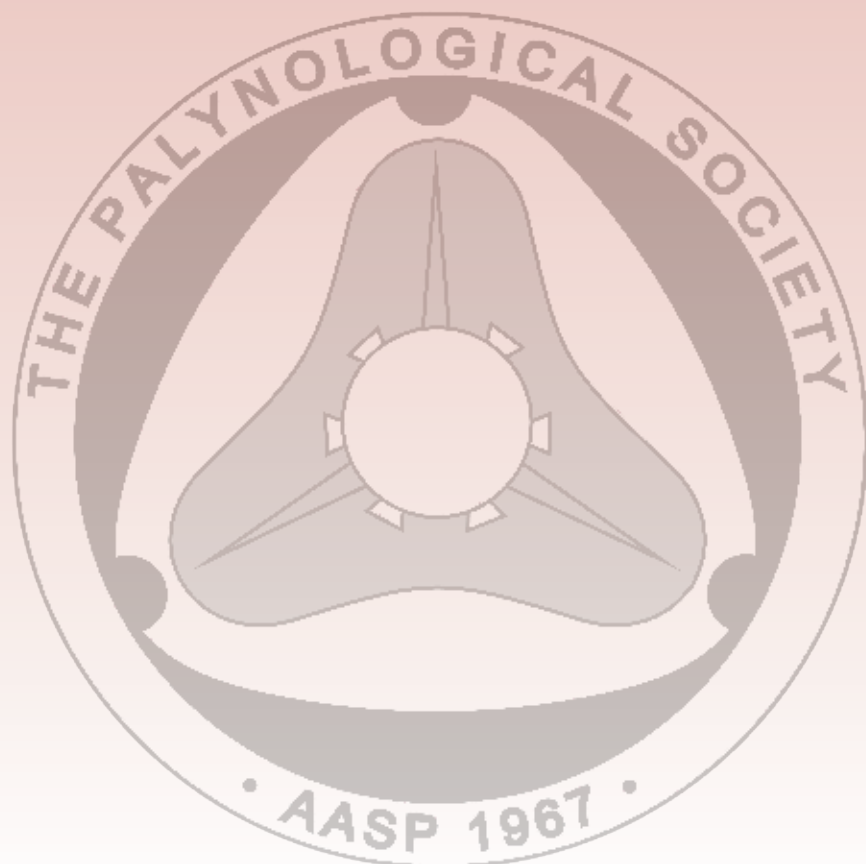


AASP- THE PALYNOLOGICAL SOCIETY



Linun narbonese
by David Jarzen

NEWSLETTER



September 2008
Volume 41, Number 3



A.A.S.P. NEWSLETTER

Published Quarterly by the AASP - The Palynological Society

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A.A.S.P.

The Palynological Society

The American Association of Stratigraphic Palynologists, Inc. - AASP-The Palynological Society - was established in 1967 by a group of 31 founding members to promote the science of palynology. Today AASP has a world-wide membership of about 800 and is run by an executive comprising an elected Board of Directors and subsidiary boards and committees. AASP welcomes new members.

The AASP Foundation publishes the journal *Palynology* (annually), the AASP Newsletter (quarterly), and the AASP Contributions Series (mostly monographs, issued irregularly), as well as several books and miscellaneous items. AASP organises an Annual Meeting which usually includes a field trip, a business luncheon, social events, and technical sessions where research results are presented on all aspects of palynology.

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Sophie Warny, 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, meetings reports, information about "members in the news", new websites and information about job openings in the industry. Every effort will be made to publish all information received from our membership. Contributions which include photographs should be submitted a week before the deadline. Deadline for next issues of the newsletter is **November 15**. All information should be sent by email. If possible, please illustrate your contribution with art, line drawings, eye-catching logos, black & white photos, colour photos, etc. **We DO look forward to contributions from our membership.**

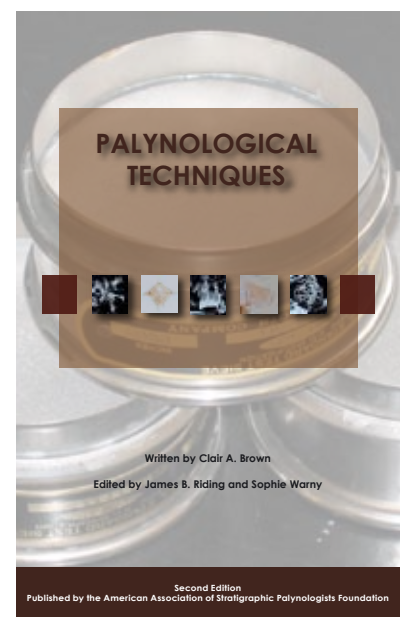
PRESIDENT'S MESSAGE

An Upbeat Time For Palynology and AASP

By Francine McCarthy

I compose this last message as president at the 12th IPC meeting in Bonn with a feeling of excitement- and not just at the prospect of turning over the office to Fred Rich at the Business Meeting Thursday night!

One does get the feeling that it is an upbeat time for palynology, looking around at the huge number of young researchers attending this conference. It is also great to see so many familiar faces, including several people who have been palynologists for more than five decades and who are still presenting papers. I think that the best thing is that the young palynologists clearly continue to value the work done by pioneers like Clair Brown, who first published his 'Palynological Techniques' in 1960 after canvassing workers in labs around the world in order to accurately pass on techniques for getting palynomorphs out of all types of media. AASP Foundation (AKA Bob Clarke & friends) reprinted a new edition of this pioneering work less than 3 weeks ago, edited by our Managing Editor, Jim Riding, and our Newsletter Editor, Sophie Warny. Every one of the dozens of volumes of 'the Brown book' carried across the Atlantic by various board members was snapped up before the end of the first day of the conference, mostly by people who were not born when the original first came out!



The AASP booth, which serves as a comforting homebase for our members at this big joint conference, continues to do a brisk business selling memberships and allowing members from overseas an easy opportunity to check their membership status and pay their dues. The increasingly international membership of our association reaffirms my conviction that the most obvious change completed during my presidency- our new name- was an excellent decision. I leave to Fred Rich and President Elect Joyce Lucas-Clark the not-too-arduous task of keeping this society moving forward to even more exciting times.

Francine McCarthy

Palynology and the US Space Shuttle Program

David M. Jarzen, Florida Museum of Natural History, Gainesville, FL
and

Linda A. Nelson, United Space Alliance, Cape Canaveral, FL

Image from NASA



Figure 1. Solid Rocket Booster (SRB) recovery in the Atlantic Ocean.

After every US Space Shuttle flight, the Solid Rocket Boosters (SRBs) are returned to earth, retrieved from the Atlantic Ocean (see Figure 1), and transported to the Kennedy Space Center (Cape Canaveral) where they are cleaned, examined and refurbished for a future flight. Following the flight of Shuttle mission, STS-120 (October 23, 2007), and during post-recovery inspection of the SRBs, a large quantity of an unknown orange-yellow liquid and semi-solid mass (see Figure 2 on the top of page 7) was observed in a small cavity and a corresponding Teflon™ drain tube in the interior of one of the upper components of the SRB frustum. This cavity allows seawater to drain from the interior of the structure after removal from the Atlantic Ocean. A preliminary inspection of the yellow mass suggested it was comprised of pollen grains.

The team making the inspections of the SRBs (The United Space Alliance), made contact with the Paleobotany and Palynology Laboratory at the Florida Museum of Natural History (FLMNH) to see if they could identify the suspect pollen to its parent plant(s), and to determine the timing of its inclusion in the tubing, that is, whether it was in the tubing prior to the flight or after the flight. Several samples of liquid and semi-solid masses of yellow-to-brown masses of gelatin-like substance were processed using standard palynological procedures.



Figure 2. Sample of "yellow material" from inside the SRB frustum.

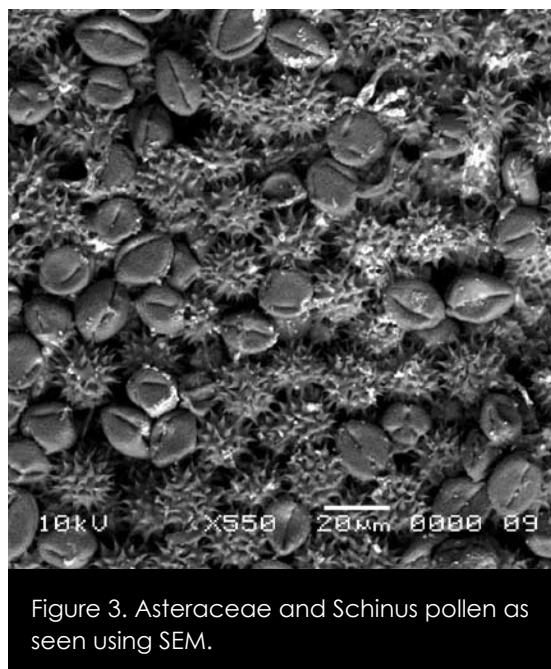


Figure 3. Asteraceae and Schinus pollen as seen using SEM.

All samples contained well-preserved pollen of primarily two taxa. The pollen was fresh in appearance, with cellular contents (observed before the acetolysis treatment), and light-to-medium yellow in color. The taxa recovered are *Schinus terebinthifolius* Raddi and a member of the Asteraceae family (Aster family; see Figure 3). Rare occurrences of pollen of *Vigna luteola* (Jacq.) Benth, *Pinus* sp. (pine) and Poaceae (grass family) were also encountered.

Schinus terebinthifolius, the Brazilian Pepper-Tree is an exotic, invasive plant occurring in much of central and southern Florida. It is present at the Kennedy Space Center, Cape Canaveral (Schmalzer et al., 2002). In southern Florida it grows on a broad range of moist to mesic sites, sometimes forming nearly monotypic stands, including tropical hardwood hammocks, bay heads, pine rocklands, sawgrass marshes, *Muhlenbergia* prairies, and the salt marsh-mangrove transition zone (Ewel, et al. 1982). *Schinus terebinthifolius* thrives on disturbed soils created by natural disruptions, e.g., hurricanes, and is especially invasive in areas affected by human activities. Brazilian pepper does not become established in deeper wetland communities and rarely grows on sites inundated longer than three to six months. In Everglades National Park, it is absent from marshes and prairies with hydroperiods exceeding six months as well as from tree islands with closed canopies (LaRosa, et. al., 1992). The Brazilian Pepper plant flowers from September through October, with a second flowering period of less than 10% of the population from March through May (Ewel, et al., 1982). Pollination is by diurnal insects including honey bees, syrphid flies, and Lepidoptera. Cassani et al., (1989) discuss the insect pollinators of the Brazilian Peppertree in south Florida.

The Asteraceae is a large family, with pollen of the many species being very similar. It is quite difficult to separate the 23,000 species based on pollen morphology alone. Pollen is both insect and wind dispersed. At the Kennedy Space Center 108 species of Asteraceae have been identified (Schmalzer, et al., 2002). The pollen recovered from the SRB is most comparable to the long-spined pollen of the sunflower group of plants (Tribe Heliantheae), which are entomophilous, dispersed by a variety of insects, especially bees. The Asteraceae pollen recovered from the SRBs are all identical to each other, suggesting they are all from the same parent plant species.

Vigna luteola (hairy cowpea), a member of the legume family, is widely distributed in the southeastern United States from Texas south to the Florida Keys, the Caribbean, Central America

and parts of South America. It primarily inhabits pinelands, coastal areas and disturbed sites. The pollen of *V. luteola* is insect pollinated.

The five samples collected from the SRBs and processed for their pollen content are comprised of the pollen of primarily two, insect- pollinated plants known to occur commonly at the Kennedy Space Center. The fact that the samples are comprised of pollen in great numbers and primarily from only two species suggests that the pollen was deposited in the drain tube vents by insects. Wind-dispersed pollen is more random in nature, and would likely contain pollen of many species. Likewise, the absence of fungal spores (mold) suggests that wind-dispersed pollen and spores are not a factor in the pollen assemblage recovered from the SRB samples.

Graham (1997) illustrated that pollen which has undergone temperature changes as low as 100° C will show a darkening, or thermal maturation, of the pollen wall (exine). Thermal maturation of the pollen recovered from the SRBs was not observed. Rather the pollen recovered is light yellow in color suggesting that the cavity area and Teflon tubing were protected (as would be expected) from high temperature changes. Elucidation of the type of insect(s) which made the deposits is unknown at this time. Observations made at the launch pad site have revealed the presence of many bees in and around the booster rocket assembly. The timing of the placement of the pollen material in the tubing is probably prior to launch, as the booster rockets are brought to the launch pad several weeks before the actual launch, certainly time enough for bees or other insects to locate vent tube openings and to make deposits of pollen. Once the SRBs are returned to Earth following a launch, the time between recovery and inspection may be too brief to allow insects to deposit pollen-bearing materials.

This study illustrates the diverse nature of our discipline, and another way in which palynological information may be used to solve many questions and make sense of an otherwise baffling situation.

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THE AASP WEB PAGES by Owen Davis

In celebration of our New Name and New Logo, the AASP web site has been revised. AASP has had a web page since 1995, when Martin Head set it up on the University of Toronto server (AASP Web Page History <http://www.palynology.org/history/Webpage/>). It and the CAP web page were two of the earliest professional organization web pages. Those of you who can't remember that first page can see at (1996 homepage <http://www.palynology.org/history/Webpage/index96.html>). It featured a beautiful header with the (old) name and (old) logo proudly displayed. At dial-up modem rates, that header was a bit of a risk, but Martin had wisely anticipated increasing baud rates.

By the time Martin, and the web page, moved to Cambridge, the AASP home page hosted most of the feature found in later web pages -- such as a list of AASP Foundation publications, lists of meetings, and the AASP email directory (1999 homepage <http://www.palynology.org/history/Webpage/index99.html>).

Paul Strother took over after Martin was no longer able to host the page at Cambridge. Paul introduced many new features to the AASP website, including graphical menus and java scripts. (2000-2004 homepage <http://www.palynology.org/history/Webpage/defaultStrother.html>). The new site boasted coordinated page designs, making it easy to navigate. Initially the page was hosted on the Boston College server, but Paul was able to obtain our domain name "Palynology.org," and transfer the site to a commercial internet service provider (Dreamhost <http://www.dreamhost.com/>). That made possible the next major step for the AASP web sites -- internet commerce.

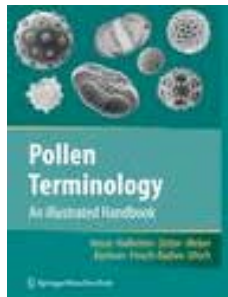
With the help of University of Arizona System Programmers Steve Sorenson and Enida Lima, Owen Davis, the next AASP webmaster, and first to be elected to that post on the AASP Board of Directors, set up a secure site to permit online sales of AASP Foundation Publications. In addition to the sales-page, he added automated forms (php), and the (AASP history page <http://www.palynology.org/history/>), with over 100 biographies of twentieth-century palynologists, and free electronic access to (**PALYNOLGY** <http://www.palynology.org/GSW/>) for AASP members.

The current revision boasts two new sites. The most ambitious of these is the (AASP commercial page <https://payment.palynology.org/>). This is based on the (ZenCart <http://www.zencart.com/>) open-source software package. This move was necessitated by our loss of free UA technical support. Now, the webmaster can make frequent changes in availability of Foundation Publication without system-level programming. It also computes shipping rates and lowers credit-card fees for AASP.

The new (AASP homepage <http://www.palynology.org/>) includes both our new name and our (new logo <http://www.palynology.org/history/logo.html>). It provides direct links for payment, the many benefits of AASP membership, access to AASP Foundation publications. It provides an introduction to palynology for the public, urges palynologists to join AASP, announces the upcoming annual meeting and cites our AASP awards and scholarship.

The AASP web site has grown substantially in the last 13 years. The content is so voluminous our newest addition to the site is a Google search engine! Try it! At the top of our (homepage, <http://www.palynology.org/>) enter the name of your favorite palynologist (yourself!), and click "Search."

NEW BOOK



Pollen Terminology

An illustrated Handbook

Hesse, M., Halbritter, H., Zetter, R., Weber, M., Buchner, R.,

Frosch-Radivo, A., Ulrich, S.

2008, Approx. 500 p. 300 illus. in color., Hardcover

ISBN: 978-3-211-79893-5

Not yet published. Available: October 4, 2008

\$ 349

About this book

This handbook is a fully illustrated compendium of glossary terms and basic principles in palynology. It is an indispensable tool for all palynologists.

The General Chapter on pollen morphology, anatomy, pollen development etc. deals with essential characters in palynology. If appropriate, ambiguous or poorly recognized characters are commented, based on the present knowledge in palynology.

The Terminology Part comprises more than 300 widely used terms illustrated with over 1.000 high quality light and/or electron microscopic pictures. This part provides a detailed survey of the manifold ornamentation and structure of pollen walls, and gives insight in their stunning aesthetic beauty. Terms are grouped by character context to allow an easier and faster comparison of similar features. In general, each term is illustrated on a separate page, including definition, plant species, and, where necessary, a comprehensive explanatory comment. The use of the terms in LM, SEM or TEM and their assignment to anatomical, morphological and/or functional pollen features is indicated by icons and colour coding, respectively.

The Textual Glossary is arranged alphabetically for a quick search on terms. Important literature is mentioned and, where appropriate, cross references to the General Chapter are included for better comprehension.

Written for:

Biologists training to become biodiversity researchers, palynologists, systematists, doctors training to become allergologic specialists

MEMBER UPDATE

Rex Harland

Despite being semi-retired Rex Harland has been appointed as a Guest Professor in Marine Geology (Marine Micropalaeontology) at the Department of Earth Sciences, Gothenburg, Sweden. The appointment is for an initial period of three years from the 1st July 2008 and will entail research on the dinoflagellate cyst record of the last 2500 years and certain teaching duties within the department.

LSU Geology & Geophysics



Marathon GeoDE

Goal of Marathon GeoDE

The goal of Marathon GeoDE is to enhance the diversity of the geoscience community by supporting and mentoring high-achieving students. The program emphasizes scholarship, research, service, and mentoring to enhance a scholarly climate that embraces individual diversity. Marathon GeoDE is funded by Marathon Oil Company and led by department faculty.

Opportunities for Doctoral Students

The Marathon GeoDE Fellows program seeks outstanding students who have high potential as scholars, researchers, and leaders for LSU's Ph. D. program in geology. Marathon GeoDE Fellows receive a \$30,000/year academic-year stipend for three years, full tuition waiver, and \$10,000/year for three years to support their research expenses. Marathon GeoDE Fellows are mentors for Marathon GeoDE Undergraduate Scholars and help lead program development and recruiting.

For more information and to apply to be a Marathon GeoDE Fellow, please e-mail Laurie Anderson, Marathon GeoDE Program Director: glande@lsu.edu.

Opportunities for Undergraduate Students

The Marathon GeoDE Scholars program is for undergraduate students in geology at LSU. Applicants to the Marathon GeoDE Scholars program can either be newly admitted to LSU or a current LSU student. Marathon GeoDE Scholars receive a scholarship that is renewable for up to four years. Students may select a research opportunity upon admission to the program, and funds for research costs and research related travel are available. After successful completion of one academic year as a Marathon GeoDE Scholar, students serve as mentors to their fellow Scholars.

For more information and to apply for a Marathon GeoDE Scholarship, please contact Laurie Anderson, Marathon GeoDE Program Director: glande@lsu.edu.

Contact Us

For more information and to apply to be a Marathon GeoDE Fellow or Scholar, please visit www.geol.lsu.edu/marathongeode.html



IF INTERESTED IN OUR Ph.D. PROGRAM:
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Smithsonian Tropical Research Institute Instituto Smithsonian de Investigaciones Tropicales

DONATION OF THE GRAHAM COLLECTION

to the Smithsonian Institution

Carlos Jaramillo, jaramilloc@si.edu

The Smithsonian Tropical Research Institute in Panama is proud to announce that it has received the donation of the best collection of neotropical pollen in the world, the Graham Palynological Collection, thanks to the generosity of Alan Graham, Professor Emeritus at the Kent State University and current curator at the Missouri Botanical Gardens.

This collection began as part of an early palynology laboratory set up in the herbarium of the University of Texas in 1954, and expanded with original preparations, and also with exchanges with numerous laboratories throughout the world. It comprises over 25,000 pollen slides of modern taxa, mostly from the neotropics, thousands of pollen slides from Dr. Graham's work on the geological history of the forests of Central America, as well as pollen residues and an impressive collection of literature (over 16,000 reprints related primarily to the biology and geology of the New World with emphasis on Latin America). The modern reference component has the added virtue that all the original preparations can be referenced to a specific herbarium collection, allowing scientists to verify the identification of fossil material and specimens used in taxonomic studies.

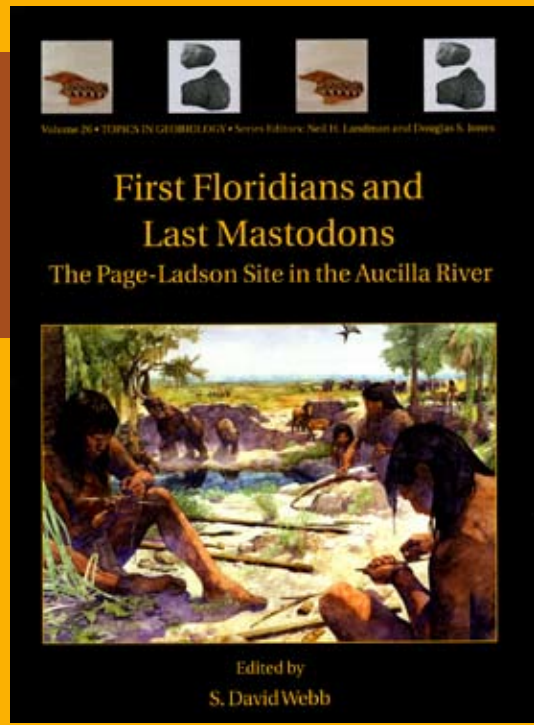
At STRI, we are grateful and honored to be hosting this collection, which is an invaluable resource for our scientists. Soon, we hope to have all components in digital format, to share it on the web with everyone who might be interested, worldwide.



Professor Alan Graham



A sample of the collection



A book review submitted by D.M. Jarzen

Florida Museum of Natural History

University of Florida, Gainesville, FL, USA Gainesville, Florida

This collective, edited work represents the culmination of 20 years of research, collection, and management of one of the most productive, underwater paleontological sites in the southeastern US, providing data and interpretations of the first contact between humans and the large mammals of Florida.

From the very first pages of the book, I was captured and drawn into the exploration of the Aucilla River and the treasures it would eventually release. *The Prologue* starts the journey of discovery and intrigue:

"The old bull elephant halted his swinging gait. His ears moved to catch the throbbing sub-sonics from a far off female in estrus – a sound that called to him urgently. But he was puzzled, and he lifted his trunk high above his flattened forehead. Increasingly an acrid and unfamiliar scent had come to him, borne on the moist breeze from a nearby watering hole. The mastodon wheeled and began moving down the dusty path that led to the dry bed of an old river, now only a strip of vegetation surrounding a few pools of water.

At the water's edge crouched a strangely twisted animal, the origin of the unfamiliar smell. With the appearance of the mastodon, the animal rose and in bizarre fashion remained balanced on its hind legs..."

Emeritus Professor David Webb was Vertebrate Paleontologist at the Florida Museum of Natural History (FLMNH) for just over 40 years. Upon his arrival at the Museum in 1964 he quickly realized the potential fossil history of this part of the world, and began a research and collection program that would become the cornerstone of Florida's fossil heritage. Perhaps Webb is best known for his studies of the "Great American Biotic Interchange" (Webb, 1976; Stehli & Webb, 1985.), the movement of terrestrial biota north and south across the isthmus of Panama, as well as his work with the Pleistocene mammals of Florida (Webb, 1974).

This book, however, chronicles twenty years (1983-2003) of exploration and presents the results of several disciplines from a remote area in the panhandle of Florida, a place that yielded the information to fill the pages of this well-documented and well-structured study – the Aucilla River Prehistory Project.

The 21 chapters of this book encompass several facets of exploration, and include the geology, paleobotany/palynology, the late Pleistocene evidence and the early Holocene evidence, and two final chapters of conclusions. Twenty-five contributors, many of whom were students of Webb, provide the evidence leading to the discoveries of this pioneering study.

In order to set the stage for the chapters that follow, Latvis and Quitmyer outline in Chapter 1, the underwater excavation techniques that were employed and developed during the 16 years of field work for the project. It is important to note that during this extended time interval, involving many divers and many hours of underwater time, not a single accident occurred. This speaks well for the organizational skills of the chief scientists who set the safety standards for the project. In reading this chapter, I was overwhelmed with the many facets of preparation needed to carry out such a successful endeavor. The logistics of working in an underwater environment, in water that is colored dark brown from the dissolved tannins, and a river bottom often snarled with tree limbs and trunks, are complex and critical to success. The care and precautions taken by the field teams were truly remarkable. Volunteers, trained by the FLMNH staff, joined on the expedition each field season and

included people from all occupational backgrounds from 15 US states, the Netherlands, Canada, and Sweden.

Geologically the Aucilla River is part of the Woodville Karst Plain, essentially a broad lowland of a flat veneer of unconsolidated sediment overlying a heavily karst terrain. It is this karst topography of the Page-Ladson site that resulted in the formation of numerous vertical sinkholes, often recording a complete sequence of latest Pleistocene and earliest Holocene deposition. This feature alone accounts for the outstanding fauna and flora recovered from the site. A total of four chapters cover the geology of the area including the geography and geomorphology (Donoghue), the stratigraphy and sedimentation (Kendrick), carbon dates (Webb & Dunbar) and climatic change (Dunbar).

The next two chapters cover the microfossil and macrofossil plant record from the Page-Ladson locality. Barbara Hansen (University of Minnesota) covers the pollen, stomata and charcoal microfossils from a continuous sequence of strata representing several millennia before, during and after the arrival of Paleoindians in north Florida. Lee Newsom (Pennsylvania State University) reports on the plant macrofossils recovered from the site. The use of plant microfossils coupled with data from the plant macrofossils provide a rich assemblage of taxa that represent the regional floral changes (palynology) and an analysis of the local vegetation communities that occurred at the Page-Ladson site. The vegetation at the Page-Ladson site underwent a change over time from mesic hardwoods with cypress swamps to a drier more open landscape environment during the Meltwater Pulses 1A and 1B, that led to the Holocene.

Twelve chapters of this hefty volume cover the late Pleistocene evidence (Chapters 8-14) as determined through a study of the fossil vertebrates, non-marine mollusca, mastodon dung deposits, mastodon tusk studies and paleoindian archaeology, and the evidence gathered from the early Holocene sections of the sink hole (Chapters 15-19.), including soil science, vertebrate paleontology, Early Archaic archaeology and a unique chapter by Muniz and Hemmings, on the discovery of hearths at the Page-Ladson site. The



Professor S. David Webb with a Mammoth specimen recovered from the Aucilla River Project.
Florida Museum Photo by Stan Blomley©1998. [Palynologist David Jarzen is at the left background of the photo.]

occurrence of hearths clearly indicates that at one point the site was subaerially exposed during at least a part of the early Holocene. The book concludes with a chapter by James Dunbar on the use of the land by Florida's earliest human inhabitants, and a final chapter of conclusions (based on all the previous chapters) by David Webb.

I found the book well written, even considering the various individual authors styles. Although I was not specifically looking for typographical errors, I noted the consistent misspelling of the hazelnut as *Coryleus* rather than *Corylus*.

Indeed a minor point which does not distract from the value and use of the book. The referencing to specific points within other chapters in the volume is especially handy if one prefers to read only selected chapters. An appendix of color photographs of images that appear as black and white in the text is especially handy when looking at underwater images of the collection site. The use of color enhances the contrast and allows a better appreciation of the nature of the Page-Ladson locality.

The book is a fine addition to the library for those of us concerned with Pleistocene and Holocene aspects of the fossil record. The book will be an asset to those studying the early impact of humans on the environment and the fauna and flora of early Florida. Certainly the book will appeal to academics, scientists and researchers in the fields of geology, paleontology, archaeology, biology, and ecology.

As I began with a quote from the book, I will also end. This quote notes the importance of an understanding of the paleovegetation in the overall study of ancient life.

"...vegetation has two aspects: It is part of the living world that is studied for its own sake, and it is also the biological setting that, combined with the physical setting, forms the total environment for all life."

E.C. Pielou.

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POLLEN AND COUNTERFEIT DRUGS

By D. C. Mildenhall
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Palynology received considerable publicity after publication in February this year of a paper on the general source of counterfeit pharmaceuticals, traced in part by forensic palynology (Newton *et al.*, 2008).

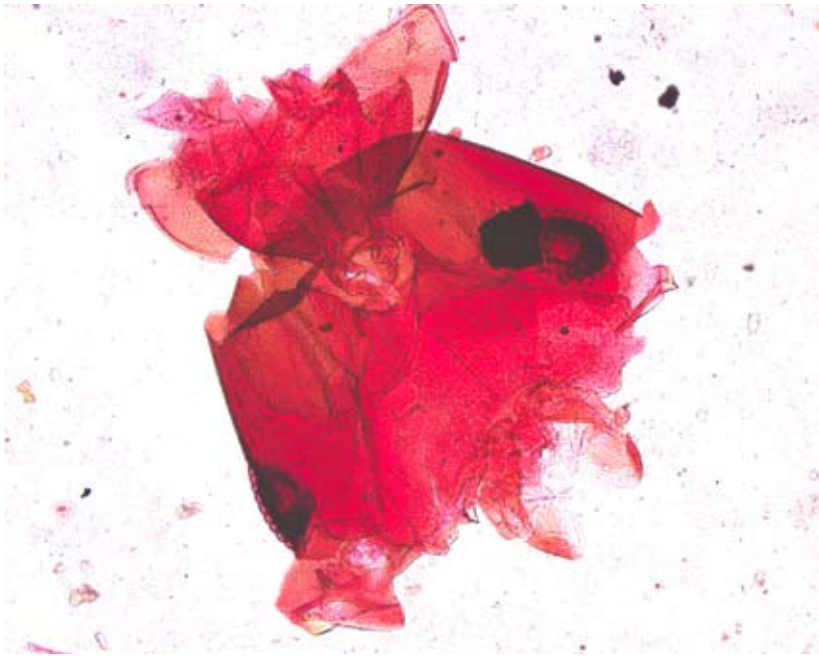
The problem of counterfeit pharmaceuticals has been growing rapidly throughout the world and few countries are not affected by it. This issue was brought to a head when a rise in the death rate of malaria patients in SE Asian hospitals and the general community was found to be caused by failure to react positively to what were thought to be genuine anti-malarial tablets. Forensic analysis of a very small selection of randomly selected tablets showed that a large percentage had no active ingredient in them and that corn starch, used to hold the active ingredient artemisinin or its derivative artesunate, was often either missing or in trace amounts. In place of starch were calcite, lactose, sucrose and talc, minor amounts of other materials and various combinations of these including some starch. Artesunate is derived from *Artemisia annua* (sweet wormwood or quinghaosu), native to China and Viet Nam but now far more widespread in the Northern Hemisphere.

With evidence of gradually increasing numbers of counterfeit tablets on the SE Asian market, INTERPOL and the World Health Organisation (WHO) brought together a group of scientists, police and health workers to try and determine where these counterfeit anti-malarial tablets were originating from. This resulted in a five year research study in which one of the techniques they employed was looking at contaminants in the tablets to see if anything could be found to enable a source area to be determined.

The results of this investigation were published in February of this year, with the result that

Captions

Top left: Chenopod pollen from counterfeit antimalarial tablets from SE Asia. Top center: Pine pollen from counterfeit antimalarial tablets from SE Asia. Top right: Myrtaceae pollen from counterfeit antimalarial tablets from SE Asia.



Caption

A mite, *Dermatophagoides*, found in counterfeit antimalarial drugs from SE Asia.

palynology received hitherto unprecedented publicity with mention of forensic palynology as a new tool in tracing counterfeit pharmaceuticals in the Guardian (UK), Independent, International Herald Tribune, Mirror (UK), Nature, New Scientist, New York Times, Reuters, Scientific American, and Voice of America.

Investigations indicated that over 50% of the anti-malarial drugs in SE Asia were counterfeit and in one Laos hospital 100% of the drugs were counterfeit. Palynology indicated the presence of numerous pollen types that suggested sources along the Chinese border areas with Viet Nam, Laos, Thailand and Burma. It was clear that there was more than one source area and analyses indicated two

dominant source areas, each area probably themselves representing multiple manufacturing, and possibly mobile manufacturing sites.

Analysis of calcite used as an excipient (filler) in some of the tablets produced a stable isotope signature that indicated that the calcite was likely to be from a high temperature hydrothermal source. Such a source is very rare but was known to occur in a mine close to the China/Viet Nam border. Samples from the mine produced the same stable isotope signature and the mine occurred in the same general area indicated by pollen from the same tablets.

Palynological analysis of the tablets produced evidence for tablet production in rather unclean facilities with no quality control over the state of the ingredients used to make up the tablets. Charcoal and black chips were common in tablets that also contained chemical evidence of the existence of petroleum products. Animal remains were present mainly in the form of mammalian hairs but also as insect remains, and occasionally almost complete mites were recovered. Plant remains also included wood fragments, some up to 5 mm long, cellular material, leaf cuticles, parenchyma, isolated vessels and fibres, bryophyte spores, fungal spores and hyphae, and spores and pollen from ferns, conifers and flowering plants. Synthetic fibres of different colours (blue, brown, green, red), or colourless, were also recovered

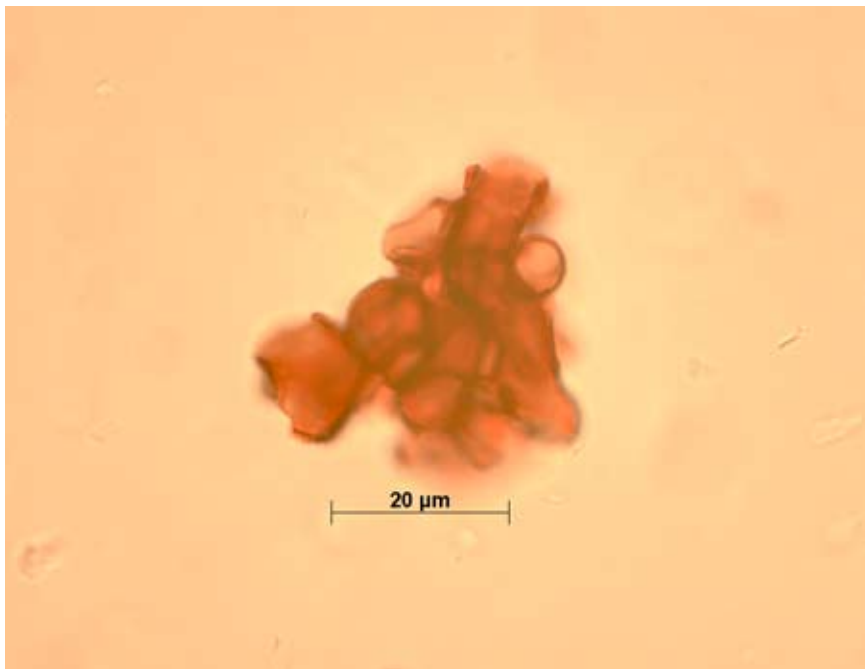
Because of the tradition in SE Asia that anti-malarial tablets are bitter, various chemicals had been added to the tablets to provide that taste. These included pharmaceuticals no longer used because of their serious side effects, carcinogens, solvents, benzene, ethanol, chloroform, anti-

malarial pharmaceuticals that are no longer active because of parasite immunity, and precursors to methamphetamines.

A wide range of spores and pollen from different ecological and geographical sources were recovered including Poaceae (a variety of types including possible cereals), *Artemisia* (probably from sweet wormwood, but possibly also from a different species), *Pinus*, *Acacia*, *Alnus*, Asteraceae, *Betula*, *Carya*, Chenopodiaceae, Cyperaceae, Cucurbitaceae, *Juglans*, Labiatae, Moraceae, Myrtaceae, *Nymphoides*, *Plantago*, *Plumbago*, *Pterocarya*, *Restio*, *Salix*, and *Ulmus*. Among the fern spores were Cyatheaceae (*Alsophila*), Dicksoniaceae, Hymenophyllaceae, *Isoetes*, Polypodiaceae, *Pteris cadieri*, and *Pyrrosia*.

When INTERPOL reported the results of research on the tablets to Chinese law enforcement agencies they acted quickly and a number of arrests were made. One of the major counterfeit drug trade routes from China into SE Asia was closed down. The number of counterfeit tablets seized was the equivalent of about half the previous year's known counterfeit supply.

China is not the only source of counterfeit pharmaceuticals. It is a widespread problem with factories producing counterfeits in other countries either in the form of "genuine" counterfeits or as copies, with poor quality control, containing either too much or not enough of the active ingredient. Anti-malarials are not the only medications being counterfeited. Over 60 counterfeit products including asthma drugs, baby milk formula, anti-biotics, birth control tablets, blood protein, cardiovascular drugs, anti-hepatitis drugs, HIV-AIDS drugs, anti-virals, social drugs (Viagra, Cialis), are known. Their presence outside of Asia and Africa will become a progressively more serious problem as they are entering distribution channels for genuine pharmaceuticals with increasing frequency.

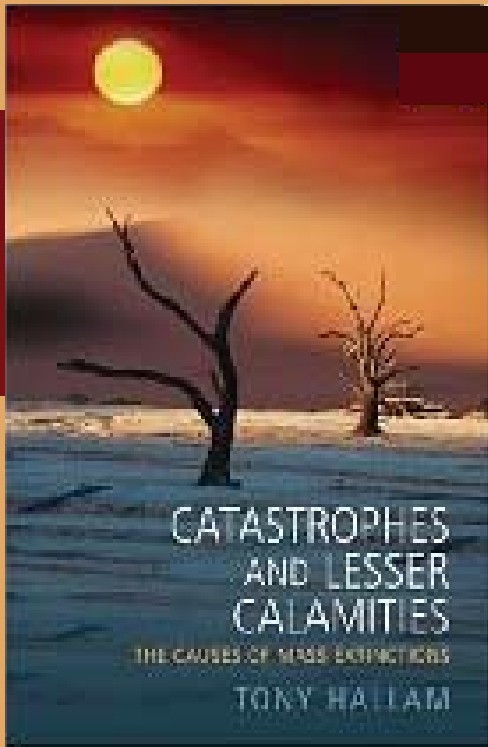


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Captions

Fungal spores from counterfeit antimalarial tablets from SE Asia.



**A book review submitted by Alwynne B. Beaudoin
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It often seems that one cannot open a newspaper without coming across yet another story about vanishing animals. Or about animals, generally cute and photogenic, that are on the verge of vanishing, but whose disappearance can be halted if only we donate to the right charity. We are given regular reports on the mating activity, or more often lack of activity, of captive giant pandas, animals that, in contrast to much of the rest of the living world, seem perversely intent on not reproducing. Extinction is the journalists' perfect metaphor. Pundits gloomily draw analogies between the fates of creatures whose inability or stubborn unwillingness to adapt to changing circumstances doomed them to extinction and the probable future of the human race, especially if we won't deal with our addiction to fossil fuels. Dinosaurs and dodos are held up as cautionary examples. If extinction of one species is a calamity, extinction of many species – a mass extinction – must qualify as a catastrophe. But how can we be sure that something is extinct? After all, newspapers also frequently report on animals that were thought to be extinct but have somehow survived and been found again. For palaeontologists, who deal with limited data, patchy records and incomplete specimens that often provide only a hazy window on the past, the question is even more acute. How do we recognize extinction, especially mass extinction, in the distant past? And how can we possibly know what caused it?

For many people, the answer to the last question isn't in doubt any more: an asteroid did it. Tony Hallam is understandably exasperated at such a facile answer and at the over-emphasis on extraterrestrial factors (asteroid or comet impacts) as an explanation for mass extinctions. In this book, targeted at the non-specialist reader, he presents a lucid and convincing exposition of other causes and includes a warning against a "one size fits all" approach to scientific explanation. Hallam strives to de-emphasize the extinction of dinosaurs so prevalent in the popular imagination. "When the subject of extinctions in the geological past comes up," he rather testily remarks, "nearly everyone's thoughts turn to dinosaurs" (p.1). Hallam wants people to know how geoscientists study mass extinctions and in particular he emphasizes that geology and palaeontology are (or should be) evidence-based disciplines. Much of his discussion concentrates on the "Big Five" extinction events (end-Ordovician, late Devonian, end-Permian, end-Triassic, end-Cretaceous) because these are the biggest (as inferred from number of species affected) and the ones best marked in the fossil record. He recognizes at least nine other "lesser calamities," including the late Cambrian, end Paleocene, and late Eocene mass extinctions. Hallam points out that most mass extinctions are best recorded in the marine palaeontological record. Indeed, the extinction of the dinosaurs stands out as anomalous among the Big Five because it has yielded marked evidence

in the terrestrial record and yet affected the fewest marine families (pp. 32-33). So, from a geoscience perspective, using dinosaur extinction as the exemplar for all mass extinctions is highly misleading.

Actually recognizing a mass extinction in the geological record turns out to be not so simple as it might seem. Following a brief review of the historical background to the extinction debates and a primer on how evidence of extinction might be adduced from the geological record, Hallam tackles this question first. Not surprisingly, terminological issues plague the debate. Is a mass extinction something that happens suddenly? Or can it happen more gradually? And, by the way, what do “suddenly” and “gradually” mean in the context of geological time? How many species have to disappear before the event qualifies as a “mass” extinction? And how much of the world must be affected? Can a regional event qualify or does the event have to be global? Does the event have to affect both marine and terrestrial realms or will just one do? After a concise discussion, Hallam proposes a definition as “the extinction of a significant proportion of the world’s living animal and plant life in a geologically insignificant period of time” (p. 19).

These definitional issues go right back to the earliest days of geology, in the debate Hallam describes between the “gradualists,” as articulated by Charles Lyell, and the “catastrophists,” as represented by George Cuvier. In the historical debate, the gradualists won, establishing a paradigm that persisted in geoscience until recent decades. This paradigm also influenced bioscience, through the writings of Charles Darwin. Parenthetically, in one of the loftiest and funniest put-downs I have ever read (p.14), Hallam dismisses Darwin: “As a young man Darwin showed great promise as a geologist, but he subsequently became sidetracked.” With the recent recognition of a bolide impact as a causative factor in dinosaur extinction, there has been resurgent emphasis on catastrophes as an explanation for geological events. Even here, definitions differ. From a geological perspective, Hallam defines catastrophes as “events affecting a large proportion of a fauna within thousands rather than millions of years” (p. 56). This doesn’t match with the popular perception of a catastrophe, which would see it more as an instantaneous event, just like an asteroid impact. However, Hallam also emphasizes that neocatastrophism is not an either/or proposition but encompasses both gradual change and sudden events. Citing Derek Ager, Hallam characterizes this position as “long periods of boredom interrupted by moments of terror” (p. 17). It is with the identification and examination of those “moments of terror” that the rest of this book is concerned.

In subsequent chapters, Hallam examines the “Big Five” explanations for mass extinctions: bolide impacts, sea-level changes, ocean anoxia, climate change, and volcanic activity. I found these chapters clearly written and even-handed, though Hallam never leaves us in doubt as to his conclusions and opinions. His discussion of the Cretaceous-Tertiary mass extinction event and the research that led to the identification of an asteroid impact as a causal factor is particularly thorough and interesting. He reviews the evidence for and against extinction at the K-T boundary in several

fossil groups besides dinosaurs. His discussion highlights one downside of specialization, the fact that palaeontologists often cannot assess or understand each other's evidence and therefore "palaeontologists who study other groups ... are obliged to take the opinions of these experts on trust" (p. 52). This can be a particular point of contention when judgements depend on the "quality of the taxonomic work used to distinguish the various species" (p. 55). Even for the dinosaurs, the poster children for sudden extinction, the palaeontological record is susceptible to different interpretations. Hallam reviews some work that suggests that "dinosaurs were already on their way out when an impact" finished them off (p. 55). He points out that even during a mass extinction, some groups actually flourish. Therefore, many detritus-feeders survived the K-T event, while the largely insectivorous mammals were not as badly affected by changes in flora as the large dinosaur herbivores (pp. 56-57). In other words, ecosystems and biota have a certain amount of resiliency and buffering capacity.

The chronologic coincidence of bolide impact and dinosaur extinction at the K-T boundary is almost irresistible. As an explanation, it seems all so neat and elegant. Nevertheless, I am reminded of that old stats mantra: coincidence does not imply causality. Hallam's examination of the other four mass extinctions reveals no close temporal association with known bolide impacts. Moreover, Hallam points out that there are plenty of bolide impacts, including those that formed the huge Manicouagan, Ries, and Morokweng craters, for which there are no consequent mass extinction events, on a local, regional or global scale. Hallam concludes that "bolide impact cannot plausibly be invoked as a general cause of mass extinctions" (p. 64).

Turning to other possible causes, Hallam devotes considerable space to discussion of sea-level changes and anoxic (oxygen deficiency) events. These are topics that he has spent much of his career investigating and the text is enlivened by several fieldwork anecdotes. The consequences of these events are, of course, best reflected in the marine biota. Anoxia is also well marked in the lithostratigraphic record by the occurrence of black shales. Hallam offers clear explanations of how sea-level changes might lead to extinction and how marine anoxia can occur. This is useful, because I suspect that these causes are likely to be the least familiar and most difficult to understand for the target readers of this book. His explanation makes it clear that these phenomena are linked and that anoxia cannot cause extinctions without some change in sea-levels or ocean basin configuration. Indeed, these phenomena, to a greater extent than the others, are consequences of planetary-scale processes, especially plate tectonics. From this, it seems that these are likely to be much slower processes than the other causal factors discussed. What I missed in Hallam's discussion was an explanation as to how these processes can occur fast enough to cause extinction. Subsidence in continental margins, for instance, would seem to happen at a rate slow enough to allow re-organization of the biota, either by migration or adaptation.

Of the other causes, readers are likely to have more familiarity with volcanic eruptions and climate change as catastrophe-inducing factors. Climate change largely involves shifts in global temperatures to either significantly warmer or cooler conditions, with mass extinctions more usually associated with cold than warm conditions (p. 108). The most obvious consequence of global cooling is glaciation, and Hallam devotes considerable discussion to the recognition of glacial deposits in the geological past. Glacial cycles are thought to be driven by orbital variations, a mechanism that is extrinsic to Earth itself. I was surprised that Hallam did not include discussion

and explanation of Milankovitch cycles in this chapter. Glaciation is, of course, something that Earth has experienced in the comparatively recent past and so evidence is abundant, especially in the terrestrial realm, which is not generally so well represented in the stratigraphic record for mass extinction events in the more distant geological past. Hallam points out that the Quaternary is not associated with significant extinctions, until the likely anthropogenic-related extinctions of the last few millennia (p. 114). The speculations as to why this is the case makes for thought-provoking reading (pp. 114-116). Global climate change can also be linked to sea-level changes, because the locking up of water in continental ice sheets and its subsequent release as meltwater causes significant eustatic sea-level changes. Global warming has been plausibly linked to a marked mass extinction event at the Paleocene-Eocene transition. Hallam suggests that release of methane from methane hydrates trapped in deep or cold ocean sediments is one mechanism for this warming (p. 120).

Volcanic events also drive climate changes, re-emphasising the point that these causal factors are linked and rarely operate in isolation. Just as for glaciation and climate changes, we have good examples of volcanic eruptions in the recent past, including Vesuvius, Krakatoa, and Mount Pelée (pp. 130-133). For related climate impacts, Hallam cites the well-known 1816 “Year Without a Summer” following the Tambora eruption of 1815 (p. 134). The amount of material emitted in these eruptions, however, pales into insignificance compared to the massive outflows associated with the continental flood basalts. These often form prominent regional landscape features, such as the Deccan Traps or the Columbia Plateau (pp. 139-146). Hallam’s review leads him to conclude that three of the Big Five mass extinctions (end Permian, end-Triassic, and end-Cretaceous) and four minor ones are closely associated with flood basalt eruptions (p. 146).

This sounds very convincing, but what does the big picture show? In Chapter 9, “Pulling It All Together,” Hallam compiles a very interesting diagram (Figure 9.1, p. 162) showing proposed evidence-supported causes for 14 mass extinction events. Seen in this way, the K-T event stands out as even more anomalous, because Hallam finds that to be the only one convincingly associated with a bolide impact. For the rest, anoxia/marine transgression stands out as the most significant causal factor, being strongly associated with 10 events, and likely associated with two more. I found the most striking aspect of this summary to be that mass extinctions are rarely associated with just one causal factor but usually have multiple causes. This probably should not surprise us. After all, components of geological and biological systems are linked; a perturbation in one part of the geological system is almost certain to have consequences or impacts on others.

Extinction is usually paired in the public mind with evolution. And so it is logical for Hallam to next turn his attention to evolutionary matters. There are two key questions here. First, whether speciation and diversification rates are related to mass extinctions and, second, whether biotic factors, especially competitive effects, the “struggle for life” in the Darwinian sense, themselves play any role in mass extinctions. Hallam answers both in the negative. I found this the most unexpected conclusion in the book. Several previous authorities, especially Stephen Jay Gould, have argued that the palaeontological record often shows greater rates of speciation and diversification following mass extinctions and that these events play a decisive role in determining evolutionary trajectories. Hallam is unconvinced and in his view the evidence does not support that conclusion (p. 181). With the

possible exception of the Cambrian explosion, Hallam finds no significant impact on the overall rate of diversification. As for the second question, he concludes that “ultimately it is physical changes in the environment that cause mass extinctions, and these changes are not caused by organisms” (p. 183).

As many journalists tell us, the extinction of the dodo and the slow disappearance of giant pandas result from actions by people and their particular propensity to modify and change their environment. Indeed, it could be argued that human-kind is now the single most important agent of landscape and biological change on the planet. So in his last chapter, Hallam considers current and late Pleistocene extinctions. Hallam, following Paul Martin, buys into the “overkill” explanation, especially for the North American megafauna, noting that the only new factor in ecological mix for the late Pleistocene is the advent of human hunting (p. 185). I should point out though that there remains considerable disagreement on this matter among North American archaeologists and the evidence is not as clear-cut as Hallam would suppose. Hallam provides examples of the devastating impact of humans on island flora and fauna in the late Holocene and recent historic past, including extinction of the moa in New Zealand (p. 189). As expected for someone who has spent much of his career working on marine faunas, Hallam also provides a review of on-going extinctions in the sea (pp. 192-196). Less discussed because less visible, these are nonetheless potentially as significant as those on land.

This book is issued in a popular science series and so it is legitimate to consider how well it fills that niche. That really depends on how you define “popular.” This is not the kind of frothy read you pick up to while away a plane flight. It is targeted more at the well-educated and scientifically literate reader with a curiosity about the history of life on Earth. Although Tony Hallam has made admirable attempts to minimize jargon, nevertheless the book does require a certain comfort with geological and other science concepts. I think that the book will probably make its strongest appeal to naturalists, biologists, ecologists, and environmental and earth scientists who may be interested in a succinct yet literate summary of current thinking on the extinction debate. As such, I would also definitely recommend it to undergraduates in bioscience, geology or palaeontology. I found it an informative, clear, and enjoyable read. On those criteria, it certainly meets and exceeds most standards of popular science writing.

info

*Catastrophes and
Lesser Calamities:
The Causes of Mass Extinctions*

by Tony Hallam, 2005.
Oxford University Press.
xiii + 226 pp.
ISBN 0-19-280668-8
\$14.95 paperback

Recent AASP-Member Publications

compiled by Sarah de la Rue

Note the new address: University of Idaho, Dept. of Geological Sciences
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Please send me your "in press" and published citations! Let others know what you've been working on!

Note: Manuscripts noted as 'in press' (below) may now be published!

AASP members' names are in bold. If I have overlooked any of our members, my sincere apology is given.

If there are any topics that you would like to see publications for, please email me! There are numerous related topics that fringe on the importance of palynological research.

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The 42nd Annual AASP Meeting September 27-30, 2009, Tennessee

The 2009 AASP meeting will be held in the Tri-Cities area of East Tennessee at The Meadowview Resort and Conference Center.

Information on the resort can be found at:

(<http://www.marriott.com/hotels/travel/tricc-meadowview-conference-resort-and-convention-center/>)

The meeting begins Sunday September 27- with all day registration and the evening ice breaker. The meeting ends Wednesday, September 30, 2009 with the business meeting. This will be co-sponsored by East Tennessee State University and the ETSU General Shale Brick Natural History Museum and Visitor Center at the Gray Fossil Site. We are planning workshops prior to the start of the meeting on Saturday September 26, 2009. I am hoping that Vaughn Bryant will agree to a Forensic Palynology workshop and we are hoping a theme for another workshop will be "Educating the next Generation of Palynologists" workshops designed to include the regions K-12 teachers and how they can incorporate lecture or laboratory exercises in the lower grades, and may provide innovative ideas to our academic members. As an added feature of the meeting I would like to have three public lectures that would begin on Monday afternoon, Tuesday afternoon and Wednesday afternoon, the public and local educators will be invited to attend in addition to our students and professionals to hear talks on e.g., "Pollen and Allergies", "Palynology and Petroleum: Supplying Americas Energy Needs" *If you have any other suggested topics or speakers or wish to volunteer to speak that may inform and entertain a wide audience please let me know.* We are also entertaining a number of field trips to begin on Thursday October 1, and return Saturday October 3, among the suggestions are "Appalachian Habitats, a trip through the southern Appalachians for bear and bird watching, it will also include local geology", another is a "Visit to Dayton Tennessee

to the Rhea County Courthouse (Home of the scopes monkey trials) an then on to Paris, Tennessee for collecting in the Eocene Claiborne Formation of West Tennessee. These localities have superb plant fossils and also produces some very nice pollen floras. A third suggestion is the Appalachian flora and Cumberland gap either a hiking trip through the gap or a more sedate road trip through the gap and include the Paleozoic of Harlan County Ky. *Any other suggestions are welcome and anyone wishing to take a lead on any of these trips or other trips is welcome to contact me.* I would also like to open the field trips up to local teachers so they too can mingle with the professionals. Finally I need some input with regard to the cost of the meeting. I am trying to hold down the cost as much as possible to insure student participation, here is what I have so far;

This includes Sunday, Monday, and Tuesday night stay, coffee breaks, all meals, icebreaker, and registration fees. However, **no** Tuesday Night Banquet, **no** Wednesday Business Lunch.

	<u>Single</u>	<u>Double</u>	<u>Triple</u>	<u>Quadruple</u>
Total estimated Cost	775	1075	1375	1700
Per person rate	775	540*	460	425

If two students occupy one room, each student will have to pay \$540 each, 3 = \$460 each, 4 students to a room each pay \$425 each.

This includes Sunday, Monday, and Tuesday night stay, coffee breaks, all meals plus Tuesday Night Banquet and Wednesday Business lunch, icebreaker, registration fee.

	<u>Single</u>	<u>Double</u>	<u>Triple</u>	<u>Quadruple</u>
Total Estimated Cost	850	1225	1600	1950
Per Person rate	850	615	535	490

This includes Sunday Monday and Tuesday night stay, coffee breaks, all meals plus Tuesday Night Banquet and Business lunch, icebreaker, registration fee, plus one additional night for field trip (Wednesday Night) or workshop (Saturday night).

	<u>Single</u>	<u>Double</u>	<u>Triple</u>	<u>Quadruple</u>
Total Estimated Cost	1000	1350	1800	2075
Per Person Rate	1000	675	600	520

This includes Sunday, Monday, and Tuesday night stay, coffee breaks, all meals plus Tuesday Night Banquet and Wednesday Business lunch, icebreaker, registration fee, plus one additional night for the Workshop (Saturday Night) and one additional night for the field trip (Wednesday Night).

	<u>Single</u>	<u>Double</u>	<u>Triple</u>	<u>Quadruple</u>
Total Estimated Cost	1100	1500	1850	2200
Per Person rate	1100	750	620	550

NOTE: A Friday arrival with a Friday night stay for the workshop, or on return from the field trip a one night stay (Saturday) will cost \$126.99

The cost will be presented in a traditional manor, i.e., as a registration fee which will have the option of alterative accommodations and food. I wanted to run this scenario by the members.