

1) Stratigraphy
2) Sedimentology
3) Sedimentary petrology
4) Diagenesis
5) Geochemistry
6) Palaeomagnetic investigations
7) Carbonate microfacies analysis
8) Bio- and phytostrangraphy
8) Permian-Carboniferous boundary
10) Palaeotectonic analysis
11) Hercynian tectonic framework
12) Alpine kinematics
13) Comparison among the P-C sequences of the circummediterranean domain
14) _____

## CALL FOR PAPERS AND PUBLICATIONS

Papers covering the listed topics must be submitted in English to the Organizing Committee not later than November 30, 1989. The Editorial Board referees will select among them the main contributes to be presented at the workshop conference. They will be issued in the pre-print Volume available at the opening of the meeting, together with Field Guide and other scientific material. Notes for compilation will be sent to contributors.
Papers collected before November 30, 1989 will be submitted to the reviewers and afterwards sent back to the authors for their approval. Since the end of the meeting there will be fifty days to modify the original manuscripts of the pre-print Volume. Then they will be issued as the Proceeding of the Workshop that will be sent to contributors and partecipants later.

## WORKSHOP LOCATION

Pramollo-Nassfeld Pass (Italia-Österreich boundary), Hotel Wulfenia and student hostels near-by. The hotel has a meeting room. Two slide projectors (24×36) and an overhead projector are available. The field excursions are arranged over a 150 km$^2$ area in the surrounding of Pramollo-Nassfeld Pass.

## PROVISIONAL PROGRAM

Four days are devoted to the excursions and field discussions, one day is to present the main contributes.
Owing to the narrow roads the excursions travels will be supported by 9-12 seat vans and (only exceptionally) personal cars.
Total excursion shifting: about 150 km by car and chair-lift and 12 km on foot. Maximum climbing not exceeding 400 m altitude per trip.

## COSTS

Registration fees are 110,000 Italian Lire, 70,000 I.L. for students and Guidebook contributors, 30,000 I.L. for accompaning members. First class hotel accomodation (full board) and field excursions will not exceed 500,000 I.L. For students, accomodation could be cheaper in the numerous boarding houses of the surroundings.
Registration fee will cover the following items:

- Guidebook, pre-print Volume and Proceedings of the Workshop (in English);
- New detailed geological map (1:20,000 scale, in press) of the whole Carboniferous to Permian domain of the Central Carnic Alps;
- Monographic Volume dealing with stratigraphy of the Carboniferous to Triassic sequence and kinematics of both Hercynian and Alpine orogenies of the Central Carnic Alps (in Italian).

Registration fee and an advanced deposit of 100,000 I.L. (part of the accommodation) are to be sent before May 31, 1990 to the organizing committers.
Instruction for payment will be sent in October 1989. Cancellations will be taken into account not later July 31, 1990. The balance is personally payable on September 3, 1990.

## INFORMATIONS

Further detailed informations concerning the Workshop program, registration, location and facilities will be provided in the second circular (April 1990). Those who need to receive personal invitation to attend the Workshop are invited to ask for it; however it does not imply financial support of the organizers.
Contact address: C. Venturini, Dip. Scienze Geologiche, via Zamboni 67, I-40127 Bologna, Italia.

The early applicants not exceeding the number of granted participants to the field excursions will be requested to send the registration fee and advanced deposit.

*The Organizing Committee*
*Corrado Venturini (Bologna)*
*Karl Krainer (Innsbruck)*

## DEADLINES

| | | |
|---|---|---|
| September | 30, 1989 | Sending back of Application Form |
| October | 1989 | Second circular posted to those who will return the Application Form |
| November | 30, 1989 | Submission of papers for the pre-print Volume |
| April | 1990 | Last circular with the detailed Workshop program |
| May | 31, 1990 | Remittance of the registration fee (110,000 I.L., 70,000 I.L. for students, 30,000 I.L. for accompaning members) and advanced deposit (100,000 I.L.) |
| July | 31, 1990 | Deadlines for possible cancellations |
| September | 3, 1990 | Opening of the Workshop and payment of the Workshop dues |
| October | 31, 1990 | Submission of revised manuscripts |
| June | 1991 | Printing and mailing of the Proceedings of the Workshop |

**APPLICATION FORM** If interested return it not later than September 30, 1989
INTERNATIONAL FIELD WORKSHOP ON CARBONIFEROUS TO PERMIAN SEQUENCE OF THE PRAMOLLO-NASSFELD BASIN (CARNIC ALPS), September 3-7 (8), 1990

Registrant _____ Tel. _____

Affiliation _____

Postal Address _____

Phone _____ Telefax _____

My chances of attending the Workshop are ☐ slight, ☐ fair, ☐ good

I expect to be accompanied by _____ person(s)

I intend to present a contribution: ☐ yes, ☐ no. If concerns the topic n. _____

I should have _____ available seats in my van (in that case the advanced deposit of 100,000 I.L. will be refunded. In case of need mentioned will be provided by the Organizzazioni).

dr. Corrado Venturini

Università degli Studi di Bologna
Dipartimento di Scienze Geologiche
via Zamboni, 67

I-40127 BOLOGNA
ITALY

**PALYNOLOGY**

xx-xx-1989

Eurodino

Dear Colleague,

Following the recent Dino IV conference, held in April '89 at Woodshole, a number of us were convinced of the need for a common forum for EUROPEAN dinoflagellate workers. Because Dino V will be held in Utrecht, The Netherlands, in mid 1993, the Laboratory of Palaeobotany and Palynology (LPP) and the LPP Foundation would like to take the initiative to propose the setting up of a European Dinoflagellate Working Group (Euro Dino), under the auspices of the C.I.M.P. (Commission Internationale de Microflore du Paleozoique).

The aim of such a working group would be to integrate those working on Recent and fossil dinoflagellates, and hopefully, to involve biologists, biostratigraphers and palaeontologists alike. Euro Dino may then also serve as an appropriate platform from which to organise Dino V.

Depending on the response to this circular, the LPP will try to promote the integration of European dinoflagellate research through, for example, a newsletter. We have included a reply form with this circular to gauge your interest and we look forward to your reply. We would appreciate it if we could have your response by 1st MARCH 1990

Any of your suggestions regarding structuring, organisation, aims, etc. of the working group and newsletter will be very welcome.

| | | |
|---|---|---|
| H. Visscher | B. Owens | H. Brinkhuis |
| I.F.P.S. President<br>Chairman LPP Foundation<br>Head Lab. Pal. & Pal. Utrecht | C.I.M.P. President | Director LPP Foundation |

LPP FOUNDATION

European Dinoflagellate Working Group

FIRST CIRCULAR REPLY FORM

Name:

Our mailing list was gleaned from a number of sources and is probably not up to date. Therefore, for those of you whose address was incorrect, please supply us with the correct one in the space below.

Address:

Telephone: Fax:

Affiliation (Acad./Indust.; Rec./Fossil; Biol./Geol./Biostrat.):

Field of expertise:

Additional fields of interest:

I will/won't be interested in joining the working group, and wish/don't wish to receive further circulars.

Name and address of colleague also interested in joining the working group:

Comments/Suggestions:

Please send back to: Henk Brinkhuis, LPP Foundation, Laboratory of Palaeobotany and Palynology, Heidelberglaan 2, 3584 CS Utrecht, The Netherlands.

LPP FOUNDATION

LABORATORY OF PALAEOBOTANY & PALYNOLOGY

8 SIMPOSIO DE PALINOLOGIA a.p.l.e

circular 1

INVITATION

At the last General Assembly of the APLE, held in Granada following the VII Symposium on Palynology, Tenerife was chosen as the island to host the VIII Symposium on Palynology. We cordially invite you to attend this event, which will take place September 24-28, 1990.

Could you please send this circular to as many people as possible, all those interested in attending can use photocopy of the registration form for preinscription.

GENERAL INFORMATION

For better efficiency and comfort scientific meettings and accomodation will be in a hotel in Puerto de la Cruz.

The Organization Commitee and Viajes Melia are studying the best transfer conditions to Tenerife from different parts of Spain (Charter flights with a stay of one week).

Due to touristic and cultural interests in the area, people accompanying participants will be able to take part in optional outings. There will also be trips, if desired, to other islands, on free days before and/or after the congress.

PROGRAM

Contributions, to be presented as either an oral communication or a poster (Spanish, English and French language), will be grouped into the following sections:

Biology of pollen
Actuopalynology
Paleopalynology
Aeropalynology
Melitopalynology

Only one communication per first author will be accepted.

In addition to the regular work sessions, plenary lectures will be given by guest specialist and round table discussions will be held on topics of interest. The General Assembly of the APLE and will also be held and there will be a botanic excursion to the Teide National Park.

REGISTRATION FEES

| | |
|---|---|
| APLE members | 15000 ptas. |
| Non-members | 18000 ptas. |
| Students (including post-grads) | 9000 ptas. |
| Accompanying persons | 10000 ptas. |

Participants will be requested to show proof of their registration category.

CALENDAR

Deadline for preregistration.....December 31,1989
Second circular (to be sent only to preregistrered persons) .....
.....February, 1990.

This will specify all details on inscription formalization, payment of registration fees, transport, board, the way to send communication, summary etc.

Deadline for registration and summaries .....April 30,1990

COMITE ORGANIZADOR
ORGANIZING COMMITEE

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Wolfredo Wildpret de la Torre

Secretaria / Secretary
Irene E. La Serna Ramos

Vocales / Committee members
Julio Afonso Carrillo
Esperanza Beltrán Tejera
Pedro L. Pérez de Paz

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María Dolores Domínguez Santana

Colaboradores / Collaborators:
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BOLETIN DE PREINSCRIPCION
PRELIMINARY REGISTRATION FORM

Apellidos / Surname .....

Nombre / First name .....

Dirección / Address .....

.....

Teléfono / Telephone .....

Presentará comunicación / I would like to submit a communication

Si / Yes ☐ ORAL ☐
No ☐ POSTER ☐

Título provisional / Provisional title.....

.....

.....

.....

Será incluida en la sesión / To be included in the following session

☐ Biología del polen / Biology of pollen
☐ Actuopalinología / Actuopalynology
☐ Paleopalinología / Paleopalynology
☐ Aeropalinología / Aeropalynology
☐ Melitopalinología / Melitopalynology

Clase de cuota / Type of fee

☐ Socios APLE / APLE members
☐ No socios APLE / APLE non members
☐ Estudiantes / Students
☐ Acompañantes / Accompanyng persons nº.....

Fecha / Date: Firma / Signature:

organiza departamento de biología vegetal
universidad de la laguna

Remitir antes del 31 de diciembre de 1989 a :
Send before December 31, 1989 to :

Secretaría del 8 Simposio de Palinología
Departamento de Biología Vegetal (Botánica)
Facultad de Farmacia
Universidad de La Laguna
38271 La Laguna - Tenerife - Islas Canarias - España

**Scientific committee**
Chairman : Godfriaux I. (Professeur, FPMs)
Members : Charlet J.M. (Chef du Service « Géologie, Etudes et Prospection), Dejonghe L. (Ingénieur en Chef - Directeur du Service Géologique, Bruxelles), Egermont G. (Conseiller du Président, Mol, CEN), Hallez S. (Chef de Service Institut d'Hygiène et d'Epidémiologie, Bruxelles), Melchior P. (Directeur de l'Observatoire Royal de Belgique, Uccle), Prive M. (Ingénieur en Chef - Directeur, Service des Ressources du Sous-sol, Région Wallonne), Samain J.M. (Chef de Service de Protection des radiations ionisantes, Bruxelles), Vanmarcke H. (Laboratorium voor Kernfysica, Gent)

**Organizing committee**
Chairman : Charlet J.M. (Faculté Polytechnique de Mons)
Members : Doremus P., secretary (FPMs) ; Quinif Y., treasurer (FPMs) ; Rorive A. (FPMs - IDEA)

**Date :** 3 - 5 october 1990

**Location :** Faculté Polytechnique de Mons, rue de Houdain, 9, 7000 MONS (Belgium).
Phone : 65/374602 - Fax : 65/374200

**Scientific program :** the papers will deal with gas methods in the following fields :
- energetic and mineral resource exploration
- geological risk prediction (earthquake, volcanic events...)
- environment, radiometric risks
- hydrogeology, geothermy, geophysics
- apparatus and measurement

**Exhibition**
A technical exhibition will be heed. Apparatus and techniques applied to gas methods may be proposed by commercial firms and university laboratories. The stands are extensible. Price/m² : 2.000 FB (special conditions for Universities).

**Excursion**
A half-day excursion is envisaged to show some sites of study in the Mons area.

**Registration fees** (excluding meals)
Colloquium 6.000 FB
Students 1.500 FB
Accompanying persons wishing to attend cultural program 3.000 FB

**Languages**
The official languages of the symposium will be French and English.

**Time table**
15 November 1989 : deadline for pre-registration
December 1989 : distribution of second circular
1 February 1990 : deadline for final registration and abstracts
March 1990 : distribution of third circular and notification of acceptance of abstracts

**Aim and topics**
Gas geochemistry is currently the objet of various applications in the field of the Earth and Environmental Science : mineral exploration, geogical risk prediction, hydrogeology, geothermy...
Moreover, radon can in itself be a health risk at the work site (underground mines...) at home or at the waste sites. Its risks are chiefly in relation to the gas migration process from the geological formation, the soil and the underground water.
Currently, in the zones with high sismicity (South of Europe, Central and South America...), the emphasis is put on the geological risk prediction (earthquakes, volcanism...) whereas in other parts of the world (North of Europe, North of America...) the studies are aimed at domestic pollution problems due to radon.
The aim of this symposium is to unite all the scientists concerned by the study of rare gas (Rn, He, Ar...) in Earth and Environmental Science, to compare research methods and measurement techniques.
Its purpose is also to enlighten scientits and environmental specialists about the problems pertaining to risk prediction.


# C.I.G.G.

## International Colloquium on Gas Geochemistry

*Radon and rare gas in Earth and Environmental Science*

MONS 3-5 October 1990

URGENT URGENT URGENT

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In order to maintain our aim of issuing at least two Newsletters each year, it is vital that we receive your subscriptions on a regular basis. In 1989 we have received mayments from less than 10% of our members.

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| France/Spain | DrS Loboziak, Lab. de Paleobotanique, Sciences de la Terre, Universite des Sciences et Techniques de Lille, 59650 Villeveuve d'Ascq Cedex, France. |
| Holland/Germany | Dr P Brugman, Lab. of Palaeobotany & Palynology, State University of Utrecht, Heidelberglaan 2, 3584 Utrecht, The Netherlands. |
| U.K./Ireland | Dr P J Hill, Dept of Geology, Derbyshire College of Higher Education, Kedleston Road, Derby, England. |
| Belgium | Dr M Vanguestaine, Lab. de Palaeobotanique, Universite de Liege, 7 Place du Vingt Aout, B.4000 Liege, Belgium. |
| Others | President or Secretary |

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# International symposium to celebrate 25 years of palynology in the North Sea Basin

Nottingham, England

April 1990

## FINAL REMINDER !!!!!!

### INTRODUCTION

The Biostratigraphy Research Group of the British Geological Survey and the Commission Internationale de Microflore du Paleozoique invite you to participate in **"North Sea '90"**, an international symposium to celebrate the contribution made by palynology to the first 25 years of exploration and development of the hydrocarbon resources of the North Sea Basin.

1990 marks the 25th anniversary of the commencement of exploration drilling in the North Sea Basin. It is appropriate that this occasion should be marked by a major symposium which will highlight the contribution that palynology has made to that exploration and development programme. From initial work on Carboniferous miospores in the southern North Sea Gas Fields to the more recent studies of Jurassic and Tertiary palynomorphs in the oil fields of the British and Norwegian sectors of the northern North Sea, palynology has become the most extensively used biostratigraphical tool in this major exploration area.

The symposium is aimed at the presentation of contributions which will demonstrate the potential of Palaeozoic, Mesozoic and Cainozoic palynological studies to biostratigraphical correlation in the North Sea Basin and adjacent areas. The programme will include contributions relevant to stratigraphical palynology, palaeoecology, palaeoclimatology and palynofacies studies from both the academic and commercial sectors.

### VENUE

The Symposium will be held in the De La Beche Conference Centre at the headquarters of the British Geological Survey at Keyworth on the southern outskirts of Nottingham.

Separate rooms will be available for workshop meetings and facilities will be available for microscopy.

Daytime catering facilities will be available in the Staff Restaurant.

### PRELIMINARY PROGRAMME

Monday April 2nd

p.m. Registration at Ancaster Hall, University of Nottingham.
Evening : Ice Breaker

Tuesday April 3rd-Thursday April 5th

Scientific Sessions : De La Beche Conference Centre, British Geological Survey, Keyworth.

| | | |
|---|---|---|
| Tuesday | a.m. | Introductory lecture<br>Lower Palaeozoic papers |
| | p.m. | Upper Palaeozoic papers |
| | Evening reception | |
| Wednesday | a.m. | Mesozoic papers |
| | p.m. | Mesozoic papers |
| | Symposium Dinner | |
| Thursday | a.m. | Tertiary papers |
| | p.m. | Quaternary and other specialist papers |

Friday April 6th

Optional one day excursion to allow collecting from Upper Carboniferous-Cretaceous sections between Derbyshire and the Humber Estuary.

The excursion will take the form of a transect from the Upper Carboniferous of the Eastern Pennine Coalfield in Derbyshire to the Jurassic and Cretaceous deposits of the Lincolnshire Wolds and the Humber Estuary, thus providing an opportunity to examine at outcrop the main stratigraphic source and reservoir units of the North Sea region. Visits will be made to a number of sections where sampling may be undertaken, including some type sections and sections which have been already documented in the palynological literature. Waterproof footwear will be required; protective headgear will be provided for use in quarry sections.

This will be a full day excursion, ending about 5 p.m. to enable participants to catch early evening trains to London from Doncaster. The excursion will return to Nottingham where an extra night's accommodation will be available if booked in advance.

Party limited to 40 places to be allocated on a first come first served basis.

Leaders: B Owens, S Warrington & J B Riding.

### THIRD CIRCULAR

A third and final circular will be issued in December 1989/January 1990 but will be sent only to those participants who have submitted Registration Forms.

**ACCOMMODATION**

An inclusive accommodation package is available using the facilities of Ancaster Hall, one of the Halls of Residence on the nearby University of Nottingham campus. The package consists of Dinner, Bed and Breakfast in the Hall of Residence (accommodation in single study bedrooms) together with lunch, morning coffee and afternoon tea at the Symposium.

Bus transport will be provided to convey delegates between the two sites.

A wide range of hotel accommodation is available in Nottingham which delegates may alternatively arrange through their own travel agents. A public bus service is available every half hour between Nottingham city centre and the Geological Survey in Keyworth.

## COSTS

| **REGISTRATION** | | PAYMENTS |
|---|---|---|
| Registration fee payable before 31st December 1989 | £40 | ..... |
| Registration fee payable after 1st January 1990 | £50 | ..... |
| Reduced registration fee for bona fide students (No reduction for single day attendance) | £30 | ..... |
| **ACCOMMODATION** | | |
| Single room in Hall of Residence plus full meals package for the following nights: | | |
| April 2nd-3rd | £28 | ..... |
| April 3rd-4th | £28 | ..... |
| April 4th-5th | £28 | ..... |
| April 5th-6th | £28 | ..... |
| **EXCURSION** | | |
| One day excursion to Carboniferous-Cretaceous of the East Midlands including travel and lunch | £25 | ..... |
| TOTAL PAYMENT | | £_____ |

**Payments**

Cheques should be made payable to "North Sea '90" and sent to the Symposium Secretariat, "North Sea '90", Biostratigraphy Research Group, British Geological Survey, Keyworth, Nottingham NG12 5GG, England.

All cheques **must** be payable in £ sterling.

Cancellation charges/refunds.
Refunds of 90% will be made for all cancellations made before 31st January 1990. After that date refunds will be limited to 75%.

**Symposium Address**

Please address all correspondence and queries regarding all aspects of the Symposium to:

Symposium Secretariat
North Sea '90
Biostratigraphy Research Group
British Geological Survey
Keyworth
Nottingham NG12 5GG

**"NORTH SEA '90" PALYNOLOGICAL SYMPOSIUM**

**BRITISH GEOLOGICAL SURVEY**
**NOTTINGHAM NG12 5GG, ENGLAND**

## REGISTRATION FORM

1. PERSONAL DETAILS

TITLE SURNAME FIRST NAME

POSITION SEX MALE/FEMALE

ORGANISATION

ADDRESS

TELEPHONE TELEX FAX

2. ACCOMMODATION

I wish to reserve accommodation in a study bedroom in a University Hall of Residence for the following nights:

April 2-3 April 3-4 April 4-5 April 5-6

I will make my own reservation in a Nottingham hotel.

3. PAPER/POSTER (Delete as appropriate)

I wish to present a paper in the Scientific Sessions entitled:

I wish to display a poster entitled:

4. EXCURSION

I wish to attend the Optional One Day excursion to the Carboniferous-Cretaceous deposits of the East Midlands

YES NO

I will/will not require overnight accommodation in Nottingham after the excursion.

5. TRAVEL

I plan to travel to Nottingham by (delete as appropriate)

TRAIN AIR CAR

# NEW MEMBERS OF CIMP

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Mr Salah y El-Beialy
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Saudi Arabia

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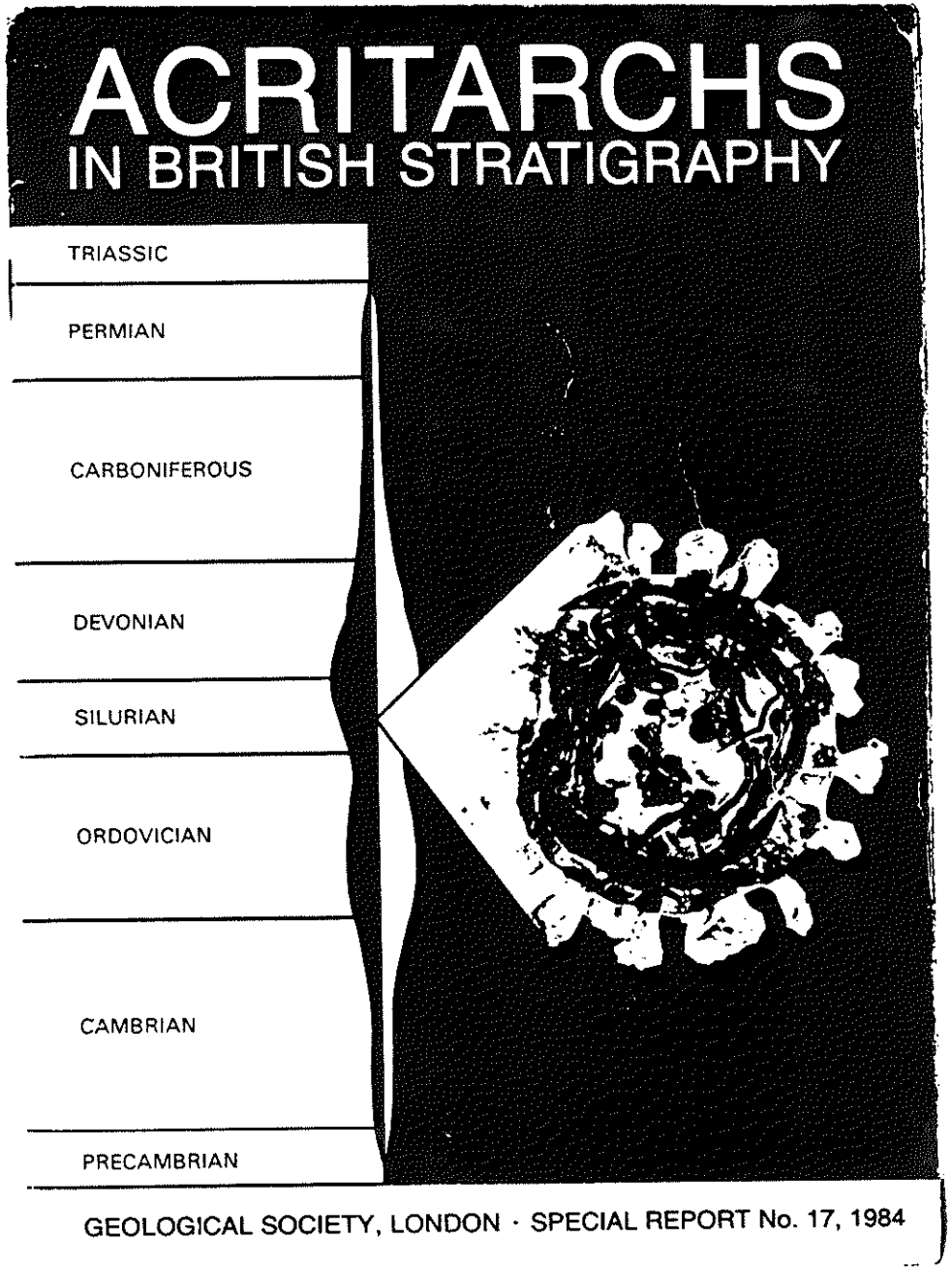

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| No. 8 Caledonides of the British Isles reviewed (1979) | 22.00 | 40.00 | | | |
| No. 10 Trench and Forearc Geology (1982) | 27.00 | 52.00 | | | |
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| No. 8 Devonian (1977) | 5.00 | 8.90 | | | |
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DATE _____

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