



Advances in Palaeozoic Palynology

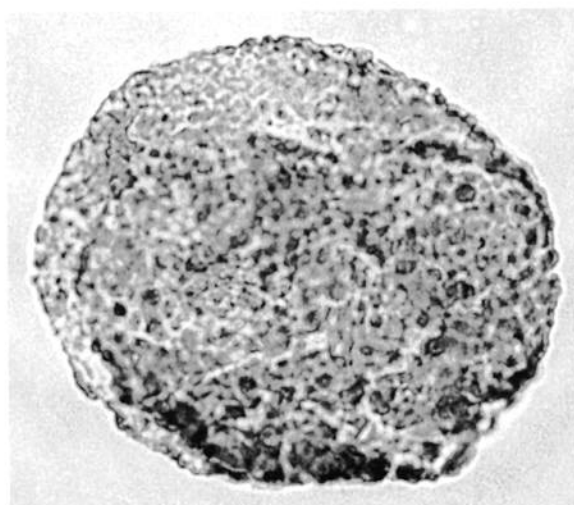
Special Issue

Stanislas Loboziak

Special volume dedicated to Dr. Stanislas Loboziak upon his retirement

Edited by

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Verrucosisporites loboziakii Marshall & Fletcher

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This volume is dedicated to Dr. Stanislas Loboziak on the occasion of his retirement in December 2001 as Research Associate of the CNRS at the Department of Paleozoic Paleontology and Paleogeography (UPRESA 8014 of the CNRS) at the University of Sciences and Technologies of Lille, France.

Stan has played an essential role in Paleozoic palynology, in particular in Devonian and Carboniferous miospore research. We had the privilege to collaborate with Stan during many years, and we have taken the opportunity to invite his colleagues to contribute to a special issue in appreciation of his studies on Paleozoic palynology.

We were very pleased to receive many positive reactions and this issue finally reflects a wide variety of topics, thus not only showing Stan's international reputation, but also reflecting his broad interest and multidisciplinary approach on various fields of palynological research.

Stanislas Loboziak was born on 7th February 1937 at Carvin, in the north of France, from Polish parents. His father worked there as a coal-miner but, during the 2nd World War, was sent to a concentration camp in Germany where he died. Stan was nationalized French in 1950 and obtained scholarship grants as "pupille de la nation". Nevertheless he had a very difficult childhood, his mother being almost without financial resources. Living in a region of coal-mines, it is not surprising that Stan orientated his first scientific interests on this subject. In 1960, he joined, at the University of Lille, the laboratory of a famous paleobotanist, Paul Corsin, who suggested to him successive research topics in coal-mine palynology. Stan obtained a MSc (Doctorat de 3ème cycle) in 1962, and a Ph.D (Doctorat d'Etat des Sciences naturelles) in 1969. His Ph.D. was a contribution to the study of mio- and megaspores of the Westphalian of northern France. Since 1962 he has worked in the same

university as a researcher of the French National Centre of Scientific Research (CNRS).

Stan's first activity in palynology concerned megaspores and their application in biostratigraphy. He started, consistently, with researches in the technical aspect of sampling (mean sampling in coal column), chemical and physical treatment, validity of correlation by quantitative analysis, working in parallel, under the auspices of the then recently organized "Commission Internationale de Microflore du Paléozoïque" (CIMP), on the revision of critical groups of megaspores. But he soon came to miospore stratigraphy of the Westphalian, demonstrating, for instance, the occurrence of Westphalian D in the northern France coal-basin. Subsequently he worked on spore stratigraphy in different coal basins in France but also in Spain, Turkey, USA, and USSR. Extending collaboration with almost all palynological laboratories of Europe, he became responsible of the Westphalian inside the CIMP miospore stratigraphy working group.

In the late seventies, he extended his studies stratigraphically to the Lower Carboniferous of Niger and Libya, and to the Devonian-Carboniferous transition of Canada and Iran. He came to the Middle and Late Devonian in 1980, in the type Ardenne-Rhine regions first, then since the late eighties in Algeria, Libya, Saudi Arabia and Brazil. Ten years ago, he started a fruitful collaboration with Petrobras palynologists, since then, participating in an updating of the biostratigraphy of the Devonian and Lower Carboniferous of Brazil.

In the sixties, Stan published mainly in regional journals (11 publications in the "Annales de la Société géologique du Nord"). From the seventies, he diversified into international journals such as *Geobios*, *Palaeontographica* and the *Review of Palaeobotany and Palynology*. He is clearly one of the palynologists who has published, often as first author, his papers most frequently in the latter journal (until now 23 papers and one or several, each year, since 1989!). In the nineties, he had also several papers in the "Bulletin du Centre de Recherche Elf Exploration-Production" at Pau (France) where he was often called as a consultant palynologist.

The approach to palynology made by Stan throughout his scientific life is exemplary in terms of the progressive enlargement of his stratigraphic and geographic expertise. In this respect the late development of his activity in Brazil and Saudi Arabia made him the undisputable Middle Devonian to Carboniferous expert in Gondwanan miospore stratigraphy. Stan has been, and is still, able to scan thousands of slides patiently, without excessive haste, and with equal, very organized, application. We wish that he had not decided to stop all palynological activities when retired because for a long time we will still need his competent advice.

We are happy to present this issue during a scientific session dedicated to Stan, a meeting which is organized in early December 2001, at the University of Sciences and Technologies of Lille, under the auspices of the Belgian Palynological Society « PPMB » (Palynologists and Plant Micropaleontologists of Belgium), one of the many societies of which Stan was a very active member during so many years.

This special issue may serve as a way of saying « thank you » to Stan for all he has done for the palynological community.

The list of papers published by Stan can be seen at the following address :
http://www.univ-lille1.fr/geosciences/page_ufr/personnels.html

Scientific publications of Stanislas Loboziak

1962-2000

Compiled by Régine Netter and Thomas Servais

*Sciences de la Terre UPRESA 8014 CNRS Cite Scientifique SN5 F-59655
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1968

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I

Late Carboniferous miospores from the Tarma Formation, Pongo de Mainique, Peru

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For the first time, a palynologic assemblage is described from the upper section of the Tarma Formation, Peru. It is dominated by monosaccate pollen grains with subordinate striate grains and very few spores. The abundance of *Illinites unicus* has allowed a discussion on its systematic position. The assemblage is correlated with the *Illinites unicus* Palynozone from the Amazonas Basin. A discussion is presented on the age of this assemblage as it relates to others that are known to belong to the overlying Copacabana Formation in the same locality and neighbouring regions. In this locality, *Reduviasporonites stoschianus* is found, together with calcareous microfossils and small foraminifera of an "Early-Middle" Pennsylvanian age in the Copacabana Formation. Based on this biostratigraphic information and that provided by fusulinids and conodonts from the Amazonas Basin, the assemblage is considered to be Westphalian C / Late Atokan.

II

Nouvelles espèces de chitinozoaires du Silurien Supérieur et du Dévonien Inférieur du bassin de Timimoun (Sahara central, Algérie)

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Dans le cadre d'une étude des Chitinozoaires du Silurien Supérieur et du Dévonien Inférieur de la partie centrale du Sahara algérien, les argilites et les siltites de la Formation de l'Oued Mehaiguène ont fourni un très riche matériel où 52 espèces de chitinozoaires ont été recensées dans le sondage de Oued Saret-1 (OS-1). Sept nouvelles espèces: *Ancyrochitina ollivierae* n. sp., *Angochitina strigosa* n. sp., *Ramochitina algeriensis* n. sp., *Margachitina saretensis* n. sp., *Muscochitina samiri* n. sp., *Pterochitina megavelata* n. sp. et *Urochitina kameli* n. sp. sont décrites et illustrées ici.

III

The *Crassispora kosankei* - *Cystoptychus azcuyi* Palynozone from the Upper Carboniferous Tupambi Formation, Tarija Basin, northern Argentina

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Well-preserved and diverse palynomorph assemblages were recovered from surface and core samples from the middle to upper section of the Tupambi Formation. The latter is the basal unit of the Macharetí Group (Upper Carboniferous) of the Tarija Basin, northern Argentina. Assemblages are composed of trilete miospores, one hilate species, monosaccate pollen grains (one species striated), one praecolpate pollen grain and green algae *Botryococcus*. Two key species, *Cystoptychus azcuyi* sp. nov. and *Crassispora kosankei* (Potonié and Kremp) Bharadwaj emend. Smith and Butterworth enable definition of the first palynozone for this basin. The age, biostratigraphic and paleogeographic significance of the palynoflora is discussed.

IV

Biostratigraphy and Palaeogeography of Late Ordovician strata of northeastern Alborz Ranges, Iran.

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Chitinozoans from Late Ordovician strata in the northeastern Alborz Range (Kopet-Dagh Region) were extracted, and 31 chitinozoan species recorded. Four successive biozones were recognised within the Ghelli Formation, viz. *T. fistulosa*, *A. barbata*, *A. cf. nigerica* and *A. merga* biozones. Correlation of these biozones with those of the North Gondwana Domain, suggest that the middle and upper part of the Ghelli Formation ranges from Late Caradoc to middle Ashgill. The number of species in common with the North Gondwana Domain suggests a close relationship between Iran and North Gondwana. However, there are a number of cosmopolitan species occurring in the Ashgill.

Three new species are described, *Armoricochitina alborzensis*, *Armoricochitina iranica*, and *Ancyrochitina persica*.

V

PALYNOLOGICAL RECORD OF PALAEOCLIMATIC CHANGES IN LATE CARBONIFEROUS - AN EXAMPLE FROM THE INTRASUDETIC BASIN (SW POLAND)

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Palynologic data of the Upper Carboniferous deposits from the north-western part of the Intrasudetic Basin form the basis for the reconstruction of palaeofloral assemblages. All important late Carboniferous plants, typical of the tropical palaeoclimate (lycopsids, sphenopsids, ferns, cordaites and conifers) have been recorded. Prominent changes in the palaeoplant associations in time are observed. The most important feature of the Westphalian A vegetation was the dominance of the arborescent lycopsids within a monotonous association. The plant communities of the Westphalian B and C were more diverse and ferns, sphenopsids and lycopsids of different kind were important components. Slight increase of the arborescent lycopsids and abundance of ferns and seed ferns were observed in the Westphalian C. All changes of the palaeofloral assemblages were probably connected with changes of palaeoclimate-related humidity. Strong dominance of the arborescent lycopsids in the Westphalian A reflects a wetter climate, whereas more diverse vegetation of the Westphalian B and C correspond to a drier period. More humid conditions probably returned during Westphalian C. Records of similar palaeoclimatic changes are known from North America and Western Europe.

VI

Chitinozoan biostratigraphy of the Late Devonian formations in well Caima PH-2, Tapajós River area, Amazonas Basin, northern Brazil

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The chitinozoan biostratigraphy of the Barreirinha Formation in its type area (Tapajós River near Itaituba town, Pará State, Amazonas Basin, north Brazil), and of the lower part of the overlying Curiri Formation, is calibrated against the local miospore succession, which in turn can be readily correlated with standard miospore biozonations of Euramerica. The present study is based on 375 samples from a ca. 137 m thick section in the Caima PH-2 shallow borehole. The 26 chitinozoan species encountered are used to recognize eight biozones in the studied well. The applicability of this zonation is yet to be tested elsewhere in the Amazonas Basin. The zones in ascending stratigraphic order are: the total range zone of *Angochitina katzeri* n.sp., total range subzone of *Ramochitina derbyi* n.sp., total range subzone of *Lagenochitina avelinoi*, interval zone of *Urochitina bastosi*, total range zone of *Angochitina carvalhoi* n.sp., interval zone of *Angochitina rathbuni* n.sp. and *Ramochitina praeritae* n.sp., total range zone of *Ramochitina ritae* n.sp., and total range zone of *Ramochitina* cf. *R. ritae*. Eleven species are newly described and listed below in order of stratigraphic appearance: *Ramochitina derbyi*, *Angochitina katzeri*, *Ramochitina hartti*, *Angochitina carvalhoi*, *Angochitina rathbuni*, *Ramochitina praeritae*, *Ramochitina clarkei*, *Ramochitina ritae*, *Angochitina loboziaki*, *Ramochitina oliveirai*, and *Ramochitina famennense*.

VII

Late Devonian and Early Carboniferous microfloras from the Hakkari Province of southeastern Turkey

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Late Devonian and early Carboniferous miospore and microphytoplankton assemblages are described for the first time from southeastern Turkey. The preliminary data show that assemblages recorded from the upper part of the Yiginili Formation are late Famennian in age and can be correlated with the VH, LL, LE Miospore biozones of western Europe, whilst assemblages from the overlying Köprülü Formation are considered to be middle to late Tournaisian in age and are tentatively assigned to the PC Miospore biozones of western Europe. Regional palynological correlations with other sections in North Africa and the Middle East are proposed. A new species, *Verruciretusispora loboziakii* is described.

VIII

Lower Devonian spore assemblages from the Arbuthnott Group at Canterland Den in the Midland Valley of Scotland

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The Canterland Den locality in the Midland Valley of Scotland exposes sediments belonging to the Arbuthnott Group. They consist of typical Lower Old Red Sandstone terrestrial fluviatile deposits, that probably accumulated in an inland intermontane basin. Palynological investigation of these sediments has yielded diverse and well preserved palynomorph assemblages dominated by land-derived forms: spores, phytodebris (dispersed cuticles and tubular structures) and rare fragments of arthropod cuticle. Interestingly, rare acritarchs interpreted as deriving from non-marine algae are also present. The spore assemblages all belong to the lower subzone of the *micrornatus-newportensis* Spore Assemblage Biozone, indicating an early Lochkovian (Early Devonian) age. They are similar in general characteristics to previously described spore assemblages from the Arbuthnott Group, but exhibit minor differences in terms of taxon composition. They differ more significantly from coeval spore assemblages from the lowland floodplain deposits of the Anglo-Welsh basin, both in terms of relative abundance of morphotypes and taxon composition. An intriguing feature of the assemblage is the high abundance of undissociated spore tetrads. It is suggested that such tetrads are a genuine feature of Lochkovian spore assemblages, perhaps reflecting more flexible and unconventional reproductive strategies exhibited by early land plants.

IX

Chinese Palaeozoic acritarch research: review and perspectives

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Palaeozoic acritarchs from China have been reported in over 100 articles, of which most are published in Chinese journals and in Chinese. One half of the papers concern the Ordovician, and the great majority of the investigated sections are located in the provinces of southern China. The present paper is the first complete bibliographical listing of all publications on Chinese Palaeozoic acritarchs.

X

Middle Devonian (Eifelian) spores from a fluvial dominated lake margin in the Orcadian Basin, Scotland

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The stratigraphic distribution of Mid Devonian spores is recorded from the Easter Town Burn Siltstone Member. A significant inception within the section is *Ancyrospora grandispinosa*. This indicates that the Easter Town Siltstone Member is a correlative of the basin-wide Achanarras lake horizon and not pre-Achanarras as hitherto assumed. It is also a correlative of the local nodular limestones. These limestones represent areas without significant clastic input, while the Easter Town Burn Siltstone Member is the point at which significant fluvial input entered an embayment at the margin of the Orcadian lake. This gives a clastic dominated Achanarras equivalent. The new species *Verrucosisporites loboziakii* is described.

XI

Biometry and paleoenvironment of *Retispora lepidophyta* (Kedo) Playford 1976 and associated miospores in the latest Famennian nearshore marine facies, eastern Ardenne (Belgium)

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The size diameter of *Retispora lepidophyta*, a stratigraphically important miospore, is reexamined in greater detail than previous studies using three sections of the latest Famennian nearshore marine facies of the eastern Ardenne. The evolutionary character of the size reduction with time is confirmed and is used for accurate correlations between the three sections. Cluster analyses (dendrogrammes) are performed on the percentages of a selection of miospore species from the two most complete sections and show a clear analogy in the lateral distribution of *R. lepidophyta* and *Vallatisporites hystricosus*, a species known elsewhere (West Virginia, USA) to belong to coastal "downstream" near-swamp plant communities (Streel & Scheckler 1990). By comparison also with the West Virginia data, three *Diducites* species are believed to represent the 'coal' swamp vegetation. A decrease in the proportion of the *Diducites* species from the lower to the upper portion of the studied sections is observed. Using biometric analysis, high resolution correlation between these sections, reveals a lateral shift of facies with time during the latest Famennian in the eastern Ardenne. Local synsedimentary block-faulting processes were probably responsible.

XII

Comparative palynostratigraphy of the early Arnsbergian (Namurian) sequences between Great Britain and Northwest China.

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The proposed stratotype section for the Pendleian - Arnsbergian stage boundary, located at Slieve Anierin in Ireland, contains diagnostic ammonoids but the sediments are thermally too mature to permit the recovery of palynomorphs. Detailed investigations undertaken on a prospective parastratotype section at Mirk Fell Gill in northern England however offers the prospect for the precise palynostratigraphic calibration of this boundary. Limited ammonoid and conodont data is available to support these conclusions.

Previous work in the British Isles has equated this stage boundary with that between the *Bellisporites nitidus* - *Reticulatisporites carnosus* (NC) and *Stenozontriletes triangulus* - *Rotaspora knoxii* (TK) miospore biozones of Owens *et al.* (1977) and Clayton *et al.* (1977).

Data from the Mirk Fell Gill section will be compared with datasets from deposits of similar age in China to assess the degree of change in palaeobotanical composition across the Euramerican landmass.

XIII

A statistical approach to classification of the Cambro-Ordovician galeate acritarch plexus

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The investigation of large populations of galeate acritarchs recovered from the Late Cambrian to Early Ordovician of the Algerian Sahara allows the definition of eleven morphological criteria which may be useful for the differentiation of individual morphotypes. These parameters have been used for statistical analyses to understand better the classification of this important acritarch plexus. Following a critical evaluation of all parameters, five of them can be retained for multivariate and cluster analyses. The current taxonomic model, with a differentiation into the four genera *Caldariola*, *Cymatiogalea*, *Priscogalea* and *Stelliferidium*, can not be maintained. The most important variables appear to be the process length and the presence/absence of ramifications of the distal end of the processes. A four cluster model is proposed to classify the galeate acritarchs from the Algerian assemblages. This study may serve as a model for future investigations to understand the galeate taxonomy with the support of statistical methods.

XIV

Two new spore genera from Upper Devonian of Euramerica and their stratigraphic and geographic distribution

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Two new genera of cavate spores, *Tergobulasporites* and *Crumenasporites* are established for the Devonian of Euramerica to accommodate species previously included in inappropriate genera of acavate spores. The new genera are restricted to Euramerica. The first entry of *Tergobulasporites immensus* (Nazarenko et Nekriata) comb. nov. is coincident over a wide area of central and eastern Europe and a good palynostratigraphic marker of the Famennian *crepida* Conodont Zone. The latter species is widely distributed along the southeastern margin of the Old Red Continent, while *Crumenasporites* has been recorded only from its northern perimeters. Spores included in both genera possess a gula which may suggest they are megaspores.

XV

The Late Cambrian acritarch *Cristallinium randomense*: morphology, taxonomy and stratigraphical extension.

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The holotype of *Cristallinium randomense* Martin in Martin and Dean, 1981 and other figured specimens (Martin and Dean, 1981, 1988; Ribecai and Vanguetstaine, 1993) are re-examined. The processes are often grouped as those of typical *Vulcanisphaera* species. Probable connections between *Cristallinium* and *Vulcanisphaera* are indicated. These genera form a plexus in which *Retisphaeridium* is also possibly involved. A complete bibliographical list of *C. randomense* is provided. Few published specimens are demonstrated to belong to this species. As a consequence, some stratigraphical dates, based on the restricted Late Cambrian range of the species, are questioned. The new combination *Retisphaeridium ovillense* (Cramer and Diez, 1972) Vanguetstaine nov. comb. is proposed.

biozonation in the Brabant Massif. The presumed Late Ordovician age of these three poorly outcropping and previously poorly dated formations in the Monstreux area is confirmed with the chitinozoans. Four of the nine Silurian formations in the study area were previously dated with graptolites (Brutia and Ronquières Formations), with acritarchs (Fallais Formation) or with chitinozoans (Steenkerque Formation). The ages of the latter two formations was confirmed or refined with the chitinozoans. Three other formations (Corroy, Petit Roeulx and the combined Froide Fontaine and Vichenet formations) are dated for the first time in the study area. The Ronquières Formation was dated previously with graptolites as lower Ludlow, which is confirmed by the chitinozoans and refined to the lower middle part of the Gorstian. A very rapid sedimentation of this thick turbiditic formation is deduced. Only one Silurian formation (Bois Grand-Père Formation) remains undated in the study areas. A new species is described: *Conochitina pumilio* sp. nov.

XVIII

Biostratigraphy, biodiversity and palaeogeography of Late Silurian chitinozoans from A1-61 borehole (north-western Libya)

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High resolution biostratigraphy is carried out on well preserved and highly diversified chitinozoan assemblages from core samples collected in the upper part of the Alternances Gréso-argileuses Formation (Late Silurian) in well A1-61 (Tripolitania, north-western Libya). The recovered chitinozoan assemblages document the range of several Pridolian taxa selected as index species for the global Silurian chitinozoan biozonation. The distribution of the important accompanying species is also discussed. The abundance and the diversity of these chitinozoans are quantified and collated with the local environmental trend as deduced from the lithology, from sedimentary features and from the associated organic walled microfossils (i.e. scolecodonts, eurypterid fragments, acritarchs, spores, leiospheres, cuticles and plant debris). The palaeogeographic distribution of late Silurian chitinozoans is discussed with a peculiar attention paid to a very discriminant chitinozoan assemblage characterising the middle part of the Pridoli of the Ibarmaghian Domain in northern Gondwana regions. Systematic notes, including detailed biometric investigations and SEM illustrations, are provided for selected taxa of taxonomic interest and useful for regional or more long distance correlation.

XIX

Palaeoecology, biostratigraphy and biogeography of late Silurian to early Devonian acritarchs and Prasinophycean phycomata in well A161, Western Libya, North Africa

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Diverse and well preserved acritarch and prasinophycean phycomata assemblages were recovered from the late Silurian to Lower Devonian strata of well A161 in western Libya, and 4 distinct acritarch biozones are recognized, based on the stratigraphic distribution of 156 species. The palynoflora is independently dated by means of chitinozoans, and allows discussion of the evolution of acritarchs and prasinophyte phycomata across the Ludlow-Pridoli boundary in relation to probable major climatic change, as well as in the early and middle Pridoli, and the lower Lochkovian. Correlations are proposed with the British Isles, Baltica, and Algerian Sahara. Sedimentation occurred in shallow high-energy conditions throughout, but with periodic rise of sea-level. The changes in marine to terrestrial palynomorph ratios through the section document the relationship between marine palynomorph assemblages and sea-surface conditions in these marginal marine environments. The major drift of Gondwana towards low latitudes during the Ludlow/Pridoli transition, seems to have been the driving force behind homogenisation of assemblages on the two sides of the Rheic ocean, and explains the similarities between phytoplanktonic assemblages of the north Gondwanan margin and the South of Baltica. The data suggest that the Rheic ocean was almost closed by the late Silurian, and had become restricted to a moderately deep sea. In the Lochkovian the microflora are strongly facies dependent and delineate more restricted provinces such as the Ibarmaghian domain in the sense of Plusquellec (1987) including the Maghreb and Ibero-armoric areas.

XX

Miospore assemblages from the Silurian-Devonian boundary, in borehole A1-61, Ghadamis Basin, Libya.

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Well preserved and diversified miospore assemblages have been recorded from a relatively continuous sequence in borehole A1-61 which spans the Silurian-Devonian boundary in the north-western part of the Ghadamis Basin, Libya. The sequence is represented by Early Devonian Lochkovian beds of the Tadrart Formation that transgress onto the Silurian Ludlow-Pridoli beds of the upper part of the "Alternances argilo-gréseuses" Formation.

The present work demonstrates a succession of miospore assemblages from closely sampled layers that have been stratigraphically dated as Ludlow-middle Pridoli and early Lochkovian by chitinozoans and acritarchs. Over 80 species of cryptospores and trilete spores have been identified. Modified detailed morphological interpretations are given. The miospore assemblages are correlated with miospore zonation schemes established for the type sequences of the Welsh Borderland, and those previously described from Libya. Early occurrences of some species as *Streelispora newportensis* on the western Gondwana plate, are put forward by comparison with the Old Red Sandstone continent. Phytogeographic and paleobotanic implications based on these observations are discussed.