

# IOP NEWSLETTER 7

## INTERNATIONAL ORGANIZATION OF PALAEOBOTANY

INTERNATIONAL UNION OF BIOLOGICAL SCIENCES  
SECTION FOR PALAEOBOTANY

Vice President : Prof. E. BOUREAU, FRANCE.

Secretary : Dr. M. C. BOULTER  
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OCTOBER 1978

### JAMES MORTON SCHOPF, 1911 - 1978

OUR PRESIDENT DIED IN THE EARLY MORNING OF 15TH SEPTEMBER 1978

SYMPATHIES ARE EXTENDED TO HIS FAMILY AND MANY FRIENDS

IT IS A TRAGIC LOSS TO THEM AND TO THIS ORGANIZATION

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PLEASE MAIL NEWS AND CORRESPONDENCE TO YOUR REGIONAL REPRESENTATIVE OR TO THE SECRETARY FOR INCLUSION IN THE NEXT (JANUARY 1979) NEWSLETTER. The views expressed in the newsletter are those of its correspondents and do not necessarily reflect the policy of IOP.

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### IOP NEWS

#### PAYMENT OF DUES

The annual dues payment time is being set at February 14th each year. Payments that members have already made are indicated by the number of the appropriate year that is shown on the lower right hand corner of your address label - this also appears on the computer print-out of members' addresses.

## MEMBERSHIP

At September 15th 1978 the dues from 273 palaeobotanists had been received by the secretary. This is a substantial increase from the 168 paid up members who were recorded in April of this year.

The computer print-out list of members' addresses has been revised to July 1978, and copies are available free to paid-up members on request from the secretary; they are despatched by surface mail and so may take several months to arrive.

## FINANCES

Money is still very short: there is just enough to pay for this third newsletter of 1978 from this year's income if regional representatives' institutions continue to give financial support with postage costs. We have made an application to the IUBS for a grant of US\$1,000 to help distribute newsletters, and to enable four newsletters to be produced in future years if there is need. This newsletter 7 has been supported by a generous donation from Prof J.W. Schopf, whose account of palaeobotany in China appears near the final pages. Similar donations to help with printing and distribution costs will be gratefully received.

IOP has the following bank accounts in England, and money can be paid directly into them: Midland Bank Ltd, 15 The Mall, London E15 1XL (account number 71030795) and International Giro, Bootle, Merseyside GIR 0AA (account number 56 631 4002).

## CHINESE TRANSLATION

The newsletter is now being translated into Chinese, and 100 copies of each edition are being distributed within the Peoples' Republic.

## ESTIMATED READERSHIP OF THE NEWSLETTER

Problems of international currency exchange mean that only those palaeobotanists readily able to send money through London Banks are recorded on the secretary's central list of membership. Consequently the newsletter is duplicated and distributed by other systems in East Europe, China, USSR, India and South America. West Germany also has a separate system through its Arbeitskreiss. In view of this complex system of communication it is important to have details of how many palaeobotanists actually read the newsletter. Information from regional representatives suggests that at present just over 1,000 palaeobotanists read each copy.

In addition, there is evidence to suggest that many non-member palaeobotanists read the newsletter obtained by a friend, thus avoiding payment themselves. Dues will have to be increased very soon to cover our mounting costs, so please help delay this by persuading your friends to pay.

## REPORTS OF RECENT MEETINGS

### LATINAMERICAN PALAEOONTOLOGICAL CONGRESS, Buenos Aires, April 1978

During the first Latinamerican Palaeontological Congress about 300 specialists were present, among them, R. Wagner (Sheffield), J. Doubringer (France), R. Weber (Mexico), O. Rösler, M.E. Bernardes de Oliveira, M. Guerra Sommer (Brazil), R. Herbst, M. Hünicken, C. Azcuy, A. Baldoni, S. Archangelsky (Argentina). Several young research students from different Latinamerican countries were also present and they followed all sections of the congress devoted to palaeobotany and palynology with enthusiasm. A publication of the proceedings is now in press and can be ordered from: Maipu 645, Buenos Aires, Argentina. The congress included two symposia: Permian - Carboniferous boundary and Jurassic - Cretaceous boundary.

### LINNEAN SOCIETY OF LONDON, London, April 1978

Morag Jones of Reading made splendid arrangements for this meeting which was attended by about 40 palaeobotanists. There were six speakers:

J/K  
Brundage

R.W. Baxendale: A new fertile Schizaeaceae fern from Iowa coal balls

C.J. Cleal: Some applications of cuticle studies to the interpretation of Neuropteris bearing foliage

M.E. Collinson: A fruit and seed flora from the Oligocene of the Isle of Wight

C. Hill: New female cones of fossil cycads from the Jurassic of Yorkshire

A.C. Scott: Some Lower Carboniferous floras - aspects of sedimentology and plant preservation.

The meeting was drawn to a close by Dr N.F. Hughes, who summarised the lectures by asking questions: Have we looked for coal balls in enough places in the world? Why use names like 'cycads' in the Mesozoic? Are the traditional groups of the Cycads and Schizaeaceae coming apart? Is there a move away from the traditional 'lumpers' and 'splitters'? Are their objectives different enough to require alternative data bases?

#### PALAEOBOTANICAL SECTION OF THE B.S.A.

Last June, the Palaeobotanical Section of the Botanical Society of America held their annual meetings at Blacksburg, Virginia. They were hosted by Stephen Scheckler who helped organize a fine field trip and meetings. About 50 papers were contributed which covered a broad range of topics, and there were several informal papers besides. The paper contributed by Edith L. Smoot (Department of Botany, Ohio State University) entitled "Phloem in the Lower Pennsylvanian fern Etapteris" was awarded a prize as the best student paper.

#### FORTHCOMING MEETINGS

##### III ARGENTINIAN PALAEOBOTANICAL CONVENTION

The Cordoba Academy of Sciences has organised this convention to be held in Cordoba city next 27-29 September. It will attempt to revise all the manuscripts left by Frederik Kurtz which were not published in his 1921 Atlas of Fossil Plants. The missing plates have now been recovered and are to be reproduced by an agreement with the German government. Dr Mario Hünicken is coordinating the meeting.

##### 9TH INTERNATIONAL CONGRESS OF CARBONIFEROUS STRATIGRAPHY & GEOLOGY

The third circular for this congress is now available from: IX-ICC, 1979, c/o Museum of Natural History, Washington DC 20560, USA.

Pre- and post-congress trips are separated by the May 21-25 technical sessions in Urbana. The field trips or technical sessions can be attended independently. The technical sessions consist of three major concurrent symposia of broad interest during each of the mornings and a variety of specialised topics and contributed papers in the afternoons.

This is the first time that the Carboniferous Congress has met in North America and it may be decades before it meets there again. It is located about one day's car drive from thousands of members of the American geological community. Dormitory housing and meals are combined at a price of about \$15.00 a day. Payment of the registration fee may be made at any time, but the deadline for abstracts is January 1st 1979.

On Friday afternoon and evening May 25th, R.L. Leary is planning a bus trip to Springfield to visit the State Museum. Participants will be able to see the collections as well as view the exhibits. There will be bus transportation to Springfield and return, dinner at a nearby restaurant and a reception at the museum. The total cost will be \$20.00. The congress organisers have promised not to schedule any pertinent papers on Friday afternoon, so this trip will give palaeobotanists an opportunity to have a relaxing time together.

Two of the formal field trips are of particular interest to palaeobotanists:

TRIP B Environments of Plant Deposition - coal balls, paper coal and gray shale floras in Western Indiana. (Eggert & Phillips; swamp and fluvial environments of deposition and modes of plant preservation in lower Middle Pennsylvanian (Westphalian B-C) May 20th, \$25.00 includes lunch.

TRIP C Early Pennsylvanian Upland Compression Flora in Western Illinois. (Leary; well preserved upland flora and a visit to the basal Pennsylvanian unconformity) May 27th, \$32.00 includes lunch.

# PALEOBOTANICAL SECTION OF THE B.S.A.

The Paleobotanical Section of the Botanical Society of America will meet at Oklahoma State University in Stillwater from August 12 - 17th 1979. A field trip will be organised. A special symposium on pteridosperms is being planned by Tom Tayler and Ben Stidd. Contact Charles Miller, Department of Botany, University of Montana, Missoula, Montana 59801 for more information.

The Section will join in meetings with the Canadian Botanical Society in Vancouver, British Columbia at the University of British Columbia's campus from late June to early July 1980. This will be followed by the second International Systematic and Evolutionary Biology Congress - details from Charles Miller (address above). The Palaeobotanical Section welcomes visitors from overseas to join these and all its meetings.

## AMERICAN ASSOCIATION OF STRATIGRAPHIC PALYNOLOGISTS (AASP)

The eleventh annual meeting of the AASP takes place from October 24 - 28th 1978 at the Del Webb Townhouse, Phoenix, Arizona. Contact Jim Canright, Botany Department, Arizona State University, Tempe, AZ 85281 for details. The AASP holds meetings each autumn and in 1979 plans to meet in Dallas, Texas, and in 1980 in Denver, Colorado.

## MISCONCEPTIONS ON NOMENCLATURE

from James M. Schopf, Ohio, 27th April 1978

Since the matter has been aired in our Newsletter 6 I suppose it may be appropriate to interject a comment regarding Prof Schaarschmidt's statement on page 17 of that issue. I hope that this type of informal communication will serve to correct some misconceptions about the Code of Nomenclature. Our foremost concern is that all persons understand that a Code of Nomenclature is not designed, and is practically forbidden, to make any decision on taxonomy. By the same token, taxonomic matters are not to be incorporated into the Code.

I suppose as 'organs' that fossil plants are nearly always represented by, Schaarschmidt means stems, roots, leaves, seeds, pollen and spores. It would be interesting to know what sort of definition of organ would include all these parts. Each, as I understand the term, would be comprised of a group of many organs. Moreover leaf-stem combinations are common in some groups where stems rather than leaves are commonly abscised. Defining organs based on abscission characteristics is not a very satisfactory basis for classification. I think it is most important to characterize plant parts according to the phase of the life-cycle that may be represented. We should not expect that this will correspond well with organography. I do agree that we may very well dispose of the term organ-genus. It was defined in the Code in response to a mandate of the 1935 Amsterdam Congress.

I do not agree it is useful to distinguish a genus based on modern plants from one based on fossils. The most important taxonomic problem is to recognise the fossil ancestors of the modern forms. The matter of fossilisation is one of the incidental conditions that influences evaluation of evidence but it is not a satisfactory basis for taxonomy, any more than is the geological age. The only relevant question is that of relationship, and there are enough artificial barriers to recognition of relationship without introducing another that is superfluous. The Code is not "made to describe living plants". It is not "made to describe" at all. The Code regulates the manner of proper application of names to members of the plant kingdom. The Code does not regulate the sense in which categories are interpreted, whether fossil or modern. It does not regulate taxonomy. Since Schaarschmidt has some misconceptions about the Code it is easy to see how he finds it difficult to apply fossil plants. It would be difficult to apply the Code under any circumstances if these postulates had any validity. I suspect they were written hastily and that he did not mean quite what he stated. Rather than a new Code, it would be appropriate for palaeobotanists to understand the correct range of application of the Code we now have. A new Code, on the other hand, might be advisable for those who prefer to classify fossils outside the confines of the plant kingdom. This is possible and for that

sort of classification no constraints are applicable.

A definition of generic and specific concepts is an essential part of taxonomy. As such, it is particularly proscribed material which will never be included in the Code. Generic and specific concepts are peculiar to every taxonomist; they are also the responsibility of every taxonomist to interpret as best he can in consideration of all evidence available, whether derived from modern or from fossil material.

Every one of the latter points that Schaarschmidt mentions for needed instruction, insofar as it pertains to nomenclature and not to taxonomy, relates to problems common to both modern and fossil plants. They are already treated in the Code in considerable detail.

For various reasons directions should not be given in the Code about how poorly preserved material should be treated. This is a matter for taxonomic decision in every specific case. A group judgement is not likely to be more enlightened than that of a diligent taxonomist who has given careful consideration to all aspects of any given problem. This is a test of individual scholarship; it is not a matter of "establishing" scientific truth by taking a vote! One may vote on matters of procedure but scarcely on matters of fact. It seems to me we once did have it decided by an overwhelming vote that the sun moved around the earth!

I do not want to discourage any productive topics for any future IOP meetings, but I hope we have very few members who feel so confident of their own interpretation of decisions of taxonomy that they could serve as a general prescription. In my experience, each taxonomic situation is a little different, requires special consideration, and generalisation based thereon for broader application would be fraught with much danger of misinterpretation. It would be best for each scientist to concentrate on his own particular problems of correctly expressing plant relationship, and not attempt to set a model that others are bound to follow. Let us all recall that every taxonomic study is a progress report. As new information comes to hand the evidence necessarily deserves a re-evaluation. By careful and correct adherence to the Rules of Nomenclature, we make our understanding of plant relationships more intelligible and easier for the next monographer to revise. In this way, I hope sincerely, that one may contribute to scientific progress.

#### PALAEOBOTANICAL PROGRESS IN GEORGIA

Dr K.I. Chochieva, Institute of Palaeobiology, Academy of Sciences of the Georgian S.S.R., Potochnaja ul. 4, 380004 Tbilisi, USSR, has kindly provided the following review of current palaeobotanical work in his region:

One of our leading Soviet palaeobotanists A.A. Kolakovsky (Sukhumi Botanical Garden) has begun publication of data from the richest Sarmatian flora of Abkhazia. A.K. Shakryl, who works in the same place, continues his investigations on the epidermis of fossil and Recent Lauraceae.

The group of Georgian palynologists with I.I. Tumadzanov (Tbilisi, Institute of Botany of the Academy of Sciences of the Georgian S.S.R.) at its head, takes part in producing the atlas-monograph on "Paleogeography of the territory of the USSR in the Late Pleistocene and Holocene".

N.S. Mamatsashvili of the Tbilisi Institute of Geography, who achieved splendid results in the study of the continental terrace deposits of western Georgia, is busy studying spores and pollen from the Marine Pleistocene deposits of Guria - the region of the classical Pliocene and Pleistocene of the Euxinic basin.

M.D. Uznadze and E.A. Tsagareli (Tbilisi Institute of Geology) have prepared a monograph on the well known Goderdzian flora - one of the most interesting and still problematic (as far as its age is concerned) fossil floras of Georgia. It has been reconstructed from leaf imprints, buried in the Volcanic deposits. I.N. Dzaparidze, who works in the same place, is now preparing for his defence of a thesis on the Maikopian flora of the Gori-Kaspi region.

G.S. Avakov (Tbilisi Institute of Paleobiology) has an article in Press: "The Miocene Flora of the Medjuda river". It is based on the richest and most wonderful collection of the leaf imprints from plants of dry and damp subtropical zones and the plants of the temperate zone.

A striking duration of existence of the family Taxodiaceae in the composition of Georgian fossil floras, up to the Pleistocene, and their high taxonomic diversity - Sequoiadendron?, Sequoia, Metasequoia, Taxodium, Cryptomeria, Athrotaxis, Glyptostrobus and Taxodiaceae gen. ind. - forms the basis of work by a group of palaeobotanists at the Institute of Paleobiology of the Academy of Sciences of the Georgian SSR (K.I. Chochieva, L.T. Chelidze, L.P. Rukhadze, E.V. Kvavadze). They are attempting to reconstruct the geological history of this family in Georgia, to look for new localities and also to study the remains of Taxodiaceae available in the palaeobotanical collections of Georgia (the locality of the remains of the Khvarbetian fossil coniferous forest will be taken as the key section). The investigations will be carried out mainly with the help of the methods of paleocarpological, palynological and epidermal analyses. We are undoubtedly faced with a very complicated and labour-consuming work. To carry it out on a high scientific level we shall need a herbarium and a pollen collection of taxa from this family from the areas of their natural growing. We will be very grateful to international colleagues for any help, and we will particularly appreciate receiving herbarium and pollen samples even if they are sent to us for temporary use. It is the absence of a herbarium and poor literary material that has delayed for many years the publication of a special article on the cones of Athrotaxis from the Late Pliocene deposits of western Georgia.

#### CURRENT PALAEOBOTANICAL RESEARCH IN SOUTH AFRICA

Dr H. Anderson of the Botanical Research Institute in Pretoria has kindly provided the following report:

##### Pretoria: Geological Survey

Dr Kovacs-Endrody is working on Ecca Permian floras and has two papers in press on Glossopteris systematics and the species concept in palaeobotany.

Colin McKae has submitted an MSc thesis on Permian palynology of two cores from Botswana and is now doing further work on the palynology of the cores from Karroo strata from the northern Transvaal.

##### Pretoria: Botanical Research Institute

Drs John and Heidi Anderson are involved in the promotion of the first volume in an envisaged series dealing with the fossil floras of South Africa. The first volume will encompass the genus Dicroidium from the Molteno Formation (Triassic). Towards this end, further collecting has been undertaken from six new localities.

##### Johannesburg: Bernard Price Institute

Dr Edna Plumstead has recently published a paper in the Trans. Geol. Soc. 80(3): "A new phytostратigraphical Devonian zone in South Africa, which includes the first record of Zosterophyllum".

Rosemary Falcon has submitted a PhD thesis dealing with palynological trends in the Permian and Triassic of Rhodesia. Her future interests are focused on the environmental side of coal and coal bearing sequences, particularly with reference to palynology and petrology.

Anna Benecke-Mallison has submitted a PhD thesis on the Sphenophyta of the Upper Permian of the Daptocephalous Zone in Natal.

Shirley Smithies has submitted an MSc thesis on Glossopterid fructifications from the Hammanskraal locality of Permian age.

Ian McGregor is finishing an MSc thesis dealing with an SEM study of Precambrian stromatolites from South Africa and Rhodesia.

##### Johannesburg: Southern Oil Exploration (SOEKOR)

Ian McLachlan is working on the palynological assessment of petroleum source-rock potential and palynological, biostratigraphical, chronostratigraphical and environmental interpretations of Upper Jurassic to Tertiary sections on the south west and eastern coasts of South Africa.

Brian Conway is working on the palynology of off-shore deposits on the west coast of South Africa.

Johannesburg: Goudstad Teacher Training College

Dr T. Erasmus obtained his doctorate on a study of the anatomy and evolution of *Osmondocaulis* (Miller) with notes on the geometry of the xylem framework of the Osmondaceous stele. His future interest lies with Cyatheaceous canidices.

Bloemfontein: Institute of Environmental Sciences

Prof Edward van Zinderen Bakker is appointed palynologist for Marion Island (subantarctic) from November 1978. He and Dr Coetzee are preparing publication of volume 2 of "Palaeoecology of Africa" which will be issued this year. He also edited "Antarctic glacial history and world palaeoenvironment" which is based on the SCAR - INQUA symposium.

Dr J. Coetzee is continuing palynological work on the deposits of Tertiary and Quaternary age in the south west Cape. She is chairman of the African Committee for Palynology (ACP) and one newsletter has been published.

Louis Scott is working on a PhD thesis dealing with pollen analysis of late Quaternary deposits from the Transvaal. He is also participating in palynological studies of the north west Cape as part of a multidisciplinary programme on palaeoenvironmental archeology.

Pietermaritzburg: Natal University

Prof Richard Pienaar is continuing work on nannoplankton occurring off the east coast of South Africa.

Prof Kathleen Gordon-Gray is working on aspects of the Permian flora in Natal.

Dr Edward van Dijk is working on the palaeobotany, palaeoecology and sedimentology of the *Daptocephalus* zone flora (Upper Permian) of Natal.

## BIBLIOGRAPHIES

### REPORT ON BRITISH PALAEOBOTANY AND PALYNOLOGY

The latest edition of this report covers the years 1976 - 1977 and was published in March 1978. Details were given in IOP Newsletter 6 (page 7). Copies can still be obtained for 50p (UK) or US\$2.00 (elsewhere) as cheques payable to 'The Botany Department', Birkbeck College, Malet Street, London WC1, England.

### BIBLIOGRAPHY OF AMERICAN PALAEOBOTANY, 1977

Charles Miller has the 1977 bibliography ready for distribution. Please write to him for details at: Department of Botany, University of Montana, Missoula, Montana 59801, USA.

### TRALAU'S PALAEOBOTANICAL LIBRARY

The Section of Palaeobotany of the Swedish Museum of Natural History has purchased the palaeobotanical and palynological part of the library of the late Dr Hans Tralau. Lists of duplicates can be sent to anyone interested in exchange: write to Prof B. Lundblad, Swedish Museum of Natural History, S-104 05 STOCKHOLM 50, Sweden, though the preparation of these will require a little time. That part of Dr Tralau's library which comprised books and reprints on living plants has been bought by the Section of Botany of the Rijksmuseum.

## NEWS OF PALAEOBOTANISTS

R. WAGNER of the University of Sheffield visited Argentina for 3½ months in the Spring of 1978 on an exchange visit arranged by The Royal Society and the Argentine Research Council. He spent most of his time doing field work on Carboniferous sections in the provinces of La Rioja, San Juan and Chabut (in Patagonia). He was based at the CIRGEO (Centro de Investigaciones en Recursos Geologicos) in Buenos Aires.

- B. BALME (Australia) paid a short visit to Chile and Argentina during August 1978. In Buenos Aires he met several colleagues to exchange slides and information on Upper Palaeozoic and Cretaceous Gondwana palynology.
- M. FRIES took up his duties in the Section of Botany at the Rijksmuseum in Stockholm on July 1st 1978. He has taken over responsibility for the Index Holmensis and therefore works mainly in the palaeobotany section.
- D.C. BHARADWAJ of the Birbal Sahni Institute of Paleobotany, Lucknow, has been appointed by UNESCO as a member of the Scientific Committee 1 of the International Geological Correlation Programme (IGCP). This committee deals with the IGCP projects on time and stratigraphy. Dr Bharadwaj attended the meetings of the committee in Paris from 13th - 18th February 1978.
- J.V. TESLENKO, chief of the Department of Fossil Plants, Institute of Geological Sciences of the Ukrainian Academy of Sciences, Kiev, USSR, visited the Birbal Sahni Institute of Palaeobotany, Lucknow, from 18th February to April 10th 1978, under an Indo-Soviet exchange programme.
- J. COETZEE of the Institute of Environmental Sciences, Bloemfontein, spent June 1978 in Cambridge with Dr N.F. Hughes, studying SEM techniques for palynology.
- L. SCOTT of Bloemfontein plans to visit Dr U. Markgraf in Arizona USA for 6 months during 1979 to take part in palynological studies of late and post glacial deposits in South America.
- C. DAGHLIAN will assume a postdoctoral position in the laboratory of Dr W. Crepet at the University of Connecticut.
- J. DOYLE has accepted a position at the University of California, Davis, to fill the vacancy of Prof D. Axelrod's retirement. Prof Axelrod will remain active in his research at Davis.
- R. GASTALDO has a new position at the University of Alabama.
- K. NIKLAS has accepted the position at Cornell University left vacant by Prof Harlan Banks' retirement. Prof Banks has an active research programme and plans to continue his work.
- G. RETALLACK is a postdoctoral fellow in D. Dilcher's laboratory at Indiana University.
- R. STOCKY has accepted the position at the University of Alberta vacated by Prof W.N. Stewart who retired recently.
- T.N. TAYLOR is a visiting professor at the University of Texas where he is teaching and working in Prof T. Delevoryas' laboratory.
- A.C. SCOTT starts work as lecturer in Geology at Chelsea College London from October 1978.

#### NEWS FROM OTHER INSTITUTIONS

##### INTERNATIONAL UNION OF BIOLOGICAL SCIENCES

Newsletter 13 was published in June 1978 and gives information of its membership, activities and publications received etc. Copies can be obtained from the IUBS Secretariat, 51 Bd de Montmorency, 75016 Paris, France.

##### INTERNATIONAL COMMISSION FOR PALYNOLOGY

Newsletter volume 1 number 1 May 1978 is available from the Palynology Laboratory, Department of Botany, Arizona State University, Tempe, Arizona 85281, USA. Its reproduction is of very high quality and includes half tone illustrations of the ICP President and a 'particularly striking palynomorph'.

##### ASOCIACION LATINAMERICANA DE PALEOBOTANICA Y PALYNOLOGIA (ALPP)

A new Council has been elected for 1978 - 1982: President Oscar Rosler (Sao Paulo), Vice president Elias Dolianiti (Rio de Janeiro), Secretary Terezinha Melhem (Sao Paulo), Treasurer Mary Bernardes de Oliveira (Sao Paulo), Editor Wolfgang Volkheimer (Buenos Aires) and Past-president Sergio Archangelsky (Buenos Aires). Delegates for the Executive Committee are Rafael Herbst (Argentina) and Marleni Marques Toigo (Brazil) - a second ballot is needed for the Mexican delegate.



## COMMISSION INTERNATIONALE DE MICROFLORE DU PALEOZOIQUE (CIMP)

Newsletter 18, May 1978 is available from the CIMP Secretary, Institute of Geological Sciences, Ring Road, Halton, Leeds LS15 8TQ, England. Newsletter 19 is expected to be published some time in October.

## INTERNATIONAL ASSOCIATION FOR ANGIOSPERM PALAEOBOTANY (IAAP)

The first newsletter of this new organisation is available from the Editor, Dr G. Dolph, Indiana University at Kokomo, 2300 S. Washington Street, Kokomo, Indiana 46901, USA.

## LABORATOIRE DE PALEOBOTANIQUE ET EVOLUTION DES VÉGÉTAUX, MONTPELLIER, FRANCE

Following the sad and untimely death of Prof Louis Grambast on December 13th 1976, the succession at the university has now been assured by the appointment of Charles Héban as Maître de Conférence. Jean Galtier, Maître de Recherche, now leads the C.N.R.S. palaeobotanical research team.

The members of the laboratory wish to express their gratitude to those colleagues from all over the world who spontaneously provided considerable support at the time when evolutionary studies at Montpellier came close to suffering at the hands of economic pressures.

## PALEOBOTANICAL SECTION OF THE B.S.A.

The symposium "Fossil Plant Reproduction in the Fossil Record" will be published soon in Rev. Palaeobotan. Palynol. and "Biostratigraphy of Fossil Plants: Successional and Paleocological Analysis" is about to go to the editors (Dowden, Hutchinson & Ross, Inc). Both symposia were sponsored by the Paleobotanical Section of the Botanical Society of America. IOP Newsletters will report on both volumes in detail at a later date.

RECENT PUBLICATIONS

## STATE UNIVERSITY OF UTRECHT

The first volume of M. Boersma and L.M. Broekmeyer, "Index of Figured Plant Megafossils" will appear in January 1979 as a special publication of the university. The volume concerns Carboniferous plants figured between 1971 and 1975 and will have about 150 pages. The volume will cost US\$10.00 and can be ordered from Dr M. Boersma, Laboratory of Palaeobotany and Palynology, Heidelberglaan 2, De Uithof, Utrecht, The Netherlands.

## VEB GUSTAV FISCHER VERLAG JENA

"Paläozoische und mesozoische Floren Eurasiens und die Phytogeographie dieser Zeit" is now available from VEB G. Fischer, DDR 69, Jena, Villengang 2, for 68.60M. The book has contributions from V.A. Vakhrameev, I.A. Dobruskina, S.V. Meyen and E.D. Zaklinskaya.

## PALYNODATA

Dr G.O.W. Kremp, Palynodata, 101N Avenida Carolina, Tucson, Arizona 87511, USA announces the following recent publications:  
number 9, 1978, Pliocene Palynological Literature: 500 implemented references  
number 10, 1978, Devonian Palynological Literature: 700 implemented references.

## SOCIETE GEOLOGIQUE DU NORD

The symposium volume of the society's December 1977 meeting at Lille is now available from B.P. 36, 59650 Villeneuve d'Ascq, France. It contains articles on palaeogeography and palaeobotany of recent work on Gondwanan fossils.

## ON PALAEOBOTANY, PALYNOLOGY AND RELATED STUDIES IN CHINA, 1978

This report has been written by J. William Schopf (Department of Earth and Space Sciences, Institute of Geophysics and Planetary Physics, University of California, Los Angeles, California 90024, USA) as a result of his recent visit to The Peoples' Republic of China (IOP newsletter 5). IOP gratefully thanks the author for a contribution of £150 to help pay for the costs of typing, distribution and duplication.

### INTRODUCTION AND BACKGROUND

From mid-May through mid-June 1978 I was a member of a ten-person delegation of American botanists<sup>1</sup> visiting the Peoples' Republic of China<sup>2</sup>. Although the trip was devoted largely to neobotanical subjects (e.g., visits to university biology departments, to botanical gardens, and to institutes of botany, biochemistry, plant physiology, hydrobiology, agriculture etc.) it provided an opportunity for me to visit the two major centres of palaeobotanical study in the P.R.C.<sup>3</sup> and to meet several of the leading Chinese palaeobotanists and palynologists. In addition, I visited several<sup>4</sup> laboratories involved in studies of Precambrian palaeobiology and biostratigraphy. The following report summarises information obtained and impressions formed as a result of these visits.

The principal purpose of this report is to provide a basis for increased communication between non-Chinese and Chinese palaeobotanists and palynologists. Among other factors, a major inhibitor of such communication in the past has been a lack of knowledge on the part of non-Chinese specialists as to which scientists doing what types of research were located at which institutes; I have therefore included here a listing of the palaeobotanists and palynologists whom I met during the trip (a listing of course which includes only a fraction of active Chinese workers in these fields). I also have included some discussion of current Chinese research in palaeobotany and palynology, and answers to a number of enquiries that were made of me by American specialists prior to our trip. It should be stressed however that this report is by no means a comprehensive analysis of the current status of palaeobotany and related subjects in the P.R.C. - my visits with Chinese specialists in these fields occupied only about 5 days of our 30 day trip, and they were hampered by my inability to speak Chinese<sup>5</sup>. Moreover there are a number of laboratories of interest that I did not have an opportunity to visit<sup>6</sup>. What follows is therefore a cursory and a rather impressionistic assessment of these areas of Chinese science.

To further put this report into perspective it is important also to understand something of the political milieu within the P.R.C. during our visit, a milieu that influenced in major ways the nature of our experience (and knowledge of which may to some degree explain the apparent differences between the experience of our delegation and that of other groups which had previously visited China). In mid-March 1978 a National Science Conference was held in Peking, attended by 6,000 persons, for the purpose of outlining the "National Plan for the Development of Science and Technology 1978-1985". The conference was addressed by HUA Kuo-feng, TENG Hsiao-ping and FANG Yi, each of whom emphasised that success of the current Chinese policy of the "four modernisations" (viz. agriculture, industry, national defence and science and technology) will hinge on modernisation of Chinese science. This emphasis, and the plan itself, represent very major departures from policies pursued in the P.R.C. during the twelve or so years prior to 1976 (when such policies were influenced by the so-called "gang of four" and their associates) and throughout our visit we were told that "it is now the springtime of science in China" - that after a long winter, Chinese science once again was beginning to bloom.

As an integral part of this new science policy, basic research (rather than only applied science) is to receive increased emphasis, and "scientific and technical cooperation and academic exchanges with other countries" are to be encouraged and strengthened. Thus, our delegation was welcomed warmly, indeed. And there seemed strong sentiment on the part of our hosts that our visit might best be used to begin

to bridge the long-standing gap in communication between Chinese and non-Chinese botanists. There seems widespread expectation among the Chinese that this new policy can lead to a marked increase of information flow, both into and out of the P.R.C., and that ultimately (but apparently) at least in part as a function of the status of inter-governmental relations) it should facilitate both the exchange of scientific specimens, and the occurrence of exchange visits by individual scientists. For the present, this new policy seems to mean at least that exchanges of reprints, books, etc. will be facilitated and that past problems regarding correspondence between Chinese and non-Chinese specialists should be substantially eased. I was told that Chinese palaeobotanists and palynologists would welcome correspondence and the opportunity to exchange information, reprints and similar scientific materials, with their non-Chinese colleagues.

## PRECAMBRIAN MICROFOSSILS, STROMATOLITES AND RELATED SUBJECTS

### Current Studies

Studies of Precambrian microfossils and stromatolites, with special emphasis on their potential biostratigraphic usefulness, are being actively pursued at several research institutes in the P.R.C.

-In the Palynology Laboratory (SONG Zhi-shen, Head) of the Nanking Institute of Geology and Palaeontology, Academia Sinica, YIN Lei-ming has been studying (since 1966) possible microfossils in thin sections of cherts from latest Precambrian dolomitic limestones of the Tengying, Toudiantuo and Nantuo Formations (see stratigraphic section below) of the West Hupeh and Yunnan Provinces and elsewhere; LI Zai-ping has recently begun studies of Precambrian microfossils, apparently largely from acid-resistant residues of shales; and GUYANG Shu is studying microfossils from Precambrian, upper Paleozoic and Triassic sediments. And in the Palaeobotany Laboratory (LI Xing-xue, Head) of the same institute, CAO Rui-qi (-TSAO Rui-chi) and ZHAO Wen-jie are investigating the potential biostratigraphic usefulness of stromatolites and "calcareous red algae" in the Chinese Precambrian.

-Also in Nanking, Professor CHU Hao-jan, a blue-green algal specialist in the Department of Biology at Nanking University, is planning to begin studies of microfossils preserved in Precambrian stromatolites (see discussion of "CYANOPHYCOLOGY" below).

-In Peking, in the Palynology Laboratory (SING Wu-shen, Head) of the Division of Palaeontology and Stratigraphy (WANG Nai-wen, Chief) of the Institute of Geology and Mineral Resources, Chinese Academy of Geological Sciences, SING Wu-shen, KAO Lin-chih, LIU Kui-chih and KAO Lian-ta are studying microfossils in acid resistant organic residues of Precambrian shales.

-In the Palaeobotany and Palynology Laboratory (HSU Jen, Head) of the Peking Institute of Botany, Academia Sinica, CHU Wei-ching is studying (by transmission electron microscopy) microfossil-like objects in mid-Precambrian cherts; and HSU Chao-liang has recently begun studies of Precambrian microfossils, apparently largely from sediments of latest Precambrian age.

-And at Peking University, CHANG Yuen, Lecturer in Palaeobotany in the Department of Geology<sup>10</sup>, has been studying possible microfossils in thin sections of chert from the Chisien Group (about 1300 m.y. in age; CHANG Yuen, 1978).<sup>11</sup>

Precambrian studies are being vigorously pursued in the P.R.C.<sup>11</sup>, and it is my impression that perhaps more than most other aspects of paleobiology, such studies are on an upsurge. I was informed at the Nanking Institute of Geology and Palaeontology, for example, that the possibility of establishing a separate laboratory (i.e. a discrete research unit) for Precambrian work was being actively considered. The impetus underlying this apparent increase of interest in the field appears to be largely biostratigraphic--the realization that Precambrian microfossils and/or stromatolites may hold the key for correlation of ancient rock units and, ultimately, effective exploitation of Precambrian mineral resources<sup>12</sup>. During the past two decades, such studies have been hampered by a lack of exchange of information,

specimens and literature<sup>13</sup> between Chinese and foreign specialists, a situation that with continuance of the current emphasis on basic research in the P.R.C., and an expansion of scientific exchange programmes (of both materials and people), should be greatly alleviated in the future.

According to briefings given me by CAO Rui-qi (at Nanking) and SING Wu-Shen (at Peking), the composite stratigraphic section for Precambrian strata of the P.R.C., and the distribution of available age dates and of major types of Precambrian fossils in the Chinese Precambrian, are those shown on page 4 (for additional information, see SIN Yu-sheng and LIU Kui-chih, 1972, 1976; and LIAN Yu-tso and TSAO Rui-chi, 1976).

### Related Subjects

**ORIGIN OF LIFE.** During the past 12 to 15 years, evidently as a result of the "theoretical nature" of this topic and the perceived "lack of practical application" of its study, few investigations have been carried out in the P.R.C. relating to the origin of life. An exception to the general absence of published reports during this period is a recent paper by LU Tze-shen (1976) in which he discusses the possible role of mineralic (e.g. clay) substrates in the pre-biotic development of organic polymers. I talked with LU at the Shanghai Institute of Biochemistry, Academia Sinica, where he is a member of a research group investigating the structure and function of insulin. LU indicated that although he remains marginally interested in studies of the origin of life, and that "at some time in the future" he might possibly carry out studies on the origin of optical activity in organic compounds (e.g. amino acids and sugars), his chief interest is the enzyme chemistry of extant organisms. He also indicated that he knew of no other Chinese scientists actively researching the origin of life. I raised this question again with the Precambrian groups both at the Nanking Institute of Geology and Palaeontology and at the Peking Institute of Geology and Mineral Resources; workers at both institutes informed me that (i) although they were not aware of any current research in the P.R.C. relating to the origin of life, (ii) they themselves were actively contemplating entering the field. Thus, it seems perhaps likely that in the P.R.C. there will be an increase of interest and activity in this area in the future.

**CYANOPHYCOLOGY ("CYANOBACTERIOLOGY").** Because of its potential agricultural importance, the study of biological nitrogen-fixation (together with studies of tissue and anther culture, photosynthesis, aspects of molecular biology, etc) is included in a list of eight government-encouraged research topics in biology for which funding is readily available (a list apparently generated by a sort of National Research Council for Science Policy based in Peking). Thus, studies of the nitrogenase enzyme systems of such heterocystous blue-green algae as Anabaena cylindricum, Tolypothrix tenuis, and Nostoc spp. (and of the nitrogen-fixing bacterium Azotobacter vinelandii) are carried out at many botanical institutes in the P.R.C.; we were briefed in detail on such studies at research institutes in Peking (the Institute of Botany and the Atomic Agricultural Research Institute), Shanghai (Institute of Plant Physiology) and Wuhan (Hupeh Institute of Hydrobiology). Studies of the taxonomy of blue-green algae centre largely in Nanking, being carried out by CHU How-jan<sup>14</sup> and his associates in the Department of Biology at Nanking University. Work is currently underway to produce a "Flora of the Freshwater Algae of China", a monographic project planned of twenty volumes and scheduled to be completed by 1990, with the first volume to be published by 1979. The Chief Editor of the Algal Flora is JAO Chin-chin (= C. C. YAO of earlier publications), a chlorophyte specialist (especially interested in the Oedogoniales) of the Hupeh Institute of Hydrobiology in Wuhan. The cyanophyte portion of the monograph is to be prepared and edited by CHU, who has previously completed an important monograph on the Chinese Chroococcaceae (CHU Hao-jan, 1963). In addition to assembling data on the freshwater cyanophytic flora of the P.R.C. CHU has recently

[illegible]

carried out studies of fossil microscopic algae (both cyanophytes and chlorophytes) extracted from oil-bearing strata (CHU Hao-jan, 1976), and when I talked with him in Nanking he informed me that he intended to begin studies "in the nearest future" of cyanophytic fossils from the Precambrian of China, especially those occurring within cherty stromatolites.

#### PHANEROZOIC PALAEOBOTANY AND PALYNOLOGY

Palaebotanical and palynological studies in the P.R.C. are concentrated in two major research groups, one at the Nanking Institute of Geology and Palaeontology, the other at the Peking Institute of Botany. In addition, several neobotanists whom I met expressed interest in the relationship between plate tectonic movements and plant distributions<sup>15</sup>, and I was informed that "more than 200 palynologists" (none of whom I met) are employed in the petroleum industry. The personnel in these two major research groups, and their main areas of interest, may be summarized as follows:

#### Nanking Institute of Geology and Palaeontology, Academia Sinica<sup>16</sup>

##### LABORATORY I, PALYNOLOGY LABORATORY -

Head: SONG Zhi-shen. Precambrian microfossils: YIN Lei-ming; LI Zai-ping. Dinoflagellates: QIAN Ze-shu; HE Cheng-quan. Paleozoic microfossils: LU Li-chang (Devonian); GUYANG Shu (also studies Precambrian and Triassic). Mesozoic microfossils: LIU Zhao-sheng, SHANG Yu-ke, LI Man-ying, ZHANG Lu-jin, LI Wen-ben. Cenozoic microfossils: SONG Zhi-shen, LIU Geng-wu, ZENG Ye-hui, CAO Liu, LIU Jing-ling (Quaternary).

##### LABORATORY II, PALAEOBOTANY LABORATORY -

Head: LI Xing-xue (=H.H. LEE of earlier publications). Precambrian stromatolites: CAO Rui-qi (=TSAO Rui-chi), ZHAO Wen-jie. Calcareous algae (and Permian fungi): MU Xi-nan. Fossil charophytes: WANG Zhen; HUANG Ren-jing; LU Hui-nan. Paleozoic plant megafossils: LI Xing-xue (Devonian, Carboniferous, Permian), ZHAO Xiu-hu (Carboniferous), MO Zhuang-guan, YAO Zhao-qi (Permian, Gigantopteris flora of South China), ZHANG Shan-zheng, CAT Chong-yang (Devonian), WU Xiu-yuan, Mesozoic plant megafossils: YEH Mei-na, ZHOU Zhi-yan, CAO Zheng-yao, LI Pei-juan, LIH Bao-xian, WU Shung-qing, WU Xiang-wu. Cenozoic plant megafossils: GUO Shuang-xing, LI Hao-min.

#### Peking Institute of Botany, Academia Sinica<sup>17</sup>

##### LABORATORY OF PALAEOBOTANY AND PALYNOLOGY -

Head: HSU Jen. Assistant Head of Laboratory: CHANG King-tang. Precambrian microfossils: CHU Wei-ching, HSU Chao-liang. Paleozoic plant megafossils: HSU Jen (also studies "Gondwanaland", Mesozoic and Tertiary-Quaternary floras), CHU Chia-nan, GENG Boa-yen, HU Yu-fan. Mesozoic plant megafossils: CHEN Yeh, TUAN Shu-yin. Cenozoic plant megafossils: CHEN Ming-hong; TAO Jun-rong. Tertiary palynology: SUN Xing-jun. Quaternary palynology: KUNG Chao-chen, TU Nai-chiu. Recent spores and pollen: CHANG King-tang (especially tropical and subtropical angiosperms), CHANG Yu-lung (especially tropical and subtropical angiosperms), SHI Yi-chen.

Palaeobotanical and palynological studies at both institutes appear to be largely descriptive (taxonomic) in nature, with considerable emphasis on the biostratigraphic usefulness of plant fossils. And research facilities in both institutes appear to be generally of good quality, with good to excellent library facilities, sufficient supporting staff, and an adequate supply of high quality light microscopes (viz. Zeiss Jena).

During the course of my visits I received rather extensive briefings from LI Xing-xue, regarding Upper Paleozoic palaeobotany in China, and from SONG Zhi-shen, regarding the current status of Chinese palynology. I also discussed in some detail with both LI and HSU Jen a series of questions that had been posed to me by American palaeobotanists and palynologists prior to my departure from the United States. Results of these and of discussions with other Chinese scientists that may be of general interest are summarized below:

### Exchange of Materials

All types of scientific materials (e.g. letters, reprints, books, photographs, fossiliferous rock specimens, dried plant material, prepared microscope slides, etc). can be received by Chinese palaeobotanists and palynologists. Such materials (which can be addressed in English, rather than Chinese) should be sent to individual scientists, rather than to their institutions, as was formerly preferred. It is my impression, however, that rules (or traditions) regarding categories of materials that can be sent out of the P.R.C. are currently rather variably applied; there seems to be considerably more flexibility in Peking, for example, than in Shanghai or Nanking, and, in general, less flexibility elsewhere. Reprints of papers, books and the like (except for some "preliminary reports" that are currently intended for internal distribution only), and photographs of specimens, can apparently be sent from the P.R.C. quite easily. In the past, correspondence has posed a more difficult problem, but this appears to be no longer the case, especially in the major research centres. Apparently, however, it continues to be difficult for Chinese specialists to send scientific specimens to foreign colleagues (and I gather it may be especially so if the foreigners reside in countries with which the P.R.C. has yet to establish full diplomatic relations).

### Exchange Visits by Scientists

At present, it is easiest to visit China either as a member of an organized tourist group (more than 1000 Americans per month are now availing themselves of this opportunity) or as a member of an invited scientific delegation. Presumably because of diplomatic considerations, visits by Australian or Canadian delegations and individuals appear to be easier to arrange than those by American scientists. Nevertheless, in recent years a number of American scientists have requested and received, permission to visit the P.R.C. as individuals rather than as members of delegations, and the frequency of such visits has increased since the National Science Conference of March, 1978. Because of language difficulties, visits by Chinese-speaking Americans are apparently easiest to arrange. With regard to visits to the United States by Chinese scientists, such visits at present are limited generally to Chinese who come as members of official delegations. Although it is possible that policy regarding scientific exchanges may change in the reasonably near future (in the fall of 1978, for example, more than 1000 Chinese college students will be studying abroad), I was given the impression that any such changes could be expected to hinge largely on the status of inter-governmental diplomatic relations.

### National Palaeobotanical Organization

The national palaeobotanical organization in China has traditionally been the palaeobotanical section of the Palaeontological Society of China. Like other national scientific societies in China, however, the Palaeontological Society has

not held a national meeting for more than a decade. The Society is now in the process of being reconstituted and reorganized and is scheduled to reinstitute annual national meetings beginning in 1979. Following this reorganization, it may prove possible for Chinese and foreign scientific societies to exchange lists of members and their addresses, specialities, etc. as a means of facilitating communication within the international scientific community.

### Graduate Education

During the period of the Cultural Revolution and the "Gang of Four" (ca. 1966-1976), universities underwent major changes: course offerings were greatly curtailed; enrollments decreased, many universities switched from a four-year to a three-year format; entrance examinations, and ultimately course examinations, were discontinued, graduate programmes were disbanded; faculty research projects were curtailed, etc. During the past 16 months, each of these trends has been reversed. Beginning in Fall, 1978, graduate programmes will be reinstated, much of the graduate training will take place within research institutes (cf. the Soviet system) and there is a general expectation that the most able graduate students will become full-time staff members within the institutes.

### Coal Geology

Studies of coal geology, coal petrography, coal mining techniques, the "coalification" process, etc. are carried out at the Coal Academy Research Institute; Sian, Shensi Province, P.R.C. (professor YUAN Yao-ting, Director). Any inquiries regarding these and related subjects might also be sent to the Ministry of Coal in Peking.

### Palynology in China

Palynological studies in China were begun by HSU Jen, who in 1952 established a palynology laboratory at the Nanking Institute of Geology and Palaeontology. In 1954, at the request of the former Minister of Geology, HSU organised a palynological training course in Peking (at the Academy of Geological Sciences) with emphasis on coal palynology and stratigraphic correlation. As a result, palynological laboratories, headed largely by HSU's former students, have been established at many of the institutes that belonged to the former Ministry of Geology (an organization restructured in 1975 to form the "All-China Geological Bureau"), including those associated with the petroleum industry. Courses in Palynology are offered at Peking and Nanking Universities, at geological institutes in Chengtu (capital of Szechwan Province) and Changchun (capital of Kirin Province), and at several other research institutes. Palynological studies at the Nanking Institute of Geology and Palaeontology have dealt with palynomorphs from the Devonian (especially from Yunnan Province, sediments containing the "Zosterophyllum flora" described by LI and CAI, 1977, 1978); from the Carboniferous and Permian (assemblages which are generally similar to comparably aged assemblages of western Europe, although many forms typical of the Carboniferous of Europe occur in the P.R.C. in strata the Chinese regard as Permian); from the lower Mesozoic (the Triassic and Jurassic floras of northwest and southwest China are similar to comparably aged assemblages of Europe and North America); from the Cretaceous (especially from the Early Cretaceous of northeast and southeast China), and from the Cenozoic (chiefly from eastern China). The palynology group at the Peking Institute of Botany has concentrated principally on studies of (i) Cenozoic and, to a lesser degree, Cretaceous fossil spores and pollen; (ii) the morphology of spores and



pollen, as studied by light microscopy; and (iii) Recent spores and pollen, especially those of tropical and subtropical taxa.

### Paleozoic Palaeobotany in China

Studies of megascopic plant fossils began in the 1880's with work on specimens collected in Permo-Carboniferous coal fields of North and (to a lesser degree) South China. Prior to 1950, however, relatively little work had been done, and there were few Chinese scientists in the field (only three palaeobotanists, for example, were on the staff of the Nanking Institute of Geology and Palaeontology when it was founded in 1950). During the past quarter century, spurred especially by the rapid development of the palaeobotanical research groups at Nanking and Peking, considerable progress has been made. **DEVONIAN:** The earliest known tracheophytic fossils in the P.R.C. occur in the Early Devonian "Zosterophyllum flora" described by LI and CAI (1977) from southwest China (Yunnan Province), three assemblages, reported to include at least 10 species of Zosterophyllum occur in the section (see LI and CAI, 1978). Later Devonian plant fossils are rare in southwest China (see WANG Zhen, 1976), but are abundant in the southwest (viz. and "Leptophloeum flora" known from at least 30 localities) and in the Dzungaria Basin of the Sinkiang Uighur Autonomous Region of northwestern China (including Psilophyton goldschmidii; Aneurophyton occurs in the Devonian of easternmost Inner Mongolia, but is as yet little studied). **CARBONIFEROUS:** Tournaisian assemblages (with Lepidodendron spp.) are well represented in the southeast (in the vicinity of Nanking, for example), in the Dzungaria Basin, and in Inner Mongolia. Vissean plants occur in both North and South China, but are especially diverse in Yunnan Province where they occur in thin coaly strata. And Namurian and Westphalian assemblages (being studied by ZHAO Xiu-hu at Nanking) are similarly well represented in both South and North China. Coal balls are as yet unknown in the Chinese Carboniferous. **PERMIAN:** Permian plants in China were first studied by T. G. Halle in the late 1920's (e.g. his "Gigantopteris flora", now usually referred to in China as the "Cathaysian flora"), but Halle's early work is now regarded as containing some errors both with respect to the stratigraphic source of the material he studied and the systematic position of the fossils he described (e.g. Halle's "Gigantopteris" has been referred to "Gigantonoclea"; for details regarding these apparent errors, contact LI Xing-xue in Nanking). Studies of the Permian of South China are being carried out by YAO Zhao-qi (1978) in Nanking; and HSU Jen in Peking is studying Upper (?) Permian coal balls (which apparently lack Glossopteris) and Gondwanaland floras (known only to occur in the P.R.C. in southern Tibet (see HSU Jen, 1976).

### Palaeobotanical and Palynological Monographs

Among others, the following monographs (copies of which were given me by our Chinese hosts) have been published since the early 1960's:  
 Section for study of the morphology of spores and pollen, Institute of Botanical Research, China Academy of Science. 1960. Morphology of Pollen in China. 276 pp. Peking (in Chinese).  
 Institute of Palaeobiological Research, Chinese Academy of Science. 1962. Handbook of Fossils of the Yangtze Region. 186 pp. + 98 pls. Peking. (In Chinese) LEE, Hsing-hsueh (=LI, Xing-xue). 1963. Fossil plants of the Yuehmenkou Series, North China. Palaeontologia Sinica, Whole Number 148, New Series A, No 6, 185 pp. + 45 pls. (Science Press, Peking-complete text in Chinese and in English).

Peking Institute of Botany and Nanking Institute of Geology and Palaeontology, China Academy of Science. 1974. Fossils of China: Botanical Fossils, vol. 1, Palaeozoic Plants of China: 227 pp. + 130 pls. Ed. by New Botany of China (Editorial Group for the Palaeozoic Plants of China), Peking. (in Chinese; contains descriptions of many upper Palaeozoic plant megafossils).

Nanking Institute of Geology and Palaeontology. 1974. Handbook of Palaeobiology of the Northwestern Region of China. 454 pp. + 202 pls. Peking, (in Chinese).

CHANG, Yu-sway et al. Eds., Spore and Pollen Section, Palaeobotanical Research Laboratory, Institute of Botanical Research, China Academy of Science. 1976. Morphology of Pteridophyte Spores of China. Peking. 451 pp. (in Chinese).

Peking Institute of Botany and Nanking Institute of Geology and Palaeontology, China Academy of Science. 1978. Fossils of China: Botanical Fossils, vol. 3, Cenozoic Plants of China: 232 pp. + 149 pls. Ed. by New Botany of China (Editorial Group for the Cenozoic Plants of China), Peking. (in Chinese; contains descriptions of many Cenozoic leaf genera).

### Miocene Flora

Since the mid-1940's, some American palaeobotanists have been concerned regarding the location and condition of type material described from the Miocene of Shantung Province by R.A. Chaney and HSEN Hsu-Hu (1940). The types were originally housed in the "collections of Type Specimens at the National Geological Survey of China". I was informed, however, that the types are now in the collections of the Nanking Institute of Geology and Palaeontology, and that the total flora is apparently intact (during the early 1940's, the types had been moved for their protection to Chungking in Szechuan Province). I was also informed that numerous specimens have been added to these collections, mostly by LI Hae-min, GUO Shuang-xing and HSU Jen, and that HSU at the Peking Institute of Botany now has an excellent additional collection of plant material from these strata.

### "Gondwanaland" Flora

The Glossopteris-flora recently reported by HSU (1976) is now known to occur at localities at Qubu, Quzong and Kujian (in the region about 50 km east-northeast of Mt. Everest); it is now interpreted by HSU as having been "rafted in" as part of the Indian tectonic plate (rather than as representing a disjunct, northern hemisphere, occurrence as apparently implied by Strid, 1976).

### Carboniferous Plant Fossils

Major collections of Chinese Permian and Carboniferous age plants are housed at the (i) Nanking Institute of Geology and Palaeontology; (ii) Peking Institute of Botany; (iii) National Museum of Natural History, Peking; (iv) National Museum of Natural History, Shanghai; and (v) the All-China Geological Bureau, Peking.

### Halle's Devonian Collections

LI informed me that the material studied in the 1930's by T. G. Halle (1936) was collected by WANG Y. L., a field geologist (now some 80 years of age) who currently lives in Peking. According to LI (who had previously discussed the matter with WANG), although WANG is certain of the geographic locality, he is not certain of the exact stratigraphic horizons from which he originally obtained the material. LI and CAI have collected additional specimens from the same section at the same locality, and they have summarized the stratigraphic setting in LI and CAI (1978); the matrix is a fine-grained, soft sandstone to claystone (and LI demonstrated to me that the leaves of Halle's Protolepidodendron fork once, rather than several times as they do, for example, in Leclercqia). In Figure I of LI and CAI (1978; fold-out diagram between pages 6 and 7), LI indicated to me that Halle's 1936 Drepanophycus comes from beds 1, 2, 3, 4, 15 and/or 16; that Drepanophycus also occurs in beds 22 and 23; and that Halle's Protolepidodendron, occurring with fish remains, comes from the labelled D2, upslope from the fault on the flank of the small knobby hill shown

at the NNW end of the section (with beds 1-5 overlain by D<sub>2</sub><sup>2</sup>) at the bottom right of the figure.

#### NOTES

1. The delegation, sponsored by the Botanical Society of America, was led by Dr. Lawrence Bogorad and included Dr. Bruce Bartholomew, Dr. Thomas S. Elias, Dr. Richard H. Hageman, Dr. Richard A. Howard, Dr. G. William Schopf, Dr. Jane Shen-Miller, Dr. Richard C. Starr, Dr. William Tai and Dr. Anita Thorhaug.

2. Entering and leaving the P.R.C. via Hong Kong, the trip included sequential visits to Canton, Kunming, Shanghai, Hangchow, Soochow, Nanking, Wuhan, Peking and Canton.

3. The Palynology and Palaeobotany Laboratories of the Nanking Institute of Geology and Palaeontology, Academia Sinica; and the Laboratory of Palaeobotany and Palynology of the Peking Institute of Botany, Academia Sinica.

4. At the Nanking Institute of Geology and Palaeontology; the Department of Biology, Nanking University; the Peking Institute of Botany; the Department of Geology, Peking University; and the Peking Institute of Geology and Mineral Resources, Chinese Academy of Geological Sciences.

5. Although this problem was alleviated to a considerable degree by the fact that several of the specialists I visited spoke English (most notably HSU Jen in Peking; LI Xing-xue and CHU Hao-jan in Nanking; and WU Cheng-yi in Kunming).

6. Among others, it was not possible to visit the Coal Academy Research Institute, in Sian; the Ministry of Coal in Peking; the Institute of Vertebrate Paleontology and Anthropology in Peking; Palynology laboratories associated with the petroleum industry; or the Precambrian geologists and palaeobiologists in Kunming or Wuhan (e.g. TING Chi-hsiu at the Hupeh Geological Bureau).

7. Precambrian studies at the Nanking Institute of Geology and Palaeontology were initiated in 1958, following a visit by the Soviet Paleophycologist A. G. Vologdin. In their early studies, the Nanking workers attempted to use oncolites for Precambrian stratigraphic correlation. This, however, proved fruitless, and they are now concentrating on columnar stromatolites, using an approach (and a taxonomic system) generally similar to that currently in use by the Soviet and Australian schools. Considerable work has been completed (chiefly by CAO and ZHAO), yielding results not inconsistent with those reported by Soviet, Australian, French and American "stromatoliphiles"; unfortunately, however, few recent Soviet publications on stromatolite biostratigraphy are apparently available in the P.R.C. and the Nanking workers have therefore been unable to compare in detail their results with those obtained in recent years from Soviet studies of the Russian and Siberian platforms.

8. In addition to SING Wu-shen, WANG Nai-shen, KAO Lin-chih, LIU Kui-chih and KAO Lian-ta, I also met at this institute LI Tseng-ming (Director of the Institute); LIU Chang-chun (Vice Deputy, Science and Technology Division of the Institute); TSAI Wen-yen (of the Geological Society of China); and CHIANG Jui-liang (interpreter).

9. These studies, apparently begun by SING nearly 20 years ago, have proven quite fruitful; spheroidal, unornamented acritarchs, many of which appear to be virtually identical to forms reported from Soviet Precambrian shales by B. V. Timofeev and his colleagues in Leningrad, have been obtained from strata representing all formations of the "Sinian Supersystem" (see stratigraphic section, p.4).

10. In addition to CHANG Yuen, at Peking University, I also met Professor YOH Sen-shing (Chairman of the Department of Geology, a specialist in invertebrate paleozoology-viz., tetracorals and brachiopods-who received his graduate education in West Germany). There are two professors in the Department of Geology, the other being Professor WANG Ni-tse, a well-known specialist in geophysics and geomechanics.

11. Although much of this work has proved quite fruitful, there continues to be some question among Chinese specialists as to whether certain of the "fossils" thus far described from the Sinian Supersystem are actually biogenic.

12. In addition to metaliferous deposits, evidence of indigenous Precambrian gas and/or petroleum has been reported from bituminous strata of the Kaoyuchuang and Wumishan Formations, and Precambrian coal is known from the Hsiamaling Formation and from a unit in Western Hupeh said to be more than 30 metres thick that "has long been mined and made use of by the natives" (SIN and LIU, 1972).

13. This is an especially crucial problem in studies of Precambrian biostratigraphy since reports of Soviet research, which have had a major influence in the field, are generally unavailable to workers in the P.R.C.

14. From 1948 through 1951, CHU was a student of L. H. Tiffany at Northwestern University; several of his early papers were published in English (e.g. CHU Hao-jan, 1944, 1952).

15. Among the most active of these is WU Cheng-yi, Director of the Kunming Botanical Institute, who is especially interested in the Himalayan flora and in disjunct distributions of taxa of modern plants.

16. This is the principal palaeobiological research institute in the P.R.C. The Director of the institute is CHAO King-ku, an ammonite specialist especially interested in the Permo-Triassic boundary problem (CHAO is also the distributor in China of the Newsletter of the International Organization of Palaeobotany). The Second Vice Director of the institute is MU An-tze, a graptolite specialist who most recently has worked in the Devonian of Tibet. The institute has a total staff of about 300 workers (150 scientific staff plus 150 administrative and supporting personnel) and is divided into six research units or "laboratories"; in addition to laboratories of palynology (Laboratory I) and palaeobotany (Laboratory II), the institute has three laboratories of invertebrate paleontology (Laboratory III = Lower Paleozoic invertebrates; Laboratory IV = Upper Paleozoic invertebrates; Laboratory V = Mesozoic and Cenozoic invertebrates), which together include nearly 90 scientific workers (about half of whom are in Laboratory V); a small group (about 15 workers) of paleoecologists-sedimentary geologists comprise Laboratory VI. The institute includes a large, excellent palaeontological library; a reading room containing an impressive set of recent periodicals; a photography laboratory; a thin sectioning laboratory; a graphic arts section; newly installed facilities for scanning electron microscopy; and a small museum that houses an excellent collection of representative plant invertebrate animal fossils. Three major publications are produced and edited at the institute: Palaeontologia Sinica, (Series A (Palaeobotany) and Series B (Invertebrate Paleontology), a publication principally devoted to long monographic treatments (Series C = Vertebrate Paleontology and Series D = Anthropology) are produced and edited at the Institute of Vertebrate Paleontology and Anthropology, Academia Sinica, in Peking); Acta Palaeontologica Sinica, a journal designed for relatively short paleobiologic reports; and Memoirs of the Nanking Institute of Geology and Palaeontology, a periodical devoted to "special papers", chiefly those intermediate in length between papers appearing in the other two publications. Work in the institute emphasizes (i) descriptive (and taxonomic) palaeobiology, and (ii) biostratigraphy. A considerable amount of "service work" (fossil identification, etc) for field geology teams is carried out by the institute staff.

17. Among the best known and most influential of botanical institutes in the P.R.C. the Peking Institute of Botany, Academia Sinica, was established in 1950 as a result of a merger between the Fan Memorial Institute of Botany and the Botanical Institute of the Peking Academy of Sciences. At present the institute includes about 700 workers (both scientific and supporting personnel) that staff a botanical

garden and the following seven laboratories: Laboratory of Plant Taxonomy (about 50 research workers with the principal responsibility of compiling and editing the "Flora of China", an 80-volume monographic work scheduled to be completed by 1985); Laboratory of Ecology and Geobotany (35 research workers, responsible for preparation of a vegetation and edaphic map of the P.R.C.); Laboratory of Morphology and Cytology (27 workers); Laboratory of Palaeobotany and Palynology (18 workers); Laboratory of Plant Physiology (60 workers); Laboratory of Nitrogen-Fixation (25 workers); and Laboratory of Phytochemistry (25 workers). The Palaeobotany-Palynology Laboratory was established in 1962 by HSU Jen (earlier, HSU had been a member of the staff at the Nanking Institute of Geology and Palaeontology (1942); a student at Lucknow University, India 1943-1946); a member of the staff and a doctoral student at the Birbal Sahni Institute of Palaeobotany in Lucknow (1946-1952); in 1952 he established a palynology laboratory at the Nanking Institute of Geology and Palaeontology; and from 1954-1962 he was responsible for establishing a palynology laboratory at the Academy of Geological Sciences in Peking). The Laboratory is divided into three principal subdivisions: (i) Precambrian, Paleozoic and Mesozoic palaeobotany; (ii) Cenozoic palaeobotany; and (iii) palynology (concerned chiefly with Recent and Cenozoic spores and pollen). Among these subdivisions, principal emphasis appears to be on Paleozoic and Mesozoic plant megafossils (including studies of recently discovered Upper-Permian calcareous "coal balls" from the Kweichow Province of Southern China) and of Recent spores and pollen (the laboratory contains a reference collection of 10,600 specimens, representing about 8,000 to 9,000 species). Laboratory facilities are scattered among several small buildings, one of which also houses a museum containing a small collection of representative plant megafossils from the P.R.C.

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#### BOOK REVIEWS

PATTERNS OF EVOLUTION, AS ILLUSTRATED BY THE FOSSIL RECORD. Ed. A Hallam, 1977. Elsevier Scientific Publishing Company. Developments in Palaeontology and Stratigraphy 5, 591 p., US \$69.50.

A general review of this book recently appeared in Circular 90 of the Palaeontological Association and so I will confine my remarks to that part of the book which concerns fossil plants. And that is where my major criticism lies. A palaeobotanist might assume (or at least hope) from the title that the book would contain several chapters on plant evolution patterns. It actually contains only one chapter on the subject. The reason for this is not oversight as one might think for the editor states, in his preface, that "only one chapter is devoted to plants, essentially because plant fossils have never in the past contributed much to our knowledge of evolution". This statement is surprising when we remember the extensive work of Florin on the evolutionary developments of the Late Paleozoic conifers and that of Banks, Beck, and others on the origin and radiation of the early land floras during the Silurian and Devonian. The author of the sole chapter on plant evolution in the book, J. A. Doyle, seems to agree with Hallam as he states that "Studies of major patterns of evolution based on the fossil record of plants .... have had little general impact compared to those of fossil animals". Even if that is true, and I wonder if it is, it would seem to me that fossil plants have as great a potential for contributing to our knowledge of at least some evolution processes as animals. Perhaps part of the problem is that a smaller number of palaeobotanists are working on evolutionary problems than paleozoologists or perhaps we just are not facing that issue in our work. If we

aren't we should face the challenge of making more evolutionary interpretations from our material than we have in the past. Hopefully, the chapter by Doyle will point the way for us.

The chapter is entitled "Patterns of evolution in early angiosperms".

In this thought provoking contribution he seeks to shed light on Darwin's famous "abominable mystery" by examining the timing and patterns of angiosperm evolution during the mid-Cretaceous. The chapter is well written but because of its eclectic coverage and detail the average reader will probably have to read it several times in order to derive the greatest benefit from it. Doyle begins with a concise general discussion of the evolutionary history of land plants. At this point he includes a chart showing the stratigraphic distribution of the major groups of vascular land plants in which he shows their presumed phylogenetic relationships by connecting at least some of the columns. (This is of particular interest because palaeobotanists rarely publish such charts although palaeozoologists commonly do so). In this chart Doyle connects the Lycopside and Sphenocoida with the Psilophytopsida and the Pterodispermales with the Progymnospermopsida which is then connected with the Psilophytopsida. He does not interconnect some of the other groups, including the angiosperms but he does, however, centre the angiosperm column over the Mesozoic seed fern column. It is not clear if he is implying a relationship here or whether the angiosperm column just happened to come out this way when it was drawn symmetrically. In any case this diagram should be useful in elementary palaeobotany courses. Doyle then examines the fossil record of the Cretaceous angiosperms placing particular emphasis on the pollen in the Early-Late Cretaceous Potomac and Raritan sequences of the Atlantic Coastal Plain of the United States with which he is so familiar. He shows that these strata can be divided into six biostratigraphic zones based on the angiosperm pollen and that there is a stratigraphic increase in abundance, numbers of species, and in range of morphological types of angiosperm pollen in the strata. The phylogenetic pattern this information forms is examined semiquantitatively by Doyle and shows there was a regular increase in the morphological types of angiosperm pollen and that the change in average advancement is higher in the earlier part of the record than in the later part. Early Cretaceous pollen of other formations and the less well-known mid-Cretaceous leaves fits the general pattern recognized in the Potomac-Raritan sequence by Doyle. He states that this pattern reflects progressive evolution of the angiosperms during the mid-Cretaceous and suggests that it could not have been obtained if the angiosperms had originated and diversified much earlier or if they had had a polyphyletic origin. He notes that his ideas do not point to a general way certain of Axelrod's concepts of the origin of the angiosperms although they do not support his concept of a long period of pre-Cretaceous diversification. Indeed Doyle implies that the evolutionary patterns of the mid-Cretaceous angiosperms indicates that they originated shortly before they appear in the geologic record. He also rejects the idea that they evolved any more rapidly once they appeared than other groups of organisms and compares the rate to that of the Late Silurian and Early to Middle Devonian land plants. In both cases the period of time involved is about 25 million years.

In conclusion I recommend that all palaeobotanists, especially the younger members of our club and others interested in the origin and early diversification of the angiosperms study this chapter carefully. It is well documented and summarizes current ideas on this important event in plant history. The remainder of the book is worth reading also although the price of the volume will limit its distribution.

S. R. Ash, Utah, USA

PHILOSOPHISCHE PROBLEME DER ARITHMETIK. U. Sucker, 1978. VEB Gustav Fischer Verlag, Jena. 119pp., 18.50M.

The ordinary straightforward palaeobotanist deals with his subject as a matter of course. Being confronted with entertaining the ideas of the most thoughtful muse of philosophy, if any exists, he may react in an embarrassed way, because his guardian

spirit would tell him that philosophy is merely a later and therefore illegitimate synonym of inconvenience.

Every now and then however we find ourselves gathering at a sort of Highland Game Party: chasing the wild organ-genus and following the form-genus. It happens at these opportunities that some of us, not perfectly used to the proper category of rifle and cartridge (or gun and shot), hit a nice companion rather than have a bad aim. Joking apart, we ought to know our terminology, based on terms, based on definitions, based on premises which doubtless have evolved in ways other than a monophyletic one. We may dislike it, but we can't neglect it.

To remind us of this malady and to offer relief, Dr Ulrich Sucker, fellow of the Humboldt University in Berlin has produced a concise paper on fundamental problems related to the use and the theory of the "species". It is printed on 119 handsome pages, with an index and a useful bibliography which includes many a well-known author. If only we would read them as well.

Regretfully, the book is in German: a language with a philosophy of its own.

K.U. Leistikow, Frankfurt, West Germany.

ORGANIC EVOLUTION IN THE CIRCUM-PACIFIC BELT: CHRONOLOGICAL AND PALEOBIOGEOGRAPHICAL BOUNDARIES. Ed. V.A. Krassilov, 1977. Academy of Sciences of the USSR; far eastern scientific centre. 160pp, 1 trouble 36kop. (In russian with english summaries)

In chapter 2, "Isoflora of the North Pacific Realm", the changing patterns of plant distribution around the north Pacific are analysed from the Permian to the Paleogene. They are said to correlate best with the hypothesis of an expanding Pacific Ocean, accompanied by a convergence of its northern coasts. Other chapters deal with the patterns of evolution and biogeography of foraminiferae, corals, ammonites, bivalves and conodonts.

B.A. Thomas, London, England.

INTERNATIONAL CODE OF BOTANICAL NOMENCLATURE adopted by the 12th International Botanical Congress, Leningrad, August 1975. Ed. F.A. Stafleu et al, September 1978. International Association for Plant Taxonomy. 457pp., 70Dfl.

This 1978 edition of the International Code of Botanical Nomenclature adopted by the twelfth International Botanical Congress, Leningrad, 1975, is similar to previous editions. In addition to the essential divisions of Principles, Rules and Recommendations, and Provisions for modification of the Code, the volume includes the French language and German language Codes, Guide for the determination of types, Appendices concerning hybrids, Conserved names with index, Bibliographia, a Concordance for article number changes for later editions of the Code, and a General index. The most obvious change in this edition is that all paragraphs have decimal numbers appended for each paragraph of every article. Many of the integral notes of previous editions are now simply numbered paragraphs. All of this should facilitate reference to particular passages of the "Leningrad" edition. The paragraphs specially concerned with fossil plants are 3.2; 7.15; 7.16; 9.3; 9.4; 11.1; 13.1(i); 13.3; 36.1; 36.2; 38.1; 39.1; 58.1; and 59.5. In addition the Committee for Fossil Plants is mentioned on page 67 and fossils are noted in the Guide for the determination of types (page 76). Nearly all the other paragraphs apply equally to names of both fossil and modern plants.

The major change that will be noticed in nomenclature of fossil plants is the deletion in Note 1, Article 3, of any reference to the organ-genus. This special category has been a source of divergent interpretation since the Amsterdam Congress of 1935, when instructions to distinguish between organ-genera and form-genera were issued, action to be taken at the next Botanical Congress. Prior to that time,



neither form-genera or organ-genera were mentioned in the Code; it may even be we should again revert to that policy where both concepts were used informally. Be it noted that, although the term "form-genus" seems to have arisen informally in paleozoology, that paleozoologists after due consideration (relating to parataxa) decided the formal concept was not needed. At the recent Botanical Congress in Leningrad, after consideration, deformatization of the organ-genus was adopted. The form-genus category remains as it was. It now remains to be seen whether or not the change regarding organ-genus serves to promote stability in the manner of treating names of fossil plants. It should be given a reasonable trial. Perhaps some further explanation is appropriate about the differences in ways "fossil, organ-genus" names may be regarded. In neobotany, regardless of the meagreness or inadequacy of sample, a name applies to all features that can be related to the same life cycle. The same reasoning can be applied in paleobotany to names of fossil plants, the only difference being that owing to organic disjunctions between different stages of the life cycle, each stage of a life cycle usually must be reported as if they represented separate subordinate taxonomic groups. Probably, owing to lack of homologous features for comparison, such taxa should be distinguished at the generic level. The groups of homologous features that permit comparison are usually taken to represent the "organs" of organ-genera. In this sense there is no essential classificatory difference between organ-genera and regular genera except that the number of homologous diagnostic features (biocharacters) of organ-genera is likely to be somewhat fewer than those of regular genera. It is, of course, fallacious to consider regular ("living") genera being completely known, or even approximately so. The potential for "complete" information is not much better for modern plants than it is for those represented by fossils. There is the difference in the manner of presenting evidence, however, that affects the reporting and the way the names should be regarded. Because of disjunct occurrences of stages of life cycle among fossils there is little doubt that reporting fossil material requires recognition of a greater number of taxa. The relationships of the taxa are likely to be phyletically overlapping, although discrete and definitive proof of relationship is only circumstantial. Yet the possibility of multiple overlapping relationships is not without benefits. Some groups of biocharacters are much more conservative than others. The greatest stratigraphic sensitivity occurs in groups of biocharacters that are the most liable to rapid genetic control. The doctrine of conservative organs, introduced by E.C. Jeffrey in 1917, is of greatest significance as a principle in paleobotany.

I believe there is not a very great difference between those who regard organ-genera as organs separated from the "complete" plants that are separately classifiable, and those who regard organ-genera as representatives of the same "complete" plants. The question is whether any parts of plants, as such, are separately classifiable according to the Code. If considered as a representation, they certainly do not need to be regarded as separate elements in order to achieve a satisfactory taxonomic result. I find it difficult to contradict the plant-representative doctrine because there are great advantages in identification of fossils as botanical objects, whether the identification is at a low or a high level taxonomically. Moreover, the doctrine of the separately classifiable organs find no justification in modern botany. Since all modern plants have ancestors, I think there is little benefit in attempting to separate arbitrarily fossil (ancient) from modern. Surely there are many complementary values to be derived in studying the plant kingdom as a whole with as great a degree of accuracy as can be achieved. Of course, special classification systems have been used in classifying seeds and similar objects. Such classification systems are a great convenience but they are not usually regarded as taxonomic. One of the important changes made at Leningrad was the deletion from Article 42

of special regulations for monotypic genera based on fossils that required separate generic and specific diagnoses. Monotypic diagnoses are legitimate for modern plants and it had never been very clear why the separate diagnoses were needed for fossil plants. It seemed to be a technicality inherited from the PB Appendix of 1956 that attempted to specify more formalistic distinctions. So far as monotypic taxa are concerned, fossil and modern plants are now on an equal footing. Article 42 applies to all plants, fossil or modern. Similarly, Article 16 now permits the author a choice about typification of the name of a supra-familial taxon. As before, neither priority or typification of such names is mandatory, but such names (taxonomic, not descriptive) may be automatically typified if they are ultimately based on a generic name. Anyone concerned with arrangements of suprafamilial taxa will find some advantage in being permitted an option. In spite of these changes, the differences from the 1972 "Seattle" edition of the Code are relatively small. I still look forward to a time when provisions in the Code do not change for every Congress. However, the changes now presented in the 1978 "Leningrad" Code are sufficiently significant that no paleobotanist should be without an authoritative copy.

James M. Schopf

(This review was received in London on September 25th, together with a letter dated September 14th, which began: "The Code arrived at last. Before entering hospital, I wrote a review of it, based on the first proof. On receiving the Code, my review has been checked against it, and I believe no changes need be made. I am therefore enclosing a copy for publication in Newsletter 7." - M.C.B.)