PRISCUM

The Newsletter of the *Paleontological Society* Volume 12, Number 2, Winter 2004

The Changing Face of Academic Publishing

by William Ausich, PS President

No member of *The Paleontological Society* prefers publication on paper more than I. I enjoy the convenience of walking to my bookshelf to look at a book or journal article. This takes from three to ten seconds (I timed it!). I read in my office, at my microscope, in the backyard, in the car, and in other locations where I can concentrate. In the electronic age, I know that I will be able to read in any obscure place that I choose, after I print (on my printer) the article desired. Still, there is something more tangible, more substantive about a journal that arrives in the mail, that is taken from my bookshelf, or that is checked out from the library, especially when I am an author. Despite my preferences, the electronic age of scientific publication is upon us, and from what I can learn, it will become even more pervasive. This topic is of primary concern because the entire business model for *The Paleontological Society* is based on the publication of our journals on paper.

As you know, in 2000 the *Society* began publishing the *Journal of Paleontology* and *Paleobiology* both in print and electronic format. This was a good decision. BioOne is the journal aggregate that provides current issues of our journals to academic libraries, and back issues are available from JSTOR, again available from many academic libraries. Articles are available on JSTOR five years after original publication. *Paleobiology* is available from volume 1 on JSTOR, but JSTOR currently has electronic format access to volumes of the *Journal of Paleontology* only from 2000 (volume 74). BioOne and JSTOR are highly reputable digital service providers in the academic community, and we are fortunate that the journal editors who chose them did their homework well.

The *Paleontological Society* business model is still fine today; the financial status of the *Society* is very good. However, this will change if and when a significant number of institutional and individual memberships are discontinued. To this end, I visited with the Head Librarian at The Ohio State University to discuss this situation. First, let me say that librarians are not the bad guys – chances are they are just as much or more of a bibliophile than you or I. However, his perspective offered little encouragement. Forced by the trends in the industry, advantages of electronic media (even I

Inside...

Priscum is published twice yearly by the Paleontological Society. Submissions are welcome. Please forward articles, book reviews, announcements, and notes to: Peter Harries, Priscum Editor, Department of Geology, University of South Florida, 4202 E. Fowler Ave., SCA 528, Tampa, FL 33620-5201 or via email at harries@chuma.cas.usf.edu.

admit there are advantages), space limitations, and financial restrictions, electronic publication will only become more prevalent; academic journals, at least in the sciences, will become dominantly or, perhaps, exclusively published electronically. This is the future for which we need to plan. As a *Society*, we need a broad discussion on this topic now, so that we can transition to whatever comes next as seamlessly as possible. I do not have special insight on this issue, but I will offer some advice – both short- to intermediate-term advice and intermediate- to long-term advice.

The short- to intermediate-term advice is that we need to maintain and increase our subscriptions. This is a challenge for every member. First, do not be tempted to discontinue your membership. Second, encourage all your colleagues who *should* be members to continue their memberships or to join. Third, get to know your librarian. Who makes the decision to continue or discontinue journal subscriptions? When are decisions of this nature made? How can you maximize your input into the decision process? Take the high ground when discussing *The Journal of Paleontology* and *Paleobiology* with your librarians. Remind them that *The Paleontological Society* is one of the "good guys," as a not-for-profit society that produces a journal with largely all volunteers. We are keeping the cost of our journals at a minimum. The value of our journals is outstanding when compared to commercially published journals. Cutting our journals saves relatively little from the subscription budget, whereas continuing the subscription of our journals supports a society that is engaged in academic publishing as it should be.

Unfortunately, the intermediate- to long-term must also be considered. If current trends in academic publishing continue, it is not likely that libraries will always maintain both print and electronic subscriptions to our journals, and we must find a new business model that recognizes this new direction. How can this be accomplished so that the quality and stature of our publications are maintained to the utmost? How can this be accomplished so that our journals are even better for their readers? The true "value" of our journals are rigorous peer-review and careful editing. In a new model, how will the publication process be changed – from submission to mark-up? Finally, what will be the business model for *The Paleontologic Society* as we enter a new era of academic journal publishing? Let the discussions begin.

Integration in Paleontological Research

by Alycia L. Rode, Student Representative

Like most graduate students, I typically concern myself with the parochial issues of the intricate details of my own dissertation research, trying desperately to finish my degree by spring semester, and the daunting job search. However, serving as student representative to T*he Paleontological Society* council this year has allowed me to view our field from a different perspective: where we are now, where we are going as a society, and what new opportunities are available for future research. In that vein, I'd like to take a few moments to discuss one direction I think paleontology is headed: integrative research.

Paleontology has always been a leader in combining research methods from disparate sources including neobiology, stratigraphy, and paleogeography, but the sources and sophistication of combined techniques are becoming more creative and more widely employed. Examples of cutting-edge integratative work can easily be found by examining graduate student research proposal topics. In the 2003 competition for GSA student research grants, 5 of the 21 recipients receiving outstanding mention were paleontologists (an excellent indicator of the health and vigor of research in our field!; *GSA Today*, v. 13, no. 9, p. 20). Each of these proposals also included an important component: integration. These proposals link sedimentary environment, biogeography, diversity trends, paleoecology, and evolution (among other themes). Browsing the proposal titles of the Steven Jay Gould grants funded in this edition of *Priscum* (see pages 4-5) also reflects many projects that link formerly disparate areas of study. Some interdisciplinary projects include the application of geochemical techniques, such as stable isotope analysis, to examine ontogeny and its relationship to the environment, while another focuses on incorporating studies of modern animals, sedimentology, and continental trace fossils to refine ecosystem models. These proposals are not isolated examples (take a peek at the table of contents of any recent issue of *Journal of Paleontology* or *Paleobiology*), integration between techniques and formerly distinct subfields of geology and biology is an area of active and productive research.

The ability to pursue paleontological questions within an integrative framework is the result of a number of developments. The most important of these, of course, is the voluminous accumulation of taxonomic and biostratigraphic work over the history of our discipline. The availability of these datasets for use in new analyses is the backbone of much paleontological research. For example, phylogenetic analyses could not be performed without an understanding of the species previously described within a taxon, and biogeographic studies require knowledge of the stratigraphic and geographic ranges of taxa. Additionally, the development of quantitative methods such as morphometrics and refined biodiversity metrics have allowed increased rigor within paleontological studies. Tools borrowed from biology and other areas of geology such as Geographic Information Systems (GIS) have also added additional techniques for paleontologists. These are just a few examples. The integration of these new methods with the wealth of accumulated taxonomic and biostratigraphic data in cohesive projects provides new opportunities to examine patterns recorded in the fossil record from a fresh perspective.

Many examples of combined approaches could be considered, I would like to discuss an area that I am particularly interested in: new ways to link biogeography, evolution, environmental change, and biodiversity dynamics. Biogeographic analyses in paleontology have frequently included range reconstructions for families

and other higher taxa, however, reconstructing and quantifying geographic ranges has typically been a cumbersome process. Application of GIS to the ranges of fossil invertebrate species greatly simplifies this problem and makes the calculation of hundreds of species ranges possible. GIS methods are widely employed by modern biologists and in other geological disciplines, but have rarely been used for analyzing geographic trends in the fossil record. These methods, however, are easily adapted for fossil species, whose geographic ranges can be reconstructed temporally and spatially. The biogeographic patterns can be quantified and analyzed against a wealth of other types of data such as phylogenetically constrained evolutionary history, sea level or environmental variables, speciation or extinction rates, and speciation mode. The results obtained from this integrated approach are exciting and relevant to both ancient and modern ecosystems. Some of the highlights include a link between geographic range and species survival during times of biodiversity crisis, determining the relative abundance of different modes of speciation, the role of interbasinal species invasions in controlling faunal dynamics, and potential long-term effects of invasive species in the modern ecosystem.

By combining methods that have been historically considered within the realm of paleontology with those from other fields, we can examine patterns in new ways and contribute to improved understanding of both the fossil record and the modern world in which we live.

Alycia Rode is a PhD student at the University of Kansas. Her research focuses on determining how the combined effects of phylogenetic history, paleobiogeography, and paleoecology have influenced the rate and pattern of evolution. In particular, she is investigating the role of geographic range expansion in brachiopod and bivalve species during the Late Devonian biodiversity crisis to determine the long-term effects of invasive species.

Report from the Stephen J. Gould Student Grants-in-Aid Committee: 2003 Awards

by Danita Brandt, Chair

We received 69 applications (not counting one that was post-marked two weeks after the deadline and not considered), from 26 U.S. states and 6 other countries. We were able to increase the number of awards from the previous level of 26 to 28, with the increment added by Council in support of interdisciplinary research. Thus, we were able to fund 41% of our applicants. The distribution of awards by degree level was as follows:

Level	# Applicants	# Funded	% Funded
Ph.D	43	18	42
M.S.	19	7	37
UG	4	2	50
Post-doc	3	1	33

Lisa Berrios Vanderbilt U.
Delayed freshwater colonization? Insights from Triassic-Jurassic freshwater deposits

Diane Boyer UC, Riverside
Paleoecology of Middle Devonian black-shale brachiopods

Ryan Carney UC, Berkeley
Using digital scanning and computer animation to construct a virtual *Deinonychus antirrhopus* forearm model, and its biomechanical and evolutionary implications for the origin of the avian flight apparatus

Matthew Clapham USC
The ecological role of the Modern fauna in late Paleozoic communities

Gregory Dietl UNC, Wilmington
Role of multiple predators in the evolution of the *Strombus alatus* complex

Alex Glass Univ. Illinois
Phylogeny and paleobiology of Paleozoic ophiuroids

Daniel Hembree Univ. Kansas
The origin and paleoenvironmental significance of fossorial behavior in reptiles: Evidence from Modern and ancient amphisbaenians

Kristin Hepper San Francisco State Univ
A new cold-seep locality in the Mesozoic Great Valley sequence

Gregory Herbert UC, Davis
Declining predator density during faunal turnover: Preliminary evidence from shifting behavioral strategies of drilling gastropod predators

Aaron Hunter U. London
Middle Jurassic echinoderm paleoecology in the "closed system" of the Jurassic Western Interior Seaway of the United States

Randall Irmis Northern Arizona U.
Axial skeleton ontogeny in phytosaurs (Archosauria: Crurotarsi): Information from a new specimen at Petrified Forest National Park, AZ

Walter Joyce Yale U.
The secondary acquisition of terrestrial habitats among aquatic amniotes: Turtles as ecological opportunists

Matthew Lamanna U. Penn
Anatomy and phylogenetic relationships of new titanosaurians (Dinosauria: Sauropoda) from the Cretaceous of Patagonia

Karen Layou Univ. Georgia
Biotic recovery from a regional extinction event: An example from the Late Ordovician of the Appalachian Basin of the eartern United States

Pedro Marenco USC
Paleoecology during the recovery from the end-Permian mass extinction using chemostratigraphy

Miroljub Medved Univ. Illinois, Chicago
Determination of biogeography of Silurian brachiopods

Matthew Mihlbachler — Columbia U.
Alpha-taxonomy and phylogenetic systematics of the Brontotheriidae (Perissodactyla: mammalia)

Philip Novack-Gottshall — Duke U.
A standard morphometric method to obtain body-size data for diverse benthic invertebrates with paleoecological applications

Michael Nowak — U. Oklahoma
Megaspore ultrastructure and the phylogenetic analysis of heterosporous ferns

Jason Schein — Auburn U .
Paleoceanography of Upper Cretaceous Gulf Coastal Plains units based on isotopes from the teleosts fish *Enchodus*

Kurt Spearing — Northern Illinois U.
Phylogenetic analysis of extant and fossil cheetahs and their close relatives

Erik Sperling — Stanford
Defining the Permian-Triassic boundary in the western United States

Nancy Stevens — Ohio U.
Mesozoic paleontology in the Etjo formation, northwestern Namibia

Kathryn Thomas — UC, Davis
$\delta^{18}O$ and $\delta^{13}C$ in extant Archosaur Biominerals and their use as dinosaurian analogs

Adam Tomasovych — Wurzburg U.
Comparative taphonomy of Triassic brachiopods in carbonate shell concentrations

Alexandru Tomescu — Ohio U.
The late Ordovician (Ashgillian) biota of the Oswego Sandstone of Pennsylvania: earliest macrofossils in nonmarine deposits

John Vanden Brooks — Yale U.
Paleo-oxygen levels and their effects on vertebrate evolution

Christy Visaggi — Syracuse U.
Testing patterns of faunal persistence in the Byram Formation of Mississippi

Paleontological Society International Research Program *Sepkoski Grants* for 2004

The Paleontological Society is pleased to announce continuation of its small grants program for paleontologists living in Eastern Europe and republics of the former Soviet Union. For 2004, thirty grants of US $500 will be awarded. These grants will be made directly to individuals and not to institutions. Grantees will be selected by a committee of the Paleontological Society based on the quality and feasibility of the proposed research. Consideration will be given to paleontologists of all ages and begins with graduate student research. ***PalSIRP Sepkoski Grants*** are named in honor of Dr. J. John Sepkoski, Jr., founder of the program. Dr. Sepkoski died at age 50 in 1999.

Applications for a *PalSIRP Sepkoski Grant* must include the following four items, all typed in English:

1. The **cover sheet** (downloaded from the *Sepkoski Grants* announcement on the internet) completely filled out and sent with the rest of the application

2. **Cover letter**, stating the applicant's full name as it appears on the passport, passport number, date of birth, institutional affiliation, address, telephone number, FAX number, and *especially the e-mail address.* The letter should also provide names and addresses (including e-mail) of North American/European Community (exclusive of former Warsaw Pact countries) paleontologists familiar with the applicant's research; these persons will be used as referees and will be contacted by the *Sepkoski Grants* Committee

3. **Research proposal**, no longer than two pages, single-sided, providing a project title, a brief description of proposed research, its significance, and the general uses of the *PalSIRP Sepkoski Grant* funds. The subject matter covered by grant proposals may be in any field under the discipline of paleontology/paleobiology. Applicants should look over the *Journal of Paleontology* as a guide to acceptable topics. Appropriate ancillary uses of *Sepkoski Grant* funds include (but are not limited to) salary support, domestic and foreign travel, and equipment purchase. Requests for field expenses, publication costs, attendance at scientific meetings, and related aspects to any of these areas is acceptable. No detailed budget or accounting is required for the $500 grant.

4. **Curriculum vitae (C.V.)** listing birth date, education, current professional position, and all published papers, articles, and books. Additional information, such as employment history, awards, participation in international conferences and projects, etc., may be included.

The last three items (2-4) should be **sent by e-mail** (in Microsoft Word or plain- text) **as a single attachment** along with the cover sheet to the following address: **<parsley@tulane.edu>**

Proposals must be received by **31 March 2004** to be considered for 2004 funding. Proposals received after that date will not be considered. Proposals not written in English will be returned without consideration.

Paleontologists living in the following countries are currently eligible for *PalSIRP Sepkoski Grants*: all republics of the former Soviet Union, including the Baltic States, Mongolia, and nations in Eastern Europe (other than East Germany), including Poland, the Czech Republic, Slovakia, Hungary, Romania, Bulgaria, Albania, and the countries of the former Yugoslavia.

There is no limit to the number of times a paleon-

tologist may apply for a PalSIRP *Sepkoski Grant* but only one application, per year, will be considered. Awards are usually made in November and December.

Applicants for the 2004 grant program are strongly encouraged to contact their North American or European Community referees by e-mail to determine their willingness to act as recommenders. It is also suggested that applicants send along a copy of their proposal to their referees for informational purposes.

The Paleontological Society asks all readers for their assistance in advertising *PalSIRP Sepkoski Grants*. Please send this grant application information to your colleagues in Eastern Europe and the former Soviet Union.

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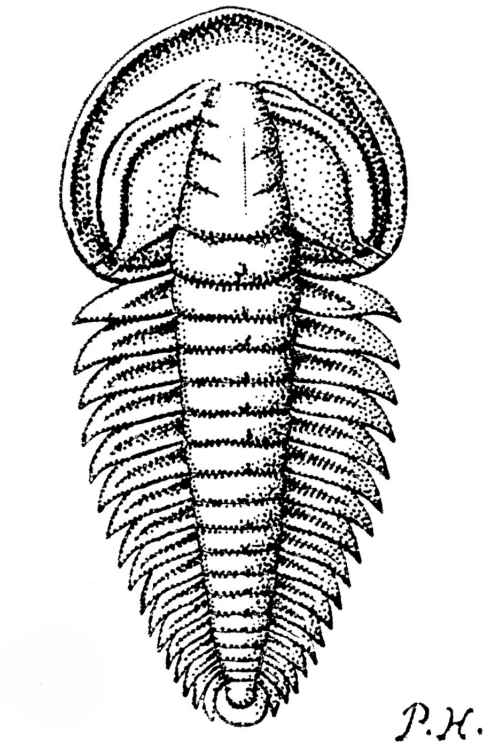
Obituary
Pierre Hupé (1907 – 2003)
by Françoise P. Bigey



Daguinaspis ambrogii Hupé & Abadie, 1950
Lower Cambrian (Morocco)

We first heard about Pierre Hupé's death through our national press at the age of 96. He was emeritus Professor at *Université P. & M. Curie (Paris VI)*, and was born in Baye (Marne) on March 22, 1907. He died in Paris on August 23, 2003. He undertook his secondary education in Strasbourg (1925), and performed well in the traditional curriculum. In addition, he was a valuable draughtsman, and this ability was recognised by a national prize (*Concours général*, 1924). He graduated with an emphasis in Natural Sciences (Nancy, 1930). He successfully passed (first rank) the competitive examination, the so-called *Agrégation* (1931). During his PhD in Nancy, he worked with the geneticist Lucien Cuénot, where he fostered his interest in biology and evolution, and which he later applied to his study of the paleobiology and evolutionary history of trilobites.

Pierre Hupé first taught Natural Sciences in secondary schools. This period (1931-1951) was interrupted by World War II during which he served as an artillery officer. He obtained the order of *Croix de Guerre 1939-1945*. After an interval at the CNRS (1945-1949), Pierre Hupé commenced his academic career at *Laboratoire de Géologie de la Sorbonne* (Paris) in 1951, and was appointed full Professor in 1960. He founded the *Laboratoire de Paléontologie des Invertébrés* (1967) and remained its director until he retired in 1977. He worked diligently to establish the lab site on the Jussieu Campus. He augmented his pedagogic excellence with the trilobite illustrations that he prepared (see figure below). After he retired, Pierre Hupé donated a portion of his trilobite collection to *Université de Rennes I*. The *Muséum d'Histoire Naturelle du Havre* houses the other part.

Research in Geology impassioned Pierre Hupé commencing when Professor Charles Jacob initially assigned him a stratigraphic and tectonic study in the Aragonese Pyrénées in 1932. Due to unforeseen circumstances, he later switched his interests to the Central French Pyrenées and Montagne Noire. Starting in 1952, at the request of the *Service géologique du Maroc,* he initiated paleontologic and stratigraphic study of the Lower and Middle Cambrian of South Morocco. He also investigated the Ordovician strata. His mongraph, entitled *Contribution à l'étude du Cambrien inférieur et du Précambrien III de l'Antiatlas marocai,* gained Pierre Hupé international scientific recognition, as exemplified by his receipt of the *Charles Doolittle Walcott Medal* in 1957, awarded by the *National Academy of Sciences* (Washington, DC). Pierre Hupé defended his Natural Sciences doctorate thesis, entitled *Nouvelle contribution à l'étude du Cambrien marocain*, in 1959. He studied numerous sections whose biozonation was established by trilobites. He also proposed chronostratigraphic units and considered questions of boundaries, paleogeography, and correlation. Based on this work, Pierre Hupé participated in several sessions of the *IGC* devoted to the Cambrian. His research, mostly focused on trilobites as characterized by his basic work *Classification des Trilobites* published in *Annales de Paléontologie* (1953, 1955), displayed his evolutionary concepts within the group, as further depicted in his extensive chapter written, at Professor Jean Piveteau's request, for the *Traité de Paléontologie* (1953). This *Classe des Trilobites* was an international standard on the subject for a number of years, and served as a basic reference for the editors of the *Treatise on Invertebrate Paleontology* (1953). Pierre Hupé was a member of French and foreign societies (*Geological Society of America* for instance). Through his travels and scien-

tific meetings, he kept numerous contacts with his colleagues. From the onset of his academic career, Pierre Hupé was a supervisor of PhD students. He was a fixture in the research of trilobite workers in France on Ordovician and Devonian faunas. When creating the *Laboratoire de Paléontologie des Invertébrés* in Paris, he continued to stress the importance of fossil study in the reconstruction of geologic history. Dissolution of this lab in 1987 was a preliminary event towards a new trend in Geology, but his vision is one to which the discipline will return to in the relatively near future.

Professor Pierre Hupé is survived by three daughters and six grandchildren.

The Paleontological Society Distinguished Lecturer Program

By Robert Gastaldo, Councilor At Large

Each year the Paleontological Society selects outstanding scientists whose works encompass a wide variety of paleontological topics as Paleontological Society Distinguished Lecturers. Each Distinguished Lecturer has national and international stature in paleontology, has traveled widely, and has published extensively. Each is also known as an excellent speaker who can communicate the interest and importance of their research topics. This program is intended to make available lecturers for inclusion in departmental speaker series or other college and university forums.

The Paleontological Society Distinguished Lecturers, topics, and short abstracts of presentations for the 2003-2004 academic years are listed below. Additional information is available on The Paleontological Society homepage at: http://www.paleosoc.org/speakerseries.html. If your department is interested in inviting one or more Distinguished Lecturer to your institution, please contact the speaker directly. Although financial arrangements must be made directly with each speaker, all Paleontological Society Distinguished Lecturers have agreed to be available on an expenses-only basis.

The Paleontological Society hopes that you take advantage of this opportunity. Paleontology is a dynamic discipline, and these speakers will certainly convey the excitement and timeliness of our science. If you have any questions regarding the Paleontological Society Distinguished Lecturer program, please feel free to contact me at: ragastal@colby.edu.

ACADEMIC YEARS 2003–2004 DISTINGUISHED LECTURERS

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The Ecology of Pennsylvanian-age Tropical Coal Swamps

Tropical peat-forming environments, or mires, were among the most prominent features of Late Carboniferous terrestrial landscapes. These habitats were home to a unique wetland flora that specialized in low nutrient conditions and high water tables. The dominant plants comprise five major groups. The bizarre tree lycopsids were spore-producers, dominant during the Early and Middle Pennsylvanian; they are bark supported and similar to colonial organisms in construction. The spore producing marattialean tree ferns dominated Late Pennsylvanian mires; they are root supported. Other locally important groups were the seed-producing medullosans and cordaites, and the spore producing sphenopids. Major extinctions at the Middle-Late Pennsylvanian boundary entirely restructured these mires and led to a major decline in wetland landscape heterogeneity. The ecology of this transition reveals lottery-like dynamics, the ascendancy of opportunists, and shortening of resource gradients.

Decline and Fall of the Primeval Forest: Rain-forest Replacement During the Permo-Carboniferous Transition

The transition from the Carboniferous to the Permian brought about major vegetational changes in the tropics, reflective of long term trends in warming and drying. These changes correspond, in part, to the termination of southern hemisphere glaciation. During this transition, a tropical wetland biome is replaced by a biome characteristic of seasonally dry conditions. The two biomes share few species in common, and the transition begins episodically during the Late Pennsylvanian. By the later Early Permian, a third biome can be detected, yet more adapted to xeric conditions, that replaces the seasonally dry biome, and that contains a number of precocious “Mesozoic” taxa. The plants of each subsequent biome are progressively more derived evolutionarily, suggesting a strong relationship between landscape position and evolutionary innovation in the terrestrial biosphere.

Evolutionary Assembly and Dynamics of Tropical Forests During the Paleozoic

The major classes of vascular plants appear during the Middle to Late Devonian. These classes represent distinct body plans. They also occupy different parts of the lowland resource gradient. Lycopsids occupy wetlands. Seed plants occupy terra firma settings. Sphenopsids are most abundant in aggradational environments. Ferns are opportunistic weeds. This pattern develops as the groups begin to appear and is set by the early part of the Carboniferous, probably contributing to the termination of evolutionary innovation at the class-level scale of architectural distinctiveness. The overlap of high-level phylogenetic lineages with ecological centroids is unique to the late Paleozoic and confers a distinct constraint on ecosystem dynamics that lasts through the Carboniferous and into the Permian. Incumbent groups retain their ecological dominance within their respective spheres until environmentally induced extinctions eliminate or significantly reduce their “hegemony,” opening up resources for colonization by members of other groups. The ultimate rise of seed plants to dominance in many kinds of envi-

ronments was made possible by these extinctions rather than inherently superior biology.

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The Eocene-Oligocene Transition – Insights to Climate Change and Causes of Mass Extinction from Stable Isotope Analyses of Biogenic Materials

From both a biological and climatological perspective, the Eocene-Oligocene transition is one of the fundamental turning points in Cenozoic earth history. Global cooling brought on by tectonic and oceanographic changes took place on both gradual and episodic time scales, and affected the global biota in a variety of ways, culminating in mass extinctions at both the middle-late Eocene and Eocene-Oligocene boundaries. Stable oxygen isotopic analyses of molluscan shell and fish otolith carbonate reveal the pattern of climate change throughout this transition, in terms of both mean annual temperature and seasonality. Ongoing research in the US Gulf Coastal Plain, the Antarctic Peninsula, and the Belgian Basin highlight differences in the pattern of climate change from low to high latitudes. High-resolution data from the Gulf Coast in particular suggest a causal link between increasing seasonality, cooler winters, and the ongoing faunal extinctions.

Tales from the Clam: What You Can Learn about Climate, Growth, and Ancient Seawater from Multi-Annual Records Archived in Molluscan Shells

Improvements in our ability to incrementally sample accretionary carbonates at very high resolution have opened the door to many fruitful avenues of research. Biogenic carbonates from long-lived macrofauna are ideal for this approach, for they record in their shell chemistry the changing conditions experienced throughout the lifetime of the animal. Stable isotopic profiles across multi-year growth trajectories go beyond the single analyses typical of microfossil research and can therefore yield estimates not only of mean temperature but also of seasonality, a crucial variable controlling the biogeographic distributions of organisms today. In addition, these records provide a clock by which to measure the changing growth rates of organisms, and hence can provide the information often needed for ecological and evolutionary studies. A smorgasbord of recent research on clam chemistry illustrates the applications of this approach to studies of past climate, ontogeny (life history), and the composition of ancient oceans.

Perspectives on the Current Status of Long-Term Faunal Stability... Is Coordinated Stasis Still Coordinated?

Coordinated stasis is a pattern of taxonomic and ecologic stability of faunal assemblages over geologic time proposed to typify the record of many shallow shelf sequences. The suggestion that patterns of punctuated equilibria may characterize not only the morphological evolution of species but also the sorting of taxa into relatively stable long-term associations was met with initial skepticism, some of it rather acerbic. If such a pattern can be substantiated, however, the implications are significant and far-reaching for paleobiology and ecology. Since its introduction, workers in various areas of paleontology have conducted studies that have bearing on the issue. Data from the Paleogene of the US Gulf Coast and the Devonian of New York illustrate the complexity of the problem.

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The Latitudinal Diversity Gradient – The Past is the Key to the Present

Understanding the factors that influence biodiversity remains the central issue of the life-sciences. This is true more than ever, given the alarming rate of extinction in the Recent. As such, paleontology needs to attack the relevant problems of biodiversity at all scales of space and time. The latitudinal diversity gradient, in which the number of species decreases away from the Tropics, is arguably the most widely-recognized and well-studied pattern of biodiversity. The diversity gradient is recognized among both plants and animals, and both on land and in the ocean. Understanding the gradient would be a major step forward in understanding diversity. But, despite over a century of research, there still are a dozen or more competing hypotheses to explain the pattern. Although several studies have demonstrated that the latitudinal diversity gradient exists at different points in time during the Phanerozoic, few studies have examined how the gradient changes *through* time. Such a deep-time approach provides an opportunity to test some of the competing hypotheses in a manner unavailable to the ecologist. An example using Carboniferous brachiopods suggests that (a) the latitudinal diversity gradient probably is not simply a function of diversification and expansion away from the Tropics, and (b) that the study of diversity gradients may be a useful, new tool for inferring paleoclimate.

Escalation in the Paleozoic: A 400 Million Year Old Murder Mystery

Escalation, the hypothesis that a species' enemies get progressively more dangerous through time and so become the primary agents of natural selection, may be a fundamental explanation for observed evolutionary and ecological patterns. However, virtually all of the hard evidence supporting escalation has come from the Cretaceous to Recent. Study of Paleozoic predator-prey systems, which involve taxa related only distantly to modern predators and prey, provides a second, independent, test of whether escalation can be generalized as an evolutionary "law". During the mid-Paleo-

zoic, predation appears to intensify, and plausible prey taxa seem to adapt to this increase. But is this general pattern rigorous proof of escalation? The present work illustrates some of the problems inherent in analyzing predation in the fossil record, as well as techniques to solve those problems. The current results provide insight into escalation in the mid-Paleozoic at multiple scales, from detailed bed by bed analysis of prey morphology and traces of predation to global trends in diversity, morphology, evolution, and extinction.

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Homepage: http://www.macalester.edu/geology/

The Stratigraphy of Vertebrate Skeletal Concentrations: Insights Gained from the Upper Cretaceous of Madagascar and Montana

An astounding variety of vertebrate skeletal concentrations punctuate the fossil record, and these concentrations provide an exceptional opportunity to explore an array of paleobiological and geological questions. For example, to what extent do bonebeds in their many expressions accurately record biological signals - exactly how does vertebrate paleoecology and behavior translate into bone-rich deposits? What are the genetic links between bonebed formation and sedimentary dynamics - can sedimentologic processes alone generate relative concentrations of vertebrate hardparts? And to what degree are bonebeds associated with significant stratigraphic intervals and surfaces, such as well-developed paleosols, marine flooding surfaces, and sequence boundaries? In this presentation I explore the ancient record of vertebrate skeletal concentrations. Genetic scenarios are considered both from a conceptual standpoint and from empirical observations, and characteristic taphonomic signatures are reviewed. Exceptionally rich vertebrate localities in the Late Cretaceous of Madagascar and Montana serve as case studies, and are examined in detail.

Expedition to the Late Cretaceous of Madagascar: Exploring the Geology and Taphonomy of a Stressed Terrestrial Ecosystem

Recent expeditions in Upper Cretaceous deposits of the Maevarano Formation (Mahajanga Basin, northwestern Madagascar) have yielded an amazing assemblage of vertebrate fossils that includes mammals, dinosaurs, birds, crocodiles, snakes, turtles, and fish. Fluvial sediments that entomb these fossils indicate a variable and flood-prone discharge regime, and associated paleosols indicate that the paleoclimate was semiarid. These same sediments yield taphonomic clues suggestive of localized and perhaps seasonal pulses of mortality. These discoveries shed light on the nature of an exotic Mesozoic terrestrial ecosystem, and also provide a wonderful opportunity to explore the paleobiogeography of Madagascar's modern fauna. In this presentation I delve into the stratigraphy and sedimentology of the Maevarano Formation and associated units, and explore the taphonomy and paleoecology of the formation's spectacular vertebrate assemblage.

New Books for Review

This section of the newsletter includes lists of books and reviews received by the Books Review Editor for the Paleontological Society. Volunteered reviews will be accepted if concisely written and of general interest. Books listed may be requested for review with the understanding that the resultant review will be ready for publication of the next issue of *Priscum.* Contact the Book Review Editor: Greg Retallack, Department of Geological Sciences, University of Oregon, Eugene, OR 97403-1272: gregr@darkwing.uoregon.edu.

Carter, D.R. and Beaupré, G.S., 2001, SKELETAL FUNCTION AND FORM: MECHANOBIOLOGY OF SKELETAL DEVELOPMENT, AGING AND REGENERATION. Cambridge University Press, Cambridge, 318 p, hardcover $80.00.

Eckhardt, R.B., 2000, HUMAN PALEOBIOLOGY. Cambridge University Press, Cambridge, 350 p., hardcover, $80.00.

Hobbs, P.V., 2001, INTRODUCTION TO ATMOSPHERIC CHEMISTRY. Cambridge University Press, Cambridge, 262 p., hardcover 69.95, paperback $24.95.

Hodge, P., 2001, HIGHER THAN EVEREST: AN ADVENTURER'S GUIDE TO THE SOLAR SYSTEM. Cambridge University Press, Cambridge, 247 p., hardcover $27.95.

Schubert, G. and Turcotte, D.L., 2002, Geodynamics. Cambridge University Press, Cambridge, 456 p.

Swindler, D.R., 2002, PRIMATE DENTITION: AN INTRODUCTION TO THE TEETH OF NON-HUMAN PRIMATES. Cambridge University Press, Cambridge, 296 p.

Taylor, F.W. 2002 THE CAMBRIDGE PHOTOGRAPHIC GUIDE TO THE PLANETS. Cambridge University Press, Cambridge, 305 p.

Thomas, G.E. and Stamnes, K., 2002, Radiative trasnfer in the atmosphere and ocean. Cambridge University Press, Cambriudge, 517 p.

Wright, D.A. and Welbourn, P. 2002, ENVIRONMENTAL TOXICOLOGY. Cambridge University Press, Cambridge, 630 p.

West, R., 2000, PLANT LIFE OF THE QUATERNARY COLD STAGES: EVIDENCE FROM THE BRITISH ISLES. Cambridge University Press, Cambridge, 320 p., hardcover $105.00.

BRIEF BOOK REVIEWS

TERRESTRIAL PALEOECOLOGY AND GLOBAL CHANGE, by V.A. Krassilov, 2003, Pensoft. Sofia-Moscow, 464 p.: $74.50 (hardcover)

Many paleontologists, including myself, consider Valentin A. Krassilov the leading paleobotanist of the day. Why? Because of his seminal studies of plant communities within phytogeographic units through time. Additionally, he has done the usual taxonomic and biostratigraphic work one expects from a leading paleobotanist; and he has dealt with higher land plants in papers and books covering the Devonian to present time span. He has worked with both plant megafossils and palynomorphs. His work with colleague Rasnitsyn on fossil insects with identifiable pollen and other plant

remains in their intestinal tracts is especially noteworthy.

The above comments are generated as background for this review of his new book, which can be viewed as several books bound between the same covers. This review concerns itself with paleobotanical, chiefly plant community evolution and phytogeography, aspects of the work. The community aspects emphasize the recognition of both successional (seral) and clinosequence (catenal) plant communities. Krassilov emphasizes that individual floras cannot be considered properly without attention being paid to the seral succession of which they are part. In emphasizing the seminal importance of recognizing and defining plant community changes through time, this work is unique. Other paleobotanists since early in the 19th Century have, naturally, recognized "floras" through time, but have not employed plant community concepts.

Other books bound between the same covers reflect the author's need to cover tectonic, magmatic and climatic questions that bear on phytogeography and community ecology. For example, the volume presents an interesting tectonic alternative to plate tectonics. A multifactorial model for geobiological crises, extinction events, is proposed as an alternative for the currently popular extraterrestrial impact theory for the KTB. The relationship of changing phytogeographic boundaries to long-term climate changes is emphasized.

Throughout the book Krassilov emphasizes the multifactorial basis of most of the botanical and physical factors that concern him. For most environmental parameters one must employ proxies rather than being able to directly measure the variable. These proxies are of varying quality and reliability, as well as not being a direct function of the variable they purport to measure. Early on he emphasizes this problem using temperature as an example. Other parameters, such as rainfall, humidity, seasonality including wet-dry, cloud cover, and the like belong here. Emphasis is placed on the ecosystem, including its value for recognizing extinctions in both the marine and terrestrial environments, where the evidence indicates significant community changes at specific horizons. Importantly, he emphasizes that global biotic changes manifest themselves most clearly at the ecosystem *cum* community level. He is relying here on his comprehensive knowledge of the terrestrial ecosystem, which concurs in this regard with the marine, although the timings may differ significantly in some instances. He comments that trying to recognize extinction events with autecological information may well be futile, as contrasted with far more informative synecological, coenological data. He also comments that graphing the time ranges of selected taxa as contrasted with coenological changes is relatively futile when searching for a better understanding and recognition of extinctions. He provides an excellent discussion of the basic difficulties encountered when trying to environmentally understand the functional morphology of plant morphologies as exemplified by his discussion of the xeromorphytic versus helophytic interpretation of scleromorphy.

Emphasis is placed on climatic change over geological time as an important factor in ecosystem evolution, phytocoenology and distribution, as well as in better understanding phytogeography. The significance of epicontinental regression and transgression in affecting the weathering area of key rock-forming minerals that consume atmospheric carbon dioxide, and in the live biomass that also locks up carbon derived from atmospheric carbon dioxide is emphasized, as well as the difficulty in estimating these variables reliably. He points out that dead plant biomass is exported to the oceans but little in the reverse direction during geologically brief intervals; terrestrial biomass is a significant factor in oceanic productivity. He seriously questions the current overemphasis on atmospheric carbon dioxide tenor as the "key" variable determining global temperature, while pointing out our still primitive understanding of climate change through geologic time.

Krassilov underlines the importance of taphonomy in determining much of what we understand about the fossil record, emphasizing terrestrial plants in this case. Underlined is the key question of whether the preserved record is adequate to answer specific questions or not. He is concerned with how little is known about the taphonomy of too many groups. He points out the importance of recognizing seral (successional) stages and catenic positions (emphasizing the clinosequence) when trying to understand floras of the past. He points out the common problem that early seral floras are likely to be over represented as contrasted with climax floras. The common lack of data concerning upland floras is emphasized.

Emphasis is placed on the fact, while using palynological information, that relative abundances of individual taxa may not necessarily reflect plant abundances as contrasted with differing levels of pollen production associated with different pollination methods, with the analogous problem applying to leaves in terms of their differing preservational characteristics. Palynologists have been well aware of this preservational *cum* environmental complexity for some time, but students of megascopic remains, chiefly leaves, have not shown the same level of concern. In all of this, rare species tend to be very under-represented, with very high diversity communities commonly not leaving a good record of the many rare species; emphasis being placed on the potential taxonomic disparity between original biomass and preservable dead biomass. He innovatively points out how pollenivorous insects provide evidence about the local plant communities since the insects presumably are not foraging over too wide an area.

The functional significance of leaf margin morphology is raised, while pointing out that it is still poorly understood, despite its ascribed importance in climatic interpretations. Leaf margins, non-drip point and the reverse, may well involve relations with herbivorous insects, and percentage of margin types changes radically from Devonian to present.

Krassilov emphasizes the repetitive nature of plant associations (communities), with dominant taxa commonly characterizing the assemblages, over significant time intervals, whether one regards this phenomenon as the result of individual taxa tracking particular environmental combinations or whether one prefers a more coevolutionary interpretation.

Krassilov makes it clear, that just as with the marine ecosystem, the terrestrial consists of a series of time successive biomes (read series of community groups for the marine), separated from each other by extinctions and subsequent adaptive radiations while belonging to the same climatic belts. These major units can then, of course, be subdivided into a variety of community types. Of great significance is Krassilov's treatment of global phytogeography through time, which considers community ecology critical to discriminating

between differing local ecologies and true phytogeographic variation. The volume provides a number of seral and catenic examples from the fossil record, with succinct advice about how to recognize them. His treatment of higher land plant community evolution is unique!

All-in-all, this innovative, highly original treatment of higher land plant evolution deserves serious consideration from any paleontologist concerned about terrestrial ecosystems, as well as evolutionists willing to consider the fossil record a serious source of useful information.

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LIFE ON A YOUNG PLANET: THE FIRST THREE BILLION YEARS OF EVOLUTION ON EARTH, by Andrew H. Knoll, 2003,Princeton University Press, Princeton, 277 p.: $20.97 (hardcover)

This book is an insider's view of the life and times of the Precambrian by a leading scholar and his associates. Knoll approves of Martin Brasier's demolition of the idea that 3.5 Ga (billion year old) "microfossils" from the Warrawoona Group of Western Australia are after all just hydrothermal artifacts, so that Knoll's own 3.2 Ga microfossils from the Barberton Mountains of South Africa become the oldest accepted microfossils. His own early work demolished earlier studies of eukaryotic unicell nuclei as taphonomic artefacts, but now his postdoc Emmanuelle Javaux's branching tubes from the 1.5 Ga Roper Group are renewed indications of very ancient eukaryotes, supporting evidence from carbonaceous compression fossils of comparable age. His student Susannah Porter's testate amoebae of the late Precambrian can be used to infer from the known tree of life that fungi evolved at least 0.75 Ga. His student Shuhai Xaio's phosphatized embryos from the Doushantou Formation of China support evidence from Ediacaran trails for animals at 0.6 Ga. The enigmatic *Namacalathus*, a latest Precambrian (0.55 Ga) problematic fossil from Namibia studied with John Grotzinger, is here considered most likely a cnidarian "scyphopolyp" (I personally think it looks uncannily like a British soldier lichen with terminal apopthecium).

Knoll's main message echoes conclusions of three decades ago. "Preston Cloud, Dick Holland, and other champions of early Proterozoic environmental transition were right" (p.103). In a nutshell, evolution was ruled by atmospheric oxygen, which was vanishingly low before about 2.1 billion years ago, then remained much lower than present until 0.8 billion years ago. Early Proterozoic microbial diversity and late Precambrian-Cambrian animal diversification are both regarded as products of atmospheric oxygenation. Dick Holland's work on paleosols, James Farquhar's work on mass-independent fractionation of sulfur isotopes and Don Canfield's work on sulfide-sulfate isotopic divergence validate this time-honored narrative.

There is another theme also, of recovery from mass extinction, and evolutionary diversification in times of *permissive ecology*. Knoll's argument is that survivors of mass extinction are under less stringent natural selection in a depopulated world, so that evolutionary experiments can thrive, and even drive adaptive radiations. The radiation of mammals following terminal Cretaceous disaster, of therapsids after terminal Permian disaster, and of invertebrates after terminal Precambrian disaster may all be comparable phenomena. I found this an intriguing idea, but was disappointed to find no mention of catastrophist views of the Precambrian-Cambrian transition by Ken Hsü, or of the comparable ideas generated by paleontologists studying other mass extinctions. These ideas could be a book in themselves.

Knoll nixes numerous recent proposals. Kirschvink's Snowball Earth is considered a slushball at most. Seilacher's views of the Ediacaran fossils as non-animal is rejected in favor of unspecified cnidarian affinities. My idea of Ediacarans as fungi or lichens was evidently beneath consideration, although it has been recently revived for some of these fossils by Peterson, Waggoner and Hagadorn (2003, Comparative and Integrative Biology 43, 127-136). McKay's recent announcement of life in a Martian meteorite is meticulously dismantled, and Kirschvink's hopes for biogenic magnetite are discounted as replicated by abiotic synthesis.

Knoll recounts an heroic struggle with seasickness on the far north Atlantic, polar bears of the Spitzbergen wilderness, and ticks of northern Australia. Most of the book details the cut and thrust of scientific battle, slashing away at the most prominent banners of the assembled host of upstart hypotheses for life of the past. When Knoll finally surveys the wreck of battle his victory is Pyrrhic. "The absence of a definitive punch line may disappoint some readers, but as a paleontologist, it is why I get up in the morning. For scientists, unanswered questions are like Everests unclimbed, an irresistible lure for restless minds" (p.224). Books like this reveal not only the colorful background of our science, but also give us a greater appreciation of our colleagues.

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ESSENTIALS OF OCEANOGRAPHY (6th edn), by H.V. Thurman and A.P. Trujillo, 1999, Prentice Hall, Upper Saddle River, New Jersey, USA, 527 p: $80.00 (paperback).

A textbook in oceanography which reaches a sixth edition 16 years after it first appeared does not need this review to encouraged sales. It is used already in many college-level introductory oceanography courses. This is the first edition in which Trujillo acts as coauthor. Compared with the 5th edition, there are two major changes: over 40 percent of the figures are new, and after each chapter a section "students sometimes ask" is added. It is also now possible to visit an *Essentials of Oceanography* web site (www.prenhall.com/thurman) with online quizzes, multiple choice questions, 'exploration' questions which use the Web for information, and links to oceanography web sites. The 15 chapters deal with all aspects of oceanography from marine geology and plate tectonics to physical oceanography and marine biology. The book is well written and excellently illustrated. My criticism is only of parts of the book, and may be helpful for later editions.

Key terms are printed in bold, defined when they are introduced, and included in a glossary at the end.

This is very helpful (but names of scientists also printed in bold are not in the glossary). Etymology of key terms is given in the text, which is nice, but apparently no one with knowledge of Greek and Latin was asked about this. Plasticus is not to mold, but from *plastikos* = easy to mold (p.36). The suffix -graphy = the name of a descriptive science is from *graphein* to describe. In protozoa, the suffix -zoa is derived from *zoon* = animal not "zoa". *Coccus* = berry (in coccolithophores) makes no sense: it is probably *coccus* = seed or shield (p. 108). In Protoctista, ctista is from *ktizo* = to establish, not "ktistos". Whether nematath (p.66, a chain of volcanos) is derived from a thread (*nema*) of dung (*tath*) and coined by a humorist is doubtful; it is more likely derived from *nema* and the verb *teino* = to spread.

Each chapter starts with a section on the history of the subject, which gives students some idea how our knowledge increased over the years. In one of these sections (chapter 7) Benjamin Franklin is called the world's most famous physical oceanographer. I will not deny his importance in studying the Gulf Stream, which resulted in its first map (1777), but most of his fame he earned in other fields. I can mention other famous oceanographers such as Matthew Fontaine Maury, Fridtjof Nansen, and Prince Albert I of Monaco. But do we need to make such an impossible choice? The well-known debate on presence or absence of life in the deep ocean (at the start of chapter 15) is simplified as a debate between Edward Forbes and the Rosses. Forbes postulated an azoic zone below 300 fathoms (550 m) based on his dredging recovering fewer and fewer species down to 230 fathoms (he did not dredge deeper!) in the impoverished Aegean Sea (not the ocean). Opponents who found animals in waters below 300 fathoms included not only John and James Clark Ross, but Michael and George Ossian Sars, Charles Wyville Thomson and Fleeming Jenkin. Interestingly it was Forbes' postulate that prompted deep-sea expeditions from the Lightning (1868), Porcupine (1869), Challenger (1872-1876), to the Galathea expedition (1952), which found life in the deep sea.

Finally the glossary at the end of the book needs some improvements in a future edition. To mention a few, Aschelminthes are "a phylum of worm-like pseudocolomates", but there is not a listing for pseudocolomates. A drift-bottle is not "any equipment used to study current movements by drifting with current" (this would include even radio-buoys), but a drifter made from a real bottle. The euphotic zone does not extend to a depth "where enough light exists to support photosynthesis", but where photosynthesis of a plant cell equals its respiration (thus photosynthesis is possible below the euphotic zone). Grain size is not "the *average* size of the grains". The K-T event is not only marked by the disappearance of dinosaurs, but by the disappearance of different groups of organisms including dinosaurs. Neritic sediments are by definition confined to the shelf and thus do not occur in the deep sea. The ocean is not the entire body of saltwater, part of this body is contained in marginal seas such as the Mediterranean, Caribbean, Baltic, and North Seas. Quartz is defined as "a very hard mineral", is this true if its hardness is 7 in a scale from 0 to 10? Moreover, it could be added that it is the most common mineral forming the major component of most sands. A spherule is simply a globular particle, this term is not restricted to cosmogenic particles. Standard laboratory bioassays are not only used to determine concentrations of pollutants that cause 50 percent mortality among test organisms, but are the quantitative determinations of a substance by measuring its biological effect (e.g. growth) on a test organism. Zooxanthellae (symbiotic algae) are not confined to "corals and other coral reef animals", but occur widely also in organisms in other environments e.g. in some planktonic Foraminifera.

By giving these remarks on minor points it is not my intention, to discourage teachers from using this book. Overall it is a clearly-written well-illustrated textbook for which I hope new editions will appear in the future.

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THE AGE OF DINOSAURS IN RUSSIA AND MONGOLIA, edited by M.J. Benton, M.A. Shishkin, D.M, Unwin and E. Korochkin, 2000, Cambridge University Press, New York, 696 p.: $140.00 (hardback).

When I was a graduate student my heart would sink when I discovered a paper in the Russian language on a fossil group with which I was working, as I knew it meant days flipping though the dictionary to make a workable translation. Despite this hassle, my citation of Russian work had the great benefit of attracting reprints from Russian colleagues, which opened new worlds for me, and facilitated more than one subsequent project. This splendid compilation of Russian vertebrate paleontology takes much of the drudgery away and gives a comprehensive introduction to the Russian literature to all who can read English, and even (in an introductory chapter) to the puzzling transliteration of Russian script, proper names and stratigraphic units.

Although the title is the Age of Dinosaurs, thankfully, the amazing Russian Permian-Triassic amphibians and reptiles are also treated in detail. The time scale used is the standard Russian stages, divided into Lower and Upper Permian, rather than the threefold Permian currently in vogue. Nevertheless, there do appear to be differences between the dinocephalian and gorgonopsian faunas comparable to those of the South African Permian. Also comparable with South Africa is a very low diversity of amphibians in the latest Permian before an adaptive radiation in the early Triassic. Shishkin and others still tout *Lystrosaurus* as aquatic, despite abundant evidence from, skeletons, paleosols and burrows in Antarctica and South Africa that it was a terrestrial burrower. Unwin and others give a concise review of two especially puzzling Triassic diapsids: the rear-end glider *Sharovipteryx* and the peculiarly plumed *Longisquama*.

Dinosaurs receive full treatment beginning with both American (Colbert) and Russian-Mongolian (Korochkin and Barsbold) accounts of various expeditions of the "Great Asiatic Dinosaur Rush" beginning in the 1920's. These discoveries continue to amaze, such as the *Oviraptor* skeleton apparently incubating a clutch of eggs, as opposed to the earlier idea enshrined in its name, that it was an "egg snatcher". Other theropods are treated by Currie who lumps most of the big, bad,

boys of this clade into *Tarbosaurus*. Tumanova points out that broad snouts of ankylosaurs, common in Mongolia, contrast with narrow snouts of nodosaurs, unknown in Mongolia, and their comparison with grazing versus browsing ungulates. Grasses are not known from the Mongolian Cretaceous, but a variety of herbaceous gnetaleans and equisetaleans are common in Early Cretaceous leaf beds. Much of this vegetation was probably low growing, considering sedimentary and paleosol evidence for aridity. Sereno notes that only neoceratopsians, and not preceding psittacosaurs and pachycephalosaurs of this clade, have an evolutionary radiation coincident with the rise of angiosperms. Eolian dune sandstones, lake shales and calcareous paleosols of the Mongolian Cretaceous are compared with the modern environment of the Okavango Oasis of the Kalahari Desert by Jerykiewicz, in an effective compromise of the desert versus lake controversy that has bedeviled interpretation of these richly fossiliferous rocks. Such a compromise reconciles two conflicting end positions. It could not have been a complete desert with so many large animals. Nor could it have been completely a lake with so many terrestrial creatures.

Sukhanov cites evidence of overturn in the mid-Aptian (116-117 Ma), which separates psittacosaur from probactrosaur faunas. Norman and Sues see this as a time of immigration into Mongolia of North American and European dinosaurs. Shuvalov reminds us that the Hühteeg Gorizont also has abundant stromatolites in its type section. This struck me as particularly significant in light of Jahren and others' (2001, Geology 29:159-162) recent discovery of a post-apocalytpic greenhouse and methane spike at this time. Sereno indicates that the Cenomanian greenhouse peak was also a time of widespread northern hemisphere dinosaur interchange.

Although fish are not included in this volume, it does aim to be comprehensive for terrestrial vertebrates, including chapters on crocodylomorphs by Storrs and Efimov, choristoderes by Efimov and Storrs, turtles by Sukanov, lizards by Alifanov, pterosaurs by Unwin and Bakhurina, and birds by Kurochkin. There is also a good summary of dinosaur and bird egg parataxonomy by Mikhailov. One chapter by Keilan-Jaworowska and colleagues details what is known about Mesozoic mammal skulls and skeletons of Mongolia, and a final chapter by Averianov summarizes the more fragmentary record of Mesozoic mammal teeth and jaws from the central Asiatic republics.

This book is not holiday reading, and in many places it is very descriptive. The price also will deter widespread purchase. Nevertheless all serious research libraries will need a copy on hand.

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DINOSAURS-THE ENCYCLOPEDIA; SUPPLEMENT 3, 2003; by Donald Glut, McFarland & Company, Jefferson (North Carolina), and London; 726p. ($95.00 library binding) ISBN 0-7864-1166-X.

Dinosaurs-The Encyclopedia *Supplement 3* (herein S3) is truly another remarkable accomplishment in this continuing series concerning the ever-changing world of non-avian dinosaurs. Once again Donald Gut has managed to pull together the latest global information, from a wide variety of sources, and present it in a matter-of-fact way. This supplement is divided into five main sections: I- *Introduction*; II –*Dinosaurian Systematics*; III-*Dinosaurian Genera*; IV-*Nomen Nudum* and V. *Excluded Genera*. These are followed by: A List of Abbreviations, Appendix: Dinosaur Tracks and Eggs, Glossary, Bibliography and an Index.

The *Introduction* (Section I) follows the format of previous supplements beginning with the "Mesozoic Era," followed by "New Discoveries, Ideas and Studies," "No consensus Yet— Ectothermy or Endothermy," "Dinosaurs and Birds" and lastly "Dinosaur Extinctions." The "Mesozoic Era" subsection is very brief and presents the three geologic periods of the Mesozoic Era in reverse stratigraphic order (from youngest to oldest) rather than the other (proper) way around. Discussions in this subsection center on the timing of the origin of dinosaurs (based on skeletal and ichnite evidence) and the recent vicariance hypothesis that support congruence of continental fragmentation and paleobiogeography of dinosaurs. I'm afraid the significance of this very short section, if any, is lost on the reader.

The meat of the *Introduction* lies within the subsection concerning "New Discoveries, Ideas and Studies." Here, Glut presents a synthesis on the latest happenings in the field of dinosaurian paleontology. There is so much information here that its streams forth in a never-ending manner. However, note that many of the data presented are derived from un-refereed, non-peer reviewed abstracts. Although Glut warns the reader up front about the nature of abstracts, they continue to provide much of the content of this particular subsection. A summary of the pioneering working by Larry Witmer on the correct position of the external nostrils in dinosaurs is arguably the most notable advance in our understanding of the biology of the dinosaurs. This subsection is further divided into: saurischians (theropods, sauropodamorphs, sauropods); ornithischians (stegosaurs, ankylosaurs); ornithopods (primitive ornithopods, iguanodontians [which include the hadrosaurids]); and marginocephalians (pachycephalosaurs, ceratopsians). Aside from this gross arrangement, there doesn't seem to be continuity within each of these subtopics.

Not much new is added to the "Ectothermy versus Endothermy" debate and dissent concerning the theropod origin of birds ("Dinosaurs and Birds") continues. The recent work of American Museum of Natural History ornithologist, Richard O. Prum, on the unequivocal fact of theropod-bird relationship is contrasted with the equally dogmatic views of the nay-sayers, like Alan Feduccia, who continue to deny the overwhelming evidence to the contrary. Papers concerning the phylogenetic relationships of the feathered "dinobirds" (*Caudipteryx*, *Protarchaeopteryx*, *Sinornithosaurus*, *Sinosauropteryx*) are presented together with contentious interpretation of oviraptosaurs as birds based on the recent (2002) study by Marya?ska, Osmólska and Wolson.

Finally, the subsection on dinosaur extinction, a subject near and dear to my heart, highlights some flawed studies that contend that there is no perceptible decrease in the decline of dinosaurs near the K-T boundary. The question has never been the number of specimens, rather the number of genera and species

that became extinct at the K-T boundary. The pattern of decline in the number of taxa during the Campanian and Maastrichtian is well documented and unequivocal. The "popularity" of the asteroid impact theory is noted, but since when is good science advanced by popular consensus?

In Dinosaurian Systematics (Section II), Glut presents dinosaur genera within the framework of higher (monophyletic) taxa. Although it is a mostly up-to-date account, some facts escaped Glut's attention, for instance, such as the removal of the enigmatic *Yaverlandia* from the Pachycephalosauria. That aside, the section for the most part is acceptable, although it will continue to change with future studies that concern new taxa and new phylogenetic analyses.

Dinosaurian Genera (section III) is, once again, the "meat-and-potatoes" of the volume. Arranged alphabetically, genera (and their species) that are either new, and/or have received recent attention, are the principle focus. Worth noting is the new replacement name *Megapnosaurus* (meaning "large dead lizard") for specimens previously referred to the "coelophysoid" *Syntarsus*, a name that belongs to a beetle (which has priority) and which was named over 100 years ago! Another interesting dinosaur is the dromaeosaur *Microraptor gui*, the media-proclaimed "4-wing" theropod (if you count its tail, it is arguably 5!) and all the new Chinese "dinobirds" (*Sinornithosaurus*, *Sinosauropteryx*, etc.).

Section IV, Nomina Nuda, is a separate new section. These "naked names" formerly were included with the Excluded Genera (Section V), which also now has its own section, in a combined section. Separation of these two sections underscores the differences between the two categories. Both sections include only a handful of genera.

The "Appendix: Dinosaur tracks and eggs" documents the ever-increasing popular world of dinosaur ichnites (principally tracks and eggs; coprolites and other ichnites are not considered). In the footprint subsection, Glut lists the dinosaur ichnogenera with only a brief characterization of each (which in the opinion of this reviewer is probably more than they deserve). Fortunately, Glut prefaces the section with a brief discussion regarding the nature and limitations and correctly notes "they do *not name dinosaurs*; nor, in the vast majority of cases, can these traces be linked with absolute or near certainty to any particular dinosaurian genus known from body fossil remains." The dinosaur egg subsection has a brief introduction followed by a listing of egg/eggshell names (oogenera). Little in the way of commentary is given on any of the oogenera.

An informative Glossary, and extensive Bibliography, and Index, round out the volume.

The quality of figures and photographs in *S3* follow that of its predecessors (D:TE, S1 and S2). While many photos are good there are still a number that are substandard, some are out-of-focus, while others are just uninformative. As with earlier volumes, reproductions of line drawings, taken from the primary literature, are very informative whereas others are less so. Nevertheless, as I have indicated in my reviews of the preceding volumes (see *Priscum*, vols. 10[2] and 11[1]), the primary strength of these encyclopedias continues to be the figures and photos of original material.

Supplement 3, like its predecessor volumes, is a "must have" for any one working on, or who is truly interested in, dinosaurs. The amount of up-to-date information compressed into this series it truly staggering. It is another indispensable reference work in the Glut series, and it is with great anticipation that I await the publication of Supplement 4. The standard in Dinosaur encyclopedias has been set.

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GEOLOGIC FRAMEWORK OF CAPITAN REEF, by A.H. Saller, P.M. Harris, B.L. Kirkland, and S.J. Mazzullo, S. J., Eds., 1999, Society of Economic Paleontologists and Minerlaogists Special Publication, 65, p. 1-222: $160 (hardcover).

This monograph is a comprehensive report on the geology of the Capitan Reef, which crops out within Permian deposits of west Texas and southeastern New Mexico. Because of the great geographic extent and scientific importance of this reef system, serving as classical example for the Late Paleozoic of North America, there is too much geologic data to be incorporated in a single publication. This study is, therefore, a current understanding of the fossil reefs within the context of work in progress. The editors have envisaged this work as a way to fulfill three main objectives: revision of previous studies, discuss current controversies, and finally to introduce new ideas. The volume focuses on stratigraphy, paleoecology, and carbonate diagenesis. These areas organize the contributions and give a structure to three separate parts to the volume.

The stratigraphic part is the most complete, including six contributions. These papers cover almost all possible stratigraphic studies, from cyclostratigraphy to biostratigraphy, applicable to a reef complex. This section is distinguished not only by quantity of contributions, but also by their high quality. Some of these, such as the ones by Lehrmann and Rankey and Mazzullo, offer interesting information of broad application to other reef complexes and depositional systems. The stratigraphic part would have been enhanced by better quality figures in a few contributions.

The section on paleoecology is less extensive and complete, with only three papers. These studies are as well of high quality and they reflect the intention of developing multidisciplinary research. However, it would be desirable to find more information on paleontological aspects of the reef complex. Particularly, there is little information on the role of other invertebrate micro- and macrofaunas, aside from those forming the main framework of the reef. As for the stratigraphic section, there are minor problems with the resolution of some photographs.

The part about carbonate diagenesis is short as well, with only three contributions. It is nevertheless comprehensive and includes an interesting contribution by Hill on karstification. The development of this aspect with additional geochemical data would have helped.

This volume contains interesting, comprehensive, and high quality information about one of the best reef complexes preserved in the Paleozoic of North America, which is a reference standard for Permian reefs worldwide. The editors have accomplished every goal out-

lined in the introduction of this monograph. I would have liked to have seen a fuller account of paleoecology and diagenesis, and also a concluding chapter, rather than just the summary at the beginning. I am also concerned that, as with many such monographic studies which focus on particular aspects of a subject, an opportunity has been lost to communicate wider geological ramifications. In this case, it has not been stressed how the study of the Capitan Reef can be used to interpret other Phanerozoic reef systems, and even modern ones. If we do not point out the relevance of our work, it will not be of broad interest or supported in the future.

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