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PALYNOS

NEWSLETTER OF THE INTERNATIONAL FEDERATION OF PALYNOLOGICAL SOCIETIES

Thomas Litt

APP
(Arbeitskreis für
Palaeobotanik und
Palynologie)



Thomas Litt is Professor of Palaeobotany at the Palaeontological Institute, University of Bonn, Germany. Born in 1957, Thomas studied prehistory, geology and botany at the University of Halle, and received a doctoral degree in geology from the University of Greifswald in 1987. He was assistant at the Museum of Prehistory in Halle before he served as a post-doctoral fellow in the Department of Geology, University of Halle (1990-1993). Thomas received the Habilitation (*venia legendi*) in geology from the same university. He was senior assistant at the Institute of Geophysics and Geology, University of Leipzig (1993-1994), before coming to Bonn.

Thomas Litt has been the acting Director of the Palaeontological Institute since 1996. He teaches courses in palaeobotany and palynology, historical geology and Quaternary geology. His research interests include the vegetation history of the Cenozoic based on pollen and plant

macrofossils, the palaeoecology, palaeoclimate and stratigraphy of the Quaternary. Thomas received the Credner Award of the German Geological Society in 1992. He is Chairman of the German Subcommission on Quaternary Stratigraphy, and a full member of the INQUA Subcommission on European Quaternary Stratigraphy. Furthermore, he is a member of the DEUQUA Advisory Board and member of the Scientific Advisory Board of BOREAS (International Journal of Quaternary Research).

Gengwu Liu

PSC
(Palynological Society of
China)



After graduating from Nanjing University in 1967, Gengwu Liu took up a position at the Nanjing Institute of Geology and Palaeontology, Academia Sinica, where he still works. In 1981 he received his MSc degree from this institute. His academic travels cover most areas of China. In the 1970s and early 1980s he joined several research projects on Cretaceous and Palaeogene palynology of eastern and southern China. He also took part in a scientific expedition to the eastern Tibet Plateau from 1981 to 1983.

In the late 1980s and early 1990s he visited, and worked with Prof. Estella B. Leopold of the University of Washington, on the Neogene and Quaternary palynology of Alaska and the western United States. He has also worked with Dr. Kenneth Cole of the US Geological Survey on the Holocene palynology of the Lake regions, and the western United States. In recent years his interests have centred mainly on the Neogene, especially the late Neogene to Early Quaternary palynology and climate of China. Professor Liu was also the Secretary-General of the Organising Committee for the 10th International Palynological Conference in Nanjing, China in June 2000.

Jiri Beck

**OCP
(Organisation of
Czechoslovak
Palynologists)**



Jiri Bek works on Silurian, Devonian and Carboniferous dispersed spore assemblages, i.e. isolated from parent plants, and Devonian and Carboniferous in situ spores (palaeopalynology). He is interested in sedimentary history, palaeoecology and reconstructions of various types of palaeoenvironments. From 1986 to 1990 Dr. Bek worked at Geindustria Prague, an output and exploitation firm, as a specialist on Devonian and Carboniferous palynology. Here he evaluated material from more than 50 core holes from various coalfields and basins of the former Czechoslovakia and other regions. Since 1990 he has worked in the Institute of Geology, Academy of Sciences of the Czech Republic in Prague. Since 1991 he has participated in the international project on Silurian, Devonian and Carboniferous strata of South America.

Jiri has served as Councillor for the OCP since 1994. He regularly participates in international palaeobotanical and palynological congresses and symposiums, including the 8th IPC (France, 1991), 63rd Jahrestagung of Paläontologische Gesellschaft (Prague 1993), Bell Memorial Symposium (Canada, 1995), European Coal Conference (Prague 1995),

8th International Congress on Carboniferous-Permian (Poland 1995), 5th European Palaeobotanical-Palynological Conference (Poland, 1998), 9th International Congress on Carboniferous-Permian (Canada, 1999) and the last IPC (China, 2000).

NEW IFPS COUNCILLORS

Rolf W. Mathewes



**(replacing Gail Chmura)
CAP(Canadian
Association of
Palynologists)**

Rolf is a Professor and Associate Dean of Science at Simon Fraser University in Canada. His home department is in Biological Sciences, but he is also an associate member of the Archaeology Department, and a member of the Institute for Quaternary research. He is a past-president of the Canadian Association of Palynologists, and more recently of the American Association of Stratigraphic Palynologists.

Since completing his Ph.D in Botany at the University of British Columbia in 1973, he has focussed his research on the Quaternary vegetation and climatic history of western Canada. Internationally, he conducted palaeoecological research at Cambridge University (UK) as a postdoctoral fellow in 1974, and also in Germany as an Alexander von Humboldt Foundation research fellow at the University of Hohenheim. In addition to his primary research in glacial and postglacial environments, Rolf also has a growing interest in Tertiary vegetation and climate change, particularly during the Eocene. He attributes this to the early influences of his Ph.D advisor, Glenn Rouse, and a natural tendency to explore new research directions. He particularly enjoys attending International Palynological Congresses, with their many opportunities to explore new ideas.

Laura Sadori



**(replacing D. Magri)
GPSBI**

Laura Sadori took a degree in Natural Science in 1984 at the University of Rome "La Sapienza". Her dissertation was in palaeopalynology under the supervision of Prof. Maria Follieri. She got a permanent position in 1990 at the Dipartimento di Biologia Vegetale of the same university where is still employed as a researcher. She obtained her masters in Botany at the University "Autonoma" of Barcelona and her research work, a palynological study of Late Pleistocene and Holocene records from central Italy, was supervised by Prof. Juan Maria Roure. Laura Sadori was the Secretary of the working group of Palaeobotany of Societ  Botanica Italiana in the period 1993-1999.

Laura has participated actively in a number of EU and national research projects on palaeopalynology palaeoclimate, and archaeobotany. Her research interests involve Quaternary palaeopalynology, palaeoenvironmental reconstructions through pollen analysis, Plant macroremains and, most recently, has focused mainly on Holocene climatic change and human impact on vegetation in the Mediterranean region.

Paul Dodsworth



BMS

Paul is a consultant palaeopalynologist with Ichron Ltd., based in Northwich, Cheshire, England, and is the current Secretary of the British Micropalaeontological Society's Palynology Group. Paul was awarded a B.Sc. degree in Applied Geology from the University of Plymouth in 1990. At Plymouth, Paul began working with Prof. Malcolm Hart, researching

microfossil assemblage changes across the Cenomanian-Turonian boundary (Cretaceous) mass extinction interval. He continued this work at the University of Sheffield, gaining an M.Sc. (1991), Ph.D. (1996) and several publications on the stratigraphy and palynology of the interval in England, Colorado and Crimea. Since 1996, Paul has worked as a consultant to the oil industry, firstly for Robertson Research (Aberdeen office) then Millennia Ltd. (Hampshire office) and most recently, Ichron Ltd., where his work involves regular wellsite 'biosteering' assignments. He specialises in Cretaceous and Tertiary palynostratigraphy. Paul is a member of the AASP, BMS and Palaeontological Association.

Robert Marchant



**(replacing M. Harley)
LSPSG**

Editor's note: Robert Marchant's cv was published in the previous issue of [PALYNOS: 23/2](#) (December, 2000)

Please, let us have news of your societies/members activities etc.

NEWS AND VIEWS

"Philippine Palynological Society"

The Philippine Palynological Society (PPS) was organized in 1998 as a response to the call of the International Federation of Palynological Societies (IFPS), and on the encouragement of Dr. Madeline Harley, as a Vice President of the IFPS, when she came to visit the Philippines in 1998. The main goal of PPS is to disseminate and develop awareness of the science of palynology,

which in the Philippines is little known. The specialists who comprise the

-3-

founding members of PPS are specialists doing actuopalynology and palaeopalynology from the National Museum of the Philippines, the Department of Energy and the National Institute of Geology, and from the University of the Philippines, respectively. Most of the members are from the University of Perpetual Help Rizal, Las Pinas City, Metro Manila, where they teach plant morphology and taxonomy, as well as ecology and earth science. PPS aims to reach out to members in the Philippines.



Officers and members of the Philippine Palynological Society. Seated (L-R) - Lerma Baptisma (Auditor), Cecilia Benavides (Vice President), Lolita J. Bulalacao (President), and Maissa Cerezo (Secretary-Treasurer). Standing (L-R) - Jimmy Arma, Miriam Ranola, Ma. Luisa Aguirre and Prescilla Jaminal.

Lolita J. Bulalacao
bulalacao@edsamail.com.ph

"West meets East"

Dear colleagues,

I plan to work actively as a new Vice President of IFPS, and try to make a positive contribution to the palynological community. An ongoing problem, and one that I would like to concentrate on, is that of the imbalance of scientific exchange among palynologists worldwide, particularly between

This problem is, however, compounded by the comparative financial wealth of western scientists, and this is particularly noticeable by the rarity of eastern colleagues at international conferences. Recently I have noticed that a few of the palynologists from Russia, and from republics of the former USSR, as well as China, Bulgaria and Romania, former socialist countries, have been able to participate in some international palynological conferences, for example, ICC-P Cracow (1995), 5th European Palaeobotanical-Palynological Congress in Cracow (1998) and the 10 IPC in China (2000). Many of them presented very interesting data and results (good preparation, excellent preservation, large number of specimens etc.), but much of their research, both palaeo and actuo, remains largely ignored.

The existing lack of communication frequently makes it very difficult (or impossible) to compare the results, or the assemblages of palynomorphs, from "East" and "West". The only profound result that we see is a climatic one (political!). For years now "splendid isolations" have developed, mainly caused by the prevailing, financially stringent, politics. My own professional interests led me to focus on palaeopalynology. In this field I am aware that many eastern palynologists have classified assemblages of palynomorphs differently to their western colleagues, and this has resulted in the erection of a number of locally "endemic" taxa. The main problem is not stratigraphical (time) correlations but comparative morphology, and taxonomy. I remain firmly convinced that no serious comparisons can be made without a deep knowledge and understanding of the most basic element: palynomorph taxonomy. In my opinion this is the root of the problem, and it is fundamental that we re-examine and rationalise existing palynomorph taxonomy on a worldwide basis, or work forever in the "Tower of Babel". If we do not address this issue, we will undoubtedly ignore many significant correlations, or erroneous interpretations, in the pollen fossil record.

research results from "western" and from "eastern" colleagues. I appreciate that there is a big linguistic barrier between many western scientists and, most prominently, our Russian and Chinese colleagues.

All palynologists must have the opportunity to compare their results with those of other palynologists regardless of political, economical or geographical barriers. Western palynologists remain largely ignorant about the results of their eastern colleagues, even for western palynologists translation is difficult or expensive. The problem is

-4-

also compounded by the fact that many eastern palynologists tend to publish their results in local journals, rather than international journals, for them the problem is not only one of language but also one of cost. What is the way out?

My idea is theoretically simple: create a database consisting of specific diagnoses published in non-English languages or, published in English but not in an internationally accessible journal (i.e. normally not available beyond specific country limits). IFPS Councillors could act as the main co-ordinators at national level. They would contact their colleagues who work on various stratigraphic levels and ask them for help in collecting and co-ordinating the data.

Basically four main sections are envisaged: Pre Cambrian, Palaeozoic, Mesozoic and Cenozoic with spore, pollen and microplankton subdivisions. Palynologists from the former Eastern-Bloc countries could help with the translation of Russian diagnoses into English, as many have had to study both the Russian and the English language (for example, I am prepared to translate diagnoses of Devonian-Carboniferous spores for Russian colleagues). Each of the Councillor's involved in the project should establish contact with, perhaps, one palynologist who would be prepared to be responsible for the Pre Cambrian section; two palynologists for the Palaeozoic section (one for microplankton and one for spore and pollen); two for the Mesozoic section (cf. Palaeozoic section), and two for the Tertiary section (cf. Palaeozoic section). (NB. the recommendations are broad, and assume that all stratigraphic levels are developed and palynologically studied in the Councillor's country). The people contacted by the Councillor (or willing contact(s) recommended by the primary contact) would initially translate selected diagnoses into English. The translated diagnoses

everyone, and without charge. A suggested format is offered below.

We have a new Millenium, and we should make a serious attempt to improve the situation that exists, where much of the potential value of our data is being overlooked. I know this problem has been addressed in the past, and it has always been concluded that it is insurmountable. Perhaps it is, but I would like to prove it isn't!

I am sure that younger eastern palynologists, in particular, would undoubtedly welcome information on scholarships, university studies, postgraduate courses, and lists of relevant grant agencies etc. The opportunity to study and work abroad, is not only beneficial to them, but gives them a good basis on which to return to their own country, and improve the level of palynology for the future. The investment is far-reaching. PALYNOS is an excellent medium for disseminating this information. Perhaps we could even have a regular column in Palynos: "West meets East". I would like to ask everybody (especially palynologists working at universities) for help. Please send to the editor of Palynos information from your institutes concerning various scientific programs, stays, post-graduate courses, grant opportunities (agencies, scientific projects etc), suitable for eastern palynologists (see for example the announcement re PalSIRP grants in this issue of PALYNOS).

It is my hope that the suggestions outlined above may lead to better international communication and understanding within the palynological community.

PROPOSED FORMAT:

NAME: full name of the species, for example: *Cyclogranisporites multigranus* Smith et

(including photos or illustrations) would then be sent to the Councillor to check and co-ordinate, and subsequently send to the IFPS Co-ordinator (Jiri Beck).

Many Chinese, Russian or other East European palynologists have limited financial possibilities and buying books may be a great problem for them. Therefore, I propose that the results: translations and photos or other illustrations, should be presented, for example, as Web pages, possibly even the Web pages of the IFPS. If diagnoses are presented as Web pages, they will be far more accessible to

Butterworth 1967, including sp. A and similar specimens, *Cyclogranisporites* sp. A sensu Smith et Butterworth 1967

HOLOTYPE: where the type specimen is stored, e.g. Smith and Butterworth 1967, Plate 4, fig. 12, prep. T91/1 in collection of Coal Survey Laboratory, Sheffield, UK.

TYPE LOCALITY: e.g. Seam at 491 ft, 10 in, Seafield No. 2 Borehole, East Fife Coalfield, Scotland, Westphalian D

DESCRIPTION: full description including the page, e.g. Smith and Butterworth (1967), p. 144, variations (if observed), measurements etc.

-5-

PERCENTAGE IN THE SAMPLE: for example, 1-5%; 6-10% , 11-20% etc.

COMPARISON: comparison with other similar species of the same or different genus including hypothetical or suggested synonyma

STRATIGRAPHICAL OCCURRENCE: Stratigraphical range (if known) e.g. Assemblage VII, Westphalian B-Westphalian D

GEOGRAPHICAL OCCURRENCE: e.g. Scotland.

REFERENCE: e.g. Smith, A.H.V. and Butterworth, M.A. 1967. Miospores in the coal seams of the Carboniferous of Great Britain. Special Papers in Palaeontology, No. 1, London, 1-324.

REMARKS: anything that is not included into previous points

Jiri Bek
IFPS Vice President, OCP Councillor

"How do pollen morphologists select the next groups to be investigated?"

There is an increasing gap between 'what pollen morphologists produce', and 'what palynologists/paleo-ecologists working on cores need'.

The interpretation of pollen records, and the translation of pollen data into results useful in the BIOME project (part of palynology's future!), is increasingly hampered by the absence of good pollen morphological identification keys of the most relevant groups. As a consequence,

clear preference for a relatively narrow ecological range. See for example, the results in Duivenvoorden & Lips, Tropenbos Series 12 (1995), page 176. It would be very helpful if pollen morphologists make use of this new understanding and let them guide as much as possible to work on pollen morphology of these groups in particular.

However, many pollen morphological studies deal with large families that are, from an paleo-ecological viewpoint, not conclusive. Moreover, because of their size, often only parts of the family are studied (for example, specific geographical areas, or a tribe, sub-tribe or section of the family) which make the results of little use in routine core analysis.

I think it is time to initiate discussion between 'pollen morphologists' and 'palynologists/paleo-ecologists' in an attempt to improve this situation. My impression from Cuba is that possibly most pollen morphologists do not realise this situation, and certainly are willing to make use of these recent insights. In this respect I had a fruitful discussion with prof. Siwert Nilsson from Sweden (Editor of the journal GRANA which is particularly focussed towards pollen morphology).

Please understand, I am not trying to dictate what pollen morphologists should do in the future But rather more to develop a better understanding between 'producers' and 'consumers' because this must be preferable.

interpretations of pollen records are not very 'sharp': there are too many groups that include many genera and even tens/hundreds of taxa with such a wide variety of ecological conditions, that any decisive conclusion about past ecological/climatological conditions is impossible (e.g. taxonomical groups, such as: Moraceae/Urticaceae, Melastomataceae/Combretaceae, Fabaceae, Euterpe/Geonoma-type (different ecologies !), Myrtaceae, Rubiaceae, Euphorbiaceae, Anacardiaceae, Malpighiaceae, Sapindaceae, Meliaceae, Bombacaceae etc. etc.).

Several recent studies in tropical rain forest plots show that a number of relatively small families are very conclusive as they have a

With best regards,

Henry Hooghiemstra
23rd February, 2001

"The Global Pollen Database"

An initial workshop for the Global Pollen Database (GPD) was held in Boulder, Colorado, 8-10 November 1999. It was organized by E. Grimm (grimm@museum.state.il.us). Participants represented several data cooperatives, including the African Pollen Database (APD), Chinese Pollen Database, European Pollen Database (EPD), European Pollen Monitoring Programme, Indo-Pacific Pollen Database, Japanese Pollen Database, Latin American Pollen Database (LAPD), North American Pollen Database, and the Pollen Database for Siberia and the Russian Far East. Also represented were the North American Plant

-6-

Macrofossil Database and the North American Packrat Midden Database. The objective of the workshop was to create a framework for developing a single Global Pollen Database for Quaternary pollen data.

The workshop created an Executive Council representing all the major databases, which will appoint their own representatives, and an Advisory Board consisting of the Workshop participants as well as a few additional members who were unable to attend. The Workshop also appointed three technical advisors familiar with database development. The workshop also created a committee to develop protocols for the GPD based on those for Europe and North America but modified to fit GPD needs.

A follow-up workshop, organized by Richard Bradshaw (rhwb@geus.dk) and Sheila Hicks (sheila.hicks@oulu.fi) was held recently at L¹venholm, Denmark, on 26-28 April 2001. Representatives of EPD, LAPD, and APD met in separate sessions to discuss issues specific to the individual data cooperatives. They then met together to discuss issues common to the incorporation of data from these cooperatives into the GPD. A major issue was taxonomic

are supplied and funded by the European Commission. The grant offers are suitable for young palynologists from Bulgaria, Romania, Estonia, Hungary, Russia, Poland, Slovakia, Slovenia and Czech Republic. Details see web pages: [HTTP://MCTS.GLY.BRIS.AC.UK](http://MCTS.GLY.BRIS.AC.UK) or contact address is: Prof. B.J. WOOD, e-mail: b.j.wood@bristol.ac.uk Deadlines are: 30/6 and 30/9 2001.

"World Directory of Palynologists: Affiliated Society Membership Lists"

The first edition of the IFPS **World Directory of Palynologists** was produced in 1988 to coincide with the 7th International Palynological Congress (IPC), in Brisbane, Australia. It was edited by Bernard J. Crilley and Robert A. Fensome. Impressively the Forward was provided in Russian, French, Chinese, German and Spanish, as well as English. Addresses and encoded research disciplines of the members of all National IFPS member societies were listed. At the end of the book all individuals names were listed alphabetically within each Affiliated Society. It was probably the most complete and wide-ranging compilation of palynologists ever produced, and it

harmonization: reconciling the desire for the database to retain the palynologists' original identifications yet insuring taxonomic harmony when data from different regions are combined in the GPD. Plans for a GPD list-server were also developed and details will be posted on the GPD web site: ngdc.noaa.gov/paleo/pollen.html The GPD data, as well as data from the individual data cooperatives, not all of which is incorporated into the GPD, are also available from this web site. This site has links to mirror sites in Europe, Africa, and South America. The GPD Executive Council and Advisory Board will also be posted on the GPD web site, as well as the final GPD protocols.

Eric C. Grimm
grimm@museum.state.il.us

ANNOUNCEMENTS

"PalSIRP grants"

3-12 month stays for young scientists (including palynologists). Travel and subsistence expenses

became an invaluable primary reference point to palynological research sources. In 1996 a second edition was published, edited by Owen Davis, coinciding with the 9th IPC in Houston, Texas. This second edition, which was also made available on the IFPS website: <http://geo.arizona.edu/palynology/ifps.html>, included a number of innovations, developed in hindsight from the first edition.

We see the World Directory as an important and valuable objective of the IFPS to its Affiliate Societies. It is distributed to all individual IFPS members free of charge. The next IFPS International Congress takes place in Granada, Spain, in 2004. It is the intention of your IFPS President, Officers and Councillors to produce a third edition of the World Directory of Palynologists to coincide with the 11th IPC in Spain.

One of the duties of IFPS Councillors is to provide annually, to the President and

-7-

Officers of IFPS, an up to date membership list with full postal address for each member of their Society. It will greatly facilitate the editorial work related to production of the third edition of the World Directory of Palynologists if individual members would actively co-operate in ensuring that they respond to any request from their Councillor to provide the required information in the format required. Basically we need your name, professional address, telephone number, fax number, email address and research interests: GROUp(s); TOPic(s); AGE; and REGion(s) using the encoding format developed for the Second Edition. Full details of the codings are on pp. xi-xii of Edition 2, and also on the IFPS website.

If you use the Directory, it is in your interests to help us make it useful. If you have any comments or ideas that might improve the 3rd Edition of the World Directory, either the electronic or the printed versions, we'd be glad to consider them. Please bear in mind that the encodings are designed to work with the electronic database version, so any changes would

MEETING PROCEEDINGS

"Congress on Tropical and Subtropical Palynology (America-Africa)"

The fourth IAAP Congress was held in La Habana, Cuba, in the National Botanical Garden (February 10-15, 2001) and was attended by 138 palynologists and accompanying members from 35 countries. It was organized by Professor Pedro Perez, Director of the Botanical Garden, Dr. Sonia Marchado Rodriguez from the Institute of Ecology and Systematics and Dr. Raquel Carreras from the National Center of Museology, with the collaboration of Dr. Emile Roche from African Museum in Tervuren (Belgium) and Councillor of PPMB. Four topics were illustrated by plenary sessions:

have to be carefully considered. However, the absolute deadline for suggestions will be by the end of October, 2001 - in time to formulate and publish the final agreed guidelines in the December 2001 edition of PALYNOS. The IFPS Officers and Councillors need your co-operation in this task to ensure that the Directory continues to be a primary reference source to active Palynological researchers worldwide.

Please send any additions or corrections for your address to your IFPS representative (see <http://www.geo.arizona.edu/palynology/ifpscnc.html>) or to the IFPS Secretary-Treasurer (mh12kg@lion.rbgkew.org.uk). Your current listing is available online at <http://www.geo.arizona.edu/palynology/search/> corrections and additions to the online version should be sent to palynolo@geo.arizona.edu.



La Havana, February 2001

Amazon River, and the modern course of the Orinoco River came into existence. Pollen sequences from the high plain of Bogotá, arranged from Middle Miocene up to Pliocene age also show an increasing elevation of the sedimentary environment.

Plant diversity in Amazonia developed in the Tertiary: lowland and montane floras, fresh water and marine conditions occurred close together in an environment where geological and river dynamics, and precession-related migration of the meteorological equator occurred. The 'museum' concept of a stable rain forest possibly is not valid for most of the rain forest area. For example, the

- Quaternary Paleo-Ecology, Prof. Henry Hooghiemstra (Amsterdam, Netherlands).
- Morphology, Dr. Maria Suarez-Cervera (Barcelona, Spain).
- Aeropalynology, Dr. Delia Fernandez (Leon, Spain).
- Melissopalynology, Dr. Irene La Serna Ramos (Canary Islands).

A total of 40 papers were given in these fields and 35 posters. A very interesting pre-symposium excursion was organized through the western part of the Island to explore the biodiversity of the endemic vegetation, with Pedro Herrera from the Botanical Garden as our Guide.

Annick Le Thomas

Abstracts of Introductory Talks:

"A travel through time in the neotropics; from the Miocene Andean uplift, the Pleistocene ice-ages, to the Holocene interaction between man and environment"

Pollen records from outcrops in the Amazon basin document the upheaval of the northern Andes; marine incursions during Miocene time became blocked by the Eastern Cordillera of Colombia which was finally uplifted between 8 and 4 million years ago. The trans-continental

-8-

In Peru open agricultural landscapes were already present 4000 years ago.

Oxygen isotopes and dust flux records from the Quelccaya ice cap show an alternation between humid and dry periods which coincide with alternating flourishing civilizations in the highlands (Incas) and coastal lowlands: pre-hispanic Andean civilization rise and fall to the rhythm of climate change.

[In this lecture I included results from many colleagues, in particular: C. Hoorn, T. van der Hammen, V. Wijninga, P. Martin, M. Absy, P. Colinvaux, J. Salo, L. Urrego, J. Maley, A. Street-

pollen record of Carajas, and the antiphase in climate humidity between Bolivia and Venezuela (Caribbean area) shows the impact of the precession cycle on the distribution of precipitation and, as a consequence rain forest, in (sub)tropical areas.

During the last 160,000 years significant climatic instability is documented with unprecedented precision in the high-resolution pollen records from Colombia. Inferred climate instability matches the records from the Greenland ice cores called 'flickering switch'. The Andean forest ecosystem is continuously responding to rapid climatic change at the order of 'Dansgaard-Oeschger' cycles from ice cores. However periodic abundance of selected taxa (*Polylepis*, C4 plants during glacial periods with low atmospheric CO₂ pressure), and immigration of taxa (*Quercus* from the northern hemisphere), cause in Pleistocene records non-linear relationships between pollen representation and environmental conditions. Non analog glacial C4/C3 plant ratios potentially impact on past temperature reconstructions although the recently calculated glacial lapse rate possibly counterbalances this effect.

Central American pollen records show moist conditions during the early Holocene. This is related to the northern position of the insolation maximum (precession of orbital forcing), followed by drier conditions after 6000 years BP. Presence of early civilizations in the Maya lowlands is documented in pollen records by deforestation, human disturbance indicators, and presence of pollen of crop plants. Climate became drier during the Maya 'Classic Period' and culminated in AD 862, 986 and 1051 when oxygen isotope records show severe droughts. Possibly crop failures and societal destabilization led to the classic 'Maya Collapse' around AD 900.

Perrott, A. Boom, A. Cleef, M. Wille, R. van 't Veer, B. van Geel, H. Mommersteeg, B. Leyden, G. Islebe, D. Hodell, J. Curtis, R. Byrne, S. Horn]

Henry Hooghiemstra
19th February, 2001

"Structure and Function of Intine in Angiosperm Pollen Grains"

The intine layer is a highly ordered complex of polysaccharides and structural proteins similar to other walls of plant cells. It contains a cellulose-microfibril network, a network of pectins and a network of structural cell wall proteins.

Structural variations among families, genera, and species are attributable mainly to the fact that the intine necessarily tends to conform to the architecture of the exine, and to adaptations concerning the regulation of water and germination rate. The basic three-layered organisation of the angiosperm intine: an outer homogeneous pectic layer (exintine), a layer of pectin with protein inclusions (middle intine) and an inner cellulosic layer (endintine), is related basically to intine function during pollen hydration, activation and germination.

In this work an attempt has been made to determine the nature and role of this intine more accurately. Pollen grains were germinated *in vivo* and *in vitro* and treated with two monoclonal antibodies against pectins, JIM 5 and JIM 7, that recognise homogalacturonic sequences with varying degrees of esterification, to localise these epitopes within the apertural intine. In some porate and colpiate pollen grains, such as Poaceae, Urticaceae, Zygophyllaceae

-9-

and Rosaceae, and in the monocolpate pollen grains of *Aristea major* (Iridaceae), the modifications of intine at germination time are described. In the pollen grains of *Euphorbia*, which have a characteristic intine structure with parallel thickenings, one on either side of the aperture, the abundant accumulation of unesterified pectins, could facilitate the necessary

joint research projects, supported by the Ministry of Education and Science, to improve the quantity and quality of aerobiological data, and subsequent dissemination, have been carried out.

One of the main goals since REA was established has been to disseminate the data through the Spanish communication media. This media-

expansion for the pollen tube emission, probably forming an elastic gel material.

In our opinion additional studies on development and cytochemistry of intine in different groups are required in order to fully understand the role of intine and its general applicability in taxonomy.

María Suárez-Cervera and Juan A. Seoane-Camba, Department of Botany, Faculty of Pharmacy, University of Barcelona

"Aerobiology in Europe: The Spanish Aerobiology Network (REA)"

The European Aeroallergen Network/European Pollen Information (EAN/EPI) was constituted in 1986. Now there are more than 30 countries (including Spain) comprising 500 sampling points, that participate in the network. The European Co-ordination Centre is situated at the University of Vienna.

The Spanish Aerobiology Network (Red Española de Aerobiología, REA) was constituted in 1992. Since then this network has been constantly growing. Today there are 16 organisations involved in air monitoring, managing 45 aerobiological stations spread throughout the Iberian Peninsula. The Coordination Centre is situated in the University of Córdoba. REA is an academic non-profit making network. The personnel involved have a background in Palynology and atmosphere dynamics, the two subjects fundamental to aerobiological studies. REA is a technology subgroup of the Spanish Aerobiology Association (Asociación Española de Aerobiología, AEA).

REA is supported by funding from both national and regional government organisations, notably the Department of Environmental Health. Some Pharmaceutical enterprises are also involved. Several

generated information provides valuable information to the community, especially doctors, and people who suffer from pollen allergy. A common methodology has been developed to enable the comparison of data obtained from the designated sampling points. As a result of REA studies, some standardisation levels have been included in a protocol to be adopted by all the members. The following protocols have been recommended:

- Samplers: the use of Hirst type samplers.
- Physic of sampling: the use of silicon fluid as adhesive.
- Location of samplers: open spaces, 15-20m above ground level.
- Counting methods: 4 longitudinal traverses, using 400 x magnification for optical microscopy.
- Expression of results: pollen grains/m³ of air.

We are actively working to align the protocols adopted by REA for aerobiological quality control, to the standards recommended by the International Standards Organisation. REA members are invited to attend a yearly meeting where they can discuss various issues, in particular: ways towards improving requirements of customers, incidents and problems encountered during the previous season, and the development of the collaborative projects.

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"Characterisation of Pollen in Spanish Honey, with special reference to Canary Island Honey"

In 1978, when APLE (Asociación de Palinólogos de Lengua Española) was created, very few data relating to the characterisation of Spanish honey pollen had been published: Vietez Cortizo 1950, 1951, Hammer & Wolthers 1956, Louveaux & Vergeron 1964,

-10-

Pozo Lora 1970, 1977, Romero Fabre 1973 & Straka 1975.

subsp. *ballota* (Desf.) Samp., but can also come from *Quercus robur* L. or *Quercus pyrenaica* Willd., depending on the geographical

During the second APLE Symposium in Las Palmas, Gran Canaria (1979) papers on honey analysis methods were presented, discussed and unified. As a basis for discussion the publications of Loveaux, Maurizio & Vorwhol (1978) and Saenz *et al.* (1980) were used.

Fourteen years later during the first Reunión de Trabajo de Melisopalinología Española (Guadalajara, 1993) honey analysis methods were reviewed, and the use of a globule-counting camera was agreed for quantitative analysis (Méndez, La-Serna, Cabrera & Domínguez, 1994; La-Serna Ramos, Méndez Pérez & Gómez Ferreras, 1999). Furthermore 700-850 grains was accepted as the minimum number of pollen grains to be identified for qualitative analysis to be reliable. Minimum percentages for some specific Spanish monofloral honey were also established.

After these meetings, abundant melissopalynological studies appeared, and typification of honey from all the Autonomic Communities commenced, and still continues. Three Spanish honey types are based on their botanical origin, their melissopalynological characteristics and their commercialisation value (Sáenz Lain & Gómez Ferreras, 1999):

MONOFLORAL HONEY: 8 honey types exist, they are widespread, and their characteristics are the best known and most appreciated by consumers. They are: *Citrus* spp., *Calluna vulgaris* (L.) Hull, *Erica* spp., *Castanea sativa* Mill., *Lavandula latifolia* Medik., *Eucalyptus* spp., *Helianthus annuus* L. and *Rosmarinus officinalis*. Moreover, another 37 monofloral honeys have also been typified, but they are very localised.

MULTIFLORAL HONEY: These are the most widely harvested. Four have been recognised by their respective Autonomic Communities as regionally characteristic, and have been given a Denominación de Calidad: Galicia Honey (with Denominación Específica), Villuercas-Ibores Honey: Extremadura (with Denominación de Calidad), La Alcarria Honey (with Denominación de Origen), Basque Country honey (with Label Eztia).

MIELADA HONEY: the most common Mielada honey comes from *Quercus ilex* L.

distribution of each *Quercus* species.

In the Canary Islands the bee flora is characterised by great variety, the presence of a high number of endemic species, and by species distribution in different vegetation types. Vegetation types vary considerably depending on altitude and orientation. Canary Islands honey is of excellent quality, and the high rate of endemism gives it a very characteristic and original aroma and flavour.

A decade ago Canary Island honey had still not been properly characterised. A situation that led, even in this day and age, to it being sold at well below its real market value, as if it was just local honey of no special quality. Such honey fetches a price of around 850-1000 ptas/kg. For this reason one of the research lines that we initiated, some years ago, was the pollen characterisation of Canary Island honey. Our aim was to contribute the scientific evidence to that would allow the honey producers to obtain the relevant Denominaciones de Calidad or origin, and to prevent fraudulent trading. At present, 13 monofloral honey types have been typified, five of them: *Carlina salicifolia* (L.f.) Cav.; *Lotus hillebrandii* Christ; *Spartocytisus supranubius* (L. fil.) Webb et Berth.; *Chamaecytisus proliferus* (L. fil.) Link ssp. **proliferus** var. *palmensis* (Christ) A. Hans. et Sund. and *Echium brevirame* Sprague et Hutch are exclusive to the Canary Islands, because their nectar is from endemic plants, a further two: *Origanum vulgare* L. ssp. *virens* (Hoffm. et Link) Ietswaart and *Mesembryanthemum crystallinum* L. have not been cited previously in any other Spanish province, two more: *Persea americana* Mill. and *Reseda luteola* L. are also produced in specific areas of the Spanish peninsula (Málaga and Palencia, respectively), while the other four: *Castanea sativa* Mill.; *Erica arborea* L.; *Prunus dulcis* (Mill.) D. A. Webb and *Echium plantagineum* L., are widely represented in Spain, but have geographical markers, that make them different from other similar honeys.

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"Acritarch and marine microflora discussion meeting" University of Sheffield, Wednesday 21st March 2001

The Palynology Group of the British Micropalaeontological Society held its first meeting for several years at the University of Sheffield in March. Ken Dorning hosted this successful event that brought together members from across the U.K. and as far afield as Eire and Norway. The twenty-five people who attended came from various universities, the British Geological Survey, oil industry operating companies and service companies.

The morning session dealt mainly with dinoflagellates. Martin Head (University of Cambridge) began proceedings with his talk entitled, "Dinoflagellates and hydrography of the SW Baltic during the last interglacial (Eemian, ca. 130ka)". Rex Harland (Dinodata Services) and K. Grosfjeld (Geological Survey of Norway) reported, "The distribution of dinoflagellate cysts from inshore areas along the coast of southern Norway (from Kragero to Kristiansand)". Paul Dodsworth (University of Sheffield, current address Ichron Ltd.) gave the first of three presentations dealing with phytoplankton changes across postulated faunal mass extinction intervals, "Palynology of the Cenomanian-Turonian boundary succession in Crimea, Ukraine". We broke for lunch at the University's '197 Club'.

The afternoon session was devoted to acritarchs. Dan Fiucaane and Ken Higgs (University of Cork) discussed, "Microphytoplanktonic decline in the Devonian-Carboniferous boundary beds at Riescheid, Northern Rheinisches Schiefergebirge, Germany". Dave Gelsthorpe (University of Leicester) spoke about, "Microplankton changes across a mass extinction interval: preliminary results from the Early Silurian Ireviken Event". The meeting then changed to a less formal format of discussion sessions. Gareth Hughes (University of Cork) outlined his doctoral research undertaken to date and his plans for future work, "Biostratigraphic correlation of the new Devonian timescale using palynology". Ken Dorning (Pallab Research) initiated debate on anomalous

Vietez Cortizo, E. 1950. Palynological observations on some Spanish honeys. Bull. Torrey Botanical Club 77: 495-502.

Vietez Cortizo, E. 1951. El polen de las mieles de Galicia. An. Edaf. Fisiol. Veg. 10: 79-100.

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high recovery of acritarchs in the Tremadoc and their extensive stratigraphical and geographical reworked distribution. Craig Harvey (University of Sheffield, current address Ichron Ltd.) summarised his doctoral research on the Devonian Campo Chico Formation in Venezuela, leading to debate on palaeogeographic floral realms and the identification of marine incursions

-12-

in predominantly terrestrial environments. Ken Dorning and Craig Harvey initiated a discussion on the importance of acritarch size in taxonomy and the problems of standardising sieve mesh size in studies of samples. Ken Dorning continued discussion on biozonations in general with reference to specific Silurian acritarch schemes in the Welsh Basin. Dave Gelsthorpe threaded together a lively debate on acritarch morphology and its possible functions.

The Palynology Group was joined by a number of other geologists for the Sorby Geological Forum lecture by former Sheffield graduate Jason Hilton (National Museum of Scotland) who spoke about, "Strange things from Chinese coal seams; a guided tour of the coal swamp plants of China and their significance". Both groups retired to the 'Red Deer' for refreshments.

The next Palynology Group meeting, possibly to be held at the Natural History Museum in London, will take place in early 2002.

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Group Secretary

1st International Seminar of the working Group: "Pollen as an Indicator of Environmental Conditions and Paleoecological Reconstructions"

The first International Seminar of the working Group: "Pollen as an Indicator of Environmental Conditions and Paleoecological Reconstructions" was held at the All-Russia Petroleum Research Geological Exploration Institute VNIGRI), in

Palynological Commission of Russia with the support of the IX All-Russian Palynological Conference, the Russian Academy of Sciences, the Ministry of Natural Resources, the Administration of VNIGRI and the Public Regional Ecological Fund: "Organism and Environment". The Seminar was devoted to, and associated problems with, the use of spores and pollen as indicators of present environmental conditions, ecological monitoring and paleogeographical reconstructions.

During the workshop sessions the following topics were widely discussed:

1. Palynomorphology and estimation of environmental quality
2. Paleoecological and paleogeographical reconstructions, and archaeological interpretations.
3. Medical aspects of palynology, especially in relation to aeropalynological investigations.
4. Melissopalynology with special emphasis on ecological aspects.

72 specialists participated from 16 cities, representing Russia, White Russia, the Ukraine, and Kazakhstan. They represented many institutes and organisations including: the Russian Academy of Sciences, the Ministry of Natural Resources, the Ministry of Higher and Middle Education. 34 reports that contained much new and original palynological data were presented and discussed. The proceedings of the Seminar have been published by VNIGRI as a special issue: Pollen as an indicator of environmental conditions and paleoecological reconstruction. This Seminar was the first time that scientists

St.-Petersburg, Russia, from March 19th - 24th, 2001.

The decision to hold the 1st International Seminar at VNIGRI was agreed in accordance with the Federal Programme, "Stratigraphy and Palaeontology of Russia", on the initiative of the

from different palynological disciplines had been able to get together and discuss new collaborative initiatives, directed towards resolving some of the more complex issues in ecology and palaeoecology.

Dr. Olga F. Dzuba
Dr. Valentina A. Fedorova
All-Russia Petroleum Exploration Institute (VNIGRI), St.-Petersburg

-13-

International Workshop: "Climate and Environment during the Last Deglaciation and Holocene in NW Russia and around the Baltic"

An international workshop on "Climate and Environment during the last Deglaciation and Holocene in NW Russia and around the Baltic" was held in Znamenka, near St.Petersburg, Russia, from March 28th - April 2nd, 2001. Over 60 specialists took part in the Workshop, and 30 oral and poster reports were presented from both Russia and other participating countries. To summarise the research results that have been obtained so far, and to compare them with other ongoing research projects, the workshop was organised with the following general objectives:

- Late Quaternary in NW Russia and around the Baltic
- Climatic and environmental changes in NW Russia during the past 15,000 years
- Baltic Sea development

Experience and results were evaluated from the very fruitful 5-year collaborative programme of networked activities, that have been carried out from 1996 to the present day, by researchers and post-graduate students from Russia, Sweden, Finland, Estonia, Denmark and Norway. The main subject areas of this investigative project: Reconstruction of Environmental changes in NW Russia and around the Baltic Basin during the last 15,000 years, were paleolimnological, paleogeographical and geological.

FUTURE MEETINGS

"Cretaceous System in Russia"

The first all-Russian Meeting: "Cretaceous System in Russia", will be held from February 4th - 6th, 2002, in the Geological Faculty of Moscow State University, Moscow, Russia.

The following topics will be discussed:

1. General questions relating to the Cretaceous stratigraphic system
2. Regional stratigraphy of the Cretaceous system in Russia
3. Biostratigraphy, palaeontology
4. Paleobiogeography
5. Geophysical and chemical methods in Cretaceous stratigraphy
6. Paleogeography, sedimentology
7. Paleoclimatology

For more detailed information: email: Barabosh@geol.msu.ru

"Aspects of Palynological Methodology"

The 10th Russian Palynological Conference, organised by the Russian Palynological Commission, will take place at the Institute of Geology and Development of Fossil Fuels (Moscow) from October 14th - 18th, 2002. The

The Workshop was initiated by the Institute of Limnology at the Russian Academy of Sciences, the Department of Quaternary Geology of Lund University, and Department of Geology at the University of Helsinki. Financial sponsorship was provided by the Nordic Council of Ministers. The fieldwork investigations were carried out in the Kola Peninsula, Karelia, the Karelian Isthmus, the Jaroslavl' region in Russia, and the territories around the Baltic Sea in the Baltic Countries of Sweden, Denmark and Finland. The data gathered have resulted in contributions to the proceedings of many different conferences, as well as articles published in national and international scientific journals.

Dr. Valentina I. Khomutova
 Dr. Dmitry A. Subetto
 Institute of Limnology of the Russian Academy
 of Sciences

theme of the conference will be "Aspects of Palynological Methodology". Our aim is to invite discussion relating to all branches of palynology, but with particular emphasis on applications and questions regarding methodology.

Previous Russian palynological conferences, actively supported by many leading palynologists, have covered a rich and varied range of subject matter, including: Palynomorphology, stratigraphy, aeropalynology, and ecology.

We invite our Russian colleagues, palynologists from the Former Soviet Union, and palynologists worldwide to take part in our 10th Russian Palynological Conference. The official language of the conference will be Russian, however, the Organizing Committee will also accept presentations in English.

-14-

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NEW BOOKS

"Amazon pollen manual and Atlas / Manual e atlas palinologico da Amazonia"

Colinvaux, P., de Oliveira, P.E. and Moreno Patino, J.E., Harwood Academic Publishers, 1999, 322 pp. Bound with hard cover. ISBN 90-5702-587-6, US \$ 90 / UK sterling □56.

The immense plant diversity in tropical rain forests makes pollen analysis in this biome a real challenge for palynologists. Characteristic of pollen diagrams from rain forest sites is the large number of species records, many of which show scores of a few grains only. Insiders are aware of such large pollen diagrams, since journals accept only a selection of the recovered taxa for publication. Had insect pollination been less

in the area covered by the atlas. A concise vegetation analysis is helpful for grouping the taxa into meaningful ecological groups, a major bottleneck in the interpretation of rain forest diagrams. The huge diversity, often more than several hundreds of arboreal taxa per hectare of rain forest, causes many taxa to apparently occur 'everywhere' and these taxa do not have a clear ecological range which severely limits their use in interpreting the pollen record. Therefore, the authors prefer multivariate statistics, to the classical ecological grouping based on lists with the floral composition of specific environments, for interpreting the pollen record. They suggest that the classical ecological groupings should be used with extreme care. However, it is now widely accepted that rain forests, just as temperate forests, include many plant communities, each with a preference for the main environmental factors of regional precipitation, as well as nutrient status, drainage capacity, and flooding frequency of soil and habitat. This has been well illustrated, for example, by the ecological diagrams on the landscape ecological maps of the middle Caquetá area in NW Amazonia by Duivenvoorden and Lips (1993). The recognition of such plant communities helps to differentiate between generalist and specialist taxa, with great potential implication for palynological studies. For example, the family

important in the rain forest, the size of a diagram would be at least twice as long.

Correct pollen identification is crucial. Pollen reference collections are seldom large enough. Therefore, pollen atlases are of great value to the palynologist. For the warm neotropics there are several atlases/series of papers available (mentioned in the introduction to the atlas part of this book; see also Hooghiemstra and Van Geel, 1998) but for the neotropical rain forest we can only mention two atlases: the 'Pollen atlas of Barro Colorado Island' (Panama), a superb publication by Roubik and Moreno (1991), and the 'Pollen atlas of useful and cultivated plants in the Colombian Amazon region' by Herrera and Urrego (1996).

A pollen atlas may be based on herbarium material, such as the 'Pollen atlas of Barro Colorado Island', and the atlas on the pollen flora of a nature reserve in Quintana Roo, Yucatan (Chavez et al., 1991). By the way, the latter illustrates many genera relevant for the rain forest biome and in addition provides a concise description of the main vegetation types

Bombacaceae and the genera *Rhodognaphalopsis* (Bombacaceae) and *Mauritia* (Palmae), have rather narrow ecological amplitudes which is helpful in the interpretation of pollen diagrams. Intensified pollen morphological studies to improve the identification of subordinate taxa of these and other specifically selected families (e.g. Apocynaceae, Araceae, Bignoniaceae, Burseraceae, Icacinaceae, Lauraceae and Tiliaceae) and genera, will yield important new options for paleo-ecological inference and should give direction to new pollen morphological projects.

The present atlas is not based on herbarium material, but makes use of the alternative option; it shows the variety of fossil pollen grains recovered from the La Pata core from northwest Brazilian Amazonia (Colinvaux et al., 1996). With the experience of Enrique Moreno who also co-authored the pollen atlas of Barro Colorado Islands, and the ample experience of the other two authors with rain forests, it is not surprising to observe the high

-15-

quality of this book which is both a manual and an atlas. The book is published in English, but also includes a full Portuguese text that is a welcome service to the Brazilian 'market'. The bilingual format explains the extra number of pages: the English text on pages 3-58 is repeated in Portuguese on pages 59-124. The figures, photographs and diagrams in the Appendix (pages 125-150) have captions in both languages. The bilingual strategy is applauded and should be used more frequently to serve colleagues, and the young students in paleoecology in particular.

Chapter 1 discusses the peculiarities of applying the method of palynology in the rain forest biome; it is shown that an ecosystem dominated by insect-pollinators offers the palynologist more than only 'silent trees'. Other topics of debate, such as the possible cooling of Amazonia as inferred from pollen diagrams, are clearly presented and well discussed.

Chapter 2 is based on the 'Huygens lecture' entitled 'The ice-age Amazon and the problem of

standard laboratory procedures including X-radiographs, core stratigraphy, radiocarbon dating, extracting pollen from sediments, exotic markers, and slide mounting. Pollen identification, the use of a pollen sum, drawing a pollen diagram, and modern pollen rain are also discussed, making this book a very helpful manual. Chapter 5 is devoted to pollen and spore morphology. The appendix (pages 125-150) gives many illustrations to these five chapters with bilingual captions.

Part 2 of this book (pages 153-299) describes and illustrates 421 Amazonian pollen and spore taxa, spread among 91 families and 246 genera. This section starts with a 'key to major pollen and spore groups', a 'key to families and genera', followed by pollen and spore descriptions. Photographs on 60 page-size plates are the backbone of the atlas section. As a rule photographs are printed at a scale of 1:1000 and mostly show various levels of focus. Some grains seem a little corroded (e.g. numbers 147, 190, 196), a few photographs are less representative

diversity' given by Paul Colinvaux in The Hague on the invitation of the Netherlands Science Foundation. The absorbing talent of Paul Colinvaux to amuse his audience is partly conserved in this chapter. The idea that the lowland tropical forest of the Amazon basin was never fragmented by aridity at any time in the last glacial cycle is controversial indeed. The school of thought supporting the idea of the presence of forest refugia during the last ice-age, also suffers from an insufficient support of data. In this respect Mark Bush presented an interesting figure in his textbook on ecology (Bush, 1997, 2000) showing the possible role of drier forest types in this debate. Amazon diversity is represented as having been generated in a 'museum' model or in an 'engine' model and possible processes involved are described. The potential effect on rain forest of cooling and low glacial atmospheric CO₂ concentrations are also discussed. This chapter provides a fascinating story regardless of other possible opinions.

The last three chapters are of practical use in particular. Chapter 3 is a very useful guide to piston coring of lake sediments. Taking samples in the centre of a lake from a floating raft gives the best chance to collect in hiatus-free sediment records. From our own experience we can state that the Livingstone piston corer, modified by Paul Colinvaux, is a very effective, elegant, and reasonably priced device that is warmly recommended. Chapter 4 describes

(e.g. numbers 198, 287), but this may be difficult to avoid in an atlas based on fossil grains. Some grains have been printed too dark and lost information about their sculpture (e.g. numbers 129, 208, 227, and 362).

The book ends with a glossary (pages 301-311), bibliography (pages 313-317), an index of botanical families (pages 319-324), an index of botanical names (pages 325-30) and a short sketch of the authors. I have hardly seen any typographical errors. Although the authors have drawn on pollen grains in sediments from lakes of the lowland tropical rain forest for their examples, the taxon list includes rain forest representatives of most of the pollen taxa prominent in other vegetation types of tropical America. So the atlas can be used to identify most of the pollen types likely to be encountered in the whole Amazon basin. The chapter on planning the field-work is original and very useful. The information on laboratory protocols and pollen morphology can also be found in other textbooks (though not in Portuguese) but it forms a logical part, and makes this book also serve as a 'manual'. Without a doubt this well produced book will serve as a major source of reference for pollen identification for a long time. The authors must be complimented on this work, and thoroughly recommend it to all researchers working in tropical areas around the world, as well as those with an interest in the specific problems of applying

-16-

palynology outside the temperate zones. This well bound hard cover book is very fairly priced.

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Colinvaux, P.A., de Oliveira, P.E., Moreno, J.E., Miller, M.C., Bush, M.B. 1996. A long pollen record from lowland Amazonia: forest and

"Synopsis of Fossil Fungal Spores, Mycelia and Fructifications"

R.M. Kalgutkar and J. Jansonius
Published by the American Association of Stratigraphic Palynologists Foundation
Contribution Series Number 39 December 2000

In this Synopsis we bring together some 950 validly published names of species, attributed to some 230 genera (plus some 70 names of extant genera, as well as many nomina nuda, and junior synonyms and homonyms). We propose twelve new genera: *Axisporonites*, *Biporipsilonites*, *Disparidicellites*, *Hilidicellites*, *Kumarisporites*, *Mathurisporites*, *Mossopisporites*, *Multicellites*, *Ramasricellites*, *Saccisporonites*, *Trihyphites* and

cooling in glacial times. *Science* 247, 85-88.

Duivenvoorden, J.F., Lips, J.M., 1993. *Ecología del paisaje del Medio Caquetá*. Memoria explicativa de los mapas / Landscape ecology of the Middle Caquetá Basin. Explanatory notes to the maps. *Estudios en la Amazonia Colombiana* 3A, 1-301; 3B, maps. Tropenbos Colombia, Bogotá.

Herrera, L.F., Urrego, L.E., 1996. *Atlas de polen de plantas útiles y cultivadas de la Amazonia colombiana / Pollen atlas of useful and cultivated plants in the Colombian Amazon region*. *Estudios en la Amazonia Colombiana* 11. Tropenbos Colombia & Fundación Erigáste, Bogotá, 462 pp. (Also published in the series: *The Quaternary of Colombia* 23)

Hooghiemstra, H., van Geel, B., 1998. World list of Quaternary pollen and spore atlases. *Review of Palaeobotany and Palynology* 104, 157-182.

Palacios Chavez, R., Ludlow Wiechers, B., Villanueva G., R., 1991. *Flora palinológica de la Reserva de la biosfera de Sian Ka'an, Quintana Roo, Mexico*. Centro de Investigaciones de Quintana Roo, Chetumal, Quintana Roo, Mexico, 321 pp.

Roubik, D.W., Moreno, J.E., 1991. Pollen and spores of Barro Colorado Island. *Monographs in Systematic Botany* 36, Missouri Botanical Garden, 270 pp.

Varmasporites. We propose one new species: *Ctenosporites sherwoodiae*.

Transfers of species to more appropriate genera resulted in 31 junior homonyms, for which we provided the following nomina nova: *Dicellaesporites largelongatus*, *D. perelongatus*; *Dictyosporites paradkarii*; *Didymoporisporonites gigas*; *Diporicellaesporites macellus*, *D. minifusiformis*; *Diporisporites pergranulatus*; *Dyadosporites antarcticus*, *D. neoconstrictus*; *Fusiformisporites duenasii*; *Hilidicellites dubius*, *H. trivedii*; *Hypoxylonites kumarii*; *Inapertisporites clarkei*, *I. edigeri*, *I. neopunctatus*, *I. triporatus*; *Kutchiathyrites canadensis*; *Monoporisporites doubingerae*, *M. mathurii*, *M. nemagnus*, *M. neoglobosus*, *M. persilatus*, *M. singularovalis*; *Multicellaesporites? songii*; *Pluricellaesporites cooksoniae*, *P. edigeri*, *P. malevisus*, *P. mexicanus*; *Scolecospores modicus*; *Staphlosporonites billelsikii*. The names of one genus and several species, not validly published in their respective protologues, are here validly published "ex Kalgutkar & Jansonius": *Asterinites* Doubinger & Pons (with *A. colombiensis*, *A. tellezii*), *Biporipsilonites bellulus* (Ke & Shi), *Cercosporites torulosus* (Trivedi & Verma), *Dicellaesporites longus* Trivedi & Verma, *Diporisporites planus* Martínez-Hernández & Tomasini-Ortiz, *Microthyriacites baqueroensis* Martínez, *Palambages colonica* Trivedi & Verma, *Pluricellaesporites dentatus* Trivedi & Verma, *P. minutus* Trivedi & Verma and *P. planus* Trivedi & Verma.

-17-

Our transfers also resulted in some 350 new combinations: too many to list in this abstract.

While we tried to include all papers of interest particularly to (paleo)palynologists, this Synopsis will also be of benefit to mycologists who find the literature on fossil remains not easily accessible. The latter also may appreciate a brief survey of megascopic remains reported in the literature. Still, we did not cover many of the earlier (nineteenth century) publications.

We give a summary introduction into paleomycology, as well as some mycological

We do not include forms described in "open nomenclature" (e.g. "*Inapertisporites* sp. A," or "*Pluricellaesporites* sp. 2"). Superseded binomials are listed, and are provided with cross references to the correct names. For the species, only the locations of types are cited, except in instances involving synonymy or emended/enlarged concepts.

For each taxon, we cite the original diagnosis (for genera) or description (for species), as well as later emendations. We also cite supplementary comments of the original authors, generally verbatim (without changing the nomenclature they

fundamentals, for palynologists; a brief section on palynological practices may be of benefit to mycologists. The discussions dealing with the morphology of fungal spores are concluded with a section "Description of fungal spores," which provides a checklist of features to be observed and reported on. Technical terms are explained in a Glossary.

The main part of this Synopsis is the systematics section, where the descriptions of genera and species are given in alphabetic order; junior synonyms and homonyms are included, with cross-references to new names or combinations. The types of nearly all species are illustrated with a line drawing. In an Appendix we list all specific epithets together with, in capitals, the names of genera to which they are now attached, and those used in earlier binomials, in lower case.

Organisation of this Synopsis

In this volume we compile the more recent world-wide literature on fossil fungal remains, as far as known to us. Although some papers as old as the beginning of the 19th century have been consulted, we have no illusion that our survey is complete (see below).

We document the wide diversity of all those fossil fungal palynomorphs, mycelia and fructifications, of which the names had, or have, been validly published. For a small number of genera and species their names are here validly published for the first time. We include a small number of generic nomina nuda, that have been (or might be) considered as validly published.

This publication provides an immediate and quick reference to the names of genera and species, furnished with descriptions and figures. It aims to stimulate the interest of mycologists in the ancestral forms of living fungi, as well as to guide palynologists to a better understanding of the morphology, classification and biostratigraphic application of fossil fungi.

used, into the rationalised nomenclature presented in our Synopsis). For some entries, we provide a "diagnosis as here emended," and/or add "our remarks"; we always clearly identify our own opinions or contributions.

Because we did not see most of the original material, we refrained from emending species concepts. However, the grouping of species into (more or less artificial) genera is a more subjective exercise. We have rationalised some past practices, which makes for more coherent generic circumscriptions and groupings. Nevertheless, we have not split these groupings farther than absolutely necessary; that task will remain for future mycologists/palynologists, after they have studied the original (or additional new) material.

In the heading of each species we cite the page and figure number of the type specimen, in the original paper (protologue). Centred on the next line, we give, in bold, the plate and figure number of our own illustration of the species. A professional illustrator made the majority of line drawings in the Synopsis. These were augmented by illustrations borrowed from the Genera File of Fossil Spores (Jansonius & Hills, 1976 et seq.); those too simplistic for the present purpose were upgraded by Jansonius. All drawings were scanned, and then sized by computer to a uniform magnification. Most spores are at 700x magnification, some small forms at 1000x. Most microthyriaceous fruiting bodies are at 500x; others at a variety of magnifications. Computer-produced scales allow a quick resolution of the actual, and relative, sizes.

We received slides, negatives and photographs from some authors whose original descriptions seemed to be at odds with their original photographs, or whose published illustrations did not show the necessary detail sufficiently. Descriptions that have been adjusted as a result of this, have been so identified.

The plates are arranged in a morphological order: first the inaperturate unicellate (aseptate) spores, which are followed

by mono-aperturate, di-aperturate and multi-aperturate amerospores. Next the inaperturate dicellate spores, the mono-aperturate ones, etc. Then, *mutatis mutandis*, the same for pluricellate spores, where curvature of linear forms, and manner of aggregation of non-linear forms play a role. These are followed by the spherical aggregations, and aggregations with more than one axis. Next are the sporangia of the mycorrhizal fungi, the fruiting bodies of the microthyriaceous fungi and those of the Paleozoic Sporocarpon group, as well as a miscellany of various fruiting structures, including some mushrooms. Some late additions had to be accommodated onto the last two plates.

The "Glossary" may help palynologists to better understand the mycological descriptions. Our comprehensive "Bibliography" may include references not directly cited in our text. We do not provide references to the works in which modern genera were published to which fossil species have been assigned; neither do we cite the diagnoses of such modern genera.

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"Index - Pollen et Spores d'Europe et d'Afrique du Nord"

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"Pollen and Pollination"

A. Dafni, M. Hesse and E. Pacini (Editors).
(2000). Springer-Verlag, Wien, New York.
ISBN 3-211-83514-8 (HB).

This well-indexed volume is a special edition of *Plant Systematics and Evolution*, Vol. 222, No's 1-4, 2000. It focuses on pollen as a living system. The subject range is slightly eclectic because it is a collection of papers by invited individuals, rather than a text book. Nevertheless, the range is broad, and more spontaneous in style than a text book. Chapter headings are: Pollen wall stratification and pollination (M. Hesse); From anther and pollen ripening to pollen presentation (E. Pacini); Cytochemistry of mature angiosperm pollen (M. Nepi & G.G. Franchi); The ecology and evolution of pollen odours H.E.M. Dobson & G. Bergström; The ecology and evolution of visual pollen signals (K. Lunau); Pollen viability and longevity: practical, ecological and evolutionary implications (A. Dafni & D. Firmage); The role of electrostatic forces in pollination (Y. Vaknin et al.); Pollen grains why so many? (R.W. Cruden); Abiotic pollen and pollination: ecological, functional, and evolutionary perspectives (J.D. Ackerman); Pollen nutritional content and digestibility for animals (T.H. Roulston & J.H. Cane); The collection of pollen by bees (R.W. Thorp); Pollen morphological evolution in bat-pollinated plants (A. Stroh); The structure and function of orchid pollinaria (S.D. Johnson & T.J. Edwards); Deceptive orchids with *Meliponini* as pollinators (D.W. Roubik); Thread-forming structures in angiosperm anthers: their diverse role in pollination ecology (M. Hesse, S. Vogel & H. Halbritter); Convergent evolution and adaptive radiation of beetle-pollinated angiosperms (P. Bernhardt).

"Fossil Plants and Spores: modern techniques"

T.P. Jones and N.P. Rowe (Editors). (1999). The Geological Society. London. ISBN 1-86239-035-5 (HB); ISBN 1-86239-041-X (SB).

As the title indicates this volume covers a wide range of recent or updated techniques for the extraction and subsequent preparation of fossil plants and spores. Also covered are: study and interpretation of morphology, anatomy and ultrastructure; geochemistry; conservation, databases and protocols; sedimentology, taphonomy and stratigraphy; palaeoclimatology; palaeoecology; international laws.

On-line Bookshop: <http://bookshop.geolsoc.org.uk>

"Glossary of Pollen and Spore Terminology"

Second and revised edition: Peter Hoen

The Glossary was first published in paperback by the Laboratory of Palaeobotany and Palynology Foundation, at the University of Utrecht in 1994. It was widely embraced by the international palynological community as a tremendous step towards the unification of pollen and spore terminology. Since then the Glossary has been edited and made available on the website of Utrecht University. Peter Hoen has been responsible for updating and improving the original paperbound version. The electronic version makes the Glossary much more accessible, and provides the opportunity for user interaction. "So, from now on, it's everybody's Glossary." 35 new terms have been added, mostly from fossil species. Try it and see - there is a good introduction - and all the illustrations are in colour - its great!

Website address:

<http://www.bio.uu.nl/~palaeo/glossary/gloss-int.htm>

"Palynofloras and Palynomorphs of China"

Song Zhichen. 2000. 233pages+ 43 plates. 180 x 265mm. Hardback. ISBN: 7-312-00185-3. Price: US\$45+US\$8 by sea mail US\$45+US\$25 by airmail. In English.

This monograph contains 20 papers, and consists of two parts:

Part one: Palynofloras

1. On the genus Noeggerathiopsisidozonotriletes Luber 1955
2. Latest Carboniferous-Early Permian megaspores from the Xinwen district, Shandong
3. On the dynamics of Permian phytoprovincial succession of the Tarim Plate
4. Upper Triassic palynoflora from northeast Guizhou, China
5. Jurassic palynofloras and their bearing on stratigraphic correlation in China
6. Discovery of a Middle Jurassic palynological assemblage from Beixiangshan of Nanjing
7. A Turonian palynological assemblage from Dongguan, Guangdong
8. Pollen record of early angiosperms in NE China
9. Discovery of the Late Cretaceous palynoflora in offshore sediments of the Fuzhou district, China
10. Paleogene arid climatic process in China
11. Eocene palynoflora from the Jishu Formation in the Jiamusi □C Yitong Graben of Northeast China
12. An affinity survey of fossil pollen Fupingopollenites Liu
13. On the first occurrences and spread of some fossil angiosperm shrub and herb pollen in China and their significance
14. On Tertiary rain forest in China
15. Pollen morphology of Dipterocarpaceae and fossil analogues in China
16. Further remarks on the environmental background of Nanjing Man
17. Environmental change and human activity since the Neolithic age in Hong Kong

Part two: Palynomorphs

1. Palynomorphs from the transitional sequences between Ordovician and Silurian of north- western Zhejiang, South China
2. Late Ludlow □C Early Pridoli palynomorphs from northern Jiangsu, South China Chitinozoan biostratigraphy in China
3. Chitinozoan Biostratigraphy in China

"Fossil Spores and Pollen of China (Vol. 1) - The Late Cretaceous and Tertiary Spores and Pollen"

Song Zhichen et al. 1999. 910 pages + 207 plates. 200 x 265mm, Hardback. ISBN: 7-03-006724-X. Price: US\$66. Postage: US\$14 by sea mail. In Chinese with English abstract.

Introduction: The monograph, summarising the Late Cretaceous and Tertiary palynological materials published before 1990 in China, consists of two parts:

Part one provides the morphological taxonomic system, and the descriptions of Late Cretaceous and Tertiary spores, 11 new combinations and 2 nominations of fungal spores; 77 genera and 392 species including 1 new species, 10 new combinations and 2 new nominations of Bryophyta and fern spores; 37 genera and 281 species including 8 new species, 12 new combinations and 1 new nomination of gymnospermous pollen; about 69 genera and 409 species including 19 new species, 27 new combinations and 2 new nominations of colpate angiospermous pollen including the Triprojectacites group; and about 109 genera and 670 species including 3 new genera, 46 new species, 110 new combinations and 6 new nominations of colporate angiospermous pollen; as well as 81 genera and 283 species including 1 new genus, 5 new species and 16 new combinations of porate pollen re-described in Chinese text. The total number of palynological taxa is about 412 genera and 2212 species including 5 new genera, 104 new species, 186 new combinations and 13 new nominations. The new genera are: *Spatulosporonites*, *Spatulosporonites*, *Moxiepollis*, *Planotricolporites*, *Yizhengopollis* and *Moraceoipollenites*. The taxonomic system of spores and pollen described in Chinese text is chiefly according to R. Potonie (1956, 1958, 1960) and with some revisions based on the Chinese materials.

Part two consists of three chapters describing consecutively the spore-pollen flora, and

"Fossil Spores and Pollen of China (Vol. 2) - The Mesozoic Spores and Pollen"

Song Zhihen, Shang Yuke et al. (2000), ISBN: 7-03-007588-9. 200 x 265 mm, Hardback 710 pages+167 plates. Price: US\$62 Postage US\$14 by sea mail. In Chinese with English Summary.

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IN MEMORIAM

Gamal El Ghazaly

Gamal El Ghazaly died, following a brief but painful illness, on the 13th of January, 2001. He was 53.

Gamal was born in Alexandria, Egypt on the 17th of June, 1947. In 1969 he obtained a B.Sc in Botany and Chemistry at the University of Alexandria. He became a demonstrator at the university and, in 1974, he obtained his M.Sc. at the University of Alexandria for his thesis entitled: "*Palynological studies in Nubia sandstone from Kharga Oasis*". This led to his appointment as an assistant lecturer in the Department of Botany, a position he held until 1979, when he obtained his PhD from the University of Stockholm for a study entitled: "*Palynology of Hypochoeridineae and Scolyminae (Compositae)*." His fascination with pollen was established. In 1980 he accepted a Lectureship in the Department of Botany at the University of Alexandria and, in 1982 he was

assemblage sequence, for the Late Cretaceous, the Palaeogene and the Neogene.

-21-

awarded the University of Alexandria Prize for Scientific Activities. He took a post graduate Scholarship in the Department of Botany at the University of Berkeley, California, USA. From 1983 until 1988 he was an Assistant Professor in the Botany Department at the University of Alexandria being seconded, however, to the University of Qatar in 1984, where he remained until 1989, becoming Acting Dean of Faculty of Science in that year. In 1988 he was awarded the "State prize in Biological Science", and the "First rank Medal in Science and Arts" and in 1989 the "University of Qatar Scientific Symbol."

During 1989 Gamal accepted the post of Curator of the Palynological Laboratory, at the Swedish Museum of Natural History in Stockholm, a post that he held for ten years. During this period he obtained his D SC (Docent) in systematic Botany, from the University of Stockholm. He also took Swedish citizenship. Following Prof. Siwert Nilsson's retirement in 1998 Gamal became Director of the Palynological Laboratory, at the Swedish Museum of Natural History. He took up Editorship of the World Pollen and Spore Flora in 1989, and the next year became an Editor of Grana. In 1998 he became Editor-in-Chief of Grana, a job which he has carried out with great skill and diplomacy.

Within the field of plant taxonomy and palynology Gamal's interests were wide: pollen morphology, palaeopalynology, pollen ontogeny, and aeropalynology in particular. During the 1980's Gamal was actively involved in planning academic programmes, teaching at all university levels, and adult teacher training for the Egyptian Ministry of Education. Author or co-author of more than 66 publications, he will perhaps be best remembered for his beautiful papers on pollen development and ontogeny, and pollen orbicules. Gamal has had many successful international collaborations, as well as numerous collaborations with his Egyptian colleagues. His rich collaborations with S.I. Saad, John Rowley and William Jensen, Siwert Nilsson and, most recently with one of his previous PhD students

Gamal travelled widely, for study visits, to present lectures, to run courses, and to attend numerous national and international workshops, symposia and conferences including the 5th, 6th and 7th IPC Congresses.

Gamal el Ghazaly was not only an excellent scientist, he was a fine person, gentle, wise, deeply intelligent, thoughtful and a natural diplomat. His warm responsive smile, and the feeling that he was genuinely interested in what one had to say will be deeply missed by his colleagues.

Gamal leaves his wife, Polixeni and their three sons: Amr, born in 1981, and the twins, Tarek and Samy, born in 1983.

[A full list of Gamal's publications will appear in an appreciation of Gamal's life and work in Grana, later this year]

Annick Le Thomas and Madeline Harley



Tamara F. Vozzhennikova

(February 7th, 1914 - February 23rd, 2000)

The Permanent Chairperson of the Paleopalynological Commission of the Academy of Sciences of the USSR, Dr. Tamara Fedorovna Vozzhennikova, passed away in February 2000. Tamara Vozzhennikova was a founder of micropaleopalynological research as a recognised discipline within the broad remit of palaeopalynology. She was also a pioneer in fossil dinoflagellate research in the USSR. Her contributions to this topic provide a rich data source within dinoflagellate studies, and have earned her worldwide recognition.

Suzy Huysmans, deserve special mention. Most recently his co-edited volume: *Plant Systematics for the 21st Century* has been published. A collection of invited papers given at a conference at the Wenner-Gren Center, organised by Gamal and his botanical colleague, Bertil Nordenstam, in Stockholm in 1998, to celebrate the births of Vivi Täckholm and Gunnar Erdtman.

Dr. Tamara Fedorovna Vozzhennikova was born on February 7th, 1914 in Vyatskay Gubernia, Russia. In 1930 she entered Leningrad State University (LSU) in the "faculty for Workers and Peasants" (Rubfac), an early Soviet Union initiative that was later

-22-

disbanded. She completed her studies in the Faculty of Biology. During 1945-1949 she passed the examination of a post-graduate course in hydrobiology at LSU. In 1949 she defended her thesis: *The Algal Flora of Mountain Streams of Tadzhikistan*, and was awarded her Ph.D. (K and biol. nauk). After this she joined the Medical Biological Institute at the West Siberian branch of the USSR Academy of Sciences.

During the long war years she worked first as a riveter in a Soviet aircraft factory and, in the later part of the war, as a laboratory technician in a troop hospital. In 1950 she started work in the Geological Mining Institute of the West Siberian branch of the USSR Academy of Sciences where she created, and was the first Head of, the Palynological Group. Tamara began to study fossil algae - Diatomea, Coccolithophoridae, Peridineae, as well as other groups from the Mesozoic and Cenozoic deposits of the Siberia and Russian platforms.

Since 1958, when the Siberian Branch of the Academy of Sciences was created, Tamara Vozzhennikova worked for more than 40 years at the Institute of Geology and Geophysics (IGG). For more than 20 years she was the Head of the Laboratory of Paleophytology at IGG, one of the largest in Siberia. During 60 years of active research she published some very important monographs, for example: *Paleoalgal characteristics of Meso-Cenozoic deposits of West Siberia* (1963); *Introduction into study of fossil Peridinia algae* (1965), and *Fossil Peridineae from the Jurassic, Cretaceous and Paleogene deposits of the USSR* (1967), publications that established her international reputation. These early publications also provided the basis for her next thesis, and in 1967 she was awarded a D.Sc. in Geology. In that same year she was an invited guest at the 'International

authority on the development of paleoalgeology as a distinct branch of palaeopalynology.

As well as her distinguished academic work Dr Vozzhennikova made a considerable contribution to the more public side of scientific research. She was as a member of the Organizing Committee of the 2nd all-Union Palynological Conference (Novosibirsk, 1964), as well as the 3rd International Palynological Conference (Novosibirsk, 1971). In 1965, under her leadership, the 1st all-Union Paleopalynological Conference was held at Novosibirsk, and then, in 1979, the 2nd all-Union Paleopalynological Conference was held in Kiev. During these years she was also a Chief of the Paleopalynological Commission, under the Scientific Problem Council of the Academy of Sciences of the USSR. The Paleopalynological Commission united more than 5 Subcommissions on different groups of fossil algae: Macroalgae, Diatomea, Coccolithophoridae, Peridineae, Silicoflagellatae, and others. Dr. Vozzhennikova initiated, and presided over, the Morphology and Evolution of Dinoflagellates colloquia and symposia that were held in Krasnoyarsk (1983); Saratov (1985); and Moscow (1990).

In 1990 Tamara Vozzhennikova co-authored, with J.K. Lentin (Canada) her last book: *Fossil dinoflagellates from Jurassic, Cretaceous and Paleogene deposits of the USSR*. This book was devoted to the re-examination of the holotypes of her 1967 descriptions. In the same year she was honoured with an AASP Award of Honorary Membership in recognition of five decades of dedicated and inspired research, and scientific achievement in the study of fossil dinoflagellates.

During her last years Tamara lived in Moscow with her daughter's family, devoting herself to her granddaughters. There are now many of her ex

Symposium on Micropaleontology of Marine Bottom Sediments' held in Cambridge, England. In 1979 she published the book: *Dinocysts and their stratigraphic significance*. During the 1980's Dr Vozzhennikova participated in a Pacific Ocean expedition on the scientific research ship "Vityaz" to study recent dinoflagellate phylogeny and ecology. During the same period she was working in the Institute of Limnology in Sevastopol city, and here she carried out a study on the recent microphytoplankton of the Black Sea. Dr. Vozzhennikova became a leading

pupils and followers working in different cities throughout Russia and the Former Soviet Union. Everyone who knew her well will keep in their hearts an image of Tamara's honesty and integrity. She will stay in our memories, not only as a prominent scientist, but also as a warm-hearted and well-disposed person.

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