AASP NEWSLETTER

VOLUME 17, NUMBER 4 OCTOBER, 1984

R. L. RAVN, EDITOR ISSN 0732-6041

NEW BOARD OF DIRECTORS

The new AASP Board of Directors, who are to take office at the October 1984 Annual Meeting in Arlington, Virginia, are as follows:

President: Vaughn M. Bryant, Jr.
President-Elect: Raymond A. Christopher
Secretary-Treasurer: Kenneth M. Piel
Managing Editor: Douglas J. Nichols
Directors-at-Large: Lucy E. Edwards (through 1985)
Virgil D. Wiggins (through 1985)
Judith Lentin (through 1986)
Reed Wicander (through 1986)

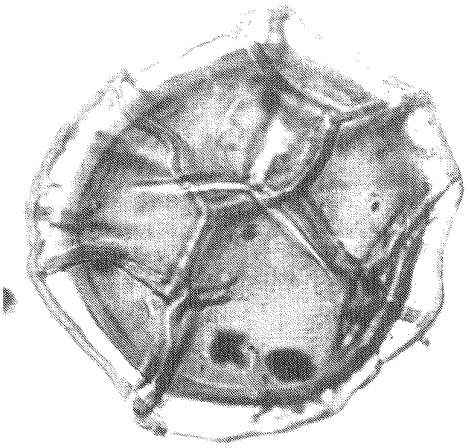
DUES

This is the fourth issue of the Newsletter for 1984, and it contains the customary and ever-popular Annual AASP Dues Notice (attached at the back). This year, for the first time in several, AASP has found it necessary to increase the annual dues, to $20.00 for individual members and $30.00 for instutional members. Even with this increase, membership in AASP remains inexpensive by comparison with many other professional societies in the fields of geology, paleontology and botany to which many of us also belong. This increase is not retroactive, of course, so if you have paid in advance for 1985 or 1986, you are covered. The voluntary air mail surcharge for overseas members who wish to receive their AASP literature by air mail has not been changed.

AASP Secretary-Treasurer Ken Piel wishes to remind all members that checks should be made out to AASP, not to Ken personally. Members residing in foreign countries should be sure to use international money orders or checks drawn on United States banks. Any other forms of remittance present serious difficulties for currency transfer.

The mailing label on the Newsletter contains a number in the upper right that indicates the year through which dues are paid, according to AASP records. If yours says "84", dues payment for next year is required; if it says "83", as it does for a few members, you are already one year in arrears. Punctuality in these matters is a significant virtue, for which you may expect to be rewarded, if not in this lifetime, certainly in the next.

A few members also will notice a plus or minus dollars figure on the label. This indicates that you have paid an irregular amount in dues, either by too much (+) or too little (-). Those having paid too much will be credited with a portion of next year's dues. Ken would greatly appreciate dues payment in an amount designed to bring this figure into conformity with an annual dues amount.

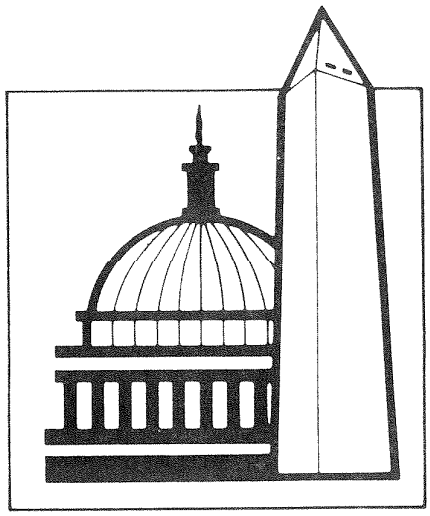


Reticulatisporites reticulatus (Ibrahim) Ibrahim, 1933; Cherokee Group (Desmoinesian) of Iowa, X600. How many laesurae does this spore have? See Technical Section in this Newsletter.

THIS ISSUE'S BEST QUOTATION

" . . . the description of new forms by an author is inversely proportional to the extent of the library available." -- M. Sedley Barss, Canadian Association of Palynologists President, in the CAP Newsletter, summer 1984.

AASP Newsletter is published quarterly by American Association of Stratigraphic Palynologists, Inc.



1984 ANNUAL MEETING

Most details about the meeting were given in the July Newsletter. However, a few items are new or are worth repeating:

REGISTRATION

Registration will take place Wednesday, October 17, from 5:00 to 8:00 p.m., and on Thursday, October 18, from 7:00 to 11:00 a.m., in the hallway outside Regency Ballrooms A and B on the Ballroom level.

TRANSPORTATION

See the July Newsletter for details on airports in this area and on travel from the airports to the hotel. However, we have one new item of useful information on this subject: A company called Airport Connections, Inc. is supposed to start limousine service directly between Dulles Airport and the Hyatt Regency (and other Crystal City hotels) this fall in time for the meeting, six times a day.

If you are driving to Arlington, or are renting a car at Dulles or BWI airports, let us know and we will send you a map showing how to get to the hotel. Call Norm Frederiksen or Lucy Edwards (703-860-7745).

Parking at the hotel for guests is a maximum of $6 per day, but you can drive in and out of the hotel at no extra charge. For those not staying at the hotel, the charge is the same, $1 per hour up to $6, but each time you drive out of the hotel and return, they start from scratch again. We remind you that daytime parking downtown is very difficult during the week; however, there is easy access to the Washington Metro (subway) via the hotel shuttle to the National Airport Metro station several blocks away from the hotel. Thursday evening, after the Icebreaker (which will be on Capitol Hill), our buses will take people either back to Crystal City or to Georgetown, one of the main restaurant sections of the city.

FIELD TRIP MATERIALS

For attendees who are not going on the field trip, we remind you that we will have a small number of sample sets for sale ($25 apiece) at the meeting. Each set contains 13 bulk samples ranging in age from Lower Cretaceous to Miocene, from southern Maryland and northern Virginia. We will also have field trip guidebooks for sale; these include, besides articles on the stratigraphy and structure of the Potomac River region, articles on Cretaceous and Tertiary dinoflagellates, Tertiary pollen, Cretaceous plant megafossils, and on Tertiary fruits, diatoms, foraminifers, calcareous nannofossils, ostracodes and mollusks.

Norm Frederiksen.

ANNUAL BUSINESS LUNCHEON

AASP President John Clendening reminds everyone attending the Arlington meeting that the Annual Business Luncheon will be held at noon, Saturday, October 20 in the Regency F room. Your attendance is encouraged.

1985 ANNUAL AASP MEETING

FIRST ANNOUNCEMENT

The Eighteenth Annual Meeting of AASP will be held October 16-19, 1985 at the Holiday Inn Hotel Downtown, in El Paso, Texas. The meeting is tentatively scheduled to include a special symposium on pollen ultrastructure on Wednesday, October 16. Two field trips also are being organized: 1) Stratigraphy and Structure of the El Paso Region; 2) Stratigraphy and Structure of Sierra de Juarez, Southern Overthrust Belt. Both of these are to take place on Saturday, October 19. Further details of the 1985 Meeting will appear in the next issue of the Newsletter. Inquiries may be directed to Bill Cornell, chairman for the meeting,

William C. Cornell, Department of Geological Sciences, University of Texas at El Paso, El Paso, TX 79968; telephone (915) 747 5218.

THIRD INTERNATIONAL CONFERENCE ON MODERN AND FOSSIL DINOFLAGELLATES

The next "Modern and Fossil" Dinoflagellate Conference is planned for August, 1985 at the Botany Department, Royal Holloway and Bedford College (University of London) at Egham, Surrey. The main scientific sessions and organisers are as follows:

Session 1. Taxonomy (Gerald Boalch)
Session 2. Cyst-Theca Relationships (Rex Harland)
Session 3. Cyst Lineages (Rex Harland)
Session 4. Biochemistry, Physiology, etc. (Gerald Boalch and John Dodge)
Session 5. Ecology (Chris Reid)
Session 6. Palaeoecology (Chris Reid)
Session 7. Evolution (Geof. Eaton)
Session 8. Evolution (Geof. Eaton)

There will be plenty of space for poster sessions and

:es for informal "workshops" can be arranged. At least two informal discussion sessions in the evenings also are proposed. Contributions are invited for any of these sessions, but the Committee reserve the right to refuse offers or to suggest alternative methods of presentation. A request for an Abstract of each formal contribution to the Conference will be sent out with the letters of acceptance early in 1985.

A number of social activities also are planned, including a mid-Conference excursion into the English countryside and an Old English dinner. Fees for the meeting are not yet firmly established, but the organizers hope that registration will cost no more than £25. A "package" for accommodation and meals is also proposed, to cost approximately £90. Accommodations will be in a Student Hall of Residence about 3 km from the Botany Department, and transportation to the meeting will be arranged.

Planning will be greatly aided if those hoping to attend DINO 3 will send in a provisional registration form. Mail to the Conference Office, Botany Department, Royal Holloway & Bedford Colleges, Egham, TW20 OLB, U.K.; telephone (0743) 35551.

PALYNOLOGY SHORT COURSE

The 17th Palynology Short Course, on Quantitative Biostratigraphy: Methods and Automated Techniques, is tentatively scheduled for February 11-15, 1985, in Baton Rouge, Louisiana. Ray Christopher and George Hart are organizing the course, under the auspices of Louisiana State University. Attendance will be limited to 30. These tentative dates are for the week immediately preceding Mardi Gras, so that those attending will have an opportunity to sample some of the traditional Mardi Gras celebrations in nearby New Orleans. Laissez le bon temps roulé! For further information, contact:

George Hart, 644 Leeward Drive, Baton Rouge, LA 70808.

DIRECTORY

Information for the 1985 AASP Directory is requested. We wish to get the directory completed and into the hands of the membership as soon after the first of the year as possible. If you have any change of address or telephone number, please notify me by December 1.

Kenneth M. Piel, AASP Secretary-Treasurer, Union Oil Company of California, Research Center, P. O. Box 76, Brea, CA 92621 USA.

SPOREBUSTERS

Those having seen this summer's hit movie "Ghostbusters" may have noticed that one of the major characters was a palynologist, at least by expressed interest. Harold Ramis, asked at one point what hobbies he had, announced that he collected fungi and spores. So if you see some mold growing on your wall, who ya gonna call? . . .

PALAEONTOLOGY SPECIAL PAPERS

The Palaeontological Association in London, publishers of the journal Palaeontology, are trying to reduce their inventory of older issues of Special Papers, and are offering remaining stock in these issues at very reduced prices. These are all lengthy and thorough papers on a variety of paleontological subjects, but three of them are of direct interest to palynologists. These are:

No. 1: Miospores in the coal seams of the Carboniferous of Great Britain, by A. H. V. Smith and M. A. Butterworth, 1967 (£4).

No. 5: Chitinozoa from the Ordovician Viola and Ferndale Limestones of the Arbuckle Mountains, Oklahoma, by W. A. M. Jenkins, 1969 (£1).

No. 19: The palynology of Early Tertiary sediments, Ninetyeast Ridge, Indian Ocean, by E. M. Kemp and W. K. Harris, 1977 (£2.50).

The offer is valid only while stocks last and will close on December 31, 1984. Orders must be in British currency, either as International Money Orders or cheques drawn on a British bank, and should be sent to:

Dr. M. G. Bassett (Palaeontological Association), Department of Geology, National Museum of Wales, Cardiff, CF1 3NP, U.K.

The prices quoted include postage, and with the U.S. exchange rate being what it presently is (approximately $1.25 per pound sterling), these are a real bargain. All issues through Special Paper 21 are available at lower prices; a list of the other papers may be found on the inside cover of older issues of the journal Palaeontology.

EDITOR'S NOTE

With this issue, the format of the Newsletter cover has been altered to facilitate reference to technical articles. A table of contents, listing each article by title and author, appears on the cover.

Articles submitted for the Technical Section ordinarily will not be reviewed other than by the editor, unless requested by the author(s). Although the Newsletter is an open forum for technical notes on a wide variety of topics, it is not appropriate as a medium for formal systematic taxonomy. Please do not use unpublished or newly proposed fossil names in articles to the Newsletter. Space limitations govern the length of articles to be printed; if editorial reduction of an article is necessary, authors will be consulted. Minor typographical or grammatical corrections may be made by the editor.

Manuscripts should be typed double-spaced. Line drawings and glossy black-and-white photographs are acceptable and encouraged, if kept to a reasonable minimum. All such illustrations should be no wider than the column width of the Newsletter as printed. They will be reproduced at the size submitted. All references cited in the text must be listed at the end of the article. The technical articles in this issue may be used as stylistic guides. Keep a copy of all submissions!

BOOK REVIEWS

Survival Strategies of the Algae, edited by Greta A. Fryxell. Cambridge University Press, The Pitt Building, Trumpington Street, Cambridge CB2 1RP, U.K. (also available from CUP's American Branch, 32 East 57th St., New York, NY 10022). 1983, 144 pp., 80 figs., $32.50 US.

The title of this book promises more than it delivers. Detailed discussions of survival strategies are limited to specialized types of cells resistant to unfavorable environmental conditions, and the algae encompassed belong to only a few major divisions; nevertheless, palynologists will find enlightening reviews and important ideas that they might like to apply to their own group of interest.

This slim, well-edited volume consists of four contributions from a symposium (held in Vancouver, British Columbia, 15 July 1980) sponsored by the Phycological Society of America and the Systematic and Phycological Sections of the Botanical Society of America. The first three chapters are 20 to 25 pages long and cover chlorophytes, chrysophyceans and diatoms; the last chapter, comprising about half the book, deals with dinoflagellates. An introduction or a more extensive preface could have placed the book in better perspective. Certainly other algal groups use resting spores as a survival strategy, as gleaned from a perusal of Tappan (1980); for example, cysts have been reported in some xanthophytes, ebridians, and at least one coccolithophorid. Fryxell writes in the preface that Norma Lang opted not to include her summary of work on blue-green algal akinetes. Considering the review nature of the articles, and the overall brevity of the book, this is an unfortunate omission. A more glaring omission, from the palynological point of view, is the lack of a section on prasinophycean phycomata, which are relatively common in marine waters and facies.

Fryxell emphasizes that a major problem confronting phycologists who study survival strategies is how to identify a resting spore with a certain vegetative cell. Palynologists who study fossil material commonly find resting spores only, but "biologists have the opportunity (some might call it an obligation) to understand the ecological conditions that produced these cells and the corresponding physiological changes they underwent. This opportunity was the motivation behind this symposium volume" (p. ix).

From the outset the book and its contributors are plagued by terminological confusion. Indeed, the chapter titles variously refer to their subjects as resting spores, resistant resting cysts, or resting cysts; within chapters, we find thick-walled cells, resting cells, temporary cysts, hypnospores, hypnozygotes, zygospores, statospores, and more. If you want to use the otherwise good index, you will need to know some of these terms because they are not cross-referenced consistently. Coleman (on chlorophytes) and especially Dale (on dinoflagellates) skillfully navigate through this mire of terms for us. The uninitiated will do well to have a current phycology text (e.g., Bold and Wynne, 1978) by their side while reading this book.

Annette Coleman (Chapter 1: The roles of resting spores and akinetes in chlorophyte survival) concentrates on freshwater chlorophytes because specialized thick-walled cells are rare in marine greens. The diversity of these types of cells in freshwater taxa is impressive. The palynologist will find this chapter interesting, partly because some resting-cell walls may contain sporopollenin. Details of wall structure in resting cells are covered; however, because I lack the experience, I found it difficult to interpret the transmission electron micrographs. The reader will search in vain for scales on the figures. Coleman authoritatively reviews the physiological and developmental aspects of resting-cell formation.

Craig Sandgren (Chapter 2: Survival strategies of chrysophycean flagellates: Reproduction and the formation of resistant resting cysts) is concerned with freshwater chrysophyceans, mainly in terms of the dynamics of phytoplankton populations. Many of these algae form a siliceous resting cyst called a statospore, which commonly has a single pore plugged with material that is at least partially organic in composition. In some species the formation of the statospore proceeds in two distinct phases. The cyst body is silicified first; ornament is added during the second phase. If the second phase is interrupted, the resultant population may consist of both ornamented and unornamented cysts. We will be challenged to think of ways to detect such a phenomenon in palynomorph assemblages. Sandgren reveals another complicating factor (all too familiar to dinoflagellate workers): *Dinobryon cylindricum* is capable of producing several distinct types of statospores. A useful review of factors that influence encystment and excystment concludes this highly readable chapter.

Paul Hargraves and Fred French (Chapter 3: Diatom resting spores: Significance and strategies) investigate the resting spores, or hypnospores, of diatoms. Although readers will learn little that is directly relevant to palynology, applications to the study of organic-walled microfossils are evident. The heavily silicified hypnospores may superficially resemble the vegetative frustule, or they may be quite different. Sound familiar? The distribution of the hypnospores is distinctive: Neritic diatoms commonly produce them, whereas open-ocean forms commonly don't. In explanation, many phycologists maintain that rapidly sinking spores are a competitive disadvantage to open-ocean species, but the little work that has been done on sinking rates does not support this suggestion (see Table 3, page 60). Perhaps the spores do not sink to the bottom, but rather to the pycnocline; from this horizon, resuspension and germination could take place. This is only one intriguing idea among many reviewed in this chapter.

Barrie Dale (Chapter 4: Dinoflagellate resting cysts: "Benthic plankton") exhaustively treats dinoflagellate resting cysts, which he christens "benthic plankton." Many newsletter readers will recognize material in this chapter; others, who are not dinoflagellate experts, will be thankful for the well-integrated review of Quaternary (both fossil and

recent) dinoflagellate cysts and the vegetative cells that made them. This article might have been shortened by deleting some details on classification and morphology, but as a non-expert, I appreciated such a comprehensive synthesis. Certainly Dale complies with the spirit of the symposium more than any other author, and obviously his chapter will be of direct interest to palynologists. Detailed discussions of encystment and excystment factors are followed by a thorough explication of the role of cysts in sexual cycles. Unfavorable conditions may only be one trigger for encystment; Dale supports the idea that "cysts are zygotes whose main function is probably nuclear replenishment through meiosis" (p. 125). Sections on the comparison of living- and fossil-cyst classifications are valuable, as are the thought-provoking passages on paleoecology and functional morphology. Dale closes by evaluating the cyst as a survival strategy. He suggests viewing the vegetative cell and cyst as "an alternation of generations, one planktonic and one benthic, the combination of which offers one viable 'life strategy.' Considered from this perspective, many of the 'survival' aspects of cysts may be adaptations toward survival of the cysts in the particularly rigorous benthic environment" (p. 128).

At the AASP Annual Meeting for 1980 in Keystone, Colorado, W. R. Evitt (1981) discussed cyst formation and reproductive strategies in dinoflagellates. His message was that "dinoflagellates do it differently." Perhaps the most important lesson to learn from Survival Stategies of the Algae is that "few algae do it similarly." The proportion of cyst-producing species varies from division to division, and the degree of morphologic variation of those cysts is not predictable. Diatoms do it differently; chlorophytes do it differently; chrysophyceans do it differently. The palynologist can only guess how problematic groups, such as the acritarchs, did it!

In summary, this book provides an eclectic review of survival strategies of the algae. Half of it will not be of direct interest to stratigraphic palynologists, especially to those who work on marine microfossils: Chapters 1 and 2 deal almost exclusively with freshwater forms; chapters 2 and 3 treat siliceous types; only Dale's chapter successfully integrates paleontologic and neontologic data. Yet, I found the biologic and ecologic viewpoints stimulating -- much of the information presented has not yet informed palynologic endeavor. I encourage you to read and apply.

(Note: For a neontologic perspective, see the review of this same book by Lund [1984, Limnology and Oceanography, 29(2): 442-443].)

References

BOLD, H. C., and WYNNE, M. J. 1978. Introduction to the Algae. Prentice-Hall, Englewood Cliffs, New Jersey, 706 p.

EVITT, W. R. 1981. The difference it makes that dinoflagellates do it differently (abstract). Palynology, 5: 236.

TAPPAN, H. 1980. The Paleobiology of Plant Protists. Freeman, San Francisco, 1028 p.

Carl V. Mendelson.

Airborne and Allergenic Pollen of North America, by Walter H. Lewis, Prathibha Vinay and Vincent E. Zenger. The Johns Hopkins University Press, Baltimore, Maryland 21218. 1983, 254 pp., 194 figs., 48 pp. containing approximately 800 individual maps of plant distributions. $60.00 US.

In the preface the authors explain that this book was written primarily for allergists and aerobiologists in the hope that it would provide them with a better understanding of the major pollen types which adversely affect the lives of millions of people living in North America. The book does an excellent job of fulfilling that primary goal and it also is a valuable reference source for others as well. For the individual hay fever sufferer the hundreds of plant distribution maps provide a quick reference showing which areas of North America contain key plant taxa which have widespread or limited wind-dispersed pollen. In addition, those affected by hay fever also are able to read descriptions about the plants and pollens that cause their acute pollinosis and see pictures of the pollen types that cause their problems. A glossary of important terms used in the book and an extensive list of reference sources provide additional aids for those sufferers who wish to learn more about the pollen types which cause allergic reactions.

For the palynologist working with Holocene and Pleistocene pollen records this book is an essential reference source. The quality photomicrographs (both light and SEM) are useful as teaching aids for students and at the same time offer the type of resolution necessary when trying to resolve the identity of some unknown pollen type. In addition, the plant distribution maps and the guide to flowering times for each plant provide other types of useful information which one must normally gather from hundreds of individual reference sources.

The book opens with a series of close-up photographs of anthers, catkins, and flowers of many of the more common wind-pollinated plants in North America. From just a casual look at these photographs the reader can begin to realize which plants produce vast quantities of pollen and which are less copious in their pollen production. Following these are 136 color pictures of fresh, stained pollen representing some of the most common types of allergens found in the air over much of North America. These two sets of color photographs are skillfully placed in the very front of the book so that they get the reader's attention before the text begins.

The introduction brief (six pages). There is a short opening statement followed by brief paragraphs on topics such as why plants have Latin and common names, how the authors compiled the information needed to produce the plant distribution maps, what sources were used to determine the flowering times for each plant type, basic types of pollination, pollen morphology, and allergenicity. It is apparent that this introduction section was intended mainly for the layman, as it lacks a detailed explanation of any of the topics.

The main body of the book is divided into three long chapters. Chapter One is devoted to a discussion of pollen allergens that come from tree or shrub sources; chapter Two covers pollen from the grasses and grasslike plants; the final chapter covers pollen types of the weeds and herbs. Each chapter is divided into a family-by-family discussion of major pollen allergens. Plant family discussions open with a brief morphological description of the plant types in that family. These are followed by brief discussions of the flowering period, pollen aerobiology, pollen morphology, and allergenicity. Along with each discussion is a suite of light microscope and scanning electron microscope photographs showing the pollen grains of the plant family. In many cases, the discussion of a plant family is accompanied by additional photographs of the plant, composite maps of North America showing generalized geographical distributions of genera within the family, and charts showing the percentage of pollen one could expect to find in the air over various regions of North America during any given month of the year.

The text of the book is followed by two appendices. Appendix One is a series of 800 maps which show generalized distributions of important wind-dispersed plant species in North America. The maps refer back to individual plant types discussed in each of the three major chapters. For each of the three groups of maps the authors have illustrated introduced species of plants first and indigenous types second. Next to each of the maps showing an introduced species is a notation as to where in North America the plant grows best, or as the authors call it, "the zone of hardiness". The second appendix discusses such things as the methodology used by the authors to prepare the pollen for microscope analysis, types of light and scanning electron microscopes used, their modified acetolysis technique, how they photographed plants in the field, and a brief statement on how to prepare pollen extracts for allergen studies.

Praise for this book by allergists, hay fever sufferers and palynologists attest to the usefulness of the book. This reviewer would likewise like to add his name to the list of those people who find this book a useful investment. Although it provides little new information to the field of palynology, it does combine under one cover a great body of information from other sources, and the SEM photographs are superb. If for no other reason, the book is worth its purchase price for those photographs alone!

Vaughn M. Bryant, Jr.

PUBLICATION REPRINTED

"Microflora of the Lower Cretaceous Mannville Group, east-central Alberta" by Chaitanya Singh (1964), Alberta Research Council Bulliten 15, 239 pages, 29 plates, 13 text figures and 6 tables, has been reprinted due to continuing demand. This reprint is in hard cover and contains descriptions and illustrations of 159 species of fossil microspores, megaspores, pollen grains, dinoflagellates and acritarchs from strata equivalent in age (late Barremian to early Albian) to the famous Oil Sands of Alberta. Copies may be ordered, at a cost of $20.00 (Canadian), from:

Alberta Research Council, Editing and Publications Department, 5th Floor, Terrace Plaza, 4445 Calgary Trail South, Edmonton, Alberta, Canada T6H 5R7; telephone (403) 438-1666 ext. 221.

MICROSCOPE WANTED

Wanted to buy: Older Leitz Ortholux microscope for personal use. Must have 10X, 40X and 100X oil objectives, trinocular head and mechanical stage with rectangular coordinates. Please contact:

Fred Stone, Mobil (MPTM), Nine Greenway Plaza, Suite 2700, Houston, Texas 77046; telephone (713) 871-5290.

NEW INDIVIDUAL MEMBERS

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NEW INSTITUTIONAL MEMBER

NOVA, An Alberta Corporation, Corporate Library, P. O. Box 2535 -- Postal Station M, 801 Seventh Avenue S.W., Calgary, Alberta, Canada T2P 2N6.

AASP NEWSLETTER TECHNICAL SECTION

A NOTE ON D.P.X. MOUNTANT

Peter Jones, The University, Hull, HU6 7RX, England

Abstract

The suitability of D.P.X. as a mountant in palynology is considered. Observations showed that it provided too little contrast. This was confirmed by consideration of its refractive index, which does not differ sufficiently from that of palynomorphs.

Discussion

At the start of a research topic on the palynology of Early Tertiary deposits of the Small Isles, Inverness-shire, advice was sought as to which mounting medium to employ for the final microscope slides. After mounting the samples on coverslips, D.P.X. was adopted to attach these to the slides. This mountant had the advantage of being easy to use, of producing permanent slides, and of permitting the relocation of individual palynomorphs with ease. In addition, its use meant that the palynomorphs were all in one plane of focus on the slide. Therefore, it seemed preferable to silicone oil, the mounting medium used in the Hull University pollen laboratory, because there appeared to be no advantage in rolling the compressed palynomorphs.

During the preparation of the Small Isles samples, the material was checked under the microscope at various stages. The water mounts showed no pollen after using HCl, HF, and HCl, but rather a mass of fine inorganic material. This was not dispersed by sieving, so that any palynomorphs in the samples were obscured. The use of heavy liquid flotation (using zinc bromide, specific gravity approximately 2.042) finally elicited a light fraction. This was of such small quantity that no water mounts were prepared after this procedure, as it appeared prudent to save all of the material for the final permanent slides. No staining was used; the information gained from spore colour was deemed of value.

The resultant mounts revealed palynomorphs of a depauperate assemblage, with poorly preserved saccate grains predominating. Though the grains were pale and therefore immature (without oxidation), it was not possible to see any details of the exine surface. The cause of this was uncertain, but was tentatively attributed to an unsuitable environment of deposition, with subsequent erosion of the exine. The lack of a varied assemblage of palynomorphs made these samples difficult to work on for postgraduate research; their apparent poor preservation accentuated this problem.

In the search for other material to study, a location in Essex was found, which yielded assemblages of Palaeocene (Woolwich and Reading Bed) age. Owing to the rich nature of the material, water mounts were made at each stage of the preparation (KOH, HF, HCl, ultrasonic sieving), so that before the final slides were made, the appearance of the assemblages was already known. On making the permanent slides, however, it was found that the appearance of some of the samples had changed from that in the water mounts. Specifically, the dinoflagellates looked paler and indistinct, the archeopyle indistinguishable, the detail of the processes lost. Their appearance immediately recalled that of the saccates from the Scottish samples.

In both cases, D.P.X. had been used to mount the coverslip to the slide. This had appeared to give good optical results; the bulk of the Essex material, for example, was sharply defined under the microscope. The fault, which became apparent with the dinoflagellates, appeared to be a consequence of their pallid colour. Unlike the pollen and spores, which ranged from yellow to light brown, the cysts were clear. In the Scottish samples, some of the palynomorphs exhibited yellow colours, but the saccates were pallid.

The loss of definition of the clear palynomorphs seemed to be due to the mounting medium, and therefore the requirements of media for their use in palynology were investigated. For good contrast the refractive index of the mounting medium should differ markedly from that of the palynomorphs (Christensen, 1954). The refractive index of most pollen exines ranges from about 1.55 to 1.60 (Christensen, 1954), and the index for dinoflagellates appears to be similar (about 1.55 to 1.62, based on specimens from the Woolwich and Reading Beds). Mounting media with refractive indices higher than 1.60 produce a confusing image (Andersen, 1960), and therefore mountants with indices lower than 1.55 are commonly used. Water (1.33) gives harsh contrast, indicating too large a deviation from the index of pollen exines. Andersen gave a suitable range of 1.40 to 1.46 for palynological microscopy. No information was supplied with the D.P.X. as to its refractive index, but, from BDH Chemicals Ltd., it was found that D.P.X. has an index of 1.517. This therefore places it in the range which Andersen gave as providing too little contrast.

Faegri and Iversen (1975) noted that staining of preparations reduces the importance of the refractive index. This might explain the prevalent use of Canada balsam as a mounting medium, although it has a refractive index of 1.53 (Andersen, 1965), which is very similar to that of pollen and spores. The maturation colour of palynomorphs may therefore act as a natural

"stain". Grains of moderate maturity or oxidised preparations of higher maturity could therefore be examined in a mountant such as D.P.X. This certainly seems true for the Woolwich and Reading Bed material and the probably reworked spores in the Small Isles samples. However, for preservationally immature palynomorphs, D.P.X. does not seem suitable.

No other plastic mountants are used in this laboratory, and therefore no check has been made as to whether this problem of unfavourable index is more widely applicable to other such mountants in use in palynology.

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DISORIENTED DINOFLAGELLATES?

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Dinoflagellates, and their cysts, are one-celled organisms lacking a radial symmetry. Even if at various times their morphology appears to reflect a tendency towards planar or radial symmetry, the very architecture of internal organelles and protective wall plates is such that detailed observation allows recognition of the asymmetric features and thereby of the proper orientation of the specimen.

Recognition of the sulcus and/or the interruption of the cingulum allows identification of the ventral face. In the anthropomorphic convention that has been universally adopted, the dorsal face, and the left and right lateral margins or sides are automatically determined, provided the apex and antapex are determined correctly.

The correct orientation is a necessary first step in determining the number and shape of plates making up the thecal covering of a motile dinoflagellate, or the paratabulation of the wall of a dinocyst. In older literature, insufficient attention was given to the orientation and paratabulation of fossil dinocysts. Often only a single focal level is photographed, without any written explanation as to the position of that focal level, or aspect of the grain. Yet, in a series of focal levels, it is important to know whether these are from highest to lowest focal level, or vice-versa.

Not less important is a mention of the optical characteristics of the microscope used. In the Leitz optical system, for instance, the image presented to the eye is true to the mounted specimen, if rotated by 180°. Thus a "2" is seen like: "Ƨ". However, the Zeiss optical system presents to the eye a rotated mirror image of the specimen: A "2" is seen as "S". Many practicing palynologists appear not to be aware of the optical tricks built into their microscopes. Yet it is of critical importance. If the ventral side is up towards the observer, but the observed image is a mirror-image of the specimen, it is easy to confuse the left and right lateral sides. For instance, Caro (1973) described *Areoligera campoensis* as being characterized by showing a strongly pronounced right antapical lobe (whereas all other known species of *Areoligera*, *Glaphrocysta*, etc., show a tendency for the left antapical lobe to be larger than the right). It prompts the question if possibly Caro was misled by left-right confusion due to a mirror-image reversal. His text contains no information on this.

Another example pertains to *Sentusidinium echinatum* of which I recently reexamined the holotype. I found that the illustration given in Gitmez and Sarjeant (1972) was a mirror image (with left-right reversal) of the specimen as it actually is positioned on the slide. Presumably, this is true for all photographs in this paper; however, there is no evidence in the text that the authors were aware of the problem, or whether or not any correction was made for it. (For instance, reversal of the negative will compensate for a mirror-image exposed to the film).

I am not familiar with the optical systems of other makes of microscopes, and possibly Zeiss and Leitz may offer more than one system in their total line-up. It is very easy, though, to check one's own microscope by the following procedure: With a diamond scribe, or even with a fine pen and India ink, write a capital "P" (as small as possible) on a glass slide. Then, examine this letter under the lowest-power lens available. If it resembles a lower case "d", the image is rotated 180°; if a "b", the image is reversed and rotated; if a "ꟼ", it is reversed without rotation. Alternatively, the writing on an "England Finder" may be used: Under a Zeiss-type microscope the writing will appear in mirror-image.

From the problems that can be introduced by the optical system, it is clear that in plate descriptions it is insufficient to explain a view of a dinoflagellate cyst merely in such simple terms as "ventral face", or "ventral focus". It must be stated explicitly whether the ventral face is seen "by transparency" (as Sarjeant would say, a.o.), or seen "in dorsal aspect" (or as "inside view" as Evitt might phrase it), or whether the illustration gives the "ventral face in ventral view". That still does not account for optic image reversal (or accidental printing of a reversed negative).

I would like to propose a more uniform (and thereby less ambiguous) terminology that would find ready acceptance. However, such acceptance might come easier if a consensus can be reached in some preliminary discussions.

ersonally, I like the term "aspect" = a position facing a particular direction; exposure (Webster's New Collegiate Dictionary). Thus a grain may be in "ventral aspect", i.e., with its ventral face exposed to the viewer; the focus may be on the "dorsal face, in ventral aspect"; if one desires to forestall any question as to position, one can give "ventral aspect, ventral focus; no image reversal". Sarjeant (pers. comm.) would prefer to call this "dorsal face, inside view". (Of course, under a Zeiss microscope that will appear as a "dorsal face, outside view").

In conclusion, I want to assert that, at this point in our published research on dinoflagellates, it is necessary to provide a statement on the optical system used in the illustrative photographs, as well as explicit information on the aspect/position of the specimen under the microscope. Wherever feasible, this information should accompany two or three different focal levels, illustrating the paratabulation (or lack thereof) of the ventral face, an optical section through the cyst wall, and the dorsal paratabulation. Any photographic tricks should be refrained from, or at least identified (such as reversal of the negative of, for instance, a "dorsal focus in ventral aspect", so as to make it appear as a "dorsal face in dorsal aspect"). However, when properly identified, such tricks would be an acceptable way to compensate for optical "tricks" built into microscopical systems.

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THE MEANING OF THE TERM LAESURA AS APPLIED TO TRILETE SPORES

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In the recent past, two separate reviewers, both AASP members with extensive publication records, have criticized in precisely opposite ways my use of the term "laesura" in reference to trilete spores. As a result of these contradictory reviews, I made a brief reconnaissance of the palynological literature relevant to the use of the term, concentrating especially on glossaries and definitions. This reconnaissance has indicated a considerable degree of disagreement and some ambiguity among palynologists regarding the application of the term. The purpose of this note is to outline this ambiguity and, hopefully, to generate further comment on the matter.

The majority of authors use the singular term "laesura" as a generalized descriptive word for the entire monolete mark of a bilateral spore, or for each individual ray of a trilete mark on a radial spore. (A few, such as Staplin and Jansonius, 1964, prefer to apply the term in a more specialized and restrictive sense, although usually adhering to the customary geometric convention described above.) To this general practice, however, notable exceptions exist. Cornet and Traverse (1975), for example, used the singular term "laesura" to indicate the entire tetrad mark of both monolete and trilete spores, implying that any single spore possesses one laesura, which may be either monolete or trilete.

Published glossaries are by no means unanimous in their definitions, and some are ambiguous on the issue of singular vs. plural usage for monolete and trilete spores. Erdtman (1946) implied that trilete spores should be regarded as having three laesurae, and later (Erdtman, 1952, p. 12) he stated: "Monolete spores have one laesura, trilete spores three laesurae radiating from the proximal pole." Harris (1955) and Couper and Grebe (1961) referred to a single laesura as being a dehiscence fissure or dehiscence line, presumably implying that a laesura is a linear feature; by this concept, monolete spores have one laesura (a single linear feature) and trilete spores have three laesurae (three linear features, joined at the proximal pole). In contrast, Tschudy (1969), in discussing the geometric differences between monolete and trilete spores, referred to both kinds of tetrad scars as types of "laesura", implying that the mark of tetrad attachment should be regarded as a single laesura, regardless of its geometry. Nilsson and Muller (1978, p. 57), the most recent formal definition I found, defined a laesura as "a linear, colpus-like, simple or trifid aperture with its centre at the proximal pole". The word "laesura" is derived from Latin, in which it means a hurting or injuring (Kremp, 1968), which to the best of my knowledge carries no geometric connotation.

Clearly, a discrepancy exists in the palynological literature over the definition of the singular term "laesura" in reference to trilete spores. Does a trilete spore have one laesura, or three laesurae? If a trilete spore is to be regarded as possessing three laesurae, as is the dominant custom in our literature, a single laesura therefore must be defined as the radial tetrad attachment line extending from the proximal pole some distance toward the spore equator. By this definition, we are left with a curious inconsistency in application of the same singular term "laesura" to mean the entire tetrad attachment mark of a monolete spore. By analogy to the meaning of the singular term as applied to trilete spores, a monolete mark should be defined as consisting of two "laesurae" diverging from the proximal pole at 180°! This is of course an absurd and useless definition, and I know of no one who would prefer to consider such spores as being "bilete".

Some pollen grains possess distal apertures which are geometrically analogous to the proximal tetrad scars of spores. These grains are termed "monosulcate" (or

"monocolpate") if they have a linear longitudinal aperture, or "trichotomosulcate" (or "trichotomocolpate") if they have a three-rayed radial aperture. In both cases, however, the feature is universally considered a single aperture (e.g., Erdtman, 1947; Faegri and Iversen, 1964; Singh, 1971), for the obvious and logical reason that, regardless of its geometry, it is one structure. By analogy, if a monolete spore is regarded as having one proximal laesura, the single geometrically different but functionally equivalent three-rayed structure on a trilete spore should be regarded as one laesura.

The use of the plural term for trilete spores and the singular for monoletes results in awkwardness when one wishes to discuss the tetrad attachment feature of all spores in general. Any number of papers have used the typographically clumsy and orally unpronounceable "laesura(e)". I suggest that the use of the plural term in reference to trilete spores is unnecessary. If we wish to use the term "laesura" at all as a general descriptive word applying to the tetrad mark, it suffices as a singular. By this usage, spores (except, of course, for alete forms) have a single laesura, be it monolete or trilete. If we need a general descriptive term to apply to the individual radiating lines of the tetrad mark, we have the ordinary English word "ray" or its equivalent in other languages. In fact, an end to the use of the term "laesura" altogether may be desirable in the interest of reducing pseudoscientific jargon, the level of which has reached alarming proportions in palynology. The simple terms "mark" and "scar" seem fully synonymous with "laesura(e)" as it is generally used. Even with these, however, I would emphasize the use of the singular. The kind of verbal confusion that can result from plural usage is illustrated by Smith and Butterworth (1967, p. 113), who defined trilete as meaning "possessing a triradiate tetrad mark", and on the next page noted that spores with radial symmetry possess three marks.

Several other terms have seen wide use in a sense similar to that of "laesura(e)". "Suture(s)" and "fissure(s)" (along with their superfluous and jargonistic Latinized versions, "sutura[e]" and "fissura[e]") appear to be near equivalents as they are normally used, and they suffer from the same plural/singular awkwardness and ambiguity. Some authors (e.g., Couper and Grebe, 1961) have drawn relatively narrow technical distinctions among these terms, but none seem to address the plural/singular problem. Readers will no doubt think of other terms to which this observation also applies.

I object strenuously to the general use of the term "aperture" for the proximal tetrad mark of spores. This word has been adapted from its proper use in pollen terminology, and it is misused when applied to spores. The apertures of angiosperm pollen grains evolved to function as outlets for germination; in doing so, they have developed in positions away from the areas of tetrad attachment, and often (e.g., periporate grains) appear to be entirely unrelated to the original tetrad position. The proximal tetrad attachment scars of spores are not, in this sense, apertures. In the majority of spores, both ancient and modern, the proximal scar did or does also function as a dehiscence site for germination, but this is not universally true. Good evidence exists to show that, in some spore genera (e.g., *Aequitriradites*; see Cookson and Dettmann, 1961), specialized distal structures developed, presumably to aid germination. Many other spores (e.g., some species of the genera *Calamospora* and *Cirratriradites*) have strongly thickened trilete marks that are almost never observed in an opened configuration, along with either specialized distal structures or generally thin exines that would be ruptured easily in any direction.

In conclusion, I advocate (and intend, in the future, to adhere to) the use of the singular terms "mark" or "scar" as general descriptive words to apply to the individual feature reflecting tetrad attachment on an individual spore, regardless of its trilete or monolete geometry. The term "ray" serves adequately to indicate one of the three radial parts of a trilete mark. I would suggest the use of terms such as "laesura" only in a well-defined specialized sense (as done by Staplin and Jansonius, 1964), and even in those cases, as singular for each individual trilete spore. To maintain the custom of reference to monolete spores as having one laesura and to trilete spores as having three is inconsistent and offers no descriptive advantage.

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