IOP NEWSLETTER 33

INTERNATIONAL ORGANIZATION OF PALAEOBOTANY

INTERNATIONAL UNION OF BIOLOGICAL SCIENCES
-SECTION FOR PALAEOBOTANY
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Secretary: Dr. M. C. BOULTER
N. E. London Polytechnic,
Romford Road,
London, E15 4LZ, England.

JULY 1987

BERLIN CONGRESS SPECIAL EDITION

PLEASE MAIL NEWS AND CORRESPONDENCE TO YOUR REGIONAL REPRESENTATIVE OR TO THE SECRETARY FOR THE NEXT NEWSLETTER 34. The views expressed in the newsletter are those of its correspondents and do not necessarily reflect the policy of IOP.

S.V. MEYEN: 1935 - 1987 IOP VICE-PRESIDENT

We are sorry to inform you of the death of Sergei Victorovich Meyen, Doctor of Geology and Minerology, Head of the Laboratory of Palaeofloristics at the Geological Institute of the USSR Academy of Sciences.
He died after a long and serious illness on March 30, 1987 at the age of 51.
The name of Dr Meyen is well known to palaeobotanists and biostratigraphers. He was the leading Soviet expert in Palaeozoic floras, which he had studied successfully for 30 years.
His public activities in science are well known for all those who research in the evolutionary sciences. He was a member of the editorial boards of the journals Palaeontographica, Biological Memoirs and the Palaeobotanist, and had been a very active Vice-President of the International Organization of Palaeobotany for ten years.
He was a good friend to the staff of the Geological Institute in Moscow and to many others all over the world. It is a tragic loss to all of us, but we are grateful that he has been with us for all this time.
A. GOMANKOV, I. IGNATIEV, colleagues and students of Dr. S. V. Meyen, at the Laboatory of Palaeofloristics, Geological Institute, USSR Academy of Sciences, Moscow, USSR.

We in Leningrad (and even many colleagues in Moscow) didn't know of Meyen's terrible illness. His death has shaken all of us very deeply indeed.
I remember Sergei Meyen very well at the beginning of his research career as an assistant of Professor Neuburg in the Geological Institute of the Academy of Sciences of the U.S.S.R. Already then it was clear that he had a great future as a scholar. He always maintained this youthful energy and sensual passion for the science. He was able to penetrate an infinitely wide scope within problems of geology and botany, with great erudition. This wonderful sense of purpose and fantastic fruitfulness were native to him. His numerous writings will be a memorial to his versatile talent and very superior mind. He shared his passion and devotion to the science with a very deep attachment to his family. His wife Margarita Meyer was his faaithful assistant and she played a great role in establishing his success in research. He loved life and up to the end of it believed in the future and made ambitious plans.
N. SVESHNIKOVA, Leningrad, USSR.

IOP BERLIN CONGRESS NEWS

CHANGES TO THE CONSTITUTION
1. In 1983, the IOP Executive Committee approved the principle that all IOP members should be able to vote, including those in countries with nonconvertible currencies. This is not explicit in the present Constitution (see IOP Newsletters 3 or 32) and so the following change is proposed by the Secretary:
DELETE Article IV 3
SUBSTITUTE Article IV 3 "Individual membership, including that referred to in By Law 5, includes voting rights, the privilege of holding office, and receipt of the Newsletter."

SECOND DRAFT AGENDA, IOP GENERAL ASSEMBLY, BERLIN, July 1987
1. Respects to deceased colleagues
2. Newsletter distribution and definition of membership in China, India, USSR, East Europe and North America.
3. 4th IOPC date and venue
4. Comments and questions to the Executive Committee
5. An appeal for less lethargy within the membership
6. Changes to the Statutes
7. Lack of funding from IUBS
8. Election of Officers
9. Any other business.

IOP MEMBERSHIP LIST
This list has been up-dated with information available in London at the end of June 1987 and includes full addresses and dues payment details for most members. No information is available for members in the Soviet Union, Peoples' Republic of China or India. Copies are available at the Berlin Congress, or directly from the IOP Secretary (please send money for postage).

3RD IOPC, MELBOURNE, AUSTRALIA, 19 - 27 August, 1988
The Third Circular is now available and will be distributed to all those who have responded to earlier requests for details. Copies will be available at the Berlin IBC.

A PROPOSAL FOR THE 4TH IOPC IN JAPAN, 1992.
It has become traditional for IOP to arrange its own Conference adjacent to each International Palynological Congress (IPC). This is a meeting additional to the palaeobotanical gatherings at each International Botanical Congress (IBC). The IPC takes place once every four years and the IBC every six years.
There is no constitutional procedure for fixing locations and dates for IOPC meetings. The decision on the location of the next IPC will presumably be atified in Brisbane, 1988. Some may favour awaiting the outcome of that decision before fixing a location for IOPC 1992.
Meanwhile, Professor Tatsuaki Kimura, Department of Astronomy and Earth Sciences, Tokyo Gakugei University, Koganei, Tokyo 184, Japan, has recently written:
"The 8th IPC will be held at Nagasaki University, Nagasaki, Kyushu, in the far western part of Japan during late March and early April, 1992. The chief organiser is to be Professor Kiyoshi Takahashi, Nagasaki University.
"I would like to suggest that I convene the 4th IOP Conference in Tokyo, in middle April 1992. Please see that this invitation is considered at the IOP General Assembly in Berlin.
"We prefer the middle of April to the middle of March because it will still be cold in middle March in Tokyo and most fossil plant localities in the Inner Zone of Japan (the Japan Sea coast) will be covered with thick snow.
"In 1989 I will be moving from Tokyo Gakugei University to the private women's college at Majirogakuen, which was built by me in 1963. The college has several good halls, meeting places and restaurants on its campus. You will have good reception from its students. But the college has no open dormitory.
"The universities and colleges in Japan have their own dormitories, but they are not open even in the summer or inbetween sessions. Accordingly, participants at a 4th IOPC here will have to stay at hotels, or so-called 'business-hotels' in Tokyo. Hotel charges in these are Y5,500 - 8,000 (single room with bath and toilet) or US$37 - 54 at June 1987 exchange rates. It takes about 30 - 45 minutes from the centre of Tokyo to the Mejirogakuen.
"Everything is expensive now in Japan. The exchange rate against the US$ has nearly doubled since 1985, though we hope for its stabilisation.
"In Japan, Palaeozoic plants are rare and restricted in distribution. Mesozoic plants are abundant and their beds are of marine origin or sandwiched in between the strata of marine origin. Cenozoic plants are also abundant and extensively distributed.We can arrange to visit some of these sites together with Japanese local folklore sites, by bus, within 3 - 4 days."

NEWS OF A FORTHCOMING MEETING

INTERNATIONAL SYMPOSIUM ON CIRCUM-MEDITERRANEAN PALYNOLOGY, Zeist, The Netherlands, April 19-23, 1988.
This meeting is being organised by the CIMP and the Laboratory of Palaeobotany and Palynology of the University of Utrecht. It will include work on Mesozoic and Cenozoic palynology as well as that from the Palaeozoic, more usually associated with CIMP.
Write to: Secetariat, Symposium on Circum-Mediterranean Palynology, Laboratory of Palaeobotany & Palynology, Heidelberglaan 2, 3584 CS Utrecht, The Netherlands.

NEWS OF A RECENT MEETING

5TH MID-CONTINENTAL PALAEOBOTANICAL CONFERENCE, Bloomington, Indiana, USA. May 8 - 10th 1987
35 people attended, and came from as far away as Virginia, Alberta and California.
Bruce Tiffney (University of California, Santa Barbara) lectured on "Changes in seed size through the fossil record". After a brief review of the ecological significance of seed size to the habitat of the parent plant and to modes of dispersal, he examined the fossil record of seeds. Three of the more significant points made were (1) the small size of many Palaeozoic seeds, (2) the anomalously large size of most Medullosan seeds (the subject of a second brief presentation) and (3) the small seed size of the early Angiosperms relative to the range of seed sizes of co-eval gymnosperms. In a talk spanning the whole record of terrestrial plants, and simultaneously invoking the record of terrestrial vertebrates, there was material to intrigue (or enrage) almost everybody.
Tom Phillips (University of Illinois) detailed the distribution, origin and chemistry of coal balls. While coal balls are not rare (being intercontinental), they are localized. While some are formed under marine influence, the majority are formed in fresh water environments, and are arranged in linear array, suggesting some control by channels or other linear features. Formation can be demonstrated "from the bottom up" in some cases, and simultaneously through the whole thickness in others. The controls of formation appear to lie in the swamp pH and in the nature of the global carbon cycle, as suggested by studies of carbon isotopes. However, while patterns are becoming increasingly apparent, the mechanism is still not understood or predictable.
Warren Kovach (Indiana University) followed with a quantitive palaeoecological study of megaspores and other small-sized plant remains from the Dakota Formation. Statistical analyses of megaspores of lycopods, "Isoetites", and aquatic ferns, along with Spermatites and various other entities, permitted him to try to characterize depositioinal environments of the nearshore region by botanical content, and to estimate the habitat of growth of some of the source plants by patterns of occurence of their remains in various depositional environments.
Bruce Tiffney returned with a detailed examination of the

potential modes of dispersal of Medullosan seeds. The seed size of some species, together with the presumed ecology of the parent plant, suggest that abiotic dispersal would not be particularly effective. On the other hand, the inferred biology of early reptiles, and the pattern of their inital geographic spread, offers the hypothesis that some of the larger Medullosan seeds may have been facultatively distributed by tetrapods.

Pat Herendeen (Indiana University) reviewed some wind dispersed legume fruits, particularly those of the Eocene Mississippi Embayment floras. His study did result in the identification of certain modern genera or groups of genera as similar to some of the fossil material. However, in my estimatation, his contribution is particularly significant in demonstrating the systematic importance of the combination of veination and cuticular characters in the identification of legume pods.

Hazel Beeler (Virginia Polytechnic & State University) presented a detailed sedimentological examination of upper Mississippian deltaic environments and their plant cover. The picture that emerged from the study site was of a crevasse-splay built out onto inter-distributory muds. The only in-situ plants in this disturbed environment appear to have been well spaced lycopods, with Cardiopteridium pinnules rafted in. Whether this was the permanent vegetation in this environment, or whether it was successional, is unclear.

Paul Grote (Indiana Univer sity) returned the discussion to seeds, with a review of some selected fruits and seeds from the Middle Eocene Claiborne Formation of the Mississippi Embayment. Of particular note were two fruits allied to the Theaceae. The first was a loculicidally-dehiscent, columellate, capsule, with five subtending imbricate sepals, bearing 2 seeds per locule, which is quite similar to Gordonia/Franklinia. Dispersed, winged seeds similar to those of Gordonia are also found in associated sediments. At the other extreme, is a large, indehiscent, five-locular capsule, with five imbricate sepals, and with three larger seeds per locule. Here the closest comparison is with extant genera in the Ternstroemioideae, of which Anneslea serves as a good example. He also illustrated some as-yet-unidentified seeds, both in the talk, and in a separate exhibit. Besides the report of new taxa, this work demonstrates the potential for extending palaeocarpological research to the southeastern Eocene.

David Dilcher (Indiana University) picked up the speculative tone set by Tiffney's evening talk, and examined the logic of the origin of the carpel. After considering its potential significance as a protective organ, he suggested that an alternative interpretation could involve the derivation of bi-sexual flowers from more primitive unisexual ancestors under the selective influence of insect pollinators. A pollen-laden bug in a system of flowers with separate sexes can visit either a staminate of a pistillate flower, but only the latter would be significant. Thus a selective pressure to make "every visit count" would favour the evolution of bisexual flowers. However, this raises the potential for inbreeding, with associated disadvantages. The interpolation of carpellary tissue between the pollen grain and the ovule raises the possibility of the

development of self-incompatability. In this scenario, carpel closure is motivated by biochemical, not mechanical, selective pressure. Mulcahey-esque pollen competition is a subsequent by-product of this system.

Larry Matten (Southern Illinois University) brought a puzzle for general consideration, in the form of an Upper Devonian lycopod axis infested with what was apparently a fungus. At first glance the specimen was simply dirty; at a second look, the interpretation of fungal infestation seemed reasonable. However, given a long and careful examination, the mode and sequence of preservation that would yield the apparent fossil became more and more problematic (never mind what the biological relation of the fungus and the fossil might have been). Larry's presentation occasioned much discussion, and was an excellent cautionary tale of the value of looking carefully at that which seemed obvious!

Ruth Stockey (University of Alberta) summarized several recently-investigated permineralized fruits, seeds and axes from the Eocene Princeton Chert of British Columbia. Among the entities reported were seeds of the Araceae (close to Epipremnum), petiolar remnants of Sabaloid palms, seeds similar to Decodon (Lythraceae) Vitis (Vitaceae) and perhaps the Nymphaeaceae, along with other seeds and fruits as-yet-unidentified. She also provided more data on Eorhiza, which now appears to have a dicot-like stem anatomy, monocot leaves, and be associated with a 4-5 locular fruit with many anatropous seeds. While the absence of external morphology is lamentable in these specimens, the glorious internal preservation more than makes up.

Steve Manchester (Indiana University) brought the formal presentations to a close with a review of several extinct genera of angiosperms in western North America. Most of these were based on the association of separate organs, each of which individually often suggested an extant genus, but when taken in aggregate, revealed a new biological entity. The published example of this phenomenon is Fagopsis. To this Steve added leaves of "Carpinus" from the John Day, associated with flower-like winged fruits; leaves of "Zelkova" from Florissant associated with winged Embothrites or Lomatia fruits; and leaves called Asarum by Chaney and Nymphoides by Brown which may be associated with a Tilia fruiting structure, and thus assigned to the Tiliaceae. In addition, new and more detailed specimens of fruits called Holmskioldia demonstrate it to probably have Malvalean affinities, and fruits called variously Ulmus, Ptelea, Pteleacarpum and Koelreuteria probably come closest to the latter genus, but are different in details. Apart from the difficulties these discoveries cause to those trying to keep track of synonomies, Steve's work demonstrates an unsuspected diversity of intermediate forms, and a dynamic pace or arboreal angiosperm evolution, in the late Palaeogene.

There were also several demonstrations. Gar Rothwell (Ohio University) and Ruth Stockey exhibited some gorgeous fossil Ophioglossales from the Palaeogene of Alberta. Quiangsheng Huang and Zhenbo Sun (Indiana University) exhibited plants from the Lower Cretaceous Cheyenne Formation of Kansas and from the Eocene Warman Clay pit of Tennessee, respectively, in both cases associated with their graduate research. Shyamala Chitaley

(Cleveland Museum of Natural History) exhibited a structurally-preserved lycopod axis from the Upper Devonian of Pennsylvania. The evening session was devoted to illustrated stories of palaeobotanists in which everyone was invited to show slides of palaeobotanists in their element. This was an extremely enjoyable finale to a great meeting. Among others, Shyamala Chitaley provided pictures and commentary on Birbal Sahni and Tom Harris, Bruce Tiffney told some of the dark secrets of the Brandon Lignite, and Ruth Stockey put faces to names with some wonderful pictures of east European and Soviet colleagues at the time of the International Congress in Leningrad. Several people had candid photos from Palaeobotanical Section field trips at the time of AIBS meetings; these prompted informal contests of "can you guess who that younger person is?" From the outset, the meeting was marked by the relaxed atmosphere that makes these regional meetings such a contrast and a delight in comparison to the harried national meetings. The Indiana palaeobotanical team is to be congratulated on the fine spirit, physical surroundings and support work.
B.H. TIFFNEY, California, USA.

REPLICAS AND POSTERS OF FOSSIL PLANTS

Stuart A. Baldwin supplies "Educational Palaeontological Reproductions" and his note-paper boasts that he is the "World Leader in Scientific Fossil Replicas". His business has three items of likely interest to IOP members:
1. JOHN RAY (1627-1705) ESSEX NATURALIST
This 80 page booklet summarises the life, work and scientific significnce of this famous man. The biography includes facsimile reproductions of drawings and title-pages from some of Ray's works as well as a useful bibliography. It costs UKL2.15 plus postage.
2. Baldwin's latest fossil plant catalogue lists replicas of numerous Carboniferous plants as well as a few made from Mesozoic and Cenozoic fossils. He also has a stock of well over 20,000 items of antiquarian books and reprints, including much on palynology and other plant material.
3. He is clearing out copies of Chaloner and Collinson's "An illustrated key to the commoner Upper Carboniferous compression plant fossils": Proc. Geol. Ass. 86, 1975. These are reduced to UKL1.00 each or 10 for UKL8.00, and the pair of wall charts that were developed from them are being sold off at 50p a set, or 10 sets for UKL4.00. Add money for postage.
Write to: S.A. Baldwin, Fossil Hall, Boars Tye Road, Silver End, Witham, Essex CM8 3QA, UK.

CALLIPTERIS NOMENCLATURE: a correction

IOP Newsletter 31 pages 9-10 included an item by Cai Chongyang entitled "Callipteris is actually a synonym of an extant fern". The original typescript contained a typing error in the fourth paragraph, referring to Callixylon instead of Callipteris. This

was not corrected in the newsletter version.
The same article encouraged two other responses. A. Traverse, Pennsylvania, says that "what Chongyang meant (should have meant) throughout was homonym, not synonym."..."and the difference is an important difference." W.G. Chaloner, London, cites two references from Taxon by J.H.F. Kerp, Utrecht: volume 30, 1981, pp.660-663 and volume 35, 1986, pp. 370-371, which "say it all - it's an untidy story, but the name overlap is clear enough".

NEWS FROM ROMANIA

Recently, Prof. R. Givulescu described a new taxon Pterocarya orsbergensis (Weber & Wessel) Jahnichen et al. for the Pontian flora of Chiuzbaia (NW of Romania); it is the last occurence of Pterocarya orsbergensis in the fossil flora of Europe (Re. Roum. Geol. Geophys. Geogr., Geologie, t.30, 1986) The same author discusses the morphology of trilobate leaves of Liquidambar europea Braunn from the Chiuzbaia flora. He concludes: there are two morphological types with horizontal lateral lobes and oblique lateral lobes. The leaf dimorphism is present before the Upper Miocene (Cour.-Forsch.-Inst. Senckenberg, 86, Frankfurt am Main, 1986).
R. Givulescu and L. Ruffle present an exceptionally well preserved specimen of Zanthoxylon europaeum = Weinmannia europea originating in Sarmatian deposits. The authors reach the conclusion that for phytogeographical reasons, we must turn back to Unger's old denomination and give up the exclusively tropical genus Weinmannia. Obtain futher information from Prof. R. Givulescu, Donath - str. 17/M2/66, 3400 Cluj-Napoca.
Under the auspices of the research programme between the Universities of Bucharest and the Ruhr, Drs Bochum, Dragastan and Trappe have investigated a section of the Liassic of Prejano (Spain) and have described six species of Sinemurian dasyclad algae (including 3 new species).
O. DRAGASTAN, Bucharest, Rumania.

ALL CATS LOOK THE SAME IN THE DARK - LM AND SEM IN PALAEOPALYNOLOGY

The Scanning Electron Microscope (SEM) began to be used extensively in the early 1970's by several groups of workers investigating the early angiosperms for studying both fossil and recent pollen morphology. This resulted in the publication of several major works such as Doyle, Van Campo & Lugardon (1975: Pollen et Spores), Walker (1976: The Evolutionary Significance of the Exine Linnean Society Symposium Series, I. and Origin and Early Evolution of Angiosperms, Columbia U.P.), Hughes (1977: 6th Birbal Sahni Memorial Lecture Lucknow), Hughes, Drewry & Laing (1979: Palaeontology, 22). These showed that many features of the morphology of the tectum were clearer to see in the SEM than they were under the light microscope (LM). In fact, several characters such as structure of the aperture membrane, shape of columellae and supramural sculpturing were seen for the first

time in the SEM.
As Batten (1986: Special Paps. Palaeontology, 35) shows, there are some fossil pollen groups, such as Vancampopollenites which have internal structures such as pore chambers, which are only visible in complete specimens in transmitted light. In this example the shape of the chamber can be used as a taxonomic feature. Yet even these palynomorphs of the Normapolles group, with relatively simple external morphology, have characters which are only clear when viewed in the SEM. This can be seen in the species V. endotriangulus Kedves and Pittau (Batten 1986, Plate 8, Fig. 4 and 5) which in SEM has either entire walls and small granules, or strongly perforated walls and no granules. Such differences in wall structure and sculpture, not visible on specimens viewed in the LM, are the type of character differences which one might expect to find in the pollen of two closely related species (Chapman, 1982: PhD thesis, Cambridge University).
Chapman (1986: Special Paps. Palaeontology,35) showed that when a group of pollen grains classified into one taxon because of the presence of large morphological features, such as similar aperture types (Chapman, 1980: 5th I.P.C. Abstracts), are studied using the SEM, several features become visible which make it difficult to split the group any further into fossil species.
When SEM photomicrographs of all the grains of a particular group from one or several samples are compared, these grains cannot be divided readily into discrete species. This is because accurate measuring of variable characters (only possible with sufficient resolution from SEM pictures) plus additional information of other discrete characters, often produces a pattern of continuation with varied associations of discrete characters (Chapman, 1982, 1986). Study with the LM of the same sample preparations show differences only in major characters such as reticulum patterns (mazed, bimodally distributed lumina, etc.) and aperture size (short, circumsulcate, etc.). This problem is found to a greater or lesser extent in many other groups of Cretaceous angiosperm pollen (Chapman, 1982).
Batten (1986) considers that the use of the SEM alone to study fossil palynomorphs is "controversial" and writes that "whether this approach is beneficial to the discipline of palynological taxonomy is debatable" (p.2). He mentions that Chapman (1986) "demonstrates some of the problems that can arise when reliance is placed solely on observations made under the SEM". (p.2 italics mine). This implies that use of the light microscope will eliminate these problems.
The amount of variation seen with the SEM in fossil pollen groups is obviously a reflection of the true biological species which produced the palynomorphs. This complexity must reflect the complex interrelationships of the individuals in different genera and species, and the development of their pollen. The fact that if a LM is used these complexities cannot be seen does not mean they do not exist. Although, for most early-mid Cretaceous angiosperm pollen groups, the LM can be used to divide the pollen flora into major groups on large morphological features, it yields no useful information for splitting groups into smaller taxa.
The LM may remain the basic tool for palynologists because of low

costs and ease of use as Batten (1986) predicts. If, however, the taxonomy of these isolated fossil palynomorphs is to be more fully understood, the most accurate data possible must be used. For early Cretaceous angiosperms this, at present, is obtained when every grain of a particular group encountered in a given volume of sample is photographed in the SEM and studied. Hand picking of individuals from a sample is not a satisfactory substitute for study of a strew of a sample; it cannot represent the whole population as it introduces the human bias of choice. Discovering the extent of, and trying to understand, the complexity of an assemblage is surely the next step in trying to increase the accuracy and finnesse of stratigraphic correlation. Where the light microscope can add no extra evidence it must be abandoned, at least until a taxonomy for the group using SEM has been formulated. Then the observations obtained using LM can be assessed using the results of the SEM classification, to determine how precisely the LM data can be interpreted.
Use of the SEM in this way is a challenge, and, of course, it causes problems: problems of how to handle unforseen excess variation. It has been suggested that, by using LM in conjunction with SEM, taxonomy will be made easier. This appears to imply that palynomorphs can be identified more easily when fewer (i.e. only larger) details are visible. The fine micromorphological detail does not go away because we cannot see it, nor does the problem of interpreting the complex interrelationships of fossil pollen groups. The SEM study is beneficial to the discipline of palynological taxonomy, even if it makes that discipline harder to interpret, because it offers the taxonomist and stratigrapher a number of extra characters not visible using LM.
J. L. CHAPMAN Cambridge, U.K.

NEWS OF AN INDIVIDUAL

BRUCE H. TIFFNEY: moved to the Department of Geological Sciences, University of California, Santa Barbara, California 93106. Phone (805)-961-2959, as of December, 1986. The institutional palaeobotany collections are virtually non-existant, and it is a substantial drive to near-by field localities, but colleagues passing through the area are warmly encouraged to visit. While it may take 10 years to remedy the collections problem, the neobotany is great, and we are in the middle of excellent wine country.

OBITUARY

Doctor Sergei Victorovich Meyen, Vice President of IOP, one of the most oustanding paleobotanists of our time died on March 30th after a long and painful illness.
Dr Meyen was born on December 17th 1935 in Moscow. Having graduated from the Moscow State University in 1958, he started working at the Laboratory of Palaeofloristics in the Geological Institute of the USSR Academy of Sciences and spent almost 30 years studying Upper Palaeozoic floras of Angaraland at this

laboratory. In the last year of his life, he succeeded Professor V. A. Vakhrameev as Head of the Laboratory. Meyen's scientific style in palaeobotany was characterized by the most detailed morphological investigations of fossil plants as well as by broad implications in phylogeny, phytogeography and stratigraphy. We owe to him the exceptional progress made in our understanding of morphology and taxonomy of such plant groups from Angaraland as cordaites, articulates, lepidophytes, pteridosperms, and conifers.

In the 1960's he undertook the broad investigation of Palaeozoic phytogeography which resulted in a series of detailed phytogeographic maps summarized in a book on Palaeozoic and Mesozoic floras of Eurasia (Russian edition, 1970), written together with a group of Moscow palaeobotanists. Meyen's doctoral thesis presented in 1969 comprised the pioneer analysis of the florogenesis as a natural process and the first florogenetic tree. Later, Meyen developed this topic by creating the theory of phytospreading. The manuscripts containing the theory's basic concepts will be published posthumously by his pupils. In 1984 Meyen published a large paper "Basic features of gymnosperm systematics and phylogeny as shown by the fossil record", which contained a new original view on the phylogeny and systematics of gymnosperms and gave rise to a powerful resonance in the whole palaeobotanical world.

Still, this year's publication of Meyen's textbook "Fundamentals of Palaeobotany" which appeared simultaneously in the USSR and England, actually summarized his palaeobotanical studies. The first English copy of this book was delivered to Meyen only two hours before his death.

Meyen was always full of energy and scientific plans. Over the last months, being already seriously ill he still continued his palaeobotanic research and management of his laboratory. His permanent kindness and humour as well as huge errudition in many aspects of biological and geological sciences attracted to him a great number of people of diverse scientific interests and views. He created the entire Soviet school of palaeobotanists comprising scientists working at different ends of the country. He will be remembered with love and respect both by those who knew him personally and those who only corresponded with him.

A. V. GOMANKOV Moscow, U.S.S.R.

BOOK REVIEWS

LATE TRIASSIC AND EARLY-MIDDLE JURASSIC FOSSIL PLANTS FROM NORTHERN TERN SICHUAN. YE Mei-na, LIU Xing-yi et al, 1986. 141pp., 56 plants, 6 tables Anhui Science & Technology Publishing House. Wuhu, P. R. China.

This is the first monograph on the Mesozoic plants from Noth-eastern Sichuan. 171 species pertinent to 78 genera are described by Ye. Descriptions of geological sections are offered by Liu et al of the Geological Team in a separate chapter. With her usual observation and preciseness, Ye worked out the fine result in a readable manuscript. Eight new species are erected, 28 species are hitherto unknown to China. Among them,

Vardekloeftia sulcata Harris and Grammaephloios icthya Harris from East Greenland represented here in more or less correlated horizons are rather interesting. Specimens of Cynepteris lasiophora Ash had already been found in China but were described under different designations, though fine examples of both sterile and fertile pinnae were available. It is Ye who assigns them to the species erected by Ash. But Ye regrets that limited by the scope of the project, any attempt on cuticle preparation was impossible. As a critical observer, she has to identify some species of gymnosperms with considerable reservation, and leaves the further investigation to a forthcoming opportunity, for which she is longing.

To the nomenclature, Ye has paid due attention. Taking the well known fern Todites denticulatus (Bongn.) Krasser of Mesozoic for example, it is interesting to note that Cl. denticulata (Brongn.) Fontaine has been believed by Harris (1961) as the name for the sterile pinnae of the former. But, in fact, Cl. denticulata as proposed by Fontaine in 1889 is nothing to do with the British Cl. denticulata (Brongn.). (Pecopteris denticulata Brongniart has aleady been transfered to the genus Cladophlebis by Nathorst, 1876). As a homonum junius, the specific name Cl. denticulata Fontaine for the American material should thus be discarded. In the meanwhile Ye points out that Baiera multipartita Sze et Lee (1952) is valid though it appears seemingly a nomen praeoccupatum, inasmuch as there are in the literatures Baiera multipatita Schimper (see Schenk, 1871), and Baiera multipartita Schenk (see Seward, 1900), the former was only a slip of the pen for Baiera pluripartita Schimper. (The same specimen described as B. pluripartita Schimper in the text of Schenk but in the explanation of plate, it is illustrated as B.multipartita Schimper). The name B. multipartita given by Sze et Lee should be regarded as nomen conservandum. In this connection, Ye is able to note that Pterophyllum ctenoides Oishi (1932) and Nilssonia undulata Stockmans et Mathieu (1939) have already been used by Braun (1851, see Schenk, 1867; Schimper, 1870-72) and Harris (1932) respectively. For those, new names are needed.

In the conclusion, the botanical characters are analysed. Vertical distribution of floral elements is summarized together with a detailed correlation of the flora with roughly contemporaneous floras of the world. Ye reaches the conclusion that the assemblages from Hsuchiaho Formation is Late Norian to Rhaetian in age, and those from the Zhenzhuchong Formation, Early Jurassic. The book is written in Chinese, with the conclusion translated in English. Most of the illustrations and tables are accompanied with an English explanation. One can get a general idea on the Late Triassic and Early-Middle Jurassic floral aspects of South China respectively after a perusal of the book. The book can be bought from the Institute of Geology and Palaeontology, Academia Sinica, Nanjing, P. R. China.

ZHAZNG SHEZN-ZHEN, Nanjing, P. R. China.

TATARINOVAJA FLORA - SOSTAV I RASPROSTRANENIJE V POZDNEJ PERMI EVRAZII (The Tatarina Flora - its composition and extension in Eurasia during the Upper Permian). A. V. Gomankov & S. V. Meyen,

1986. Trudy 401, 174 pp., 16 Pls, 4 tables, 81 text-figs. Nauka.
As usual, Sergei Meyen again presents data of fundamental importance, this time with his colleague A. V. Gomankov from the Geological Institute of the USSR Academy of Sciences. The paperback monograph represents a comprehensive, well elaborated study on plant assemblages from seventeen localities in the territory of Malaja Severnaja Dvina, Sukhona and Viatka rivers, i.e. from the stratotype area of the uppermost Permian strata (Upper Tatarian) in the Soviet Union. The concept of the "Tatarian Flora", a new palaeofloristic phenomenon, has its course in some 10-years long investigation of the Severnaja Dvina River Fm. plant-bearing deposits (S. Dvina River and Viatka River Horizons in Russian terminology). The treatment performed mainly with the help of cuticular analysis has brought 36 specific determinations, including 24 new species and 9 newly erected genera of Hepaticopsida (Pelliothallites MEYEN), Bryopsida (Rhizinigerrites MEYEN), Lycopodiophyta (Fascistomia GOMANKOV), Polypodiophyta (Fefilopterris GOMANKOV), Peltaspermaceae (Peltaspermopsis GOMANKOV, Salpingocarrpus MEYEN, Doliostomia MEYEN), Lebachiaceae (Dvinostrobus GOMANKOV et MEYEN) and gen. et sp. inc. sed. (Arisada MEYEN). Evidently, the main attention was paid to the description of Ginkgopsida (Peltaspermales, Leptostrobales), predominating elements of the floral assemblages. Resulting from detailed studies the authors suggested that a specialised late Palaeozoic vegetation developed at the boundary between the Pechora Province and the East-European one. It was composed mostly of peltaspermalean and leptostrobalean forms of early gymnosperms (genera Tatarina, Peltaspermopsis, Lopadiangium, Lepidopteris, Phylladoderma, Sphenarion etc.) with some bryophytes, Vojnovskya-like and lebachiacean coniferopsids admixed. The most surprising seems to be a lack of pteridophytes, namely ferns and equisetacean plants. Among dispersed sporomorphs and those macerated in situ protosaccate (protodisaccate) pollen have been ascertained belonging mostly to the taxa of Protohaploxypinus, Vittatina, Scutasporites, Vesicaspoa, Lueckisporites, Alisporites, Falcisporites and Vitreisporites. Beside the mentioned macrofossils different seeds were also collected resembling those of form-genera Spermatites and Carpolites.
From the theoretical point of view, the authors bring a detailed morphological terminology of fructifications, seeds and cuticles as well as valuable considerations on natural affinities within the class Ginkgopsida. The genus Tatarina is explained as a member of phylogenetical lineage leading probably from Lower Permain callipterids. The "Tatarina Flora" as such is characterized as an intermediate Eo-Mesophytic phytochory of the Sub-Angarian palaeofloristic region (its NW part) which possibly influenced further development of both boreal and equatorial Mesozoic ginkgopsids in Siberia and Gondwana.
The book is equipped with numerous pen drawings of cuticles and 16 plates of photographs. It is to be regretted only that the Russian text is not accompanied by a summary in English or German. As a total, the study is a serious, well founded contribution to the discussion on pre-Mesozoic gymnosperms.
A. HLUSTIK, Praha, Czechoslovakia.

THE EVOLUTION AND PALAEOBIOLOGY OF LAND PLANTS. B. A. Thomas and R. A. Spicer, 1987. Croom Helm - Dioscorides Press, 309pp. 16.95 pounds sterling. ISBN 0 7099 2476 3.
[USA: order from Timber Press, 9999 SW Wilshire, Portland, Oregon, 97225. Hardcover $51.95; paperback $28.95; plus $3 shipping and handling]

Textbooks on palaeobotany can either be routine ones or those expressing ideas upon data available. Most books of the latter kind are not easy to understand without profound knowledge of fossil plants and related subjects. It is not the case of Thomas & Spicer°s brilliant version of what can also be called " An evolutionary biology of higher plants". To those not well acquainted with general palaeontological or biological problems concise chapters on fossilisation processes, palaeontological and neontological taxonomic concepts and genetics are attached (surprisingly not at the beginning of the book, where they should have been placed).

The specific interests of both authors in different aged mega-fossils is clearly seen throughout the text. Although not omitted problems of palynology are only modestly touched as an aid of tracing plant evolution (mainly in discussions of adaptation to terrestrial environment and the evolution of angiosperms). However, not only the scope of authors° studies but also an imperative, which I fully agree with, that "phylogenetic studies should be based whenever possible on the reconstructions of whole plants rather than on individual organs", lead them to such an approach.

The main body of information concerns Palaeozoic and Mesozoic higher plant evolution largely based on excerpts of recent anglo-american literature, which seems to be a little preferred over other sources. A line of new views can be followed throughout the text and clearly indicates that more detailed data are available about specific structures of fossil plants, with more new concepts challenging the older ones . I just mention Bank°s reevaluation of Psilophyta, Beck°s Progymnosperms, Taylor°s treatment of early seed plants, Meyen°s concepts in Gymnosperms, though there are many others. Only in the case of the angiosperms are we still in a completely confusing situation. In spite of recent studies by Doyle, Hickey, Dilcher, and others, we only understand that the main differentiation of angiosperms must have taken place in the Cretaceous and earliest Tertiary. As to the origin of this group nothing conclusive can so far be suggested. One line of evidence, in my opinion, has not so far been properly followed, namely that of dispersed diaspore assemblages. The pertinent chapters in this book, even if they are supplied with all the information of early angiosperms available to date, cannot satisfy neobotanists as to patterns of evolution at least on the family level and the ideas from this book should stimulate us to more efforts.

The last chapter is the only one that does not deal with what we would expect from its title: "The evolution of modern vegetation". The topic would certainly be good for a thick book on its own. I think we must clearly differentiate between the

terms such as flora versus vegetation or bioprovince versus biom. I am also a little uncertain to what extent we can rely upon the pollen record of early angiosperms when assessing evolution of extant orders and taxa of still lower rank. There again, simultaneous studies of fruits and seeds (e.g. Mai, 1981 & 1984; Mai & Knobloch 1986) should be consulted. Also the history of global floral changes during the Tertiary and Quaternary can hardly be explained on only one page, as is attempted in this book. Still continuing with critical remarks, I cannot overlook some errors in plant names, which repeat unchanged in the index, like Ameylon-Amyelon, Arthrotaxis-Athrotaxis, Buriaea-Buriadia, etc. etc.. These discrepancies will cause student readers some confusion.

These small details aside, my impression after going through the whole text is very good. As I stated at the beginning the style of the book is clear and simple and so also are the numerous illustrations showing what the primary authors have in mind. I can recommend it to all who look for a stimulating synthesis of the recent advances in our knowledge of the evolution of land plants.

Z. KVACEK, Praha, Czechoslovakia.

THE EVOLUTION AND PALAEOBIOLOGY OF LAND PLANTS. B.A. Thomas and R.A. Spicer, 1987. (see above for full reference)

When I was asked to review this book it was referred to as "another paleobotany text-book". If by a palaeobotanical text-book we infer such recent accounts as Wilson Stewart's "Palaeobotany and the Evolution of Plants" or Thomas Taylor's "Palaeobotany", or the more ancient texts such as those by Chester Arnold and Henry Andrews, this book is of a quite different genre. The authors state in their Introduction that "We have attempted to get away from the strait-jacket of writing a text entirely on plant fossils, for they must be seen in the context of living plants."

The book contains an abundance of interesting information which is precisely documented as to original sources, and I have learned a great deal from reading it. It deals in considerable part with living plants as well as fossil ones and it is my impression that it would serve well as a reference text for serious students of palaeobotany and plant evolution generally; whether it is suitable as an introductory text is questionable. It will probably be most informative for the reader of this review to first summarize the contents.

In contrast to the more traditional texts the book deals to a considerable degree with ecological, environmental, physiological and genetic aspects of land plants, both living and fossil. The illustrations are all drawings which in many cases do not seem to quite do justice to the significance of the fossil plants. A considerable number of genera are brought in very briefly and without illustrations. I think that to understand and appreciate these most readers would have to do considerable peripheral reading in the sources cited.

The book starts with a useful geological time scale and this is followed by a short account of the earliest evidences of plant

life, going back some 3,000 MY. Next is a chapter on evidences of problematical fossils - spores, cuticles, thalloid structures and bryophytes. Then comes a chapter on the more primitive vascular plants of the early Devonian - the Rhyniophytes, Zosterophylls and Trimerophytes, followed by a short discussion on the geologic time scale, and fossilization. I think that this last is a bit too short but it does bring in some mention of the important and significant pioneering work of James Hutton and William Smith.

The fifth chapter "Time, Space and Species" seems to me to express the tone of the book as well as the basic interests of the authors. This is a relatively long account of 25 pages that reviews the species concepts of such notables as Charles Darwin, Ledyard Stebbins, Ernst Mayr and numerous others. In so far as I am able to comprehend it this is a very compact review that cannot be read casually. One may wonder whether the proliferation in biological terminology, as used in this chapter, is entirely necessary. I intend this comment to be directed to biologists generally and not just to Thomas and Spicer. The text deals with 'Typological Species', 'Non-dimensional Species', and 'Hologamodemes and Biological Species' as well as 'Meitic Drive', 'Genetic Drift' and 'Molecular Drive'. I am not sure that it would be easy for all readers to follow such statements as "Allogamous plants are by definition chasmogamous, but in addition they can be geitonogamous, when cross-pollination occurs between two flowers on the same plant, or xenogamous where cross-pollination is between two flowers on different plants." And "The most extreme morphological condition favouring allogamy is dicliny where anthers and stigmas are seperated in different blossoms, either on the same plant (monoecy) or on different plants (dioecy)." (page 250). And is it necessary to have a term such as 'diaspores' to refer to fruits and seeds? (pages 271-272).

Chapter 6, entitled "Specialism in Form and Function", is concerned with the evolution of leaves, roots, abscission, bark, as well as size generally, and the arborescent habit. This seems to me to be a commendable assemblage of information that contributes to our understanding of the over-all biology of vascular plants. Again, referring to terminology, a comment seems appropriate on the word 'group'. It is stated in Chapter 6 that "By the late Devonian all extant major plant groups, except the Angiosperms, were recognizable" (page 73). This statement is apparently intended to encompass all of the gymnospermous plants under one 'group'. However, none of the gymnospermous 'groups' described in Chapters 9 -12 (a very diverse lot), except the earliest Pteridosperms, appeared until post-Devonian times. Chapter 7 deals with the lycopods and articulates (horsetails) and Chapter 8 with the ferns.

The 'ferns' continue to present a problem - what should be called a fern? The authors tend to use a very inclusive concept, including such unique plants as Psilotum and Tmesipteris (page 95), as well as the Ophioglossales, Salviniales and Marsileales (pages 136 - 138).

Palaeobotanists look for relationships and evolutionary sequences among fossil plants and the living, and rightly so, but it is

sometimes pressed a bit too far. The fossil record reveals plant groups, large and small, that cannot always be readily classified. The term 'fern' has been used seemingly out of desperation (for want of a better one) for a very diverse assemblage. In their recent book Plant Life in the Devonian Gensel and Andrews urge that no Devonian plant should be called a fern and that the term should be reserved for plants within the concepts of the Marattiales and Filicales.

Thomas and Spicer do take a cautious approach (in Chapter 8) to the use of the word 'fern' in dealing with the Paleozoic Cladoxylopsida, Coenopteridopsida and Rhacophytopsida, in calling them "Early 'ferns'". I suggest that such taxa should be described on their own merits and, where adequate evidence of relationships is lacking, it should be admitted that we do not know what their affinities are. I tend to feel rather strongly about this - and readily admit that I have committed errors in this way over the years!

Chapters 9 - 12 constitute a commendable effort to present the many and diverse groups of gymnospermous plants - clearly a most varied assemblage whose interelationships are far from clear. Chapter 10 is devoted to the Pteridospermophyta, treated under the subheadings Calamopityales, Lyginoperidales, Medullosales, Callisttophytales, Glossopteridales, Peltaspermales, Corystospermales and Caytoniales. Chapter 11 deals with the Cordaitales and Coniferales and includes some curious plants such as the Vojnovskyaceae and Rufloriaceae. Chapter 12, entitled "The Limited Success of Other Gymnosperms" encompasses the Cycadales, Cycadeoidales, Ginkgoales and Gnetophytes.

Chapter 9, entitled "Progymnosperms and Ovule Evolution" is a good introduction to the evolution of the seed. I am, however, rather disappointed to see so little space and apparent credit given to the work of Albert Long. There have been few men (or women) in the history of our science who have contributed so much (and much of it under adverse working conditions) to a solution of one of the most important evolutionary problems in biology - the evolution of the seed.

The remaining chapters (13 - 16) devote, quite appropriately, more space to the angiosperms than do most previous texts. They are headed "The First Flowering Plants", "Angiosperm Radiation", "The Evolution of Angiosperm Floral Morphology" and "The Evolution of Modern Vegetation". This is welcome and up to date information. I do take exception to an initial statement concerning the relative importance of certain recent areas of research. It is said that "This has come about not as the result of any new fossil finds (although new material has resulted from intensified activity) but from a change in philosophy and the way the fossil record is interpreted" (page 232). The implication is that studies and interpretations of fossil spores and pollen, leaves, and the "Cladistic Approach" are of greatest importance. I do not in any way want to under-rate the fact that this work is highly important but I submit that the authors do not give adequate credit to the recent studies of fossil flowers, seeds and fruits - especially the first.

There are frequent references in the text to the fragmentary nature of the fossil record - quite true - but I think that it is

not nearly so fragmentary as many biologists understand. One example should suffice: page 26 shows line drawings of the early Devonian plant Renalia hueberi. This is known from abundant and beautifully preserved compressions that reveal the general habit of the plant, the form, dehiscence mechanism and spores of the sporangia, and some information on the vascular tissue. Photographs would portray this far better than drawings.
In summary the book seems to be designed not so much as an introduction to palaeobotany and land plant evolution as a reference work leading one to a comprehensive picture of what is known.
H.N. ANDREWS, New Hampshire, USA.

FUNDAMENTALS OF PALAEOBOTANY Sergei V. Meyen, 1987. 432pp. Chapman and Hall, London. ISBN 0-412-27110-9. UKL 65.00
The Russian- and English-language editions of S. V. Meyen's book "Fundamentals of palaeobotany" were published almost simultaneously by "Nedra" Publishers in Moscow and "Chapman and Hall" Publishers, London & New-York. The fact that since about 1970 palaeobotany has been using more and more refined techniques such as optics (including electronic ones), new physical and chemical methods of preparation, and methods of ion beam etching, there is promise for further detailed long-term studies of extinct plants, including their morphology and anatomy. Naturally enough, this technical re-equipment has considerably affected many branches of palaeobotany which significantly improved and extended our views on plant systematics, phylogeny and florogenesis and in some aspects promoted their radical reconstruction. Hence, it has become pressing to creatively summarize the scientific results obtained during the last decade.
Against this background which has affected palaeobotany, with the applied techniques and solved problems constantly growing more involved, it has gradually become very difficult for a specialist to cope with the widening stream of palaeobotanical information. Under the circumstances, the systematic and comprehensive presentation of the entire palaeobotanical course with allowance for the latest results, is of paramount importance for both palaeobotanists and those whose interests are focused on sciences "relating" to palaeobotany - neobotanists, specialists in the theory of evolution, stratigraphers, palaeoclimatologists, tectonists and other researchers.
S. V. Meyen has been long known as a prominent palaeobotanist and an expert in Late Palaeozoic plants and floras. To estimate his original contribution into the comprehensive picture of present-day palaeobotany presented in his book, it is sufficient to mention that he deciphered the gymnosperms general phylogeny and used it as the basis for a new original system of this group. He also recognized the prime importance of seed anatomy for phylogeny and systematics, and emphasized the key role of scarcely known groups such as the trichopityans and dichranophylls. He also established the hypothesis of angiosperms originating from bennettites by means of gamoheterotopy (transfer of characters of one sex to another), constructed

the first florogenetic trees and advanced the theory of phyto-spreading (shifting of subgeneric taxa from low to high latitudes in the course of their evolution).

The second chapter of this book is the largest and occupies the greatest part of the book. It covers fossil plants' systematics from bacteria to angiosperms. The extent of its detail was determined by the importance of fossil evidence to the general morphology and systematics of a particular group. Therefore, the description of the groups whose systematics is mainly based on the data from recent forms (the lower plants and angiosperms) is abridged. As was mentioned, the system of higher spore-bearing plants was mainly the author's own creation. At first glance some of its features seem unusual. For instance, the absence of the pteridosperms, the separation of Ephedrales from Gnetales and Welwitschiales, the separation of ginkgos from conifers and cordaites and their alliance with the peltasperms. Some readers may be unaccustomed to new names attributed to traditionally established groups (bowmaniteans for sphenophylls, arberians for glossopterids, leptostrobans for czekanowskias, etc.). However, closer analysis shows that the author provides a phylogenetic justification for each particular taxonomic and nomenclatural decision that he assumes, so that the entire system corresponds well enough to the higher plant phylogeny that is substantiated in the book (i.e., is strictly monophyletic). As regards the new names attributed to a number of taxa with appropriate comments, their introduction accounts for the author's wish to base a system on the structure of reproductive organs which is least of all subjected to parallelism and convergence, as is seen from palaeobotanical data. The entire palaeobotanical experience proves this approach to be the only way of saving fossil plants systematics from unavoidable nomenclatural controversies. In this publication the author introduces a new term "satellite genus", which is conventionally referred to some suprageneric taxon with the aim of searching information. For all that, different species of several satellite genera may belong within different families, orders and even divisions (Sphenopteris).

While describing angiosperms, the author's attention is mainly focused on ancient flowering plants and the problem of their origin. To determine the inferred angiosperm ancestors, characters of gymnosperm seeds were analysed. It has been found that each major gymnosperm group is characterized by stable features, unchanged in the process of the seed's evolution. Unfortunately, this fact has been ignored by several foreign palaeobotanists who critisized Meyen's scheme of gymnosperm evolution. The author hypothesized that angiosperms had evolved from bennettites by means of gamoheterotopy. He mentioned that most Cretaceous angiosperms probably belonged to the extinct orders and families which, in the author's opinion were still waiting to be classified. This calls for a further study of palaeobotanical material, whose implication for angiosperms phylogeny is still undervalued.

The third chapter treats the funadmentals of palaeopalynology with a comprehensive insight into all problems related to fossil spores and pollen, except, probably, their specific systematics which are discussed in specialist monographs.

The fourth chapter is devoted to epidermal analysis. It may be questioned why this method has been chosen from the entire anatomical store of palaeobotany. The answer is the existence of such palaeobotanical objects as dispersed cuticles which are as specific and informative as dispersed miospores. Though the epidermal cuticular studies are the oldest anatomical method applied in palaeobotany, systematic research of dispersed cuticles has not yet been conducted. It is mainly a matter for the future and the fouth chapter of Meyen's book is certainly addressed to the future.

The fifth chapter is also of considerable size. It concentrates on palaeofloristics which, according to the author's own remarks, crowns the whole edifice of palaeobotany, comprising the data synthesis from all its sections. The chapter discusses both the methods and actual results of palaeofloristics - the land flora evolution of the Earth is described in detail starting from the Silurian; the origin of land vegetation is treated thoroughly as well as the main features of florogenesis. The problems of floras in transition from the Paleophytic through the Mesophytic to the Cenophytic are also considered. Many palaeofloristic problems are treated in the light of such a mobilistic approach.

Speaking of the book as a whole, it should be mentioned that it shows advantages when compared to the previous Russian-language guides and contemporary foreign editions (e.g., Taylor's textbook, published in the USA in 1981), which are characterized by a certain palaeobotanical "Euro-American-centrism". As the studies of West European (and North American) fossil floras had commenced earlier than those of other floras, and accordingly yielded better evidence by the present time, they were primarily used as the base for theoretical generalizations of either rank. Information on plants from other regions was hardly if ever employed for most theoretical constructions, but was mainly referred to as the illustrative material. S. V. Meyen, possessed comprehensive information on World floras and his theoretical inferences were mainly based on the data available from these floras, with no preference given to any of them. Hence, his views on conifers evolution, Late Paleozoic climates, the transition from the Paleophytic to the Mesophytic and many other problems, are naturally fresh and original.

The author's own drawings that illustrate the handbook are particularly worth mentioning. They are achieved at a high technical level which combines conciseness, clear graphics and aesthetic expressiveness.

It is always rather difficult to choose a system to be used when reviewing the plant kingdom. The system suggested by S. V. Meyen is based on palaeobotanical ground. These two different approaches towards their construction, the palaeo- and neo-botanical ones, correspondingly result in certain discrepancy. In the light of this the attention of numerous researchers, may possibly be drawn to the discussed problem, ensuring vigorous discussions which we believe will do a lot of good to neobotany and to palaeobotany as a whole.

A. V. GOMANKOV, M. P. DOLUDENKO & E. L. LEBEDEV, Moscow, USSR.