IOP NEWSLETTER 39

INTERNATIONAL ORGANISATION OF PALAEOBOTANY

INTERNATIONAL UNION OF BIOLOGICAL SCIENCES
SECTION FOR PALAEOBOTANY
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OCTOBER 1989

THE NEXT NEWSLETTER, NUMBER 40, WILL BE A SPECIAL EDITION TO INCLUDE FULL DETAILS OF THE NEW IOP PROJECT ON ***The Plant Fossil Record.*** PLEASE SEND YOUR REACTIONS TO THE PROPOSALS (see below) TO YOUR REGIONAL REPRESENTATIVE OR TO THE SECRETARY. The views expressed in the newsletter are those of its correspondents and do not necessarily reflect the policy of IOP.

IOP NEWS

FROM THE PRESIDENT

The health of any field of research should be directly related to the importance of the questions asked and the quality of the efforts to answer them. Unfortunately, the very existence of some small fields may be threatened by the lack of understanding of their importance by university administrators and government officials faced with economic constraints, and they may be assigned a priority for support much lower than deserved. For example, today, in many countries, molecular biology and geophysics receive major support, sometimes to the exclusion, and often to the restriction, of support for systematic and evolutionary studies. Systematic and evolutionary (including ecological) studies of extinct organisms have been especially severely affected.

This problem was discussed at the IOP business meeting in Melbourne in August 1988. The lack of support for paleobotany in Great Britain was emphasized especially strongly, but it became apparent from numerous comments that the problem exists in many other countries as well. The problem in the United States is reflected in the recent decision of David Dilcher to move (in the summer of 1990) from Indiana University to the Florida State Museum. Fortunately, he will be able to move a major part, possibly all, of the paleobotanical collection to Florida where it will continue to receive excellent care and be available for study by the international paleobotanical community. The failure of Michigan State University to replace Aureal Cross, and the University of Montana to replace

Paleobot.

Charles Miller, with paleobotanists upon their recent retirements is additional evidence of the growing problem as is the great difficulty that recent recipients of the Ph.D. have had in securing positions in the field. Some who have found academic positions are not teaching or doing research in paleobotany, and others have gone into entirely different fields. Ironically, one of my recent students is now a technician in a molecular biology laboratory.

What is the solution to this international problem? It has been suggested to me that perhaps all we need to do is to wait, and the pendulum of support will swing in the other direction. I believe this passive stance is very dangerous. Once university positions are lost, they are very difficult to regain. Thus, we must actively attempt to educate university administrators, legislators and other government officials who control the economic support for many major universities about the scientific importance of our field.

At the request of IOP members attending the business meeting in Melbourne, and with some suggestions from David Dilcher, I have prepared *A Case for the Support of Palaeobotany.* This is reproduced later in this newsletter. It can be used as it is, or as modified by IOP members, in whatever ways they feel might be useful to the cause of paleobotany. Assuming that it will be distributed primarily to non-paleobotanists, I have kept it largely non-technical.

CHARLES B. BECK, Michigan, USA

THE COST AND VALUE OF MEMBERSHIP

Recent correspondence received suggests that some members feel that IOP membership dues are bad value for money. One extreme example of such criticism was made after receipt of newsletter 38 which contained much *more* copy than any other!

Readers may have noticed that the new computerised desk top publishing format of the newsletter increases the amount of text on each page by about 30%. The use of small 8 point typeface, as in the last item of Newsletter 38, saves even more paper. The new method of production also allows the incorporation of photographs and drawings. The first experimental photograph appears in this issue.

PAYMENT OF MEMBERSHIP DUES

Some members have written to say they don't know when their dues payments were last made. Most regions have the last year of payment printed on the bottom left-hand corner of their address label.

The secretary is working at revising the IOP address list. This will give up-to-date membership names (as demanded by our new 1988 Constitution), latest addresses and last payment dates. The accuracy of this list depends on the efficiency of Regional Representatives. SO WILL REGIONAL REPRESENTATIVES PLEASE CHECK THEY HAVE SUBMITTED THE LATEST INFORMATION.

TOWARDS A PLANT FOSSIL DATA BASE

The statement of principles printed on pages 2-3 of IOP Newsletter 38 has formed part of a proposal for financing the IOP project ***The Plant Fossil Record.*** Comments of support, resulting from the newsletter item, have been received from many IOP members including Anderson, Andrews, Beck, Dilcher, Chaloner, Galtier, Hughes, Penny, Punt, Traverse, Venkatachala and many others. The IOP Executive Committee has agreed to begin a feasibility study based on the software package ***Smart*** marketed by Informix Inc.

Informix have generously made a contribution to this project and part of the grant from IUBS allocated to the ***Names in Common Use*** project (IOP Newsletter 38) is also available. These grants will allow the IOP office to customise ***Smart*** for a variety of Record formats and to experiment with input (magnetic copying from ING, text scanning Andrews 1965 etc.) and retrieval methods with that package.

Discussions with the Directors of ***Pelynodata*** are being proposed at the October AASP meeting at Oklahoma and a presentation of the project's progress is being arranged as part of the Frankfurt Krausel symposium in June 1990. At that meeting it is planned to have an open discussion of the problems and their solutions and to make a Declaration of the format for the Records. This is anticipated to be the international standard for plant fossil taxonomic descriptions.

This first stage feasibility study will concern only genera. It is part of the Names in Current Use project (IOP Newsletter 38) and is designed to extend to further applications of fossil plant taxonomy.

Full details of the project and examples illustrating the progress being made will be distributed in Newsletter 40 later this year. This is to encourage intensive international debate on the principles and standards to be adopted.

3RD IOP CONFERENCE FINANCES

Now that the accounts of the 1988 Melbourne Australia meeting have been finalised a surplus of $170 has been achieved. The conference organiser, J. Douglas, has kindly sent this to help balance the central account of IOP.

The Proceedings of the Conference are being published and details will be announced in a future newsletter.

REPORTS OF RECENT MEETINGS

ARBEITSKREIS FUR PALAOBOTANIK UND PALYNOLOGIE, Krefeld, 9-12 May 1989

The setting of this years APP Tagung certainly contrasted with that of last year's cosy gathering on the sunny seashore of Denmark. The19th annual meeting of the

German-speaking Arbeitskreis fur Palaobotanik und Palynologie was held in Krefeld, a mid-sized industrial city near the Dutch border in northwestern Germany. As was appropriate for its location on the western edge of the Ruhrgebiet where Carboniferous coals provide most of the energy for the heavy industry concentrated in this part of the country, the meeting was organized by K.-H. Josten and his colleagues at the State Geological Survey of Nordrhein-Westfalen, one of the largest Landesamte in Germany. The professional sessions (talks and posters) were held at the Survey while our lodgings and socializing activities centred about downtown Krefeld. About 90 people were in attendance, many of whom hailed from northern Germany, but also including the "regular" contingents from all over Germany and its neighbours Holland, Belgium, Switzerland, and Austria. Al Traverse from Pennsylvania (who gave a talk and even chaired a session completely in German!) was the only real contender vying for the long-distance visitor award.

The 27 talks, comprising one of the largest and most diverse APP meetings in recent history, were given in the course of one-and-a-half days, with a half-hour poster session on the first afternoon. The spectrum of topics discussed reflected the diversity of this active group of plant paleontologists, the focus shifting continuously from palynomorphs to megafossils, from leaves to wood to seeds, from regional questions to those of interest to a wider audience. The first session, devoted to those intriguing Devonian plants, covered new structural information about Rhynie chert sporophytes and gametophytes (W.Remy) and the possible biological relationships between them (H.Hass), a rich, newly discovered middle Devonian megaflora from China (H.-J.Schweitzer), and the palynological dating of the "Catskill magnafacies" in New York state (A. Traverse & A. Schuyler).

Palynological investigations also elucidated the biostratigraphy of Devonian to Lower Cretaceous sediments in NW Germany (C. Hartkopf-Froder), Cretaceous beds inthe Sudan (E.Schrank), Tertiary strata in central Germany (M.Hottenrot), andMiocene marine deposits in Lauenburg (J.Lund & J.J. Lund, poster), as well as the paleoecology of the Pennsylvanian coal beds in the Ruhrgebiet (C.Alexa, W.Riegel, & V. Wilde) and of the Triassic marine sediments in central Germany (C.Heunisch).

Palynology also proved to be a useful tool in solving problems in Survey work (G.Arnold & R.Stritzke) and in archaeological research (H.Engel). To make sample processing and data analysis go smoother and quicker, various time-saving techniques were presented in poster form; they included a system for more efficient sieving (R. Ashraf & C. Hartkopf-Froder) and even a set-up for automatic sieving (T.Muntzos & C.Heunisch) as well as AutoCAD software for computer generated pollen diagrams (G.Arnold & R.Stritzke).

Plant megafossils were, of course, also a popular theme. Floral investigations centred on those in Central Europe: the Carboniferous floras of the Ruhrgebiat (S.Schultke) and southern France (N.Hutton), the Lower Cretaceous leaf coal of Hils (V.Wilde), the upper Eocene wood and seed flora of northern Germany (H.Gottwald), and the Miocene brown coal (F.Nowotne, W.Riegel & V.Wilde) also found near Hils in northern Germany.

Seeds also came into the picture in the form of one excellently preserved, lauraceous specimen (M.Pingen & D.K.Ferguson) and en masse in a new project involving the computerisation of Late Tertiary European seed data (T.Gunther & H.J.Gregor, poster), while wood showed up again in the form of fossil charcoal (M.Sander & C.T.Gee).

Taphonomical studies of modern analogs in fluvial deltaic systems were discussed in a pair of complementary talks (J.M.Rabold, C.C.Hofmann), while biostratigraphic changes in the charophyte floras at the Jurassic-Cretaceous boundary in NW Germany were closely examined (M.Schudack & M.Feist). Questions were also asked about the taxonomy of Equisetites foveolatus (K.P.Kelba, poster) and Wackersdorfia dubia (H.Jahninchen), while the Messinian Mediterranean salinity crisis was challenged using the paleobotanical record (H.J.Gregor).

Other special topics included the application of ore microscopy in the study of Triassic plants(K.P.Kelber), cooling trends in Cretaceous-Paleogene Antarctica as reflected in the fossil plants (C.T.Gee & B.Mohr, poster), oncolite formation by Recent and Quaternary cyanobacteria and its significance for fossil forms (C.Hartkopf-Froder & R.R.Leinfelder), and the potential of biophysical work in paleobotany (T.Speck).

No paleontological meeting in the Ruhrgebiet would be complete without an outing to the Upper Carboniferous coal beds which were the primary goal of the first, half-day field trip led by K.H.Josten an R.Stritzke. Other points of interest in the area included stops at the University of Bochum Botanical Garden and at a nearby outcrop. We also visited the Geological Garden in Bochum (like a botanical or zoological garden but with rocks in captivity) where one could look at various geological structures as well as local fossils and rock types as they more or less naturally occurred in the walls of a landscaped quarry.

On the following day, participants on the second field trip collected from the conifer and angiosperm rich Miocene strata of central Germany. Visited were outcrops of the Rheinish Brown Coal at Bergheim (SW of Cologne), and of clays near Adenorf (SW of Bonn). The leaders of this trip included G.Arnold, R.Gossman, G.Gross, J.Prufert, and R.Stritzke.

Next year's APP meeting will be held in Munster in northern Germany in early June. Organised by Winfried Remy, the meeting will incude a workshop centering on those fabulous Devonian fossils which feature so prominently in the evolution of early plants, as well as an excursion to their place of collection. For those paleobotanists attending the International Symposium in Paleobotany in honour of Richard Krausel in Frankfurt scheduled immediately beforehand (details in IOP Newsletter 38), it may be a good (and perhaps the last and only) opportunity to see the wonderful collections

and facilities in Munster as Professor Remy is now retiring. Participants interested in the Devonian-oriented APP meeting should contact Prof.W.Remy (Universitat Munster, Forschungsstelle fur Palaobotanik am Geologisch-Palaontologischen Institut, Hindenburgplatz 57-59,D-4400 Munster, West Germany) while those wanting to attend the Krausel symposium should write to Dr. F. Schaarschmidt (Sektion Palaobotanik, Forschungsinstitut Senckenberg, Senckenberganlage 25, D-6000 Frankfurt am Main, West Germany).

C.T. GEE, Zurich, Switzerland.

INTERNATIONAL SOCIETY FOR THE STUDY OF THE ORIGIN OF LIFE, July 3-8, 1989, Praha, Czechoslovakia.

This was the sixth triennial Meeting of ISSOL and attracted 260 participants. There were the following palaeobotanists: Blanka Pacltova (Charles University, Prague, Czechoslovakia), B.S. Venkatachala, M. Skukla, and P.K. Maithy (Birbal Sahni Institute of Palaeobotany, Lucknow, India). V. C. Towari (Wadia Institute of Himalayan Geology, Debra Dun, India), M.B. Gnilovskaya (Institute of Precambrian Geology and Geochronology, Leningrad, USSR), and J.W. Schopf (University of California, Los Angeles, USA). Palaeobotanical papers dealt with Vendian metaphytes from India (Maithy) and the USSR (Gnilovskaya), Middle Proterozoic stromatolites and microfossils from India (Venkatachala, Skukla, Tewari), Late Proterozoic microfossils from the Bohemian Massif (Pacltova), and diversification and extinction in the Proterozoic biosphere as evidenced by some 3,000 microfossil occurrences now known worldwide (Schopf).

PALEOFLORISTIC AND PALEOCLIMATIC CHANGES IN THE CRETACEOUS AND TERTIARY, Prague, August 1989

This meeting was within IGCP project 216 whose leader is Prof O. Walliser, Gottingen, West Germany. It was organised by Dr E. Knobloch of the Czechoslovakian Geological Survey. More than 60 participants from a total of 17 countries made it one of the most truly international exchanges in the subject.

Lectures, discussions, field trips and good food made it a memorable experience.

The proceedings are to be published by the Czech Geological Survey in 1990 and details are available from Dr E. Knobloch, Geological Survey, Malostranske nam 19, Praha 1, Czecholovakia.

NEWS OF FORTHCOMING MEETINGS

UPPER PALAEOZOIC PALAEOBOTANY, Cordoba, Spain, 16-20 April 1990

In IOP Newsletter 37 it was announced that this meeting is planned for September 1989. Due to an unexpected clash of dates it has been re-scheduled for Spring 1990 when the weather in Spain is very comfortable.

The programme for the meeting is little changed from that detailed in newsletter 37 and the second circular is available from Dr C. Alvarez-Vazquez, Jardin Botanico de Cordoba, Apartado 3048, 14080 Cordoba, Spain.

5th SYMPOSIUM ON MESOZOIC TERRESTRIAL ECOSYSTEMS & BIOTA, Oslo, August 12-15, 1991.

This symposium will deal with Mesozoic terrestrial floras and faunas, their evolution, ecology, taphonomy and stratigraphy. Papers on problems of plant-animal interaction, insect faunas, vertebrate palaeoecology, and the terminal Cretaceous event are especially welcome.

It will be held in a Conference Hotel on the outskirts of Oslo where the participants will be housed. An approximate inclusive price is 4,000 NOKs.

Field trips are being organised to northern Norway, Scania and east Denmark and extended abstracts will be published in a symposium volume.

Write for details to: Dr N. Heintz, Paleontologisk Museum, Sars gate 1, N-0562 Oslo 5, Norway. (Fax 472 571437) The deadline for returning the second circular is March 31 1990.

MEETINGS PLANNED IN SOUTH AMERICA

1-7/9/1989. XI Congreso Brasilero de Paleontologia. A realizarse en Curitiba, Parana, Brasil. Comision Organizadora Dto de Geologia UFPR, Centro Politecnico. Caixa Postal 19011. Curitiba 81540, Parana Brasil.

23-28/10 / 1989. Congreso Mexicano de Paleontologia. Mexico, DF.

6-10/11/1989. VII Coloquio de Paleobotanica y Palinologia. Comite Organizador: Subdireccion de Servicios Academicos. Moneda No 16, Caixa Postal 06060, Mexico DF.

3-7/ 12/ 1989. II Congreso Brasilero de Carbon. Porto Alegre, RS, Brasil. Contractos: Carlos Hoffman Sampaio, PPGEMM, Escola de Engentaria, Av. Oswaldo Aranha No. 99, sala 609, Porto Alegre, 90210, RS. Brasil.

23-27/ 4/1990. V Congreso Argentino de Paleontologia y Bioestratigrafia. San Miguel de Tucuman, Argentina. Facultad de Cs. Nat. e Instituto Miguel Lillo, U.N.de Tucuman, Miguel Lillo 205, 4000 San Miguel de Tucuman, Rca. Argentina.

29-30/11/1990. VII Simposio Argentina de Paleobotanica y Palinologia. Castilla de Correo 128, 3400, Corrientes, Rca. Argentina.

SUMMARY LIST OF FORTHCOMING PALAEOBOTANICAL MEETINGS

This summary is taken from earlier announcements in the IOP newsletter. Please send further information on useful omissions.

1989

September

2nd European Palaeobotanical Conference, Madrid
Tertiary & Cretaceous floristics & climate, Prague
Palaeontology, Brasil

October

AASP, Oklahoma
Palaeontology, Mexico

November

Palaeobotany & Palynology, Mexico

December

Carboniferous, Brasil

1990

March

Pollen and spore diversification, London

April

Upper Palaeozoic, Cordoba
Biostratigraphy, Argentina
North Sea, Nottingham

May/June

Krausel Symposium, Frankfurt
Devonian, Munster

July

ICSEB, Maryland

1991

August

Mesozoic Terrestrial Ecosystems & Biota, Oslo
September
Carboniferous-Permian Palynology, Buenos Aires

1992

August

8th IPC, Aix en Provence

September

4th IOP Conference, Paris

1993

International Botanical Congress, Tokyo

A CASE FOR THE SUPPORT OF PALEOBOTANY

Paleobotany is an important broad area of investigation because paleobotanists utilizing data from fossils ask questions, and solve problems that cannot be resolved with data from any other source. Research efforts center on several different, but often overlapping, subdisciplines including morphology, taxonomy, ecology, plant distribution (phytogeography), and evolutionary relationships. Consider the following questions, the answers to which attempt to capture in brief the essence and significance of these areas:

1. What is the nature of plants that lived in past geologic time, from recent pre-history to the Pre-Cambrian, over 600 million years ago?

The only basis for answering this question is evidence from the fossilized remains of these plants that occur in rock strata of the Earth's crust. Knowledge of organisms, plants and animals, and the variation in their form and structure through geologic time, provides both a record of their existence and the only direct evidence of evolution. It is also the source of data for studies of taxonomy, ecology, and evolutionary relationships, and provides the most direct basis for determining rates of evolution.

2. Why do we need to apply principles of taxonomy to fossil plants?

It is through taxonomy that we name and identify plants, those that lived in past geologic time as well as those that live on Earth today. Without names we would have no effective means of referring to and utilizing organisms in Paleobotanical and other studies; and the importance of a uniform worldwide system of names is evident to all.

3. Why are we interested in the ecology of extinct plants?

The kinds of plants in a sediment, as well as its composition, provide the basis for estimating the conditions under which the plants lived and under which the sediment was deposited. It is important to understand the conditions, both biotic and abiotic, under which these plants lived in order to more accurately interpret their morphology and their role in the plant community.

4. Why would one wish to study plant distribution?

A knowledge of the distribution of plant (and animal) fossils in time (i.e., through the geologic record) and space is of the utmost importance. It provides the basis of biostratigraphy and furnishes essential data for interpreting and understanding the climates and the positions of the continents during Earth's past history.

5. Finally, Why do we seek to understand evolutionary relationships of extinct plant groups?

The ultimate goal of systematic paleobotany is to understand the origin of major groups of plants and the course of their evolution through time. Systematists who study living plants as well as those who study fossils use several methods to suggest relationships of major groups, but the only direct means of determining the ancestors of plant groups is by a study of the fossil record.

The best way to understand the significance of a field is through specific examples of the use of information which it generates. Such information may be used in practical applications or to contribute to the solution of major problems in the field or in related fields. For example, paleobotany is of great practical importance in providing evidence for biostratigraphy. The use of pollen grains and spores is especially important in identifying oil-bearing formations and in correlating disjunct strata, and many paleobotanists who are specialists in the study of pollen and spores (palynologists) are employed by major oil companies and state and national geological surveys for such purposes.

Evidence from paleobotany is routinely used in solving problems and developing new hypotheses in systematic and evolutionary biology. Consider a few examples.

Until 1960 evolutionary biologists were confronted with the dilemma of the existence of complex seed plants in the Carboniferous and no recognized ancestral group. The psilophytes of the Devonian were so relatively simple in morphology it was impossible to conceive of the seed plants having evolved directly from any member. In 1960 the progymnosperms, a more complex group with some characteristics of both psilophytes and early seed plants was recognized, thus providing the intermediate group that had been anticipated.

The place, if any, of the bryophytes in vascular plant evolution has been a long-standing problem of considerable interest. Recently, German workers discovered gamete-producing plants similar to those of bryophytes

in the Lower Devonian Rhynie Chert of Scotland. The association of these gametophytes with some of the most morphologically simple spore-producing vascular plants known suggests a possible early, evolutionary relationship between bryophytes and some vascular plants, although the nature of this relationship is still unclear.

Very primitive seeds and seed-like structures have been found in increasing numbers in Upper Devonian sediments during the past several decades. All are characterized by a similar, funnel-shaped structure, apparently adapted as a pollen-catching mechanism. This remarkable similarity in morphology is the basis of the belief that the gymnosperms, the first seed plants to evolve, were derived from a single ancestral source–that they were monophyletic. A slightly younger seed-like structure recently discovered in France deviates from this pattern in lacking the specialized, funnel-like structure. Instead, the comparable region has no evident pollen chamber or pollen-catching structure at all. This striking difference in morphology as well as the implied differences in reproductive biology suggest that seed plants might have evolved at least twice, thus supporting the view that gymnosperms might be polyphyletic.

The origin of angiosperms and the closely related problem of the nature of the primitive flower are among the most compelling problems in paleobotany. Since the 1930's the primitive flower has been thought by many systematists and morphologists to be large, with many conspicuous floral parts arranged helically on an elongate axis, much like that of *Magnolia*. These flowers were probably pollinated by insects. A competing viewpoint, introduced in the latter part of the last century, considers the primitive flower to be small and simple, consisting of few floral parts, with many such flowers attached helically to an axis (forming a "catkin"). Flowers of this type characterize wind-pollinated plants such as Poplar and Willow. Paleobotanical discoveries during the recent past have shown conclusively that simple flowers of the latter type were common among primitive angiosperms that lived during mid-Cretaceous time. It is not clear, however, that this was the primitive type since several other floral types have been discovered in sediments of the same age, and *Magnolia*-like flowers have been described from even older strata. It seems likely, however, that continued research will eventually solve this problem.

These four examples, from among many that could have been chosen, show clearly how research in paleobotany is contributing to the solution of long-standing problems in evolutionary biology. It might seem, at first thought, that paleobotanical systematists and molecular systematists have little in common, yet both have, ultimately, the same goal--understanding evolutionary relationships of organisms. And there can be a mutually beneficial relationship between them. A knowledge of paleobotany assists molecular systematists in choosing problems on which to do research, and evidence from each discipline can provide tests of hypotheses based on evidence from the other.

Several additional examples will illustrate the contributions of evidence from paleobotanical research in the solution of important problems in related disciplines.

The widely accepted Berkner-Marshall hypothesis of the origin of Earth's atmosphere, based in large part on biogeochemical evidence suggests that the contribution of oxygen to the atmosphere began about 3 billion years ago with the advent of organisms that release oxygen as a product of photosynthesis. Certain organic compounds isolated from 3 billion year old rock samples suggested an origin from green plants. The prevailing viewpoint at that time (about 1965) was that photosynthetic plants did not evolve until Ordovician time, only about 450 million years ago. However, paleobotanical investigations of the 3 billion year old chert which had been analyzed geochemically demonstrated the presence within it of unicellular plants resembling photosynthetic blue-green algae, thus supporting the Berkner-Marshall hypothesis. An understanding of the evolution of Earth's atmosphere may very well be crucial to an understanding of the nature and evolution of the atmospheres of other planets in our solar system such as Mars, the exploration of which seems destined to continue.

Early in the history of the study of Earth's crust it was assumed that the oceans as well as the bounding continents were permanent features, and that the characteristics of the continents such as mountains, valleys and inland seas had resulted from the shrinking and consequent wrinkling of the crust upon cooling. In 1915 the German geophysicist, Alfred Wegener proposed the startling hypothesis of *continental drift*. He hypothesized that initially all of the land was consolidated in a single large land mass that he called Pangaea. According to his hypothesis, about 200 million years ago Pangaea began to break up into smaller pieces, the continents, which have slowly drifted to their present positions. Whereas continental drift is widely accepted today, most geophysicists and other geologists were not convinced until, nearly 50 years later in 1963, two British geophysicists, F. J. Vine and D. H. Mathews, demonstrated identical patterns of normal and reverse paleomagnetism in alternating bands of magma on either side of a Pacific ocean ridge, thus providing incontrovertible evidence for the mechanism of continental plate movement by "sea-floor spreading" that had been suggested a few years earlier by H.H.Hess of Princeton University.

Paleobotanical evidence provided some of the strongest initial support for Wegener's hypothesis of continental drift, and many paleobotanists and other biologists were convinced of the fact of continental drift long before it became widely accepted. The presence in Permian and Triassic sediments of identical species of *Glossopteris* on opposite shorelines of Africa and South America provided strong evidence for Wegener's hypothesis. How could fossils of these plants be so widely separated today, by thousands of miles of ocean, if these plants had not earlier evolved on a common land mass? Furthermore, the shapes of

the western African and eastern South American shorelines was such as to provide an almost exact fit when placed together. Then there was the matter of distinctly different floras on either side of the Himalayas. Immediately to the north the Permian flora of China was characterized by *Gigantopteris*, whereas immediately to the south the Permian flora of India was characterized by *Glossopteris*. Perhaps India had once been a part of the southern land mass of Gondwana (along with Africa, South America, Antarctica and Australia), characterized by a *Glossopteris* flora, and had slowly moved northward, eventually coming into contact with the Himalayas. This would account for the disparate floras separated only by the mountains. Today we know that that is what happened, and that the Himalayas were, in fact, formed by the collision of the Indian plate with the Asiatic plate and the subduction of the northern edge of the Indian plate beneath the rising Tibetan plateau, a process that is continuing.

Another less direct kind of paleobotanical evidence for continental drift is the tropical nature of the flora of the Carboniferous found throughout the northern continents. This can be explained if one assumes that when this flora lived, the continents were in much more southerly latitudes. It is interesting to note also that the distribution of plants living today provides support for continental drift, especially the distribution of disjuncts, taxa that occur in widely separated regions, often on different continents. For example, the Southern Beech, *Nothofagus*, occurs in southern South America, Australasia and, as fossils, in Antarctica. The Tulip Tree, *Liriodendron*, of the Magnoliaceae, grows today in eastern North America and southeastern Asia. Fossil evidence indicates that it once lived throughout North America, Europe and Asia. Its current distribution as well as that of *Nothofagus* is best explained on the basis of the separation of the continents during the late Mesozoic and Tertiary.

Since the paleobotanical evidence in support of continental drift has been proven to be valid, geologists and other scientists are more ready than previously to accept paleobotanical evidence; and paleogeographers and geophysicists who study continental plate movements and positions through time routinely utilize evidence from paleobotany in concert with that from studies of paleomagnetism and other sources in reaching their conclusions.

It should also be emphasized that scientists interested in climates during past geologic time also use data from paleobotany. Plants provide very sensitive indicators of climatic conditions by characteristic anatomical patterns. For example, plants living in temperate climates with strong seasonal temperature changes are characterized by conspicuous growth rings in their wood whereas those living in climates uniformly warm throughout the year lack growth rings.

The role of paleobotany in research has been emphasized thus far in this essay. It follows that paleobotany also has an important place in undergraduate and graduate curricula. As a significant area in evolutionary biology, all educated persons should have some knowledge of the field. Furthermore, one must have a significant information base and a knowledge of methods and techniques in order to do research in an area. It is essential therefore, that information about fossil plants must be included in introductory botany and biology courses as well as in undergraduate courses in systematics and evolution. In addition, specialized courses in paleobotany and palynology are necessary in order to prepare future researchers in the field and to inform persons in related fields of the significance of paleobotanical data to their own research efforts.

As the only means of documenting the evolution of organisms through time, as a major contributor in clarifying the evolutionary relationships of organisms, and as the source of data essential for the solution of problems in the interdisciplinary areas of biostratigraphy, paleogeography, paleoecology and paleoclimatology, paleobotany is a science of utmost importance that deserves the strongest possible support.

C.B. BECK, Michigan, USA

PALAEOBOTANICAL CORRELATIONS OF THE CRETACEOUS AND TERTIARY

The participants of the August, 1989 Conference in Prague 'Paleofloristic and Paleoclimatic changes in the Cretaceous and Tertiary' propose the following project as part of the activities within IGCP project 216. They have been sent to the leader of IGCP project 216, Prof O.Walliser, Gottingen, West Germany, for his approval. Palaeobotanists wishing to take part in the work should write to Dr Z. Kvacek, Geologicky Ustav, 182 09 Praha 6, V. Holesovickach 41, Czechoslovakia.

Objectives

1. To agree an internationally workable taxonomic data base.
2. To identify useful key taxa.
3. To identify useful palaeofloristic events.
4. To attempt correlations/comparisons within territorial and marine, sediments.
5. To attempt to establish paleofloristic zones in particular basis/regions.

Principles

1. If appropriate, to use zonations and correlation data from results of earlier projects e.g. IGCP 124.
2. When possible, to consider the integrated evidence from leaves, fruits, seeds, spores, pollen, dinocysts, acritarchs, nannoplankton, charophytes, mammals, etc.
3. Eventually to organise and retrieve data in personal computer and in publication.
4. To adopt a standard approach to taxonomy and nomenclature.
5. To structure the work within IGCP project 216 with a separate organising group.
6. To accept help from the entire palaeobotanical community.

Administration

1. Z. Kvacek serves as co-ordinator with help of J. Kovar-Eder.
2. His regional advisors are:
   S. Khibia USSR
   A. Sweet North America
   L. Stuchlik GDR, Poland, Czechoslovakia, Hungary, Austria
   M. Collinson UK, Belgium, Netherlands
   D. Mihajlovic Yugoslavia, Greece, Romania, Bulgaria
   H. Gregor Italy, Spain
   J. Berger Switzerland, France.
   S. Guo China
   C. Gee Antartica
   Advisors from other regions will be sought by personal contact and through newsletters.
3. Information in the progress of the project will be disseminated through the International Organisation of Palaeobotany newsletter.
4. Participants in the project will meet at Bratislava 1991 andDresden 1993.

Work

Stage 1

Before December 1st, 1989 regional advisors, through consultations with others in their region, send the following data to the co-ordinator:

- a list of basins/areas to be included in the comparisons
- a complete list of taxa of useful plants represented in the region, with their tentative ranges or fixed occurence.

From this information Kvacek will co-ordinate regional advisors to agree a standard for biostratigraphy. This will be done by postal exchanges in early 1990.

Stage 2

In the middle of 1990 Kvacek will publish this standard in the IOP newsletter. It will be a table of key taxa set against a biostratigraphic scheme. Regional advisors will accumulate details of taxa and events for each basin/area in their region.

Floristic events will be included. Progress reports will be sent by regional advisors to Kvacek for standardisation and comparison. He will compile a time-table for the complete compilation and amalgamation of these data for preliminary correlation.

These initial correlations will be debated and improved at Bratislava 1991.

The Bratislava meeting will discuss the data of stage 2, define palaeofloristic zones and events, approve plans for activities leading to a meeting in Dresden in 1993.

THE CARBONIFEROUS IN GONDWANA

Bob Wagner went on his once a decade Gondwana trip, this time spending a few months in Australia on the invitation of the University of Newcastle, N.S.W. working with Noreen Morris in Newcastle and visiting with Mary White in Sydney, Keith Holmes in Wellington, and John Rigby in Brisbane. It was possible to make a good start with the revision of Carboniferous megafloras in eastern Australia. Although Mary White's magnificent book on The Greening of Gondwana providing some marvellous pictures of Carboniferous plants, a full revision is still outstanding. It is not generally realised that good Carboniferous plant collections exist in the Australian Museum (which is also in the process of receiving the material collected in Newcastle) and that these plants are even more closely similar to the South American (Argentine) ones than current taxonomic nomenclature makes one suspect. One important item of synonymy is *Botrychiopsis ovata* = *B. weissiana* of the South Americans. The poorly diversified, but highly characteristic later Carboniferous (Pennsylvanian) floras of Gondwanaland are notably lacking in pteridosperm and fern taxa, and contain a relatively high proportion of probable progymnosperms. Although not always easy to interpret properly, fructifications are becoming available for some of the Carboniferous Gondwana material. Climatic controls on floral distribution are obvious when dealing with these Pennsylvanian Gondwana plants and the presence of marked growth banding on a possible ginkgophyte (formerly attributed to the Lycophyta) emphasises the climatic aspect. A follow-up visit in 1990 will be necessary to finish the revision started in late 1988.

R.E. WAGNER, Cordoba, Spain

OBSERVATIONS

ELEVEN PALAEONTOLOGY INSTITUTIONS?

The Melbourne newspaper *Age* suggests that as well as the Tyrell Institute in Canada there are "ten" other institutions devoted solely to palaeontology. Jack

Douglas has no doubt there are more than ten and is contacting the Tyrell Institute for their answer. This will be the authoritative list for his prize to the first correct answer he receives: two bottles of Australian wine where practicable, or Mary White's *Greening of Gondwana*.

PALAEOBOTANY IN ADVERTISEMENTS

A street placard advertisement for Air Canada has recently appeared on hoardings in English streets. On one side it shows a picture of the familiar Air Canada maple leaf emblem and on the other a compression fossil of a fagaceous leaf. At more than 1 metre in height it must be the largest colour reproduction of a fossil plant.

Diane Secours
748-8131

NEWS OF INDIVIDUALS

J.W. SCHOPF

For "the best sustained scientific research program in the origin of life field" and, in particular, for his contributions to understanding of the evolution of Precambrian life, J.W. Schopf was presented with the International Society for the Study of the Origin of Life A.I. Oparin Medal, the highest accolade awarded by the Society: the previous recipients of this gold medal have been Stanley Miller (University of California, San Diego, USA), Juan Oro (Barcelona, Spain and the University of Houston, USA), and Cyril Ponnamperuma (Columbo, Sri Lanka and the University of Maryland, USA). Supported by a Guggenheim Fellowship, Schopf is currently spending a one-year sabbatical leave in London, working in the Department of Palaeontology, Palaeobotany Section of the British Museum (Natural History) where he is editing and in part writing a major monograph on Proterozoic life to be published in late 1990 by Cambridge University Press.

D.D. PANT

of Allahabad University India delivered the 7th J. Sen Memorial lecture at the Univeristy of Calcutta on: 'Forests of India through the ages'.

K.L. ALVIN

After many years researching and teaching palaeobotany at Imperial College London, K.L. Alvin retires this year. His contributions to Mesozoic plant fossils must be among the most fastidious and scientifically well-thought-out pieces of work. It is to be hoped that he accepts the offer from one of his ex-students, Bob Spicer, of "a corner at Oxford", to continue his palaeobotanical work.

A NEW JOURNAL FROM WEST GERMANY

Documenta naturae - a guick and cheap periodical with contents of natural sciences (palaeontology especially palaeobotany; geology, archaeology, botany, etc. Only a limited number of copies are printed. The document is published up to 10 times per year, depending on number of manuscripts submitted. Every issue number has one theme only (Carboniferous, Tertiary floral elements etc) or a number of short articles of nearly related themes (Mediterranean floras etc) and has another price, calculated according to the number of pages and plates.

Manuscripts (German, English, French) can be sent to the publishers and printed very quickly (1-2 months) and are not refereed. So the content represents only the author's opinion. There are no free reprints (until now), but the author gets one free issue.

Prices have ranged from 9 to 80DM and IOP members recieve a 35% discount.

Write for details to Dr H.-J. Gregor. Hans-Sachs-Strasse 4, D-8038 Grobenzell, West Germany.

RECENT PUBLICATIONS

LA FLORE AU COURS DES TEMPS GEOLOGIQUES. Y. LEMOIGNE Geobios

Memoire special 10 (2 volumes), 1988-89. (written in French)

Volume 1: Generalities. The Pre-Cambrian and Paleozoic floras. 384 pages; 356 figures & 32 plates.

Volume 2: The Mesozoic and the Tertiary-Quaternary floras. Conclusion: essay on the evolution of plants, considering both extinct and living ones.

This memoir records the successive paleofloristic data during the geologic time. For each period the following are considered:

1. The major paleogeographical data likely to have had a decisive effect on the vegetation;
2. The global composition of the flora:
3. Its geographical distribution (paleofloristic provinces):
4. The systematics of the major taxa:
5. Special remarks (e.g. in the Cretaceous, the problem of the origin of the Angiosperms).

Price (2 volumes):
Laboratores and institutes: 800FF or US$ 160
Individuals (without invoices): 530 FF or US$ 105
Individuals (members): 400 FF or US$ 80
Shipping: 50 FF or US$ 10
Send your order to: GEOBIOS, Service Promotion, 43, Bd du 11 Novembre, France 69622 Villeurbanne Cedex

GUIDE PALEOBOTANIQUE DANS LE TERRAIN HOUILLER SARRO-LORRAIN. J.P. LAVEINE.

Published by Les Charbonnages de France. Service geologie. For further information, write to J.P. Laveine, Laboratoire de Paleobotanique, Universite des Sciences et Techniques de Lille, 59655 Villeneuve d'Ascq, France. (written in France). 2 volumes: Text, 154 pages & 112 figures; Atlas, 64 plates. 400 FF.

Primarily written for professionals working in the Sarro-Lorrain coal basin, this guide describes in a simple and clear style the main species of the Carboniferous flora of this area. 92 species have been reported and for each of them are given drawings pointing out their major characteristics. These descriptions are preceded by small chapters summarizing more general geological and paleobotanical data.

The quality of the plates is noteworthy and should be appreciated by specialists of Carboniferous floras as significant bases for comparison. In addition, the stratigraphical information included in this guide is not only the latest but also the most complete available for the Sarro-Lorrain coal basin.

BOOK REVIEW

L'EVOLUTION DES GYMNOSPERMES. APPROCHE PALEOBIOLOGIQUE ET BIOLOGIQUE.

Bull. Soc. bot. France, 134, Actual. Bot. 1987 (2), 151p. Price: 120 FF (order from: Societe Botanique de France. Rue J.B. Clement. F - 92296 Chatenay-Malabry Cedex, France).

This volume, edited by Jean Galtier, represents the *Proceedings of the Conference on the evolution of Gymnosperms* held in Montpellier from 22 to 26 September 1986. It includes 11 articles which correspond to the lectures given during this Conference which was organised under the care of the Botanical Society of France by the Foundation Louis Emberger and Charles Sauvage.

In the foreword, Galtier gives a summary of the different aspects of the Conference. He concludes in dedicating this volume to the memory of one of the participants and collaborators in this volume, S.V. Meyen from Moscow, who died six months (30 March 1987) after the Conference. In the Conference opening speech, Armand Pons gives an historical account of this creation of the Foundation Louis Emberger & Charles Sauvage of which he is the President.

The eleven scientific articles which follow are alphabetically classified : five are in English with a French abstract, five are in French with an English Abstract, and one is in Spanish with a French and an English abstract. They deal with varied topics : the cytologic analysis of the fertilization, the pollen ultrastructure of the living and fossil gymnosperms, the evolution from the spore to the pollen, from homospory to seed, the morphology, embryology and ecology of a living Cycad in danger of extinction, the structure of the Glossopterid reproductive organs and their affinities, the origin of the Ginkgoales and evolution of Ginkgoopsida, the seedlings of living conifers and their bearing for the phylogeny of this group, the morphology of the reproductive organs and the secondary wood anatomy of a Cheirolepidiaceae from the Lower Jurassic and the notion of a "paraphyletic group" in a cladistic context applied to Progymnospermopsida and living and fossil Prephanerogams.

Through cytologic analysis, L. Chesnoy (p. 51-56) shows that the conifers are submitted to rules which are quite different from those known among the Angiosperms and the other plant groups. In conifers, the proembryo proplastids orginate exclusively from the male gamete. The same seems to occur in *Ginkgo biloba*. J.C. Audran (9-18) demonstrates that in spite of a similar eternal aspect, the pollen grains of the Cycadales and the *Ginkgo biloba* show important differences in their onotogeny and exine ultrastructure suggesting that they belong to two quite distinct phyla. The comparison by Lugardon (p. 57-66) between the sporoderm ultrastructure of the Pteridophytes and living Gymnosperms allowed him to underscore some similarities which suggest a common but remote origin. He also shows how the gymnosperm exine may have evolved from the pteridophyte exospore.

For the author, sporoderm studies constitute one of the best data sources in the determination of the systematic position and relationships of fossil plants. However, among the fossil sporoderms many have an original structure without any equivalent to extant spores or pollen grains which suggests that they belong to extinct lineagues (cf. Medullosales). T.N.Taylor and E.L.Taylor (p. 125-140) present a review of all the studies on the pollen ultrastructure of the fossil, their ancestors, the Progymnospermophyta. They note that the data are still inadequate, and therefore do not allow us to homologize wall layers in pollen from different taxonomic categories. However, within major clades, there is some uniformity in the infrastructure of the pollen wall. They also note that very few studies were made on fossil sporoderm development but it is clear that even among the Paleozoic pteridosperms there is diversity in the manner in which the mature wall forms. Concerning the saccus evolution, the eusaccate type seems to have predated the protosaccate type. W.G. Chaloner and J.M.Pettitt (p.39-49) present an interesting analysis on the evolution from homospory to seed which was accomplished in some 40 million years within the Devonian period. The discovery of new material of *Archaeopteris latifolia* from the Late Devonian of Pennsylvania reduces the gap between typical *Archaeopteris* and the early seed, *Achaeosperma*. E.Pena E.Grillo and L.Diaz (p.95-105) study the morphology, anatomy, embryology and ecology of *Microcycas calocoma*, a monotypic genus, strictly endemic to western Cuba. This study is undertaken in the framework of a scientific program intended to pre-

serve this species which is in danger of extinction. D.D. Pant (p. 77-93) gives a review of all the *Glossopteris* fructification genera and attempts to classify them.

He notices that their structure on the whole is still badly understood and has been interpreted in different ways depending on the authors. Often, it is not possible to determine if they are male or female. It is regrettable that this review does not take into account the enormous work of J. and A. Anderson *(1985 - Palaeoflora of Southern Africa. Prodromus of South Africa megafloras Devonian to Lower Cretaceous, 423p., ed. A.A.Balkema, Rotterdam)* of which a great part (p.106-140: pl.53-147) is devoted to Glossopteridales and especially gives many reconstructions of their reproductive organs. D.D. Pant discusses the different hypotheses about Glossopteridalean affinities and noticed that, in spite of the uncertainty regarding their position among the gymnosperms and their relationships with the other groups of naked seed plants, they are closer to the Peltaspermales. S.V. Meyen (p. 67-76) presents his views on the evolution of the Ginkgoopsida and the origin of the Ginkgoales. After a critical analysis of the cladistic methods recently applied to this group of plants which led to results opposed to those generally admitted and after a warning against the dangers of applying the current cladistic analysis to complex synthetic taxa, S.V. Meyen discusses the plants and morphological transformation of organs which appear most important in establishing the ancestral position of the Peltaspermales to the Ginkgoales, Leptostrobales and Caytoniales. Thus he undercores the limit to standard procedures of the current cladistic analysis. P.Woltz (p. 141-151), in studying and comparing the anatomical features of their seedlings, shows that the Araucariaceae and the Podocarpaceae differentiated from a common ancestor of Abietaceae type. The striking parallelism which exists in the Podocarpaceae between the evolutionary stage of the cotyledon anatomy and the geographical latitude suggests a common Gondwana origin, Antartic or circum-Antartic. Moreover it indicates that the evolution of the Podocarpaceae is closely related to that of Gondwana. B. Barale (p. 19-37) studies the morphology of the reproductive organs, both male and female, and the secondary wood of a lower Jurassic conifer belonging to the Cheirolepidiaceae. He concludes in giving general considerations on this fossil family. W.E. Stein and C.B. Beck (p. 107-119) investigate the notion of "paraphyletic group" in a cladistic context. They assess the paraphyletic status of both Progymnospermopsida and living and fossil Prephanerogams under the phylogenetic views of Beck, Rothwell, Meyen and Doyle and Donoghue.

L. GRAUVOGEL-STAMM, Strasbourg, France.

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REPORT OF A RECENT MEETING

7TH U.S. MID-CONTINENT PALEOBOTANICAL COLLOQUIUM, Cleveland, Ohio, May 19-21, 1989

The Cleveland Museum of Natural History hosted the 7th Mid-Continent Paleobotanical Colloquium May 19-21, and it was a great success. All the participants were highly impressed with the excellent program and organized facilities. Tom Taylor of Ohio State University wrote that "It will be a hard act to follow for the Chicago Field Museum in 1990 and at Ohio State University in 1991!" Bill DiMichele of the Smithsonian Institution wrote "it sets a standard that will be difficult to exceed in the future". There were eighty five registrants including paleobotanists and geologists from Ohio, Michigan, Pennsylvania, Indiana, Illinois, New York, Washington D.C., Massachusetts, Louisiana, Kansas and Canada. It was commendable that many teachers from local institutions and members of the Museum´s Fossil Society participated in the colloquium with great interest.

It was a delicious feast hearing the talks of the keynote speakers, Tom Taylor and Harlan Banks, on the two evenings after grand buffet dinners amongst the pleasant surroundings of American Indians and Dinosaurs. Tom´s adventures on studying the fossil vegetation of Antaractica were wonderfully well-handled. The awareness of the lush vegetation grown on the South Pole during Permo-Triassic and Cretaceous periods certainly provide very valuable data for understanding more about the bio-ecological evolution in the various plant groups.

After the welcome address on Saturday by Dr J. Mary Taylor, Director of the Museum, and an introduction by Shya Chitaley, Aurial Cross told a number of delightful anecdotes about the late Professor J.H. Hoskins whose extensive collection of nearly 25,000 fossil plant specimens form the basis of the Paleobotany Department of The Cleveland Museum of Natural History. He described Hoskins as a person, his moods and temperament, especially when Aurial showed him a prepared specimen of a lycopod cone! Aurial still treasures Hoskins´ hammer and the Ohio maps used for collection trips. He gave a good account of the field trips with Hoskins (who never wanted to be photographed) with a lot of humor. Dr Art Blickle, a colleague of Hoskins who could not attend the colloquium due to ill health, wrote that "on field trips, Aurial was the chief cook while Art washed the dishes!"

That night Harlan Banks gave an exciting talk on the early land plants and their evolution. His talk was titled "Of this and that", an enigma as usual! He poured all his knowledge and vitality into this super talk making us feel younger still!

This colloquium included nineteen contributed papers and six poster demonstrations. All the contributions were interesting indeed, but the papers on "Fossil banana seeds", "Fruits and seeds of Theaceae", and "Plant-insect interactions from fossil and recent insect mouthparts" were fascintating and understandable enough even to the non-paleobotanists to satisfy their curiosity and to promote interest in this discipline of science.

The Paleobotany Department has arranged a display of the

Cleveland Shale plant fossils. Participants were amazed to see several huge lycopod cones from this Upper Devonian collection and the magnificent specimen of a small unbranched lycopod tree bearing basal appendages and an apical lepidostroboid cone! This preview of the department's Devonian fossil collections was useful for the participants who took the field trip on Sunday morning to dig in the Cleveland Shale. Everyone had a piece of compressed axis but finding a cone was not easy. It took almost sixty years for the Museum to accumulate such wonderful specimens useful for research, dug out from the Cleveland Shale! Lycopods, both axes and cones, are no doubt dominating in this shale flora but other good specimens from marine algae to pro-gymnosperms also form a very valuable portion of this upper Devonian collection.

S. CHITALEY, Cleveland Museum of Natural History, Cleveland, Ohio, U.S.A.

NEWS OF FORTHCOMING MEETINGS

4TH INTERNATIONAL CONGRESS OF SYSTEMATIC AND EVOLUTIONARY BIOLOGY The Unity of Evolutionary Biology. July 1-7 1990. University of Maryland, College Park. First Circular from ICSEB-IV, Department of Microbiology, University of Maryland, College Park, Maryland 20742, USA.

OBITUARIES

EDNA PAULINE PLUMSTEAD DSc FRS S.Afr

On Sunday the 24th of September 1989, Edna Plumstead died peacefully at her home in Johannesbury. Her relatives, past students, colleagues and many other friends attended the funeral service at her parish church to mourn to remember her.

Edna was born in Cape Town in September 1903, the second daughter of William Janisch. Her early years were spent in the Cape Peninsula, where she learned to love the wonderful South African vegetation. Although she moved with her family to Johannesburg in 1911, and lived there ever since, she always had a fondness for the Cape and its flora.

Her scientific career began, in 1923, with a B.Sc. in Geology from the University of the Witwatersrand. She went on to take an Honours degree in the Geology Department in the following year, and was awarded an M.Sc., with distinction, in 1925. For this latter work she was awarded the Geological Society of South Africa's Corstophine Medal "for geological research of outstanding merit".

She was also awarded the H.B. Webb Research Scholarship, which allowed her to begin research for a Ph.D. at Cambridge; her chosen subject was "The Petrology and Palaeobotany of South African coals". Unfortunately, she was never to complete this work, for she was recalled to South Africa to teach in the understaffed Geology Department. From then on, teaching duties occupied most of her time, but she was able to publish several papers and a geological mapping book of which three editions have been published.

At this time, her interests became fixed on the subject of continental drift, and in particular the Gondwanaland supercontinent. Much of her later work reflected this interest. In 1934 she married Edric Plumstead, a mining engineer, and, for the next 12 years, she devoted her energies to running a home and raising a family of three sons and two daughters.

At the beginning of 1946, the numbers of ex-servicemen returning to South Africa requiring tertiary education placed a great strain on the University's teaching staff, and Edna returned from her temporary domestic retirement to a lecturing post in the Geology Department.

In the fifties, her descriptions of the newly discovered Glossopteris fructifications formed the climax of her distinguished career. She told me a few years before her death how pleasing it was for her to unlock some of the mysteries of this enigmatic group of plants. Glossopteris had not only provided the raw material for the coal formations she studied, but the Glossopteris flora also lay at the very heart of the concept of the supercontinent of Gondwanaland. Although the Glossopteris leaves were well known then, and had been reported from localities throughout Gondwanaland, their affinities were obscure, since nothing remotely fertile had ever been found attached. She found the evidence at Vereeniging, and described seven new genera in a classic series of papers. For this work she was awarded the degree of Doctor of Science by the University of the Witwatersrand in 1959. Also in that year, Edna was awarded the Jubilee Gold Medal of the Geological Society of South Africa for the year's most outstanding publication.

The paleobotanical world immediately recognised her contribution, and Edna's name became synonymous with that of Glossopteris. She was then invited to act as President of the Subcommission on Gondwana Stratigraphy and Palaeontology, a position which she held for 9 years. In 1966, she was elected fellow of the Royal Society of South Africa.

Of her many honours, two of the more notable ones were that from 1969-1972 she was a member of the Executive Committee of the South African Association of University of Women, and, in 1970, she was awarded the Draper Medal of the South African Geological Society for distinguished services to South African Geology.

In 1971 she retired from lecturing, but continued to research and supervise graduate students at the Bernard Price Institute. Indeed, up to the time of her death, she was an Honorary Research Associate of the University of the Witwatersrand, and still took an interest in the affairs of the Institute. In all, she was associated with the University for more than 65 years, and with the Bernard Price Institute for most of its 40 year life.

In later years, Edna battled against poor health, and suffered from shortness of breath caused by emphysema. Neither her spirit nor her passion failed her however, and I remember with fondness many lively discussions we had on her work and her fossils. The palaeobotanical world had lost a great character.

Edna is survived by her husband, Edric, four children and seven grandchildren.

R.J. RAYNER, Bernard Price Institute for Palaeontological Research, University of the Witwatersrand, Johannesburg.

REFLECTIONS ABOUT JOHN HOLMES

Les membres du Laboratoire de Paléobotanique del´Univerité de Montpellier ont la grande tristesse de vous faire part du décès de leur ami John Holmes. Le 26 Octobre 1989.

The death of John Holmes caused me to reflect on our many activities together at Montpellier and Urbana and the lasting friendship developed from a common interest in coal-ball plants and ferns especially. John was a dedicated student to the reconstruction of whole-plant fern morphology and contributed significantly to the basic information on Anachoropteris, Botryopteris, Psalixochlaena and Rhabdoxylon. These are among the most detailed and carefully worked out reconstructions of the Carboniferous ferns. John´s interests and enthusiasm for coal-ball collecting were the driving force behind those trips into Lancashire to collect, cut, peel and select the specimens to haul back to Montpellier. Because of my interests in quantitative analyses of the coal-swamp vegetation, John generously provided the middle peel of each cut specimen for our analyses. A renewed interest in the Lancashire coal-ball studies traces back to the field work of John and Jean Galtier, going back well over a decade ago.
John also reopened research into the coal-ball collections at Liege. His visit with Muriet Fairon-Demaret was an exciting time with the discovery of new species of Botryopteris and hundreds of uncut Belgium coal balls. This led to, "A new look at the flora of the Bouxharmont coal balls from Belgium" with Muriel and a letter to me exclaiming the plant finds with peels to see. My last contacts with John centered on his new interests in phloem presevation and his development of the "disappearing peel technique", a phrase indicative of his tongue-in-cheek dislike for jargon. This too was a significant innovation.
John achieved one of those unusual shifts in transplanting himself and his way of life from England to France without a glitch in languages. He completed his doctorate with Jean Galtier and joined the Laboratoire de Paleobotanique at Montpellier. John married a lovely school teacher, Nicole, and they have three children, ages 4 to 9. The tragedy of his prolonged illness and passing is heavy for his family and mourned by all of us who had the good fortune to know him and work with him.
T.L. PHILLIPS, Urbana, Illinois, USA.

E.D. ZAKLINSKAYA

A telegram from Moscow to London dated October 13th 1989 says: "With deep regret we inform that on October 10 1989 distinguished palynologist Professor E.D. Zaklinskaya passed away. On behalf of all colleagues from the Palaeobotanical Laboratory, Geological Institute of the USSR Acedemy of Sciences. Akhmetiev."