

January, 1995

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Martin J. Head, Editor

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The AASP NEWSLETTER is published four times annually. Members are ENCOURAGED to submit articles, "letters to the Editor," technical notes, meeting reports, information about "members in the news," and information about job openings in the industry. Every effort will be made to publish all information received from our membership.

The deadline for the next NEWSLETTER, the second of 1995, is **March 15**. All information should be sent on computer disk (MS Word for the Mac is best, but anything will do) or by e mail, if possible, or if not—send hard copy. Always include a duplicate typescript of all electronic copy sent so I can check formatting, diacriticals, etc. If possible, please illustrate your contribution with art, line drawings, eye-catching logos, black & white photos, color photos, etc. We look forward to contributions from our membership.



PRESIDENT'S MESSAGE

It's a new year and I hope everyone enjoyed the holidays. I have been pleased with the response I've received to my presidential address, both the positive and negative comments it has generated. The nice thing about being president of this organization is that you doesn't have to worry about what the polls say, it's one term and you're out, and there are no provisions in the bylaws for impeachment!

Without repeating what I said in my presidential address, and to respond to some of the comments I have already received, I feel that I should elaborate on some of the points I made. To begin with, I have appointed an Ad Hoc committee to **study** the possibility of affiliating with another organization, and in particular, the possibility of holding joint meeting with them every year or every other year. This committee is being chaired by myself and includes the following members. Sarah Damassa, Thomas Demchuk, Harry Leffingwell, and Paul Strother. I want to emphasize that this committee is **only studying** the possibility of affiliation, and **will not make any decisions without the input and vote of the entire membership**. I hope we can have a report ready for the 1995 meeting in Ottawa so that the various issues of affiliation can be debated. Furthermore, this report will appear in the Newsletter so that those who cannot attend the meeting will have an opportunity to be included in the debate.

One of the points I made concerning the makeup of our membership is that there has been a trend away from purely stratigraphic palynology and towards other aspects of palynology. Because of that and the fact that many of our members are not trained as geologists, it has been

pointed out to me by several people that we should not assume that GSA or the AAPG are the only organizations we should look to for possible affiliation. I agree, and the Ad Hoc committee will be looking at other organizations. Another point I was taken to task about, concerned the name of our organization. I mentioned that because we are truly an international organization, this might be reflected in a name change, as has been done for AAPG by adding "An International Geological Organization" to the end of their name. I am not proposing that we change the name of our organization, only that we look at whether the name still accurately reflects our organization.

I urge everyone to read Harry Leffingwell's letter in the last Newsletter (vol. 27, no. 4, p. 6) regarding affiliation with other organizations, and Geoff Norris's letter in the October (December) 1993 (vol. 26, no. 4, pp. 2-4) Newsletter. Both letters are very germane to the questions of affiliation and joint meetings. I hope everyone will give some thought to where palynology and AASP are headed and how we can make our science and organization even stronger in the future. Please write, call (517-774-3179), fax (517-774-2142) or email me your comments and suggestions concerning this important issue.

You probably noticed that there was not much time to get news items for this issue to Martin Head, the Newsletter editor. This is because we are trying to get the Newsletter back on schedule so that it comes out in January, April, July, and October. Rest assured that commencing with this issue, there will be the normal amount of time to send items to Martin. However, please don't wait until the last minute to send Martin your contributions, as it takes awhile to put the Newsletter together and have it mailed out.

The other items I have to report concern the Board Meeting following the AASP annual meeting in College Station, Texas. Following the appointment of elected officers, a variety of topics were discussed. Vaughn Bryant gave his report on the just concluded College Station meeting and the bottom line was that we will make a small profit. I would like to thank Vaughn and his committee for a most enjoyable meeting. Susan Jarzen gave a progress report on the 1995 Ottawa meeting which is progressing nicely and should be an excellent meeting. Vaughn Bryant then gave an update on the progress of the 1996 IX IPC Houston meeting. At this point, what are needed are volunteers to help organize sessions, symposia, field trips, and other essential tasks. Please let Vaughn or one of the Houston committee members know if you can help out. The last item concerning meetings was that no invitation had yet been received for the 1997 meeting. As of January 4, 1995, I still have not heard from anyone offering to host our 1997 meeting. Please let me know as soon as possible if you would be interested in hosting the 1997 meeting.

Jim Canright's IFPS Report was delivered by Owen Davis, and one of the items discussed was the need to get the Newsletter back on a January, April, July, and October schedule so that *Palynos* can be mailed out with the January and July issue. As reported above, that has been taken care of.

Jan Jansonius reported that a serious effort will be made to publish *Palynology: principles and applications* by April, 1995. John Wrenn then reported on the activities of CENEX. He now has two graduate students, and receives many applications from students who would like to study at CENEX, but unfortunately, do not have the necessary funding. John has had several donations of equipment and collections and is actively seeking funding for CENEX. I might add that John has done an excellent job at getting CENEX up and running and we are now seeing the results of his hard work.

Among other business discussed was committee appointments. Fred Rich (Chairman), Bill Cornell, Norm Frederiksen, Sharma Gaponoff, and Roger Witmer were appointed to the Nomination Committee; Farley Fleming continues as the AGI Liaison; Owen Davis was appointed the INQUA Representative; and Farley Fleming was appointed

as Ballot Committee Chairman.

And finally, the mid-year meeting will be held in Chicago on April 4, 1995. The hotel site has not yet been chosen. Remember that all members of AASP are welcome to attend the mid-year meeting. If you are interested in attending, please contact me and I will let you know where we will be meeting.

Best wishes for 1995.

Reed Wicander, President

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AASP AWARDS FOR 1994

At the AASP Annual Meeting at College Station, Texas, last November, the best student paper was given by Dr. Gretchen Jones, who graduated in 1993 with her Ph.D. in botany from Texas A&M University. Her paper, authored jointly with Vaughn Bryant, was on *Techniques in Melissopalynology*. The best poster award—for which there was a tie—went to Francisca E. Oboh (Department of Geology and Geophysics, University of Missouri–Rolla) for "Correlating Palynofacies Assemblages with Sequence Stratigraphy in Late Campanian Sediments of the Book Cliffs, East-Central Utah," and Colleen Gillespie and Gail Chmura (Department of Geography, McGill University) for "*Pediastrum* Assemblages in Tributaries of the Mississippi River."



Best student paper award winner, Gretchen Jones, with Vaughn Bryant at the AASP Annual Meeting at College Station, Texas, last November.

REPORT OF AASP NOMINATING COMMITTEE

This year's nominating committee submits the following list of candidates for consideration by the AASP membership. The nominating committee included Fred Rich (Chairman), Bill Cornell, Norm Frederiksen, Sharma Gaponoff, and Roger Witmer.

President-Elect Stephen A. Hall
Gordon D. Wood

Secretary-Treasurer: David T. Pocknall (currently and unopposed for re-election)

Managing Editor: David K. Goodman (currently and unopposed for re-election)

Director-at-Large: Donald W. Engelhardt
Joycelyne A. Legault
Francisca Oboh
Robert S. Van Pelt

According to Article 7.03 of the AASP Inc. bylaws, "Additional nominations may be made by any member in good standing by submitting a petition, signed by at least nine (9) other members in good standing, to the Secretary-Treasurer by March 1."

Submitted by Reed Wicander, President

[Pictures and bibliographies of candidates will appear in the next, i.e., April, issue of the Newsletter.]

UNOCAL⁷⁶

UNOCAL BEST APPLICATIONS PAPER FOR 1994

Gordon D. Wood, John H. Wrenn, Donald W. Engelhardt, Brenda L. Claxton, Jeffrey A. Stein, and Gary W. Barker were awarded the Unocal best applications paper for 1994 for their talk entitled "The importance of reworked palynomorphs in interpreting depositional and thermal history; examples from Argentina, Pakistan, and South East Asia." This talk was given at AASP's 27th Annual Meeting, College Station, Texas, and the abstract appears on page 53 of the conference Program & Abstracts volume.

Supplied by David Vork
Unocal, Sugarland, Texas

EMAIL ADDRESS CORRECTION

AASP Secretary-Treasurer David Pocknall's email address is not as indicated in the November issue of the Newsletter (Although some messages got through, so I guess it was close.—Ed.) Dave's real address is: dpocknall@hou.amoco.com

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HAVE YOU THOUGHT OF AASP IN YOUR WILL?

Happy occasions call for celebration. My husband and I had a bottle of champagne ready and waiting for the finalization of our daughter's adoption. On a more serious note, we also had new wills ready and waiting for the finalization. Looking out for our family is a very important to us. I also consider AASP my family and my new will includes a bequest to AASP. Have you thought of AASP in your will?

Lucy E. Edwards, AASP Past President



1994 AASP STUDENT SCHOLARSHIP RECIPIENTS

The AASP Awards Committee is pleased to announce that Martine Hardy, Timothy Kroeger, and Yuan Xun lai are the winners of the AASP Student Scholarships. These awards are based on the qualifications of the student, originality and imagination evident in the proposed project, and the likelihood of significant contribution in the field of palynology. Each awardee received \$300 (US). The relatively high number of awards this year were made possible by generous donations from AASP members and a contribution from the Southern California Palynological Society after the group disbanded.

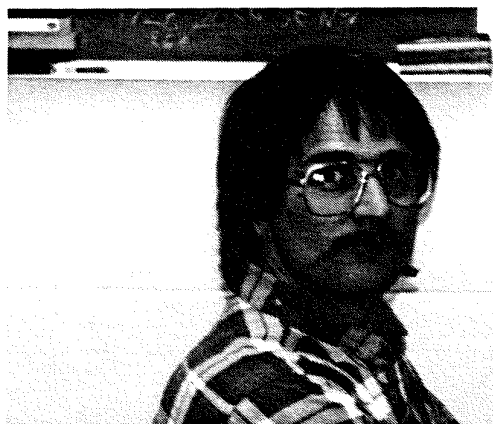


MARTINE HARDY is working on her Ph.D. at Louisiana State University (CENEX), Baton Rouge, under the guidance of Dr. J.H. Wrenn. In 1992 she completed a bachelor's degree in Biology, and in 1993 a Master's degree in Applied Palynology. Both degrees are from the University of Liège (Belgium); Professor Maurice Streef was her thesis advisor. She presented the results of her thesis at the AASP Annual Meeting in College Station. Martine's winning proposal is entitled "Factors controlling the organic content in siliciclastic sediments coming from similar fluvio-deltaic contexts at different periods of time."

Her dissertation project consists of studying the lateral distribution of kerogen, pollen, and spores in the Holocene Mahakam Delta, Indonesia. Last May and June, Dr. John Wrenn, Dr. Loretta Satchell, and Martine collected surface sediment samples in the Mahakam Delta. The ultimate goal is to improve the understanding of the distribution of organic matter within continental and deltaic environments of deposi-

tion, so as to produce an organic distributional model for the modern Mahakam Delta.

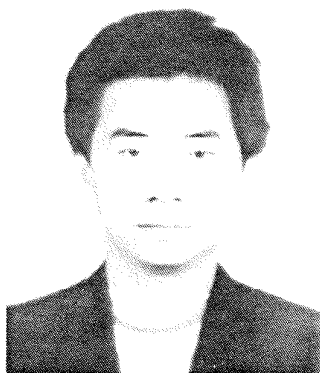
Martine would like to thank Prof. Maurice Streeel and the "Services associés de Paléontologie de l'Université de Liège" for her fantastic experience with them and their enthusiastic support for three years.



TIMOTHY J. KROEGER is completing his Ph.D. at the University of North Dakota under the supervision of Dr. Patricia Kelly and Dr. Doug Nichols (USGS). Tim received his B.Sc. from the University of Minnesota in 1979 and his M.Sc. in 1985 from the South Dakota School of Mines. His winning proposal is entitled "Paleoecology of Paleocene palynomorph assemblages from the lower Fort Union Group of southwestern North Dakota."

The goals of Tim's research are to relate palynomorph assemblages to specific depositional environments, using paleoenvironmentally significant assemblages to interpret the habitat of the paleoflora and determine the age of the maximum transgression of the Cannonball Sea. Although Tim's dissertation has palynostratigraphic aspects, it also offers the opportunity to confirm paleoecologic interpretations that are based on the ecologic requirements of phylogenetically related extant plants. He is using multivariate statistical techniques to objectively delimit palynomorph clusters.

Tim is has accepted employment as an Assistant Professor at Bemidji State University, Minnesota. He is currently involved in research on the Cretaceous-Tertiary boundary in southeastern Montana. Tim will use the award to complete his dissertation.



YUAN XUN-LAI is working on Late Proterozoic fossils at Nanjing Institute of Geology and Palaeontology, Academia Sinica, Nanjing, under the supervision of Dr. Yin Lei-ming. Yuan completed his B.Sc. in geology (specializing in Paleontology and Stratigraphy) at Beijing University in 1987, and received his M.Sc. (in Late Proterozoic microfossils) from the same university under Prof. Zhang Yun in 1990. His

winning proposal is entitled "The microstructures of acritarchs from the Late Proterozoic phosphatic deposits and their biological affinities."

Yuan's project will integrate the acritarch palynology and sedimentology of the Late Proterozoic Doushantuo Formation, South China. The acritarchs are well preserved and occur in situ with multicellular thallophytes, cyanobacteria, and protist-like microfossils from the saprophosphatic bed of the Doushantuo Formation. They constitute a distinctive phytobenthoplanktic fossil assemblage characteristic of the Late Proterozoic phosphatic deposits. He will use maceration, normal petrological thin section, and SEM methods to study the microstructures of acritarchs. On the basis of morphological comparison with modern microphytoplankton, he hopes his study will reveal details of their original structures and biological affinities.

Merrell A. Miller, AASP Awards Committee Chairman



AASP STUDENT SCHOLARSHIPS AVAILABLE

The application form for the American Association of Stratigraphic Palynologists, Inc. Student Scholarships is included at the back of this newsletter. **Up to two scholarships of \$1000(US) each may be awarded.** Applications must be received by April 3, 1995 and the winners will be announced by April 28, 1995. Previous winners of this award are eligible only if they are pursuing a different degree than the one they were pursuing when they received the previous award. AASP Scholarships are available to all students of palynology in all countries.

AASP MEMBER HONORED

PROFESSOR W.G. CHALONER receives LYELL MEDAL of the Geological Society of London

Reprinted from *Geoscientist*, 4[5]: 21

PROFESSOR CHALONER your early interest in the geological sciences was encouraged by classes attended at Chelsea Polytechnic whilst still at school in Kingston. You went then to Reading University where you obtained first class honours in a general degree programme covering Botany, Chemistry and Geology. The following year you were awarded first class honours in Botany. You chose to stay on in Reading to work with Professor Tom Harris and obtained your Ph.D. for a thesis on *in situ* spores from Carboniferous lycopods.

Much has been made of the breadth of your interests and your prodigal powers of observation. These seem to follow logically from your record of outstanding achievement in such a broadly based first degree. Yours is the example to quote to students who so often perceive success only in narrow specialization. Your seminal work on fossil lycophytes remains the major reference text and your pioneering work on the palaeoecology of fossil spores and Palaeozoic flora generally remains highly influential.

Perhaps most of all, you have been gifted with foresight. You have stimulated research in so many important new fields. The list is long: growth rings in fossil trees, palaeobiogeographical reconstruction of fossil charcoal and palaeoatmosphere composition, biomolecular palaeontology and links between stomatal density and atmospheric

CO₂ concentrations.

You also have that precious gift of being able to pass on your enthusiasm in these many subject areas to generations of students. I have heard it said in this context that few geologists have not been enthralled by a Chaloner lecture.

It is right that you have received many honours for your work. It is appropriate to mention at least one of the more recent of these: Volume 49 of the *Palaeontological Association Special Papers in Palaeontology* was entirely dedicated to you and your work.

The Society regards the Lyell and Murchison medals very highly indeed and I am delighted to ask you to accept the Lyell Medal for 1994 and by so doing add distinction to what I am sure you will agree is already along and distinguished list.

REPLY: Mr. President, Members of the Society and Guests, I am deeply grateful to the Council for this award, not least because I am really only a part-time geologist. The rest of the time I am a botanist, or at least a palaeobotanist.

I did hold a Chair in Geology in Pennsylvania State University for a year, but for the greater part of the last 20 years I have been a professor of botany. I have benefited in having my feet in both camps, in being able to explain to fellow botanists that my ignorance of plants was due to my being a geologist; while in the company of geologists I explained away my inadequacies in the grounds that I was at heart a botanist.

That I managed to get away with this duplicity, I attribute in great measure to good luck. This started with my going to Chelsea College—Chelsea Polytechnic as it then was—to study geology with Dr. Fleet. He was a remarkable man, to whom I owe an enormous debt. Fellow students—a year ahead of me—were Derek Ager and Doug Shearman who both became Lyell Medallists. Two enthusiastic demonstrators on Dr. Fleet's staff were Wally Pitcher and Bill Smith, who was later to head the Chelsea department.

I am humbled to see that two other people who had a great influence on me, W.N. Edwards and Percy Allen, are also Lyell Medallists. I believe I just had the enormous good fortune to meet helpful people at the right stage in my career. But the greatest debt I owe is the 30 or so young people who have been postgrads or postdocs in my lab. They have taught me far more than I taught them. I can only wish them as much good luck as I have had.

Submitted by Judith K. Lentin

[Professor Bill Chaloner FRS was awarded the AASP Scientific Medal in 1984
The full title of this publication is: Collinson, M.E. and Scott, A.C. (Eds.), 1993. Studies in palaeobotany and palynology: in honour of Professor W.G. Chaloner, FRS. *Special Papers in Palaeontology*, 49: 1–187; pl. 1–27. Price: £50/\$100, available from Blackwell Publishers; phone: (617) 547-7110; fax: (617) 547-0789.—Ed.]

NORMAN FRANCIS HUGHES 1918–1994: AN APPRECIATION

by Ian Harding

Norman Hughes, one of the founding fathers of academic palynology, passed away on the 18th September 1994 after a short illness and his loss has been keenly felt by both his family and his colleagues. There have already been several obituaries published in various broadsheets and newsletters concerning Norman's extremely active career, his research interests and accomplishments and the myriad students he supervised who now hold notable positions in the academic and industrial hierar-



Norman Hughes, 1918–1994, at his desk in Cambridge.

chy. This passage is intended therefore, not as a duplication of these obituaries, but as a personal appreciation of a great paleontologist and palynologist.

I clearly remember my first meeting with Norman in July 1982 when in Cambridge for an interview for a research studentship. I confess I was rather overawed by his imposing presence as he appeared from behind masses of apparently randomly stacked piles of literature in his old office, conforming very much to my mental image of what a Cambridge don would be like. I had arrived with a mad whim about wanting to do a Ph.D. on spores and pollen, but with no really clear idea of a research topic, so we sat down and started to work out a proposal together. However, at that stage I seem to remember that the only thing I could say in response to Norman's question "What would you like from a Ph.D.?" was a fatuous "Well, I'd like to travel." As he rocked his head back in response, that was probably the first time I heard the characteristic Norman chuckle, and I somehow realized that this was someone with whom I would enjoy working. Audrey MacDougall, James Penny and I all started working with Norman at the same time, and we all got on like a house on fire, but even so, such was Norman's presence that it was about 18 months before any of us could bring ourselves to call him by his Christian name!

I first became aware of Norman's long academic association with the Department of Earth Sciences whilst whiling away a few minutes outside the Sedgwick Geology Library. Anyone who has visited the Department will probably be familiar with the corridor outside the Library, which proudly displays the photographs of the student geological society, the Sedgwick Club. For those with an eagle-eye, Norman can first be found on these group photographs as an undergraduate studying the Natural Sciences Tripos in 1938, proudly sporting a full head of hair. Although his studies were unfortunately interrupted by the war, Norman returned to Cambridge to continue his studies in 1946, when he again appears on the Sedgwick Club photographs, although this time unfortunately minus the hair.

I was of course exposed to the Hughesian concepts of the "biorecord" and "paleotaxon" methods which Norman clearly explained as being designed to allow greater access to and interpretation of primary data. Indeed the first paper to which I contributed, with Norman as first author described an unusual monospecific dinocyst assemblage from the

Wealden of southern England, but using "biorecords" not conventional Linnean binomials. Whilst I would not claim to agree with every Hughesian proposal myself, the clear, logical and above all honest method of recording paleontological data should be held up as an example to all scientists. Anyone who has ever tried to extract data published several years ago for interpretative purposes will undoubtedly have discovered shortcomings in the nature of the recorded data. Norman's proposals were primarily designed to combat such shortcomings, his personal crusade was to ensure that the maximum amount of information was recorded for the benefit of later workers. I would like to make an impassioned plea to anyone who has not previously come across the biorecord concepts to take the time to read through the methodologies that Norman proposed (Hughes 1976, 1989, 1994), with an unbiased mind.

Norman's forthright views in all matters including palaeontology resulted in him becoming something of an anti-establishment figure, although I think Norman himself in many ways revelled in playing the Devil's Advocate, thoroughly enjoying every opportunity to communicate his provocative and controversial ideas. I clearly recollect times when Norman would deliberately bait female graduate students over coffee or formal meals in college. His usual line of argument began something along the lines of "I don't think that women scientists should receive funding as all they do after their Ph.D.'s is go off and have babies," and not surprisingly it usually produced his desired reaction of outrage! Not that Norman necessarily held such views, he just liked to stimulate discussion on controversial subjects and get people's grey matter moving! Society should always be appreciative of someone brave enough to stand by their convictions and to stimulate active, even heated discussion.

In the final stages of writing up my thesis, Norman would read through drafts of my chapters. He would again chuckle at certain statements I'd made, saying that I couldn't possibly say that sort of thing about someone else's research at such an early stage in my career, adding with a glint in his eye however, that he would be able to get away with it as he had already firmly established his reputation in the field! On one occasion I recall him wandering into our dry preparation lab just as I was venting my fury at a very derogatory letter from a senior academic, by throwing the said letter onto the floor and jumping up and down upon it, swearing that if this sort of unwarranted reaction was the norm the Department had seen the last of me! Norman rocked back on his heels and had a jolly good laugh at the whole thing, and of course managed to calm the situation down enough for me to see sense and continue my research! James and I always found Norman to be totally unselfish, even lavish with his time, ideas and energy during the tenure of our Ph.D.'s, indeed I think that it would be difficult to find a better research supervisor. Both James Penny and I came to regard Norman with great warmth and affection and would regularly refer to him as a surrogate uncle rather than a supervisor. Again, after two years unofficial post-doctoral work, were it not for being intercepted by Norman in the Departmental Coffee Room, and his persuasive reasoning, I would probably have decided to turn down the offer of the lectureship I now hold in Southampton. As an indication of the formative influence that Norman had on my own career, when I am discussing problems with my own research students, I regularly find myself thinking "Now how would Norman have approached this situation?"

Norman also fulfilled many important roles in his Cambridge college, Queens', with great dedication, such as being for many years the Keeper of the College Records. Certainly on his return to the Department in the afternoons after an arduous lunchtime wine-tasting, the rosy cheeks he sported indicated that the position of Wine Steward was one that gave him great satisfaction. Again I have many happy memories of the advice he provided to me on my several stints as Graduate Steward for the college, when we were organizing feasts or tastings for the

graduates. James and I always treasured being invited to dinner with Norman and Pamela, spending many a pleasant and cultured hour, discussing Pamela's fine art work of which Norman was always so supportive, or their latest overseas visit and all the fascinating plants and birds that they had seen. Although I have to confess that after the excellent food and the many and varied alcoholic beverages such as evening presented, I always viewed the bicycle ride homewards with some trepidation!

Queens' College have lost a dedicated and respected Fellow, palaeontology has lost an invaluable and stimulating scientist, many of us have lost a valued friend and colleague and Pamela has lost a devoted and much loved husband after over fifty years of happy marriage, and our thoughts and support are with her.

All of our lives have been enriched by being privileged to have known Norman.

The successor volume to Norman's *The Palaeobiology of Angiosperm Origins* (Hughes 1976), was published shortly before his death. Entitled *The Enigma of Angiosperm Origins* (Hughes 1994), Norman dedicated the tome to his one-time teacher Hugh Hamshaw Thomas with the statement that he "solved a significant part of the problem in the context of knowledge seventy years ago, but was ahead of his time." In another seventy years I believe people will be saying the same of Norman Francis Hughes.

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- Hughes, N.F., 1976. *The palaeobiology of angiosperm origins*. Cambridge University Press, Cambridge, 242 p.
- Hughes, N.F., 1989. *Fossils as information*. Cambridge University Press, Cambridge, 136 p.
- Hughes, N.F., 1994. *The enigma of angiosperm origins*. Cambridge Palaeobiology Series, No. 1. Cambridge University Press, Cambridge, 303 p.

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[Personal tributes to Norman Hughes, written by David J. Batten and W. Brian Harland, appeared in the November 1994 issue of the Newsletter.]

MEMORIAL FUND FOR NORMAN FRANCIS HUGHES

Many of Norman's friends and colleagues have enquired about the possibility of dedicating a memorial to his memory. After discussion with Pamela Hughes and many of his former Ph.D. students, the opinion was that a lasting memorial in the form of a newly planted grove of trees as close as possible to his home in Cambridge, would be an extremely appropriate memorial. Such a memorial would be a fitting tribute to



Norman's career as a palaeobotanist, to his consuming interest in all things natural, and also be a lasting tribute for the benefit future generations. To this end we have ongoing contact with the Woodland Trust, a British conservation charity responsible for the purchase and planting of native broadleaved woodlands with regard to identifying a suitable location for this dedicated grove. Former students, colleagues and friends of Norman Hughes who felt able to contribute to the fund are invited to send their contributions to "The Norman Hughes Memorial Fund" c/o Dr I C Harding, Department of Geology, University of Southampton, Highfield, Southampton SO17 1BJ, England. All contributions will be gratefully received and all those who contribute will be informed prior to the formal dedication of the grove.

Ian Harding

IN MEMORIAM

Francine Martin

I report with deep regret that Francine Martin died on December 16, 1994 after a long bout with cancer. She was a pioneer in the study of acritarchs and an obituary for her will appear in the next Newsletter.

Submitted by Reed Wicander, President

Warren S. Drugg

Warren Drugg sadly passed away on December 1, 1994. He will be remembered for—among other things—his many important contributions to fossil dinoflagellate research. An obituary for him will appear in the next Newsletter.—Ed.

THE U.K. SCENE

by Jim Riding, our U.K. correspondent

A vacancy for a palynologist was recently advertised by the University of Wales, Aberystwyth. The position of lecturer in palynology involves both teaching and research responsibilities. It arose due to the recent resignation of Bruce Tocher. Bruce joined the Institute of Earth Studies, one of the U.K.'s largest geology departments, several years ago and was instrumental in setting up the M.Sc. course in palynology at Aberystwyth. This relatively new course was one of the results of the review of U.K. geology departments carried out by Ron Oxburgh in the late 1980's. The closing date for applications is the 31st of January 1995, a deadline which may have passed by the time you read this. However, any enquiries should be addressed to Professor David Batten at Aberystwyth. Bruce Tocher is moving to a position at IKU Petroleum Research, Trondheim, Norway in January 1995. IKU (Institutt for Kontinentalsokkelundersøkelser og petroleumsteknologi) is a well-established institute which specializes in research projects on the petroleum geology of Scandinavia and the Arctic. They have a relatively large biostratigraphy group led by Martin Smelror. We all wish Bruce well in his new job. The palynological scene in Norway is vibrant at the moment; a vacancy for an academic palynologist was recently advertised by the University of Oslo. Enough of the Nordic countries, I'm supposed to be the U.K. correspondent!

1995 is the 25th anniversary of the founding of the British Micropalaeontological Society. One of the five specialist groups of BMS, the palynology section, has been the main focus of U.K. palynologists since 1970. We are holding a special Silver Jubilee meeting on



A happy 25th to the British Micropalaeontological Society.

Saturday 18th of November 1995 at University College, London.

Six keynote lectures will be given by prominent workers on ostracodes, foraminifers, calcareous nannofossils, conodonts, radiolarians, and palynomorphs. The full lineup of speakers and titles is not yet finalized; however Bill Reidel has agreed to give the radiolarian lecture. We are holding a celebratory dinner at UCL in the evening; there will be an after dinner speaker. AASP members are cordially invited to this meeting. If you intend to come, could you please write to me enclosing a £10/\$15 registration fee. (The fee is waived for student members of BMS). Full sets of volumes 1–12 of the *Journal of Micropalaeontology* are still available from me at the bargain price of \$108. It may be that the high cost of postage (\$76) is putting some people off. We are happy to sell individual papers from these volumes (except vols. 2 and 3) to AASP members at \$1 per reprint. I am happy to send out listings of the papers available to interested parties.

During October 1994 two Russian palynologists, Valentina Fedorova of VNIGRI, St. Petersburg and Vera Ilyina of the Institute of Geology and Geophysics at Novosibirsk visited the laboratories of the British Geological Survey, Nottingham. They spent two weeks examining palynofloras from the U.K. Mesozoic in order to make comparisons with material from the Russian Platform and Siberia.

Would fellow U.K. palynologists please forward me news reports for future editions of this feature.

J. B. Riding
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England, U.K.

THE JURASSIC MICROFOSSIL GROUP

by Niels Poulsen, our correspondent for the Nordic countries

The Jurassic Microfossil Group (JMG), formerly the Jurassic Micropalaeontological Working Group, is an informal working group of the International Subcommission on Jurassic Stratigraphy (ISJS). The current membership stands at nearly 170 members.

The main purpose of the JMG is to provide a newsletter for the membership which includes information on upcoming meetings within and outside ISJS, summaries of current projects of JMG members, summaries of the ISJS working group meetings, advertisements of microfossil publications, and requests for samples exchanges.

A computer directory and database of the members (including addresses, specialties, current projects, and recent publications) has been established by the former convener of JMG, Donna Meyerhoff Hull of The University of Texas at Dallas. A copy of the membership database is now being distributed.

At the last 4th International Congress on Jurassic Stratigraphy and

Geology, Mendoza, Argentina, 19–23 October 1994. Donna Hull resigned as secretary and convener of the JMG. Four persons are replacing her now, this in itself highlights the amount of work Donna has put into the JMG. Niels Poulsen (Geological Survey of Denmark) will be secretary and newsletter editor, with Karen Dybkjaer (Geological Survey of Denmark) as co-secretary. The database of the Research Directory of the members of JMG will be taken over by Patricia Whalen (South Methodist University, Dallas, USA) and David Cole (University of Southampton, UK) will take over the publications index [see separate item in this Newsletter]. David will run the database using the Papyrus system, which should be compatible with most systems and people will be able to send their information on disk.

It was also agreed at the congress in Argentina that subscription to the yearly JMG Newsletter should cost in total \$15 for the period until the next congress of ISJS in 1998. Further information on the newsletter may be given me.

The 5th International Congress on Jurassic stratigraphy. The next congress for ISJS is expected to be in August 1998 in Canada, arranged by Russel Hall (University of Calgary, Canada).

Bathonian Working Group The Bathonian Working Group under the ISJS dealing with biostratigraphy, biochronology, sedimentology, sequence stratigraphy, magnetostratigraphy, and paleontology is now being reorganized. Palynologists and other geologists interested in participating in the work of the Bathonian Working Group may contact the convener, Charles Mangold, Centres des Sciences de la Terre, Université Claude-Bernard, Lyon I, 43 boulevard du 11 Novembre 1918, 69622

Villeurbanne Cedex, FRANCE.

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JURASSIC MICROFOSSIL PUBLICATIONS INDEX

Following the meeting of the Jurassic Microfossil Group in Argentina last October it was decided that, in time for the meeting in 1998, an index of all publications concerned with Jurassic Micropalaeontology should be compiled.

With some trepidation this task was undertaken by myself (David Cole) and the rest of the team at the University of Southampton. The system is now up and running with only a few very minor glitches so I am now trying to get in touch with everybody who has an interest in the Jurassic and ask a really big favour and help me to fill up the rapidly growing database. Anything you feel should be included within this compilation, that has been published (not in press, sorry) is welcome. For the listing we are asking for all the usual information that comes with a reference citing (including journal title in full please for some of those more obscure publications!) as well as up to a maximum of 10 keywords for cross-referencing (Jurassic obviously need not be one). The ideal format for downloading at this end is a plain ASCII textfile with at least one blank line between references (we can convert most other formats and will of course accept

hardcopies—but not too many please.

All information can be forwarded to me at:
DCC1@SOTON.AC.UK

or David C. Cole,
Department of Geology
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MEETING REPORT

GEOLOGICAL SOCIETY OF AMERICA COAL GEOLOGY DIVISION SYMPOSIUM

Monday, October 24, 1994 Seattle, Washington

“Origin of Compositional Characteristics in Tertiary Coals: Paleocology, Paleobotany and Palynology”

Report by Tom Demchuk

This symposium was held at the Annual Meeting of the Geological Society of America, Seattle WA, on the morning of Monday, October 24, 1994. The symposium was organized and co-convened by Thomas D. Demchuk (Amoco E&P Technology, Houston), Timothy A. Moore (Coal Research Association, Lower Hutt, New Zealand) and Jane C. Shearer (Foundation for Research, Science and Technology, Wellington, New Zealand). Eleven papers were presented during the symposium proper, and three were given during the afternoon coal general session.

The symposium opened with a keynote presentation by Dr. P.E. Moore (Kings College, London) entitled, “The development of modern peat-forming processes.” This presentation, describing present day hydrological and vegetational differentiation within mires, set the stage for the remainder of the symposium. Dr. Jane Shearer et al. gave the next presentation, “Coal character and Tertiary flora: causes and effects”, which discussed the uniqueness of Tertiary coals and some possible causes of these characteristics. Paleobotanical and palynological coal paleocology was then discussed by Dr. Garland Upchurch Jr. (S.W. Texas State University, San Marcos, TX) and Dr. Doug Nichols (U.S. Geological Survey, Denver) respectively.

Geographically specific presentations then followed and these included:

R.F. Fleming and B.F. Pierce, “Paleocene coals from the Raton Formation, Colorado and New Mexico—palynological and petrographic characteristics.”

I.R. Sluiter et al., “Stratigraphic, ecological and biogeographic relationships of the Oligo–Miocene brown coal flora, Latrobe Valley, Victoria, Australia.”

G.R. Holdgate et al., “Sequence analysis and the origins of Tertiary brown coal lithotypes, Latrobe Valley, Gippsland Basin, Australia”

R. Sykes et al., “A coal seam facies model for the recognition of raised mire deposits in the Tertiary.”

W. Riegel et al., “The botanical signature of Neogene lacustrine lignites in Greece and its application to ecosystem reconstruction.” (Unfortunately Dr. Riegel was unable to be present.)

W. Schneider, “Paleohistology of Miocene lignites in central Europe.”

D.J. McIntyre et al., “Petrological, palynological and geochemical characteristics of Eureka Sound Groups coals, Stenkul Fiord, Ellesmere Island, Arctic Canada.”

Three other presentations which were given in the afternoon general coal session, which fell under the auspices of the symposium included: J. Dehmer, "The interpretation of petrological and organic geochemical data of Recent peats with know environments of deposition."

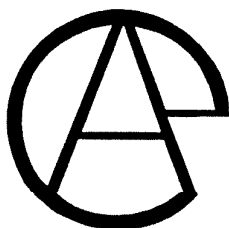
P.D. Warwick, "The San Pedro and Santo Tomas coals of Webb County, Texas: anomalous nonbanded coals associated with Eocene-age lignites."

L. Jie, "The preliminary study on the origin of the higher content of bitumen from Tertiary *Sphagnum* brown coal." (Unfortunately Dr. Jie could not be present.)

One of the palynological highlights occurred at the Coal Geology Division Business Luncheon when the paper presented by Doug Nichols was awarded "runner-up" best paper award. Doug is to be presented with a citation from the coal division, and it is noteworthy that a palynology paper be recognized in this manner by a non-paleontological group.

Fifteen papers will be included in a proceedings volume, which will be published as a Special Volume of the International Journal of Coal Geology. It is hoped that this volume will be out before the end of 1995. The co-convenors would very much like to acknowledge the Coal Geology Division of GSA for their support of this symposium, and would very much like to thank the Petroleum Research Fund of the American Chemical Society for a grant which offset travel costs for some of the overseas speakers.

Dr. Thomas D. Demchuk
Amoco Exploration and Production Technology Group
Biostratigraphic Support and Development Section
Houston, Texas



WHAT IS CAP?

CAP is an acronym for Canadian Association of Palynologists, a society founded in 1978 to promote and encourage Canadian palynology. CAP in the past has hosted several AASP annual meetings (e.g., Toronto, Halifax, Banff Springs) and is hosting the 28th Annual Meeting in Ottawa next October [see article by David and Susan Jarzen, November 1994 issue of the Newsletter, p. 5]. CAP members receive semi-annually the CAP Newsletter, edited by Alwynne Beaudoin, and which covers all aspects of Canadian palynology including features on research at Canadian institutions, Canadian thesis abstracts, recent publications by Canadian palynologists, meetings calendar, personalia, and much more.

A recent letter from a U.S. colleague points to the still lingering impression that CAP membership is restricted to Canadians. This item hopes to put the record straight. CAP, which presently has numerous non-Canadian members scattered across the globe, actively encourages overseas membership. And all members (not just Canadians) are encouraged to submit items to the CAP Newsletter—one of the best in the business. CAP membership dues are CAN\$10 per year, payable annually or up to three years in advance. Funds are payable at the beginning of each year. Those wishing to join CAP should make checks

payable to "CAP" and send to:

Martin J. Head
CAP Secretary/Treasurer
Department of Geology
University of Toronto
22 Russell Street
Toronto, Ontario
Canada M5S 3B1



FORENSIC PALYNOLOGY

Just a brief note to let members know that my invited 1991 FBI Academy paper on "Forensic palynology" is available through the National Technical Information Service, Washington, D.C. (800/553-6847; order # PB94-145877) for \$36.50. The 283 page monograph, entitled "Proceedings of the International Symposium on the Forensic Aspects of Trace Evidence," includes, in addition to my paper, some 16 others as well as 31 extended abstracts. Unfortunately, the cost of this work prohibited me from sending the original to colleagues; photocopies were sent to those who include me on their reprint list.

Edward A. Stanley
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PALYNOLOGY IN THE NEWS

ANCIENT FARMERS' FEAT: RESEARCHER DISCOVERS
PUEBLO INDIANS GREW COTTON AGAINST GREAT ODDS

by Jason Flores-Williams

reprinted from *Santa Fe*, April 18, 1994.

Pueblo Indians were growing cotton in the Rio Chama Valley more than 500 years ago—a newly discovered feat of high-altitude, dry-land farming that leaves modern scientists impressed.

The discovery—by Santa Fe researcher Glenna Dean, who developed a technique for studying cotton pollen—offers new insights into the sophistication of Pueblo Indian society.

"This was no accident," Dean said of the success of long-ago farmers in battling the arid conditions of the Rio Chama Valley. "They had a conscious breeding program for their cotton. They grew it in places that are too high to even think of growing modern cotton in."

At elevations above 6,000 feet, farmers face a short growing season. In the Rio Chama Valley, Pueblo farmers also were faced with scarce rainfall.

Despite that, Dean said, the farmers managed to raise large fields of cotton.

Tim Maxwell, director of the Office of Archaeological Studies at the Museum of New Mexico, said the Indian farmers employed special

techniques to conserve moisture in the soil.

"Growing drought-tolerant cotton required that they use gravel mulch fields," he said. "They would construct the fields by gathering river cobbles—that is rocks and pebbles from the river—and would put together square beds that would serve three purposes: save the soil, protect against frost and prevent erosion.

"Gravel mulch technology was very successful," he said. "It worked for over 250 years."

Maxwell said cotton production in the valley appears to coincide with a population boom that occurred around 1250. He estimates the population of the valley was between 4,000 and 10,000 at the time.

"We knew that the people in this area during that time grew cotton, we just didn't know where," he said.

Dean termed the technique she used to pinpoint the cotton farming sites Intensive Systematic Microscopy.

Because cotton pollen, especially ancient pollen, is extremely rare in the soil, Dean needed to find only one cotton grain per soil sample to prove cotton production was carried out in the area.

To help identify the grain, she put under the microscope a known substance along with the sample thought to contain cotton pollen. Determinations were made by comparing the substances.

Submitted by Vaughn M. Bryant, Jr.

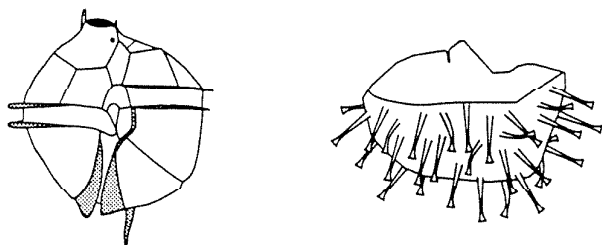
DEATH IN THE PLIOCENE

by Carl Zimmer

reprinted from *Discover*, 16(1): 85 (January 1995).

In 1989 paleontologist Steven Emslie was nosing around a shell pit in Sarasota County on Florida's Gulf Coast when he started finding fossils of fish, seals, and birds. Most of the birds were cormorants—goose-size diving birds that still live along seacoasts around the world. There were lots of cormorants: Emslie eventually dug up 137 skeletons, as well as thousands of disarticulated bones. Judging from the way the fossils had been deposited, almost all the birds had died at once, 2.5 million years ago. Emslie had a murder mystery on his hands.

He thinks he solved it this past year. Emslie, who is now at Western State College of Colorado in Gunnison knew that Gulf Coast cormorants today are sometimes killed by red tides, blooms of marine algae that produce swift acting poisons. Fish are poisoned when they eat the algae, and when cormorants eat the fish, they die too. Emslie had already found a lot of fish fossils along with his cormorants, and last summer he sent sacks of the Sarasota rocks to an expert on fossil algae, John Wrenn of Louisiana State University. Wrenn dissolved the material in acids and put it under the microscope. He found more than 30 kinds of algae—and by far the most abundant was a species called *Pyrodinium bahamense*, which causes red tides today. "We know it causes death, sometimes in



Pyrodinium bahamense, an important culprit of red tides. The theca is on the left (from Fensome et al., 1993). Its cyst, on the right, is also known by the fossil name *Polysphaeridium zoharyi* (from Edwards & Andrie, 1992).

humans," says Wrenn. "You suffocate from paralysis. It's a pretty nasty way to go."

Red tides are thought to have been the first plague visited on the Egyptians in the Bible, and they are becoming increasingly common these days—some researchers blame marine pollution. But Emslie and Wrenn's finding is the first fossil evidence of a red tide animal kill. Now that researchers are aware of the possibility, though, more cases of murder-by-algae are likely to turn up in the fossil record. "This particular species of algae has been on the Gulf Coast for at least 50 million years, essentially unchanged," Wrenn points out. "Whatever it's doing, it's doing a great job of it."

Submitted by Vaughn Bryant, Jr.

[This story was covered also by Scott Fields in the popular science journal, *Earth*, p. 14, under the threatening title "Red Menace."—Ed.]

A NEW EVOLUTIONARY MODEL FOR THE ANGIOSPERMS

by Gilbert J. Brenner

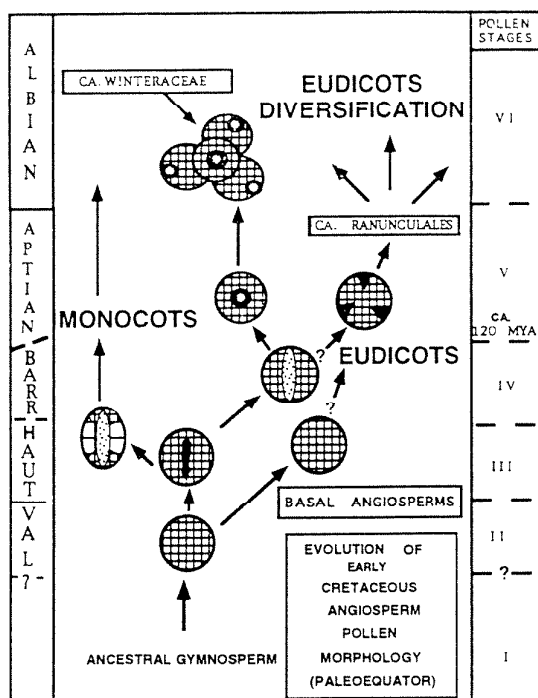
While I am still involved in palynostratigraphy, I thought you might like to see how palynology can be a powerful tool in evolutionary studies.

Next year I will contribute a chapter in new book published by Chapman and Hall and edited by Leo Hickey of Yale and David Taylor of Indiana University that presents a new theory on the origin of angiosperms sometimes referred to the "Paleoherb Hypothesis." I will present data that is contrary to the prevailing views about the origin of flowering plants. My model (see Text-figure) suggests the gymnosperm *Gnetum* as the closest living ancestor to the angiosperms and presents the monosulcate aperture as a derived character, evolving from the inaperturate condition.

Palynology has been playing a major role in the search for the ancestral state of the flowering plants. For several years I and several other workers have been searching for the oldest angiosperm pollen as a clue to their botanical origin. I have to admit that this search has been more like a competitive race rather than a cooperative effort.

The classic idea is that the oldest angiosperms should have large boat-shaped pollen like the pollen that is found in the living members of *Magnolia*. So entrenched is this Magnolean model for the origin of the angiosperms that for years palynologists have searched the fossil record for large boat-shaped monosulcates in Jurassic and Lower Cretaceous sediments that could be transitional between gymnosperms and the first undoubted angiosperm pollen in the Lower Cretaceous.

Years ago I realized that the lower I looked in the Cretaceous the smaller and rounder the tectate-columellate monosulcate angiosperm pollen got! A few years ago I fortunately had the opportunity to observe what I feel is a phyletic sequence of angiosperm pollen in cores from the Upper Valanginian, Upper Hauterivian, Upper Barremian and Lower of Israel. What I saw was totally contrary to the accepted expectations. The Valanginian forms were poorly reticulate-columellate, very small (12–20 μm), and distinctly devoid of any sulcus! The pollen was more like the pollen of the Chloranthaceae, Piperaceae, and Saurauraceae (sometimes referred to as the paleoherbs). In the Hauterivian, the pollen develops a sulcus, although crude in form, beneath the position of some newly developed endexine. The endexine typically absorbs safranin stain more readily than the ectexine. Before the Barremian, angiosperm pollen are extremely rare (one grain per 500). By the Upper Barremian Lower Aptian the sulcus is well defined and the assemblage of



monocolpates is highly diversified. Tricolpates first appear in the Lower Aptian (in the equatorial zone only) reflecting the evolution of the more advanced dicots (the eudicots).

I should mention that there is much opposition to the above ideas, but already new data are coming along from other parts of the world that support my model of pollen evolution.

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BOOK REVIEWS

SHORT REVIEWS OF GEOLOGICAL SOCIETY OF AMERICA SPECIAL PAPERS RECENTLY RECEIVED

by

Reed Wicander, AASP Book Review Editor

The Prebatholithic Stratigraphy of Peninsular California by R. Gordon Gastil & R.H. Miller (Eds.), 1993. Geological Society of America Special Paper 279. Geological Society of America, 3300 Penrose Place, P.O. Box 9140, Boulder, Colorado 80301. 172 pages, with 7 pocket plates. \$65.00.

This impressive volume is a compilation of the research of numerous geologists on the pre-Late Triassic rocks of southern and Baja (peninsular) California. The 12 chapters and one appendix provide an overview of what is known of the prebatholithic stratigraphy, paleontology, and geology of this region. As acknowledged in the Preface, the 12 papers are not parallel in style, nor do all of the authors agree with each other. However, within this volume one will find a wealth of geological information on pre-Late Triassic Peninsular California. Because there has been no formal stratigraphic nomenclature for rocks older than Late

Triassic in this region, several group and formation names are introduced. In other cases, the informal stratigraphic names have been used because it is likely that further work will result in the abandonment of the formal name.

According to the editors, Peninsular California can be viewed as consisting of at least five separate tectonostratigraphic terranes. Each of these terranes is defined and shown on an index map for reference in later papers. The structural relations between these terranes is poorly known and an area of continuing study.

Each contribution to this volume concerns a specific aspect of the pre-Late Triassic geology, stratigraphy, or paleontology of Peninsular California. Among the contributions are: "Prebatholithic stratigraphy of the San Felipe Area, Baja California Norte, Mexico" by Paul Anderson, "Allochthonous Ordovician strata of Rancho San Marcos, Baja California Norte, Mexico" by Carl Lothringer, "Permian and Lower Triassic stratigraphy along the 30th parallel, Eastern Baja California Norte, Mexico" by I. Philip Buch & Marc P. Delattre, "Permian crinoid columnals from the Zamora Formation near El Volcan, Baja California Norte, Mexico" by Gary Webster & Marc Delattre, "The Early Mesozoic Julian Schist, California" by Mark Germinario, and "Prebatholithic history of Peninsular California" by R. Gordon Gastil.

This final chapter by one of the editors, Gordon Gastil, provides an overall geologic summary of Peninsular California, drawing upon the work of contributors to this volume, as well as uncompleted and unpublished work. It is, however, the interpretation of the author and does not necessarily reflect the views or opinions of the contributing authors.

In addition to the papers, this Special Volume also includes six geologic maps of the area and one columnar section.

Effects of Scale on Archaeological and Geoscientific Perspectives

Julie K. Stein & Angela R. Linse (Eds.), 1993. Geological Society of America Special Paper 283. Geological Society of America, 3300 Penrose Place, P.O. Box 9140, Boulder, Colorado 80301. 96 pages. \$32.00.

In this Special Paper, "the effect of scale on archaeological and geoscientific perspectives is examined with special emphasis upon its role in interdisciplinary geoarchaeological research." The seven papers in this volume, which resulted from a symposium at the 1990 annual meeting of the Geological Society of America, are organized around those areas within geoarchaeology that are most affected by scale.

The first paper by Julie Stein, defines scale, and examines how the role of scale in archaeology, the geosciences, and geoarchaeology has changed during the past century. The remaining six papers deal with various aspects of scale primarily in the archaeological sciences. These papers are: "Geoarchaeological scale and archaeological interpretation: Examples from the central Jornada Mogollon" by Angela Linse, "The scale of soil investigations in archaeology" by Vance Holliday, C. Reid Ferring, & Paul Goldberg, "Archaeochronology and scale" by Bonnie Blackwell & Henry Schwarcz, "Geoarchaeological perspectives on the past: chronological considerations" by Jeffrey Dean, "Issues of scale in Archaeogeophysical research" by Rinita Dalan, and "Archaeology, geology, and geochemistry in obsidian provenance studies" by Richard Hughes & Robert Smith.

Tonsteins: Altered Volcanic-Ash Layers in Coal-Bearing Sequences

by Bruce F. Bohlen & Don M. Triplehorn, 1993. Geological Society of America Special Paper 285. Geological Society of America, 3300 Penrose Place, P.O. Box 9140, Boulder, Colorado 80301. 48 pages. \$24.00.

For those who don't know what tonsteins are (and that included me until I read this Special Paper), they are "altered, distal, air-fall volcanic-

ash layers commonly preserved in coal-accumulating environments in nonmarine strata. The clay mineralogy of these thin claystone layers is usually kaolinitic, with phenocrysts of primary volcanic minerals floating in a clay matrix." Because tonsteins are associated with coal-forming environments, their geologic range is Devonian to Recent. They are found on almost every continent, but are best known from North America and Europe where their study began in the Upper Carboniferous coal beds of the Saar region of Germany. Because of their volcanic air-fall origin, tonsteins are isochronous and can be used to vertically zone coal beds and provide control for various geologic sampling as well as the calibration of palynologic zones.

This Special Paper provides the reader virtually everything he or she would want to know about tonsteins. Following an introduction, the authors discuss the nomenclature and classification of tonsteins, their geographic occurrence, volcanic characteristics, and methods of study. An extensive section follows on the mineralogy of tonsteins which is beautifully illustrated with both black and white photographs, color photographs, and SEM photos of the various minerals comprising tonsteins. The gross texture, alteration of volcanic ash to tonstein, environmental effects of thick ash falls, and the stratigraphic uses of tonsteins complete this Special Paper.

One of the points made in this volume is that precise dating of tonsteins in coal-bearing beds can improve the calibration of paleobotanical and palynological zonations. This, in turn, can extend the usefulness of these zonations in coal beds where tonsteins are not present by being able to provide approximate age dates for these zonations. This has already been done by combining the palynology and paleobotany in Tertiary coal beds of southern Alaska and western Washington with conventional K-Ar and fission-track dating of tonsteins in these coals.

As the authors suggest, the utility of these studies would probably be improved if the tonsteins were redated using $^{40}\text{Ar}/^{39}\text{Ar}$ techniques, as well as applying these age dating techniques to determine the age relationships of Carboniferous fossil floras of eastern North America and Europe. Here is an excellent example of how palynologists and geochronologists can work together to solve and clarify stratigraphic as well as evolutionary problems.

Modern and Ancient Coal-Forming Environments by James C. Cobb & C. Blaine Cecil (Eds.), 1994. Geological Society of America Special Paper 286. Geological Society of America, 3300 Penrose Place, P.O. Box 9140, Boulder, Colorado 80301. 202 pages. \$52.50.

The goal of this interesting volume is to examine how research on modern coal forming environments in equatorial ever-wet climates such as in Indonesia may be helpful in improving models that can be used to predict the quality and occurrence of coal deposits, particularly in the formation of low-ash and low-sulfur coals. The thrust of this research is, in part, dictated by the Clean Air Act Amendments of 1990 that regulate the emissions of sulfur dioxide in the United States, which are partly determined by the sulfur content of the coal.

As the editors point out in the Introduction, coal is the major fuel for the generation of electrical power in the world and is vital as a fuel in some industrial applications and in coke manufacture for use in the steel industry. As developing countries use more coal to fuel their industries, and concern about the environment increases, it is imperative that we know as much as possible about the conditions under which coal forms so that geologists can "predict the chemical and physical characteristics of coal beds for utilization."

Part I of this volume contains seven research papers dealing with modern coal-forming environments in Indonesia. These seven papers are interrelated in that they deal with different aspects of the same deposits. Among the papers are: "Allogenic and autogenic controls on sedimentation in the central Sumatra basin as an analogue for Pennsyl-

vanian coal-bearing strata in the Appalachian basin" by C. Baine Cecil et al. in which the recent sedimentation patterns in the central Sumatra basin may help explain the cyclic nature of Pennsylvanian deposits in the eastern United States. "Inorganic geochemistry of domed peat in Indonesia and its implication for the origin of mineral matter in coal" by Sandra Neuzil et al. examines how the inorganic geochemistry of the domed peat deposits in Indonesia may be possible modern analogues for some types of low-sulfur and low-ash coals. "Brown coal maceral distributions in a modern domed tropical Indonesian peat and a comparison with maceral distributions in Middle Pennsylvanian-age Appalachian bituminous coal beds" by William Grady et al. illustrates that the optical characteristics of peat constituents are consistent with the characteristics of macerals observed in brown coal, and thus brown-coal maceral terminology can be used in the analysis of modern peat. The last paper in Part I is "Detrital peat formation in the tropical Mahakam River delta, Kalimantan, eastern Borneo: Sedimentation, plant composition, and geochemistry" by Robert Gastaldo et al. and deals with the sedimentology, plant composition, and geochemistry of a detrital peat deposit in the eastern Borneo from the perspective of its potential as a source for petroleum.

The four papers in Part II of this volume concern the origin of Pennsylvanian-age coal and coal-bearing strata. The first paper by Cortland Eble & William Grady, "Palynologic and petrographic characteristics of two Middle Pennsylvanian coal beds and a probable modern analogue" deals with the palynology and petrography of the commercially important Stockton and Fire Clay coal beds of the Kanawha Formation from the central Appalachian Basin. Eble and Grady show in this paper that these coal beds resulted from the transition between a planar and a domed peat swamp. This paper will be of particular interests to palynologists because of the use and application of palynology in this study.

Palynology also plays a key role in two of the other three papers. "Vegetational patterns in the Springfield Coal (Middle Pennsylvanian Illinois Basin): Comparison of miospore and coal-ball records" by Debra Willard looks at the vegetational composition in the Springfield Coal on the basis of coal-ball and miospore records to determine the different aspects of the coal-swamp vegetation. "The evolution of a ground-water-influenced (Westphalian B) peat-forming ecosystem in a piedmont setting: The No. 3 seam, Springhill coalfield, Cumberland Basin, Nova Scotia" by J. H. Calder details the lithology, maceral, and palynologic characteristics of a Nova Scotian Pennsylvanian coal bed.

Overall, this is an excellent resource for current research in modern and ancient coal-forming environments. It also ranks up there in terms of having some of the longest titles for papers in a Special Paper volume.

Perspectives on the Eastern Margin of the Cretaceous Western Interior Basin by George W. Shurr, Greg A. Ludvigson, & Richard H. Hammond (Eds.), 1994. Geological Society of America Special Paper 287. Geological Society of America, 3300 Penrose Place, P.O. Box 9140, Boulder, Colorado 80301. 268 pages. \$60.00.

This volume deals with the rocks of the eastern margin of the Cretaceous Western Interior Seaway. Most geologists are familiar with the paleogeographic reconstructions of North America during the Cretaceous in which a broad epicritic sea divided the continent into two large islands. The rocks along the western margin of this seaway are also generally well known, in part, because of the coal, petroleum, natural gas, and uranium associated with the region. The rocks of the seaway's eastern margin, however, are not as well known, and one of the goals of this volume is to make detailed studies from the eastern margin more readily available to a wider audience.

Interestingly enough, it was the eastern margin strata that was first studied in 1804 by the Lewis and Clark expedition. Members of that expedition described Cretaceous rocks from outcrops along the Mis-

souri River in what is now Iowa, Nebraska, and South Dakota. Yet, because of the lack of continuous exposures, and few economic resources, such as are found along the western margin, the geology of the eastern margin is nowhere near as well known as the western margin. As is pointed out by the editors in their Introductory Remarks, "it is impossible to understand the Cretaceous dynamics of the Western Interior Seaway without the perspectives provided by the record from the eastern margin. This volume presents data that must be integrated with information from the center and western margin of the seaway to produce more realistic interpretations."

In the 12 chapters that follow, the geology, paleontology, stratigraphy, and geochemistry of strata from along the eastern margin of the Cretaceous Western Interior Seaway is presented. Among the titles are: "Upper Cretaceous stratigraphy and sea-level history, Gulf Coastal Plain of Central and Eastern Alabama" by D. T. King, Jr., & M. C. Skotnicki, "The Dakota Formation in Iowa and the type area" by B. J. Witzke & G. A. Ludvigson, "Sequence stratigraphy of Cretaceous Albian and Cenomanian strata in Kansas" by V. Hamilton, "The Mid-Cretaceous boundary in the Western Interior Seaway, Central United States: Implications of palynostratigraphy from the type Dakota Formation" by R. L. Ravn & B. J. Witzke, Evolutionary and paleoecological implications of fossil plants from the Lower Cretaceous Cheyenne Sandstone of the Western Interior" by Q. C. Huang & D. L. Dilcher, and "Faults and structure in the Pierre Shale, Central South Dakota" by T. C. Nichols et al.

Of particular interest to palynologists is the paper by R.L. Ravn & B.J. Witzke. They state that palynological evidence from Dakota Formation sections in the type area of eastern Nebraska and western Iowa indicate that the mid-Cretaceous unconformity may be traceable to a horizon within the Dakota Formation which separates the upper Woodbury Member from the lower Nishnabotna Member. This suggested interpretation thus calls into question whether to include the Nishnabotna Member within the Dakota Formation.

THESIS ABSTRACTS

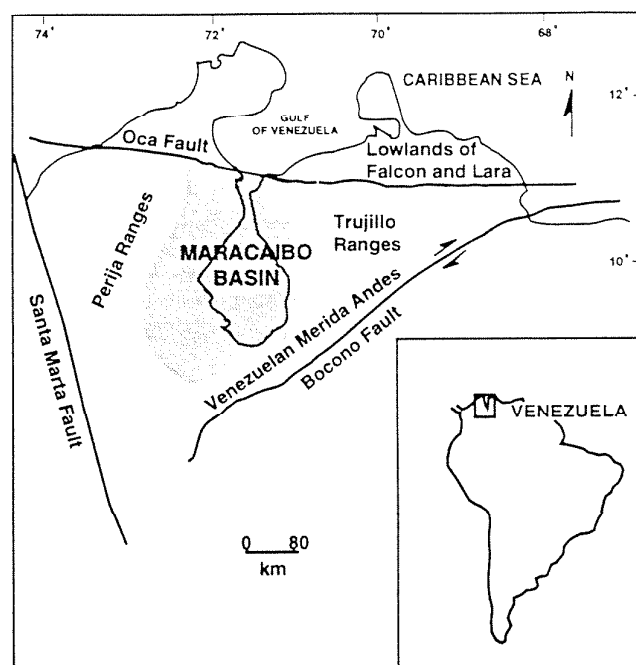
LOWER CRETACEOUS PALYNOSTRATIGRAPHY, ORGANIC SEDIMENTOLOGY AND EVOLUTION OF THE MARACAIBO BASIN, WESTERN VENEZUELA*

Ph.D. thesis by Omar A. Colmenares

Palynological analyses of four outcrop and four subsurface sections of the Aptian-Albian siliciclastic-carbonate platform facies of the Aguardiente Formation and the Cogollo Group of the Maracaibo Basin yielded a total of 97 species of miospores 60 species of dinoflagellate cysts, freshwater protists and acritarchs, and numerous phytoclasts.

Corollina, *Araucariacites* and *Afropollis* are the most common elements, indicating close resemblance with coeval assemblages from Brazil and Africa. Quantitative comparison of the dinoflagellate cysts and the occurrence of *Xenascus plotei*, *Achomosphaera triangulata*, *Kiokansium unituberculatum* and some species of *Subtilisphaera* indicate similarities with low latitude areas. The occurrence of several species of *Subtilisphaera* in tropical and subtropical areas indicates initiation of provincialism of peridiniacean dinocysts during the Aptian-Albian.

Four biozones are defined using marine and terrestrial species of palynomorphs. Biozones I (Early Aptian) and II (Early to Middle Aptian) have rich terrestrial assemblages and lesser or absent marine components. Biozone III (Late Aptian) is characterized by the diversification of tricolpate angiosperm pollen in northern South America and increasingly diverse dinocysts. Biozone IV is defined by the first



Geographical location of the Maracaibo Basin, western Venezuela, showing major faults.

occurrence of *Elaterosporites klaszi* and *Xenascus plotei*, determining the base to be Early Albian. The Aguardiente Formation is Aptian-Albian, the Apón Formation is restricted to the Aptian, the Lisure Formation is Late Aptian to Albian and the Maraca Formation is Albian. Regional palynostratigraphic correlation indicates major facies changes related to carbonate dominance northwards away from the siliciclastic influx from the south.

The palynofacies and palynological assemblages of the Aguardiente Formation are dominated by terrestrial organic matter. Size statistical variations of terrestrial phytoclasts and the compositional variation of the palynofacies are related to relative sea-level changes and to paleoenvironmental oxidation. Five sedimentary phases are defined indicating transgressive and regressive pulses, correlated to relative sea-level changes.

The miospore assemblages of this study are inferred to represent mainly coastal plant communities. Dinoflagellate cysts are dominated by a few generalist species. Seven new species of miospores are described and new taxonomic combinations and emendation are also proposed. Many species of rare miospores and dinocysts are described in open nomenclature and may be new.

*Ph.D. thesis, 1994, Department of Geology, University of Toronto, Ontario. Supervisor: Geoffrey Norris.

GEOCHEMICAL AND PALYNOLOGICAL CHARACTERISTICS OF TERTIARY OIL SHALES AND LIGNITES OF THE MAE MOH BASIN, NORTHERN THAILAND*

M.Sc. thesis by Le van Minh

The sources of organic matter, the depositional conditions during the lacustrine/swamp phases, the degree of post-depositional thermal alteration are examined for a Tertiary intermontane basin in northern Thailand, the Mae Moh Basin. Alternating oil shale and lignite layers in this basin also preserve a record of changing temperature and precipitation patterns, and variable contributions from swamp flora and

lake primary producers.

Variations in molecular and isotopic geochemical characteristics (including compound-specific stable carbon isotope compositions) and spore and pollen assemblages (including thermal alteration index) across a 300 meter section of the Middle Mae Moh Formation are investigated. Samples collected are classified into: group I, lignite; group II, argillaceous lignite; and group III, oil shale. The saturate fraction for all samples is dominated by n-alkanes from C_5 to C_{33} . Group I is characterized by a high abundance of the high molecular weight (HMW) C_{26} to C_{33} (up to 82%), and a low abundance of the low molecular (LMW) C_{15} to C_{19} (3 to 8%). Group III has a lower abundance of the HMW alkanes (29 to 66%), and a greater abundance of the LMW homologues (13 to 43%). Group II has n-alkane distribution that is intermediate between these end members. Although the dominance of higher plant contributions is indicated throughout the section, the oil shales clearly received substantial contributions from lake primary producers (algae). These molecular trends are consistent with the $\delta^{13}C$ values determined on bulk samples, which vary from -22.5 to -26.8‰. The $\delta^{13}C$ of n-alkanes in the HMW range, which are mostly lighter than -30‰, also substantiate a dominantly higher plant source. Algal contributions are suggested by the relative abundance of LMW alkanes with carbon isotopic compositions (about -24 to -30‰), which are somewhat enriched compared to the HMW homologues (-28 to -35‰).

Decomposition and settling conditions of organic particulates are inferred from the pristane/phytane ratios (Pr/Ph). Oil shale samples, having Pr/Ph ratios close to unity (0.95 to 1.58), were likely deposited during oxic-anoxic fluctuations on the bottom of lakes and bogs within the basin. Deposition and degradation of lignitic organic matter probably occurred in prevailing oxic conditions as indicated by their Pr/Ph values that range from 1 to 3.53.

The degree of thermal maturation given by thermal alteration index (TAI) values ranging from 2.0 to 2.4 and carbon preference index (CPI) from 0.63 to 3.77 (most values are >1) indicate immature to early mature stages in terms of oil generation for Mae Moh source rocks. The spore and pollen assemblages are mainly palm (*Spinizonocolpites*, *Oncosperma*, *Calamuspollenites*, and *Cyrtostachys*), fern (*Verrucatosporites* sp. and *Polypodioidites* sp.), deciduous trees (*Quercoidites*, *Alnipollenites*, and *Trivestibulopollenites*), and other specimens of unknown affinity: *Crassoretitriletes* sp., *Trichanthera* sp., *Monosulcites*, *Cupuliferoipollenites*, *Biretisporites huonensis* and *Roipites* sp. Their temporal variations suggest a dominant tropical paleoclimate with possible cooler conditions in the early stage of basin evolution.

*M.Sc. thesis, September 1994, Department of Earth Sciences, Memorial University of Newfoundland, St. John's, Newfoundland. Supervisors: Drs. T. Abrajano and E. Burden.

CUSTOM CORING EQUIPMENT

Greenfield Machine Works have developed some real fans among Quaternary scientists in the eastern U.S. Located off the beaten track in Old Town, Maine, we are a great source of custom coring equipment and coring supplies.

We can supply or make hard-to-find items such as cables, metric drive rods, T-handles, casings, specialty thread adapters, and replacement doors and pistons; but our real strength is building custom sampling equipment. Each coring system we've made has been a unique design, reflecting specific research interests. Making a finished research tool from a back-of-an-envelope sketch is what we're good at.

We are the primary supplier of research corers and equipment and repairs for the Institute for Quaternary Studies at the University of



George Jacobson and Chris Dorion from the Quaternary Institute at the University of Maine operating a Greenfield Machine Works-made Russian corer to take lake bottom samples from the frozen surface of Mansell Pond in Alton, Maine. Photo courtesy of the Institute for Quaternary Studies.

Maine and have supplied corers to researchers at Colby College and Duke University. We have extensive experience with Russian corers, Wright-type hydraulic piston corers, and Davis reconnaissance corers but are willing to take on any project you can envision. Frequently we are asked to make metric replacement parts for European made equipment. Prices charged are just a little over cost as we view this work as a "good cause" rather than "good business."

John Erdman, the owner of Greenfield Machine Works, is a Ph.D. scientist refugee from a Fortune 500 company where he spent a career doing research and designing and building specialty scientific equipment. Freed with a golden parachute of early retirement and seeking the simpler life in the north woods, he has built a business that designs and builds specialty manufacturing equipment. He can be contacted by phone at (207) 827-5557 or via email on the Internet at JPErdman@AOL.com.

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HF FATALITY

A splash of lethal acid recently killed the employee of a small Mosman Park laboratory in Western Australia. The victim, aged 37, died an agonizing death after he accidentally splashed about 100ml of a 70 percent solution of hydrofluoric acid on his leg on October 28.

The victim apparently jumped into a swimming pool in a vain bid to neutralize the virulent chemical.

He had the leg amputated but the acid poisoned his blood and he died on Saturday in Freemantle Hospital. The acid has to come in contact with **only 2 percent** of the body to be fatal. A permit is needed from the Health Department [in Western Australia] to use the acid and it is a condition that a neutralizing agent, calcium gluconate gel, be kept on site.

According to a health expert, the victim would have had little chance of surviving a hydrofluoric acid spill as big as the one that killed him, even if every precautionary measure had been taken.

[Synopsis of a report "Man in acid death agony" by Jeremy Chitty, which appeared in The West Australian, November 17, p. 3.—Article supplied by David Goodman.]



TREATMENT OF HF BURNS

HF is one of the strongest of inorganic acids. It differs from other acids in that the fluoride ion readily penetrates the skin causing destruction of deep tissue layers and even bone. Unlike other acids, which are rapidly neutralized, this process may continue for days. One of the problems with recognition of HF burns is that contact with concentrations less than 50% HF may not produce clinical symptoms for 1 to 8 hours, and with concentrations less than 20% the latent period may be up to 24 hours.

Burns may be treated by injecting milliliter quantities of 10% aqueous calcium gluconate into the subcutaneous tissue of the burned area (at a rate of 0.5 ml per square cm. of burned area). However, it appears that calcium gluconate injection is not necessary in the majority of cases. Instead, the injured part may be soaked in an iced aqueous solution of Hyamine. This solution should be available at all times in the first aid cabinet; it is prepared by dissolving 2g of Hyamine in a liter of distilled water). The soaking may be done either by immersion of the injured part or by the continual application of iced compresses. There is a lag period with HF between the time of contact and the beginning of tissue damage so there should be no cause for panic.

Hyamine is a high molecular weight quaternary ammonium compound. It is thought to work by penetrating the skin and forming an insoluble complex with the fluoride ion, thereby preventing further damage.

Burns to the eye must be immediately washed with copious amounts of cold water followed by installation of pontocaine drops to relieve pain. Cortisporin, or similar agent, is then used and a consultation with an ophthalmologist is recommended.

Exposure to HF fumes can also cause serious problems, in particular, pulmonary edema. Prompt and prolonged administration of oxygen can alleviate or prevent this problem from occurring.

Extracted from the Ontario Geological Survey laboratory safety manual, p. 123–125. Is your laboratory equipped to deal effectively with an HF accident? Why not check your first aid cabinet now!—Ed.]

CALL TO ALL POLLEN ANALYSTS

by J.P. SUC

A Ph.D. thesis is being undertaken in Marseilles and Montpellier (France) by Séverine Fauquette to quantify the Pliocene climate in western Europe and in the whole Mediterranean region.

As evidenced by Dowsett et al. (1992: *Science*, 258, p. 1133–1135), the supervisors of the thesis (Dr. Joel Guiot, Marseilles and Dr. Jean Pierre Suc, Montpellier) consider it very important to estimate Pliocene climates—the warming which occurred at 3.1–3.0 Ma being a good past analogue for the extension of the greenhouse effect.

The western Europe and Mediterranean region is very rich in well-dated, detailed Pliocene pollen analysis. Unfortunately, unlike East Asia, western and eastern North America, the Mediterranean region is devoid of any living plant representative of tropical–subtropical environments. As a consequence, we urgently need modern surface samples (10 cc; from lakes, coastal marine sediments or mosses) from East China, Japan, North Vietnam, eastern and western North America, and the Red, Caspian, and Black seas. Their pollen analysis will be used for reference to better understand the climate response of significant taxa. Existing pollen-analytical data are also welcome. In each case, we need to know the latitude, longitude and altitude of each sample locality.

Samples (or pollen spectra) should be sent to:

Dr. Jean-Pierre SUC
Laboratoire de Palynologie (case 061)
Université Montpellier II
F-34095 Montpellier cedex 5 (France)
Tel. (33) 67 14 32 69
Fax. (33) 67 04 20 32

Any help will be greatly appreciated. If you have difficulty mailing samples, please contact J.P. Suc. You will be informed about using the dispatch box of the French Embassy in your country. Many thanks.

SOUTHWEST PACIFIC POLLEN ATLAS

by Geoff Hope

The Southwest Pacific Pollen Atlas is an electronic Atlas of pollen types designed to give an overview of types encountered in the Australian–Malaysian area for which no conventional Atlas exists except one for Taiwan. The project is now in pilot stage, and a test version, containing mangrove taxa, has been sent to collaborators for comment and suggestions.

The Atlas is being developed in the Division of Archaeology and Natural History in the Research School of Pacific and Asian Studies, the old department of Biogeography and Geomorphology having been merged with Prehistory and the Quaternary Dating Centre.

The Atlas runs on PC or Macintosh using Filemaker II, and there is also a Delta (Unix) version. Pollen images are stored as quicktime movies of 4 or 5 views, any one of which can be viewed by sliding a button on the screen. The movies are stored separately from the data file, which currently describes 4600 pollen types. The pollen description has been kept simple on purpose, but a full diagnosis is included as a test. Thus pollen can be quickly found on the basis of a few characters. At present each "find" must be looked at sequentially; however a screen of found images (up to 16 at a time) is being developed. Images are not of high quality, but file-size constraint prevents high-resolution scanning at present. We are looking into rapid compression/decompression

programs, because when the Atlas contains 12,000 entities it will exceed our goal of containing it on a single CD.

Tagging selected records allows a printed copy of required taxa to be produced. The quality of output from standard 300 dpi laser printer is quite satisfactory. Current plans for the first issue of the Atlas on CD-ROM are to release it at the end of 1994. If better software is encountered, there may be some delay. Collaborators in the region will send in new taxa for checking and incorporation. Meanwhile image improvements, addition of SEM and other changes will be taking place. The Atlas should thus be upgraded once or twice a year. Cost will be that related to producing and mailing the CD.

The Division has decided to develop jointly a SE Asian-Pacific site database with John Dodson, University of New South Wales and Peter Kershaw, Monash University. Ed Cushing (University of Minnesota), John Flenley (Massey University) and other active groups will also be involved. We will follow the North American Database format, utilizing the 16 groupings of the Atlas plus some additional areas in southeast Asia to collect all Quaternary sites. Initial lists indicate that about 250 sites are completed, not including New Zealand. Tilia files are already constructed for about 70 sites, but standard dictionaries and surface sample files need to be developed. Funding for the data entry is currently being sought.

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AUTOMATION OF POLLEN IDENTIFICATION AND COUNTING USING DIGITAL IMAGE PROCESSING TECHNIQUES

by Walter J. Treloar

There are several examples of studies that combine different types of cellular analysis with digital image processing techniques. Systems have been developed for the analysis of genetic material within cells, the sizes of planktonic bacteria, or to count blood cells. The research being undertaken at Massey University is to use image processing techniques. The first method is a standard statistical classifier, the Fisher Linear Discriminant Function (Hand, 1981), and the second is based upon artificial neural networks (Rumelhart et al. 1986).

Results.—Initial attempts to classify 12 pollen taxa using only texture features produced very poor results. However the classification scheme outlined above successfully split these 12 pollen taxa into sub-samples consisting of between 1 and 4 taxa each. The sub-samples were correctly identified (using only the statistical method) at the lower level of the scheme at an average of 91% of the tie. The majority of the classification rates were 100% but due to a pair of taxa with very poor classification rates the average rate dropped to 91%. The textures of these two taxa were inverses of each other (in the same way that a photograph's inverse is its negative), and the texture measures used were not powerful enough to differentiate them. The neural network proved to be more efficient than the statistical classifier as 100% classification rates were achieved in all cases except those that included the two taxa described above.

Problems Remaining to be Solved—Research here at Massey has now moved away from the use of SEMs for automatic pollen identifi-

cation. Even though it has been demonstrated that pollen images taken from SEMs are ideal for identification purposes there are drawbacks to using them in an automated system. Every image captured from the SEM took at least 45 seconds to construct due to the relatively slow scan rate of the electron beam. Images captured using much faster scan rates were of too poor a quality. This slow scan rate in a final automated system would be unacceptable. Also the cost of a final system, if it incorporated a SEM, would be beyond the financial capabilities of most pollen laboratories.

As a result research has now shifted to the use of more conventional light microscopes. An attempt is currently being made to repeat the results achieved on the SEM using a Zeiss Axiophot Photomicroscope. Images may be captured instantaneously from a CCD Video Camera mounted on the microscope. The frame-store used has been upgraded to one with a maximum image dimension of 768 x 512 pixels and 256 gray-levels.

Work is also being done to improve and develop the texture discriminators used and thus to drive down the misclassification rate of some taxa. A new and more powerful set of discriminators has now been incorporated and is currently being assessed.

With the need to classify a greater number of pollen taxa the present classification scheme may need further refinements. Research is currently under way in the Department of Probability and Statistics at the University of Sheffield to improve the efficiency of the classification scheme. The possible role of neural networks as a solution will also be explored further.

The final area that requires work is the automatic control of all the microscope functions including stage movement, lens changing and focusing. Similar systems are already available, for example, in the automatic analysis of cervical smears.

Conclusion.—There are many areas that still require work before an automated pollen identification system is produced. However, none of them can be said to be unsurmountable.

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AEROPALYNOLOGY PUBLICATIONS

by David A. Frenz

Beginning January 1995, I will publish a summary of the current literature in the area of aeropalynology. This publication is called *Progress in Aeropalynology* and will contain three issues per volume (January, May, September). Material in each issue will be indexed by author and keywords, pointing in each case to the references arranged in the body of the issue. Each index will be cumulative for the volume: no. 2 will index no. 1 and 2; no. 3 will index the contents of the entire volume.

Progress in Aeropalynology will be reasonably specific to the field of aeropalynology, although the types of materials indexed will be necessarily diverse. Topics I will follow will range from atmospheric pollen surveys, to pollen-antigen isolation, to biometeorological models for pollen dispersal, etc. My objective is to treat the subject with the breadth required to appeal to investigators working in various research areas.

Progress in Aeropalynology will be published on a non-profit basis. The subscription cost of \$21US is required to cover the expenses I will incur compiling, printing and distributing this publication. For at least the first year of publication, *Progress in Aeropalynology* will be printed on paper and mailed to subscribers. At some point in the future I will consider also making it available in electronic format.

For those familiar, *Progress in Aeropalynology* draws its inspiration from the summaries Erdtman published in the early issues of *Grana palynologica*. Even in the era of electronic databases, I consider those summaries more helpful in form and function than other sources of indexed information.

Those interested in subscribing to *Progress in Aeropalynology* should direct inquiries to:

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INFORMATION ON SPORE TABLETS

Lycopodium spore tablets are used as a "spike" for estimating absolute abundances of palynomorphs (see also October 1992 AASP Newsletter). They have been used for many years in Quaternary studies, but now are also finding their way into research on Neogene and older samples. The Department of Quaternary Geology at Lund University is the sole supplier of *Lycopodium* spore tablets, and the following account from Lund University (supplied by Vaughn Bryant, Jr.) describes their newest batch.

***Lycopodium* spore tablets (batch 124961).** *Lycopodium* spore tablets can be dissolved in water or in HCl, but not in NaOH. They have been prepared in a slightly different way compared to that described by Stockmarr (1971, 1973). The tablets are thus based mainly on sodium bicarbonate together with polyvinylpyrrolidone and polyethyleneglycol, which must be carefully washed away with water and finally with diluted HCl before further treatment. The spores are acetolysed.

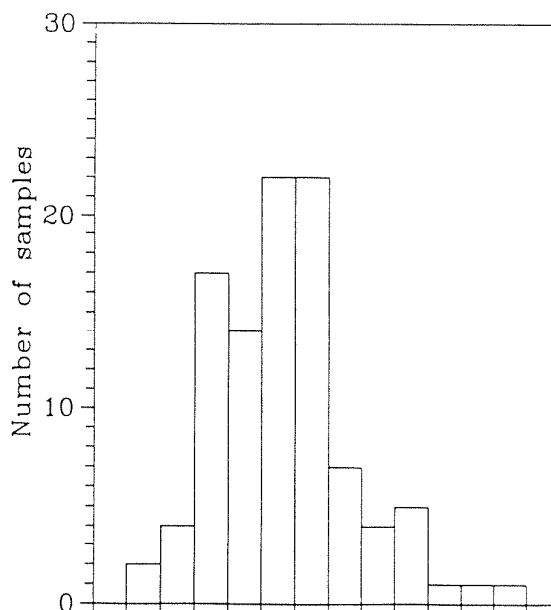
The spore concentration has been determined with an electronic particle counter, Coulter Counter ZB (cf. Stockmarr, 1973), tube size 40 µm. One hundred samples of five tablets each taken from different places in the batch were prepared by dissolving the tablets in Isoton II NaCl solution 100 ml flasks. Twenty counts each of 0.5 ml were made

on each sample.

Result: $\bar{X} = 62,712$; $s = \pm 2081$; $V = \pm 3.3\%$

For one tablet: $\bar{X} = 12,542$

The distribution of the samples, based on class intervals of 1000 spores, is shown in the figure below.



Production, distribution, payment. Spore tablets for calibration of pollen analyses have earlier been produced and distributed by Dr. Jens Stockmarr, Copenhagen. In October 1980 this business was taken over by the Laboratory of Quaternary Biology at the Department of Quaternary Geology in Lund. A new batch, No. 124961, is now produced and calibrated and tablets are available.

The tablets are manufactured at Dansk Droge Import A/S, Ishøj, Denmark.

Lycopodium tablets will be distributed in plastic bottles with 500 tablets per bottle. The price in Swedish currency is SEK 150/bottle (500 tablets), plus postage. (US\$1 ~ SEK8, July 1994). Examples of current postage (airmail/surface mail) are:

U.K. and Germany: 500–5000 tabl. SEK 130/117, 5500–10000 tabl. SEK 150/129.

USA, Canada: 500–5000 tabl. SEK 160/123; 5500–10000 tabl. SEK 210/141.

South America: 500–5000 tabl. SEK 175/135, 5500–10000 tabl. SEK 240/155.

Australia: 500–5000 tabl. SEK 210/135, 5500–10000 tabl. SEK 310/165.

A university invoice will be sent separately to the receiver of the tablets or to the purchase office. Please remit to Swedish postal giro account No. 1 56 50 - 5 or by check (bank draft) payable to Lund University. The invoice No. must be quoted with your remittal. Payment by private check or credit card cannot be handled.

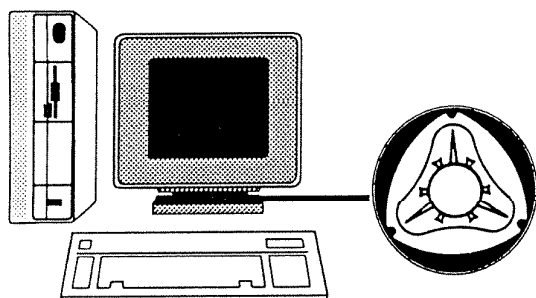
Please note that production and distribution of tablets is done at cost price, which makes it necessary to reduce administration to a minimum. Therefore, the machinery of payment must be as simple as possible—so, please follow our instructions and try not to impose too many administrative duties on us, which will only result in delayed deliveries.

Send your orders to our address below.

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I QUOTE...

"Every great scientific truth goes through three stages.—First, people say it conflicts with the Bible.—Next they say it had been discovered before.—Lastly, they say they always believed it." Jean Louis Agassiz (1807–73).



THE INFORMATION HIGHWAY

How E-MAIL LISTS WORK

by Florin Neumann

Each list has associated with it two e-mail addresses, the **list** address and the **listserv** address. A message sent to the **list** address will be taken over by a special piece of software called the **listserver** and distributed to every subscriber to the list. A message sent to the **listserv** address will be interpreted by the listserver as a command and will not be sent any further; if the listserver understands the command it will perform it and send the results to the originator of the message; if it doesn't, it will send back an error message, which usually also contains a help file with a synopsis of commands the listserver understands.

Say you want to join the list MORUS. The **list** address is `morus@university.utopia.edu`; the **listserv** address is `listserv@university.utopia.edu`. To join MORUS you must send a command to the listserver to add your name and address to the list. Usually the command is an e-mail message with a blank subject line and containing the following line in the body of the message:

SUBSCRIBE MORUS YourName

If you send this message to `morus@university.utopia.edu` the listserver will not interpret it as a command at all; instead it will distribute the message to every subscriber! Result: rather than having your name added to MORUS, you will have generated a bit of bad feeling from busy subscribers who find a useless message in their mailbox.

But if the message is sent to the listserver address

(`listserv@university.utopia.edu`), the listserver will interpret it as a command; your name will be added to MORUS and you will receive a welcome message containing a short description of the list and its rules, and a synopsis of commands understood by the listserver. (It's a good idea to save this message for future reference.) Most listserver commands require that you specify the name of a list, because one listserv usually services more than one list.

To cancel your subscription to MORUS you will have to send to the listserver address (NOT the list address) an e-mail message with a blank subject line and containing the following line in the body of the message:
UNSUBSCRIBE MORUS

or

SIGNOFF MORUS

and the listserver will reply with a good-bye message.

COMMON MISTAKES

Subscribe/Unsubscribe The most common mistake is to send a subscribe/unsubscribe command to the **list** address, rather than the **listserv** address. There is really no good excuse for this carelessness (especially for the unsubscribe command).

SOLUTION: Send the UNSUBSCRIBE (or SIGNOFF) command to the **listserv** address, rather than to the **list** address. All the details should be in the welcome message—which (of course) you have saved for future reference! If it doesn't work, or if you can't find it, send a message to the list owner/moderator (not to the list).

RCPTs. Some e-mail programs (Pegasus Mail in particular) are configured to include automatically in the e-mail message a confirmation request. When a message containing such a request is browsed with a compatible mailer, the programme will automatically send back to the message's originator an RCPT (an e-mail message confirming the receipt of the initial message). That's all fine and dandy, but if there is a list between the sender and the browser, then the RCPT will be sent back to the list, i.e. to each and every subscriber! It's not a pleasant sight to check your mail one morning and find your mailbox clogged up with 30 RCPT messages.

SOLUTION: Make sure that (a) your mailer's confirmation request feature is disabled, and (b) your mailer's automatic response to confirmation requests is disabled.

Old E-mail Addresses If you change your e-mail address the listserver will regard you as a different person. It won't accept a command to cancel the old subscription issued from the new address. Postings will continue to be sent to the old address, and if the old address has become invalid, they will be bounced back to the list, i.e. to every subscriber to the list.

SOLUTION: If you are going to change your e-mail address, cancel your subscription and re-subscribe to the list from the new address. If you haven't been able to do that, as a last resort, contact as soon as possible the list owner/moderator and ask him to remove your old address from the list.

MORE TIPS: DIGEST, POSTPONE, AND REVIEW

Digest. If you have joined several lists you may easily find every day over 100 messages waiting in your mailbox. You can decrease this number by using the **digest** option, which means that instead of sending you every message posted to the list as soon as it is posted, the listserver will mail you once a day a document comprising every message posted to the list in the previous 24 hours. The digest option is highly recommended, because it also reduces net traffic, and overhead and resource utilization on the machine which runs the listserver.

To set your mail to digest, send a message (no subject) to the listserver address (not the list address!) containing only the following line:

SET xxxxx MAIL DIGEST

(Substitute the string xxxxxx with the list name.)

Note that not all lists support the digest option (e.g., PaleoNet, Rocks-and-Fossils).

Postpone. If you are going to be away from your computer for a week or more your mailbox may fill up with unread messages. Usually the system manager has set an automatic limit for the number of unread messages a user mailbox may hold; if the limit has been reached, incoming messages will be bounced back to the list. To prevent this, send a message (no subject) to the listserver address (not the list address!) containing only the following line:

SET xxxxx MAIL POSTPONE

(Substitute the string xxxxxx with the list name.)

The listserver will stop sending you postings or digests until you reset it (e.g., by sending again the `digest` command).

Review. You want to send a personal message to a colleague subscribed to a list—but you don't know his e-mail address. How can you get it? Well, you can ask the listserver. Just send a message (no subject) to the listserver address (not the list address!) containing only the following line:

REVIEW xxxxx

(Substitute the string xxxxxx with the list name.)

The listserver will mail you back a file with a general description of the list (if the list owner/moderator has been thoughtful enough to provide one), the list statistics, and a listing of all list subscribers with their e-mail addresses.

(Note that the listing produced by the `review` command will not include concealed addresses. To find out how to conceal your own address, send `help` to the listserver.)

LIST ETIQUETTE

Common sense and courtesy obtain in electronic communication just as they do in written or oral communication.

GENERAL INTEREST

If you use the `reply` function to answer a list posting your reply will be sent to the list, i. e. to every subscriber. If your message regards only one subscriber, send your message directly to him.

SIGNATURE FILES

Mails can be configured to append automatically to an outgoing message a file, usually called `.SIG` (for signature), containing your name, address, affiliation, etc. Try to keep the `.SIG` file as small as possible: four to five lines is usually considered adequate.

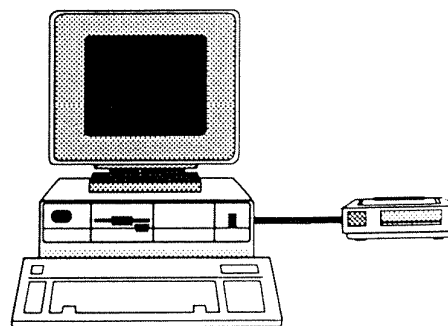
QUOTES

E-mail makes it easy to include in your own posting a previous posting to which you reply. But do try to edit the quoted text as much as possible: eliminate the header and the signature and anything else which is not directly relevant to the point. Follow the USENET rule (your message should contain no more than 49% quoted text).

HOW TO FIND DISCUSSION LISTS

By E-mail

Send an e-mail message to `listserv@ndsuvml.bitnet` with a blank subject line and the following text:



```
//dblook job echo=no
database search dd=rules
//rules dd *
select xxxxx in lists
index
select xxxxx in intgroup
index
select xxxxx in new-list
index
```

This will look for all lists that have the string xxxxxx in the list name, interest group description, or in the list of new lists. Substitute xxxxxx with whatever it is you're looking for. You'll receive in a couple of minutes an e-mail message with the results of your search.

By WWW (from TidBITS #254, an on-line newsletter)

Internet mailing lists are often hard to find, since there are so many. However, there's a Web page that supposedly lists all of them. It enables you to sort alphabetically or by category, and when you sort by category, you can get more detailed information on the list. The site appears to be a functional advertisement for a \$99 tool (currently only Windows-based, but a Mac version is in the works and slated for November release—they'd better hurry) called InfoMagnet, which lets you find, search, and participate in LISTSERV-based mailing lists. From the sound of it, Info-Magnet is a front-end interface to the often-complex LISTSERV commands.

<http://www.clark.net/pub/listserv/listserv.html>

In addition, another Web page enables you to search a database (maintained by Dartmouth College) of almost 6,000 mailing lists. The database is updated weekly, and this site has become one of my favorite tools on the Web.

<http://alpha.acast.nova.edu:80/listserv.html>

Other Sources of Information

Una Smith (una.smith@yale.edu) has put together a detailed BioGuide, a guide of Internet resources for anyone with interest in life sciences. It can be downloaded by anonymous ftp from [sunsite.unc.edu](ftp://sunsite.unc.edu/pub/academic/biology/ecology+evolution/directory) in the `/pub/academic/biology/ecology+evolution/directory`.

Bill Thoen and Ted Smith (ted.smith@cdmg.uucp.netcom.com) have put together a guide called Online Resources for Earth Sciences (`ores.txt`). It can be downloaded by anonymous ftp from [ftp.csn.org](ftp://ftp.csn.org) in the COGS directory. The available version is a bit old, but it should be updated soon.

There are numerous sources of information about Internet, e-mail, etc. One of the easiest to use is the Electronic Frontier Foundation (EFF) Guide to the Internet. It can be downloaded by anonymous ftp from

ftp.eff.org in the /pub/Net_info/EFF_Net_Guidedirectory.

INTERNET DISCUSSION LISTS OF INTEREST TO PALYNOLOGISTS

The following internet discussion lists may be of interest to palynologists. Please note that this compilation is not comprehensive; if you know of a list missing from this document which should be included, please contact the author.

MICROPAL—"MicroPal is an electronic bulletin board for micropaleontology."

LIST ADDRESS: micropal@ucmpl.berkeley.edu

MODERATOR: Jere Lipps (jlipps@ucmpl.berkeley.edu)

HOW TO SUBSCRIBE: Send to listproc@ucmpl.berkeley.edu an e-mail message (no subject) containing only the following line: SUBSCRIBE MICROPAL YourName (Replace the string YourName with your real name, e.g., John Smith. Do likewise for other lists given below.)

PALCLIME—"Paleoclimate, Paleoecology for late Mesozoic & early Cenozoic periods."

LIST ADDRESS: palclime@sivm.si.edu

MODERATOR: unknown (mnhpb016@sivm.si.edu)

HOW TO SUBSCRIBE: Send to listserv@sivm.si.edu an e-mail message (no subject) containing only the following line: SUBSCRIBE PALCLIME YourName

PALAEOBOTANY—"The Palaeobotany mailing list at RHBNC links together over fifty Palaeobotanists throughout the world."

LIST ADDRESS: palaeobotany@vax.rhbnc.ac.uk

MODERATOR: Philip Taylor (p.taylor@vax.rhbnc.ac.uk)

HOW TO SUBSCRIBE: Send to listserv@vax.rhbnc.ac.uk an e-mail message (no subject) containing only the following line: SUBSCRIBE PALAEOBOTANY YourName

PALEOLIM—"Paleolimnology Forum"

LIST ADDRESS: paleolim@nervm.nerdc.ufl.edu



MODERATOR: Tom Whitmore (whitmore@nervm.nerdc.ufl.edu)

HOW TO SUBSCRIBE: Send to listserv@nervm.nerdc.ufl.edu an e-mail message (no subject) containing only the following line: SUBSCRIBE PALEOLIM YourName

PALEONET—"PaleoNet is a group of linked listservers, gopher holes, www pages, and anonymous ftp sites that provide the paleontological community a means whereby its members can communicate with others."

LIST ADDRESS: paleonet@nhm.ac.uk

MODERATORS: Norman MacLeod (n.macleod@nhm.ac.uk)

Rich Lane (hrlane@hou.amoco.com)

HOW TO SUBSCRIBE: Send to listserver@nhm.ac.uk an e-mail message (no subject) containing only the following line: SUBSCRIBE PALEONET

POLLEN-SWEDEN "List members will receive pollen reports prepared by the Palynological Laboratory of the Swedish Museum of Natural History. These reports are presently restricted to the Stockholm region. The list is also open for discussion about both the reports and the activities of the Palynological Laboratory."

LIST ADDRESS: pollen-sweden@nrm.se

HOW TO SUBSCRIBE: Send to mailserv@nrm.se an e-mail message (no subject) containing only the following line: SUBSCRIBE POLLEN-SWEDEN YourName

POLPAI—"A bulletin board for general exchange of information, news, views, questions and answers in POLLINATION & PALYNOLOGY and related disciplines."

LIST ADDRESS: polpal-l@uoguelph.ca

MODERATOR: jmcgarry@uoguelph.ca

HOW TO SUBSCRIBE: Send to listserv@uoguelph.ca an e-mail message (no subject) containing only the following line: SUBSCRIBE POLPAL-L YourName

QUATERNARY—"Canadian Research in Quaternary Science"

LIST ADDRESS: quaternary@morgan.ucs.mun.ca

MODERATOR: Dave Liverman (dgl@zeppo.geosurv.gov.nf.ca)

HOW TO SUBSCRIBE: Send to listserver@morgan.ucs.mun.ca an e-mail message (no subject) containing only the following line: SUBSCRIBE QUATERNARY YourName

OTHER LISTS OF INTEREST

COCCOLITHS—"A list for International Nannoplankton Association to encourage fellow nanno workers to interact using e-mail. INA will use COCCOLITHS to send out information or notes of interest to our membership and other interested subscribers."

LIST ADDRESS: coccoliths@morgan.ucs.mun.ca

MODERATOR: Helen Gillespie (helen@sparky2.esd.mun.ca)

HOW TO SUBSCRIBE: Send to listserv@morgan.ucs.mun.ca an e-mail message (no subject) containing only the following line: SUBSCRIBE COCCOLITHS YourName

DIATOM-L—"An electronic distribution list of researchers whose interests involve the diatom algae."

LIST ADDRESS: diatom-l@iubvm.ucs.indiana.edu

MODERATOR: P. Roger Sweets (SWEETS@ucs.indiana.edu)

HOW TO SUBSCRIBE: Send to listserv@iubvm.ucs.indiana.edu an e-mail message (no subject) containing only the following line: SUBSCRIBE DIATOM-L YourName

DINOSAUR—Anything about dinosaurs and archaeosaurs.

LIST ADDRESS: dinosaur@lepomis.psych.upenn.edu

MODERATOR: Mickey Rowe (rowe@lepomis.psych.upenn.edu)

HOW TO SUBSCRIBE: Send to:

listproc@lepomis.psych.upenn.edu an e-mail message (no subject) containing only the following line: SUBSCRIBE DINOSAUR YourName

HISTORICAL-GEOLOGY—"Mail Server offered by the American Heritage Center, University of Wyoming. During the initial stages of this product, the use will be limited to assisting historians in locating archive collections of value to writing mining histories."

LIST ADDRESS: Historical-Geology@uwyo.edu

HOW TO SUBSCRIBE: Send to mailserv@uwyo.edu an e-mail message (no subject) containing only the following line: SUBSCRIBE HISTORICAL-GEOLOGY YourName

GEOLOGY—Anything related to earth sciences.

LIST ADDRESS: geology@ptearn.cc.fc.ul.pt

MODERATOR: Pedro Amorim (AMORIM@PTEARN.cc.fc.ul.pt)

HOW TO SUBSCRIBE: Send to listserv@ptearn.cc.fc.ul.pt an e-mail message (no subject) containing only the following line: SUBSCRIBE GEOLOGY YourName

ROCKS-AND-FOSSILS—"The rocks-and-fossils list welcomes amateur and professional rockhounds and fossil enthusiasts world-wide."

LIST ADDRESS: rocks-and-fossils@world.std.com

MODERATOR: Sharon Shea (sshea@world.std.com)

HOW TO SUBSCRIBE: Send to majordomo@world.std.com an e-mail message (no subject) containing only the following line: SUBSCRIBE ROCKS-AND-FOSSILS

VRTPALEO—"The Vertebrate Paleontology Community discussion list."

LIST ADDRESS: vrtpaleo@vm.usc.edu

MODERATOR: Sam McLeod (smcleod@vm.usc.edu)

HOW TO SUBSCRIBE: Send to listserv@vm.usc.edu an e-mail message (no subject) containing only the following line: SUBSCRIBE VRTPALEO YourName

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[This is an update of the item "How do internet discussion lists work?" by Florin Neumann, which appeared in the Canadian Association of Palynologists (CAP) Newsletter, edited by Alwynne Beaudoin.]

EDITORIAL

The "prehistoric" Wollemi pine, hailed as the greatest discovery of its kind since the coelacanth, is getting plenty of media coverage. It was found growing in a 1800-ft deep gorge in the Wollemi National Park 125 miles west of Sidney, Australia, and apparently belongs to a newly discovered genus whose nearest relatives died out in the Jurassic and Cretaceous (*Nature*, 372, p. 712 and 719). Details apparently have yet to be released but there is already a frenzy of excitement. The environment minister for New South Wales has called it "the Australian Christmas Tree." But what about the pollen of the Wollemi pine? How does it differ from its closest living relatives and how does it compare with those of its supposed ancestors? This "living fossil" plant is a marvellous discovery for paleobotany. Perhaps it also offers paleo- and actuopalynologists an opportunity to share some of the limelight.

Speaking of palynology in the news, this issue of the Newsletter ("Death in the Pliocene," p. 10) features an exciting discovery by John Wrenn (CENEX, Louisiana State University) of a probable red-tide kill in the late Pliocene of Florida. The victims were sea birds and fish. This is not the first time dinoflagellates have been charged with causing mass mortalities deep in the geologic past (see for example, Noe-Nygaard, N., Surlyk, F., and Piasecki, S., 1987: Bivalve mass mortality caused by toxic dinoflagellate blooms in a Berriasian-Valanginian lagoon, Bornholm, Denmark; *Palaos*, 2: 263-273). But this time the culprit seems to have been *Pyrodinium bahamense*, a known toxic dinoflagellate whose cysts were found in abundance with the fossilized victims. Unfortunately, a cause-effect relationship cannot be proven because 1) cysts today don't always occur abundantly in sediment where *Pyrodinium* red tides are prevalent; and 2) abundant fossil cysts don't often coincide with evidence of massive fish kills. But the discovery offers a plausible explanation for a puzzling taphonomic phenomenon, and is one that the general public can relate to, particularly in Florida where red tides remain a problem today. It's worth noting that the cyst, known also by its fossil name *Polysphaeridium zoharyi*, has a record extending at least back to the early Eocene. Perhaps we should be looking more carefully for evidence of red tides in the fossil record, and getting more frequent media coverage.

This issue contains several items about e-mail and the internet. From my own experience, the internet—as a means of routine communication and keeping an ear to the ground—is still buggy and sometimes frustrating. But when I don't have access to it I feel isolated, something I would not have experienced a year ago. I advocate e-mail and this newsletter benefits directly from it (many items received for this issue were sent by it). If you have an e-mail address, please send that information soon to David Pocknall (dpocknall@hou.amoco.com) or Bob Clarke (rtclarke@dal.mobil.com) so it may be added to the AASP Directory. And if you want to surf the internet, why not check out Florin Neumann's informative article on How e-mail lists work (pages 18–20). Perhaps in the not too distant future we will have the AASP newsletter and a regularly updated AASP membership list available on the internet. I invite your thoughts on this.

Many thanks to those of you who have contributed articles to this issue of the Newsletter. Vaughn Bryant, a former AASP Newsletter editor and pictured on page 2, deserves a special mention for his constant flow of news items over many years—thank you Vaughn. You may have noticed that the Newsletter is back on schedule after a slightly late November issue. In order to keep it this way, I ask that you please submit contributions to the April issue by **March 15**. Note also that the application deadline for AASP Student scholarships is April 3. See you on the internet...



American Association of Stratigraphic Palynologists
Student Scholarship

The American Association of Stratigraphic Palynologists is pleased to announce its program of Student Scholarships to support studies in palynology. Currently, up to two scholarships for \$1000 (US) each may be awarded annually. Ordinarily, the scholarships will be awarded to graduate students, but advanced undergraduate students may also apply.

Basis of Awards - The qualification of the student, the originality and imagination evident in the proposed project, and the likelihood of significant contribution to the science of palynology are factors that will be weighed in selection of award winners.

To Apply - Part A of this form is to be filled out by the student and Part B by the student's faculty supervisor. The faculty supervisor will send both forms together to the address given at the end of Part B. Scholarship applications must be received no later than April 3, 1995 and awards will be announced by April 28, 1995.

Part A - Application for A.A.S.P. Student Scholarship

Student's name: _____

Address: _____

Universities or other institutions attended (earliest listed first). Include the institution that you will be attending during tenure of the scholarship, the degree you will be seeking, and the anticipated completion date:

Institution	Degree	Beginning	Completion
		Date	Date
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Project Supervisor: _____

What is your background in palynology?* _____

Professional experience:* _____

Previous awards or honors:* _____

Summary of institutional or other support for your project (specify whether granted or applied for):

*Use additional sheet, if needed.

(OVER)

Title of proposed investigation: _____

Summary of the investigation (250 words or less, on an attached sheet); include objectives, why you selected this problem and its significance, and how you plan to approach and carry out the investigation.

I agree that the recommendation I am requesting from my faculty supervisor will be held in confidence by officials of my institution, and I hereby waive any rights I may have to examine it. **yes** _____ **no** _____

Date: _____ Applicant's signature _____

Part B - Endorsement by Faculty Supervisor

1. Ranking of the applicant versus other students you have known who are pursuing the same degree: lower 50% _____ upper 50% _____ upper 25% _____ upper 10% _____ upper 5% _____
2. Did the idea for the project originate from student? **yes** _____ **no** _____
3. Can you verify the student's statements as to other awards, honors, or financial aid received or applied for? **yes** _____ **no** _____

Comments: _____

4. Please provide a brief summary (100 words or less on an attached sheet) or your assessment of the applicant's project and his or her potential to attain the objectives. Among other traits, please comment on the student's native intellectual ability, ability to express him(her)self, perseverance, imagination and the probable creativity, and the value of the project.

Faculty supervisor's name: _____

Signature: _____ **Date:** _____

Position: _____

Institution: _____

Address: _____

Please return Parts A and B to:

Merrell A. Miller
Amoco Production Company
P. O. Box 3092
Houston, TX 77253-3092

Phone: 713/366-3919

Fax: 713/366-7565