PRISCUM

The Newsletter of the *Paleontological Society* Volume 10. Number 2 Fall, 2001

Fossils via Electrons and Other Innovations

by Patricia Kelley, President

Some of my colleagues assume that, because paleontologists study the past, we're an old-fashioned, regressive bunch of people. Not so! If anything, as we approach the century mark, the vitality of the Paleontological Society is increasing through a host of new ventures.

If you are reading this article, you know that the Paleontological Society has moved into the electronic age. Welcome to our first online issue of *Priscum*, edited by Peter Harries of the University of South Florida. Thanks, Peter, for taking on this challenge! Online publication of our newsletter will allow us to disseminate information in a timely and cost-effective manner. (And if you're like me, and just have to have a paper copy, you can always print yourself one.)

Online *Priscum* joins the *Journal of Paleontology* and *Paleobiology*, which became available online this year through the BioOne consortium (http://www.bioone.org/bioone/?request=index-html). If your institution subscribes to BioOne, you have full access to all articles; only titles and abstracts are available to non-subscribers. To ensure full access by all PS members, the journals are also available to you and your institution at a stand-alone ("silo") site (http://www.psjournals.org), which will be free throughout the rest of 2001. Check it out – you may enjoy online access (including browsing and search capabilities, and moving among articles by clicking on references) so much that you will want to take advantage of an incredible offer: for only $10 for *Journal of Paleontology* ($5 for *Paleobiology*), you can add an online subscription to your paper copy starting next year! Thanks to our journal editors for guiding the PS through the complicated process of going online.

Although the decision to publish electronically has been the primary focus of PS Council meetings for the past couple years, your Society leadership has been seeking additional ways to serve you better. The Society remains firmly committed to its student membership (e.g., through our Grants-in-Aid program and by not raising student rates for dues and journal subscriptions). PS Student Representative Seth Finnegan has been working to facilitate a student-mentoring program and to provide a venue for students and young professionals to network better. We hope to better serve members outside North America by increasing the visibility of the Paleontological Society International Research Program (PalSIRP) Sepkoski Grants.

(continued on page 2)

Inside...

Priscum is published twice yearly, in March and September, 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.

Thanks to Councilor Chris Maples, we also have a PS Distinguished Lecturer, Andrew Smith, located outside the U.S. And Councilor Nigel Hughes has worked out an agreement with the Palaeontological Association to provide reciprocal discounts on publications to members of our two societies.

The Paleontological Society would like to find ways to serve the avocational paleontological community better. Alan Goldstein of the Falls of the Ohio State Park has been working with Society leaders to identify needs of the amateur community and ways that amateur and professional paleontologists can cooperate. Outreach beyond the paleontological community is being carried out effectively by Education Coordinator Dale Springer and her committee through publications (including the new booklet on *Evolution and the Fossil Record*, co-published with AGI and now on line at http://www.agiweb.org/news/evolution), teacher workshops, and other venues.

Professional meetings are key to disseminating results of our research and to networking with one another. Thus, a significant PS goal is to participate in offering high-quality programs at GSA and other meetings (e.g., the very successful recent North American Paleontological Convention). GSA recently established an Associated Societies Forum, of which I am a member and through which we can make our needs known to GSA. In addition, the Society continually tries to enhance our meetings (see Program Coordinator Mark Wilson's article on funding for PS-sponsored sessions). One of my goals has been to streamline the PS Business Meeting; thanks to the vitality of our profession, GSA is so jam-packed with paleontology sessions that we cannot afford the luxury of a protracted business meeting. Last year, we streamlined the meeting significantly, even eliminating the Presidential Address. I've had mixed feedback regarding this deletion, so I'd appreciate your comments on this experiment. (Actually, I'd rather have a dance than give an address!)

The PS has a dedicated group of officers who are here to serve you! Any ideas or suggestions are always appreciated. Please email me at kelleyp@uncwil.edu with your thoughts and concerns. And thanks to all the officers and members who serve the Paleontological Society in so many ways.

Paleontological Programs at the Annual Meeting of the Geological Society of America (November 4-8, 2001)

by Mark A. Wilson, PS Program Coordinator

Once again there will be more presentations in paleontology than in any other discipline at the annual GSA meeting. We have scheduled over 250 talks and posters, starting with the short course on Sunday, extending through six topical sessions, seven sessions of volunteered oral presentations, and three poster sessions.

The Paleontological Society short course topic this year is "Brachiopods", organized by Sandy Carlson and Michael Sandy. As with all our short courses, these presentations are designed to introduce non-specialists to the topic. Sandy and Michael have brought in several brachiopodologists who do not normally attend GSA meetings, so the talks will be diverse and lively. Future PS short-course topics are "The Fossils Record of Predation" (2002, Michal Kowalewski and Patricia Kelley) and "Bridging the Gap: Trends in Ostracode Biological and Geological Sciences" (2003, Lisa Park and Alison Smith).

The six PS-sponsored topical sessions are:

Stratigraphic Paleobiology. Conveners: Steven M. Holland and Mark Patzkowsky.

Partnerships in Paleontology: Involving the Public in Collaborative Research. Conveners: Paul G. Harnik and Robert M. Ross.

High-Resolution Geochemical Bioarchives: Recognition of Signals and Implications for Evolution, Paleoecology, and Paleoclimatology. Conveners: David H. Goodwin and Stephen Schellenberg.

Evaporite Systems: The Geology, Paleontology, and Biology of Evaporite and Near-Evaporite Systems in Both Terrestrial and Extraterrestrial Environments (co-sponsored with the NASA Astrobiology Institute-Johnson Space Center). Conveners: Susan J. Wentworth and Penny A. Morris.

Insects and Terrestrial Arthropods in the Fossil Record: Are So Many Really Represented by So Few? Convener: Robert E. Nelson.

"Traces" of Soil Ecosystems through the Phanerozoic: New Insights into Terrestrial Paleoecology, Paleohydrology, and Paleoclimate. Conveners: Stephen T. Hasiotis and Marilyn D. Wegweiser.

There are 179 paleontology oral and poster presentations in the volunteered sessions at GSA. They include talks from every subdiscipline in our field, with topics as diverse as systematics, paleoecology, extinctions, biostratigraphy, and evolution. We will all be kept very busy at this GSA meeting!

If you are considering a short course or topical session proposal, please contact the PS Program Coordinator, Mark Wilson (mwilson@acs.wooster.edu). The next opening for a short course is in November 2004. Topical session proposals for the 2002 GSA meeting (October 27-30, 2002, in Denver) must be submitted by the session organizers to GSA by January 17, 2002. PS sponsorship should be obtained prior to submitting a proposal to GSA. To facilitate consideration of sponsorship by the PS Council, please submit ideas to Mark Wilson by November 1, 2001 (especially if you wish to request funding for the session, see below).

PS Funding of Short Courses and Topical Sessions at Annual GSA Meetings

by Mark Wilson, PS Program Coordinator

In March 2001, the Paleontological Society Council approved a plan to partially support PS-sponsored short courses and topical sessions at annual meetings of the Geological Society of America. We recognize the value of these events for our membership and other scientists, and we would like to make them less burdensome to develop and also increase the di-

versity of participants. Short course organizers may request up to $3000 per year to defray the travel expenses of visiting speakers on the program. These funded speakers must be individuals who are not normally expected to attend the annual GSA meetings, with the Council looking most favorably on individuals from outside the geological sciences. Organizers may apply to the PS Council for these funds at the time they submit the short-course proposals, justifying the qualifications of the speakers and emphasizing the educational value to our membership of the resulting presentations. The application need be only a few paragraphs accompanied by a proposed travel budget. The organizer must be a member of the Paleontological Society to receive funding. In the same manner, the PS Council has allocated up to $2000 per year for PS-sponsored topical sessions at the annual GSA meetings. The rules are the same as for short-course funding, except that topical sessions may be competing for the limited funding, and that no single session will receive more than $1000. This funding program will be in place for the next three years, starting with the 2001 short course (Brachiopods) and the 2002 topical sessions. At the end of this interval, the PS Council will reconsider the value of the program and the allocated amounts.

We always encourage short-course and topical-session proposals, and we are excited about the new ideas and speakers this funding makes possible. If you are considering a short-course or topical-session proposal, please contact the PS Program Coordinator, Mark Wilson (mwilson@acs.wooster.edu). The next opening for a short course is in November 2004. Topical-session proposals for the 2002 GSA meeting (October 27-30, 2002, in Denver) must be submitted by the session organizers to GSA by January 17, 2002. PS sponsorship should be obtained prior to submitting a proposal to GSA. To facilitate consideration of sponsorship by the PS Council, please submit ideas to Mark Wilson by November 1, 2001 (especially if you wish to request funding for the session).

The "Young Paleo" Meeting at GSA

At the request of several students, there will be a "Paleontology Students Gathering" at 3:30 pm on Tuesday Nov. 6, following the PS luncheon. The purpose of this informal meeting is to provide an opportunity for students and recently graduated students to meet one another and share interests and concerns. The gathering will be held in the banquet hall, at a specific location to be announced during the luncheon (this will give easy access to the post-luncheon beer keg!). If popular, this activity may become a regularly scheduled GSA event.

Treaurer's Report for Fiscal 1999 and 2000
by Thomas Kammer, Treasurer

Your Society is in strong financial shape. Assets at the end of 1999 totaled $1,757,034, which was an increase of $75,765 (mostly from appreciation of investments) over 1998. Investment allocations were 40% stock mutual funds, 40% bond mutual funds, and 20% cash.

Total income, excluding that from investments, was $390,347. This included $306,890 from dues and subscriptions to our journals, $30,463 from donations, $25,953 from page charges, $18,491 from Special Studies publications, $4,076 from royalties, $3,519 from bank interest, and $955 from rental lists.

Total expenses were $365,628. A detailed listing of expenses were provided at the Annual Business Meeting and Luncheon at the Annual GSA Meeting in Reno. Some of the more notable expenses included: $203,701 to print our two journals plus Priscum; $41,175 for editorial costs of the two journals; $38,231 for Business Management of our journals and Society memberships by Allen Press; $20,549 for Special Studies publications; $13,500 for student research grants; $12,585 for PalSIRP grants; and $26,061 for overhead to operate the Society (meeting expenses, travel by Council members, insurance). This overhead cost was only 7% of total expenses.

Assets at the end of 2000 totaled $1,754,641, which was a decrease of $2,393 (mostly from depreciation of investments) from 1999. Investment allocations were 40% stock mutual funds, 40% bond mutual funds, and 20% cash.

Total income was $359,376. This included $263,465 from dues and subscriptions to our journals, $17,777 from donations, $28,179 from page charges, $11,980 from Special Studies publications, $4,871 from royalties, $3,037 from bank interest, $1,719 from rental lists, and $28,348 from investment income.

Total expenses were $365,351. A detailed listing of expenses will be provided at the Annual Business Meeting and Luncheon at the Annual GSA Meeting in Boston. Some of the more notable expenses included: $191,095 to print our two journals plus the Membership Directory; $45,000 for editorial costs of the two journals; $33,922 for Business Management of our journals and Society memberships by Allen Press; $14,506 for Special Studies publications; $12,000 for student research grants; $13,112 for PalSIRP grants; and $27,448 for overhead to operate the Society (meeting expenses, travel by Council members, insurance). This overhead cost was only 8% of total expenses.

Once again, I want to remind all Society members to please renew your journal subscriptions early, certainly by December 31 each year. Early renewals could save the Society thousands of dollars in business management fees by Allen Press if we don't have to send out so many renewal notices plus stop and then re-start journal subscriptions to late-paying members.

Bones, Baselines, and Biodiversity
by Seth Finnegan, Student Representative

This is the first (though hopefully not the last) time that the student representative has been asked to write a column for *Priscum*. There are both advantages and disadvantages to this. On one hand, this will by definition be the best students rep's column yet. On the other hand, there is no precedent to which I can turn for guidance. Since I have been informed that this doesn't count as a publication, I'll try to minimize the arm waving, and I certainly won't present any

evidence to back up what I say. I'll focus instead on what is arguably my greatest strength as a writer: pontification.

Lacking any burning grievance to air or a dramatic New Way of Looking at Things, I'm left with the third major thematic cliché of column writing: My Thoughts on the Direction of the Field. Don't worry, though -- I haven't been in the field long enough to have developed any grand, sweeping visions of the future. Rather, I'd like to call attention to an area in which I believe paleontology has only begun to make its mark: the growing field of conservation biology.

As biologists struggle to develop strategies for dealing with the current biodiversity crisis, it is increasingly clear that neontological data alone are insufficient to address many critical questions. Just as modern studies of global warming are meaningless except in the context of well-established paleoclimatic patterns, efforts to assess the human impact on modern ecosystems must establish "ecological baselines" against which to compare current data. To most (both?) of the readers of this column, this point will seem absurdly obvious. As paleontologists, we have a unique perspective on ecological change and biodiversity patterns, a perspective that we often take for granted. Though it is apparent to us that, in many ways, the past is the key to the present, many neontologists are only beginning to appreciate this.

Of course, this point is hardly an original one. Paleontology has been concerned with issues of Quaternary biodiversity change since the time of Cuvier, and the current concern over anthropogenic extinctions stems in part from the recognition that humans may have been responsible for many Pleistocene extinctions. There are now many paleontologists working on issues related to the conservation and restoration of a variety of habitats, but I believe that we have only begun to scratch the surface. Recent advances in stratigraphy, biogeochemistry and geochronology have greatly improved our ability to resolve ancient patterns of ecological change. Paleontologists can now participate in conservation planning, not just by offering vague caveats about the transient nature of many ecosystems, but by offering hard data on how those systems have changed in the past. Data of this sort give us our best hope of separating anthropogenic effects from "natural" change, and give us insight into how we may prevent further damage and degradation

I am not suggesting that all new graduate students should stop what they are doing and go to work on Pleistocene reefs of Indonesia or mollusks of the California coast (I myself work on the Ordovician). On the contrary, the more we improve out understanding of a variety of ancient systems, the more insight we will bring to our study of the Recent. I do, however, believe that it is the obligation of paleontologists, who have so often complained of feeling marginalized or irrelevant, to make sure that our voices are heard on this most pressing issue.

Seth Finnegan is a graduate student at the University of California, Riverside. For his dissertation, he is studying the paleoecology of the Ordovician radiations in the Great Basin.

Call for the Paleontological Society Medal and Schuchert Award Nominations

The PS Medal and Schuchert Award recognize excellence in the pursuit and the study of paleontology. Recipients of the PS Medal must have achieved eminence based on advancement of knowledge in paleontology, whereas the Schuchert Award is given to paleontologists whose work early in their careers reflects excellence and quality. There are no restrictions placed on nominees for the PS Medal; recipients of the Schuchert Award, however, are ordinarily under the age of forty when presented.

The nominations should include: 1) nominee's full name, address, phone number (and email if available); 2) letter of nomination; 3) letters of support for the candidate; 4) CV; 5) information about the candidate's research accomplishments and their impact; 6) professional outreach; 7) contributions other than research; 8) special honors received.

Please submit nominations by February 1, 2002, to Carl W. Stock, Secretary of the Paleontological Society (Dept. of Geology, University of Alabama, Tuscaloosa, AL 35487-0338). If you have questions, please contact Carl Stock (205-348-1883; FX: 205-348-0818; or cstock@wgs.geo.ua.edu) or Peter Crane (020-8332-5112; FX: 020-8332-5109; or p.crane@rbgkew.org.uk).

Call for Strimple Award Nominations

Do you know an amateur who has furthered the field of paleontology? Please recognize that person by nominating him or her for the Paleontological Society Strimple Award.

The Strimple Award recognizes outstanding achievement in paleontology by amateurs (someone who does not make a living full-time from paleontology). Contributions may be an outstanding record of research and publication, making outstanding collections, safeguarding unique paleontological materials through public service, teaching activities in the area of paleontology, and collaborations with others working in paleontology.

Anyone, including other amateurs, may make a nomination. Nominators do not have to be members of the Paleontological Society.

The nominations should include: 1) nominee's full name, address, phone number (and email if available); 2) contact information for nominator; 3) certification by the nominator of the amateur status of the nominee; 4) description of the nominee's achievements in paleontology (not to exceed three pages); 5) three to five supporting letters and other documentation, which will be bound and presented to the awardee.

Please submit nominations by February 1, 2001, to William I. Ausich, Chair of the Strimple Award Committee (Dept. of Geological Sciences, 125 South Oval Mall, The Ohio State University, Columbus, Ohio 43210. If you have questions, please contact William Ausich at the above address, call 614-292-3353, or email ausich.1@osu.edu.

Paleontological Society International Research Program - *Sepkoski Grants* For 2002 by Ron Parsley

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 2002, twenty-four 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 and quality of past achievement. Consideration will be given to paleontologists of all ages. Awards are now called *PalSIRP Sepkoski Grants* 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 three items, all typed in English:

1. 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 references.
2. 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. 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.
3. 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.

These three items should be **sent by e-mail** (in Microsoft Word ***as a single attachment*** or plain-text) to the following address:

Dr. Ronald L. Parsley
PalSIRP Sepkoski Grants
Department of Geology
Tulane University
New Orleans, LA 70118 USA
e-mail: parsley@tulane.edu

Proposals received prior to 31 March 2002 will be considered for 2002 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 paleontologist may apply for a PalSIRP *Sepkoski Grant* but only one application, per year, will be considered. *Applicants for the 2002 grant program are strongly encouraged to contact their North American/European Community referees by e-mail to determine their willingness to act as recomenders. 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 grant application information to your colleagues in Eastern Europe and the former Soviet Union.

Fossils of Ohio Honored with Golden Trilobite Award

PS officers recently discovered that, in part due to the hiatus in publication of *Priscum*, the Society had failed to announce the most recent Golden Trilobite Award. The book *Fossils of Ohio*, published in 1996 and edited by Rod Feldmann and Merrianne Hackathorn, has been recognized by the Paleontological Society Council with a Golden Trilobite Award. This award recognizes excellence in paleontological publication, in this case of a general or popular book.

Rod Feldmann, now retired from Kent State (and former PS President), served as editor-in-chief of the volume. Merrianne Hackathorn is Senior Geologist and Editor at the Ohio Division of Geologic Survey; she was managing editor for *Fossils of Ohio*. The book also has received an award from the Association of Earth Science Editors. By coincidence, the volume is reviewed in the Book Reviews section of this issue of *Priscum*.

Belated congratulations to all those involved in producing this fine book!

Boucot Research Grants Program Established

For a number of years, Art and Barbara Boucot have contributed generously to a fund earmarked for research grants to be given by the Paleontological Society. This spring a formal agreement was signed with the Paleontological Society and the details of the research grants program established.

In addition to donations already residing with the Society, the Boucots have established the Arthur James Boucot Research Fund with the Oregon Community Foundation. The funds will be used to support the Arthur James Boucot Research Grants program. According to the agreement, awards will support taxonomic, morphologic, and biostratigraphic studies "at the postdoctoral level and higher, except for the occasional individual deemed to be unusually well qualified." Applicants may be of any nationality and need not be PS members. Awards will be made annually, beginning when the Fund reaches a level to support an annual distribution of at least $10,000.

The Paleontological Society thanks Art and Barbara Boucot for their generous support of paleontological research.

Paleontology Society and Palaeontological Association Joint Agreements by Nigel C. Hughes, Councilor-at-Large (Under 40) and Timothy J. Palmer, Executive Secretary, Palaeontological Association

As a result of a recent agreement between the Paleontology Society (PS) and the Palaeontological Association (PA) we are pleased to announce a series of agreements that will benefit the membership of both organizations. Benefits for PS members are: 1) PA offers its own members discounts on single purchases of its outstanding Special Papers in Palaeontology series. These discounts are generally about 50% of the cover price); and 2) PA members are entitled to a 25% reduction in the cover price cost of PA-published fieldguides. PS members are now eligible for the same discounts (plus postage and packaging at cost).

The PA volume back list can be viewed at http://www.palass.org, and all orders should be made through Dr. Tim Palmer <palass@palass.org>, Palaeontological Association, IGES, University of Wales, Aberystwyth, Wales SY23 3DB, UK. Payment (personal check in dollars or Visa / MasterCard details - **not** Amex) should be made with the order.

Paleontological Society Grants in Aid Awards, 2001

During 2001, the awards committee, chaired by Steve Hageman with members Danita Brandt, Richard Herbert, and Rick Lupia, awarded grants to 27 of 59 applicants. They funded proposals from one of two undergraduates, seven of 16 Masters candidates, and 19 of 40 Ph.D. candidates. Additional information about the Grants in Aid as well as application material can be accessed at http://www.paleosoc.org/grantin.html.

The following students received funding:

Outstanding ($1000)

Haidi Hancock — James Cook University, Australia
Early Palaeogene foraminiferal and carbon isotope stratigrapy, Dee Stream South Island, New Zealand

Distinguished ($500)

Jenney Hall — Louisiana State University
Glacial-interglacial variation of Li/Ca and δ^6Li in foraminiferal tests from sediment cores, plankton tows, and laboratory cultures

Eugene Hunt — University of Chicago
Morphological covariance through geologic time: Micro- and macroevolution in the deep-sea ostracode genus Poseidonamicus

Brenda Hunda — University of California, Riverside
Event bed deposition in the Cincinnatian Series: Implications for assessing micro-evolutionary changes within Flexicalymene

Karen Samonds — SUNY at Stony Brook
The origins of the modern Malagasy vertebrate fauna

*Jocelyn Sessa — University of Cincinnati
The dynamics of faunal turnover during the Middle Devonian of New York State

*Andrew Lee — Purdue University
Bony tissue microstructure of Centrosaurus *humerii with implications on forelimb posture and movement*

David Sunderlin — University of Chicago
Permian paleobotany and tectonics of the Farewell Terrane in Denali National Park, AK

*Kenton Trubee — The University of Akron
Ostracodes as paleoenvironmental proxy indicators: characterizing the variability of non-marine ostracode faunas on San Salvador Island, Bahamas

Funded ($500)

Jeffrey Agnew — Arizona State University
Taxonomy, taphonomy, and paleoecology of Neogene decapods crustaceans from temperate and tropical America

*Melissa Berke — University of California, Riverside
Biohermal mounds and the associated facies within the Neoproterozoic Noonday Dolomite

Monica Carroll — Virginia Tech
Analyzing the environmental record contained in freshwater mussels: Applying paleontology to conservation biology

Raul Esperante-Caamano — Loma Linda University
Taphonomy of fossil whales in the Miocene/Pliocene Pisco Fm, Peru Caamano

Aspen Garry — Iowa State University
Shark teeth bite: Unraveling the mysteries of bull shark evolution

Alexander Glass — University of Illinois at U-C
Paleobiology of Hunsrück stelleroids

Wayne Henderson — University of Chicago
Late Cambrian Saukiid trilobites and their implications for paleogeographic and paleoenvironment reconstructions

Jonathan Hendricks — Cornell University
Systematic revision of the Pinecrest Conus *complex*

Russell House — University of Indiana
The utility of epiboles in the identification of community competition

*Gayle Levy — University of Georgia
The influence of environmental change: The brachiopod Sowerbyella rugosa *in the Upper Ordovician Kope Formation of the Cincinnati Ohio area*

**Jih-Pai Lin — Tennessee Technological University
Cambrian brachiopod faunal relationships between North America and China

Vicky MacEwan — University of Manchester
Siluro-Devonian terrestrial arthropods

*Pedro Marenco — Univ. of Southern California
Early Triassic gastropods in theoretical morphospace

Alistair McGowan — University of Chicago
The effect of the end-Permian event on Triassic ammonoid morphological evolution

*Sara Pruss — University of Southern California
Reversed onshore-offshore gradient of stromatolite development during the recovery from the end-Permian mass extinction

Rolf Schmidt University of Adelaide
Geochemical signatures of bryozoans in enigmatic Eocene environments

Allison Tumarkin University of Pennsylvania
Evaluation of bone surface textures as ontogenetic indicators in Centrosaurine horned dinosaurs

Andrew Webber Unversity of Cincinnati
Methodological advances in the use of faunal data for regional high-resolution correlation in the type Cincinnatian Series (Upper Ordovician)

* = MS students
** = BS students

Sepkoski Grant Recipients for 2001

What follows is the name of the recipient, the title of their project, and their home institution. Each recipient received $500.

I.G. Fõzy: Hungarian Natural History Museum, Budapest • *Excavation of Late Cretaceous dinosaurs and associated vertebrates in the Bakony Mountains, Hungary*

Urszula Hara: Geological Museum, Polish Geological Institute, Warszawa • *Antarctic Cenozoic Fauna*

Coralia-Maria Jianu: Muzeul Civilizei Dacice i Romane Deva, Romania • *New dinosaurs from Transylvania (Late Cretaceous, Romania)*

Rimma Khodjanyazova: Institute of Geology and Geophysics, Tashkent, Uzbekistan • *Late Paleozoic calcareous algae from the Southern Ferghana (Central Asia) and their facial distribution*

G.N. Kiselev: Department of Paleontology, St. Petersburg University, Russia • *Cephalopod assemblages from the Northern Gondwana (Northern Caucasus, Western Tien Shian, Tuva, Southern Siberia)*

P. E. Kondrashov: Paleontological Institute, Russian Academy of Sciences, Moscow • *Paleocene-Eocene Mammals of Tsagan-Khushu and the P-E boundary in Mongolia*

Anna Kozlowska-Dawidziuk: Institute of Paleobiology, Polish Academy of Sciences, Warszawa • *Evolutionary trends in the retiolitid (Graptolithina)*Gothograptus *lineage of Baltica and Laurentia*

Anna Kotasowa: Polish Geological Institute, Upper Silesian Branch, Sosnowiec • *The Visean and Serpuchovian plants from the Lvov-Volhynian basin, Ukraine*

T. B. Leonova: Paleontological Institute, Russian Academy of Sciences, Moscow • *Biogeography and biostratigraphy of the Permian ammonoids*

Peep Männik: Institute of Geology, Tallinn Technical University, Tallinn, Estonia • *Silurian Conodonts and biostratigraphy in Central Siberia, Russia*

Minjin Chuluun: Department of Geology and Mineralogy, Mongolian Technical University, Ulaanbaatar • *Tabulate corals from the Ordovician and Silurian of Mongolia*

Tamara Nemyrovska: Institute of Geological Sciences, National Academy of Sciences of the Ukraine, Kiev • *Problem of correlation of the Moscovian conodonts of Eastern Europe to the Atokan and Desmoinesian ones of North America and its possible reason*

I. G. Nigmandjanov: State Committee on Geology and mineral Resources of Uzbekistan, Tashkent District • *Position of a level Mid-Carboniferous boundary (boundary of Mississippian and Pennsylvanian) in Middle Tien-Shan (Central Asia, Uzbekistan)*

M. N. Ovechkina: Paleontological Institute, Russian Academy of Sciences, Moscow • *Upper Cretaceous calcareous nannoplankton zonation and paleoclimatic conditions in the Campanian-Maastrichtian of the Boreal Region*

P. Yu. Parkaev: Paleontological Institute, Russian Academy of Sciences, Moscow • *Shell muscle of the Cambrian Molluscs and its significance for systematics and phylogeny*

Zbynek Rocek: Geological Institute, Czech Academy of Sciences and Department of Zoology, Faculty of Natural Sciences, Charles University, Prague, Czech Republic • *Revision of the European Tertiary salamandrid* Chelotriton

S. V. Rozhnov: Paleontological Institute, Russian Academy of Sciences, Moscow • *Russian- American field trip in the Cambrian of Yakutia (Northern Siberia)*

A. A. Sabirov: Institute of Geology, Academy of Science, Dushanbe, Tajakistan • *Upper Devonian-Lower Carboniferous foraminifers of the Shishkat section (Zeravshan Range), Tajikistan*

A. V. Shumnyk: Institute of Geological Sciences, National Academy of Sciences of the Ukraine, Kiev • *Calcareous dinoflagellate cysts and coccoliths of Upper Cretaceous-Paleogene sequence of the Northwest Black Sea shelf*

N. D. Sinitchenkova: Paleontological Institute, Russian Academy of Sciences, Moscow • *The European Mesozoic mayflies*

Jana Slavílková: Department of Paleontology, National Museum, Prague, Czech Republic • *Paleoecology and taphonomy of Bohemian Llanvirnian trilobites*

Andrei Soloviev: Geological Institute, Russian Academy of Sciences, Moscow • *Late Paleocene echinoids from the Mangyshlak Peninsula*

Svetlana Syabryaj: Institute of Geological Sciences, National Academy of Sciences of the Ukraine, Kiev • *Paleobotanical criteria of paleolandscape reconstruction on the territory of spreading Tertiary amber bearing formation on the northwestern slopes of Ukrainian Shield*

N.E. Zavialova: Institute of Geology and Development of Fossil Fuels, Moscow, Russia • *Fine morphology of cordaite and early conifer pollen in connection with the evolution of Pinopsida*

Notes From an Obsessed Amateur
by Jack Kallmeyer

We All Start Somewhere

"How long have you been doing this?"—A simple question asked of many a serious amateur by beginning collectors. The answer is most commonly, "since I was a child." A number of my professional friends give this same response. The beauty of childhood is rampant curiosity. Add to this an innate fearlessness of the unknown and we have the ideal environment for learning. Here in Cincinnati we sit on one of the best exposures of Upper Ordovician strata in the world. Children in this area can't help but find fossils in their own yards. Here then, are the roots of a collector.

Then what? What happens next will be the result of the child's total learning experience. Children's minds are sponges for soaking up information from their environment. Intelligent parents, whether educated or not, may encourage a child's learning experience by exposing them to the people and places with the knowledge they seek. Well-meaning adults can also give erroneous information. Children most easily believe an adult authority figure. Robert Park states this concisely, "Small children are particularly open to new beliefs, accepting without question whatever they are told by adults" (*Voodoo Science*, Oxford University Press, 2000, p.36).

Rocks in a Box

Many early collections are just so many oddly shaped rocks in a box. I still have mine—a collection of a handful of brachiopods, horn coral, and trilobite parts all carefully coated with clear nail polish to preserve them—just like a real paleontologist. I suppose I hang on to these for purely sentimental reasons. Collections such as this are where many of us get our start. At this stage, we are novices and collectors—not amateurs. Admittedly, many collectors remain at the novice level, choosing to covet fossils as some covet stamps in an album. For these people it is "the having" that is the goal and the enjoyment. For true amateurs, the goal is knowledge.

Evolution in Learning: The Amateur's Continuing Role

The roots of paleontology began with amateurs in the classical sense—serious students of the field who did not derive their living from it. The early pioneers in paleontology were physicians, clergy, and other educated members of the elite citizenry. None of these people would be considered anything but amateurs in today's world. Yet their contribution to the science of paleontology cannot be disputed. How did these "amateurs" build the foundation for the science of paleontology? To a person, they were keen observers with a burning desire to understand the natural world. These people made meticulous collections, recorded observations, and provided detailed descriptions of their finds. Today's amateurs do much the same.

Professional paleontologists benefit from a mutually beneficial relationship with the amateur community. Amateurs have the time to spend in the field observing and collecting not often enjoyed by busy professionals. Consequently, amateurs discover many new sites and fossils. Professionals have the education and training necessary to analyze and understand what amateurs may have discovered. The two groups working together add to the collective knowledge of the ancient world. Exchange of information with professionals is a driving force for the amateur. Professionals want to study important discoveries. Amateurs want to know what they've found, how it lived, how it died, what was the world like "back then," and so on. Above all, amateurs want to contribute to the science. Exchange of information teaches the amateur, the collector, and the novice alike. How does the child with a box of rocks learn?

Further Advancement through Organization

Amateurs and professionals alike can benefit from association with organizations such as my group, The Dry Dredgers in Cincinnati, Ohio. There are many similar organizations throughout the country. We have been associated with the University of Cincinnati since 1942. The group and its members have contributed specimens or locality information to many of the Master's and Doctoral students at U.C. They have also provided specimens for study to professionals across the country and around the world. The Dredgers can boast of having a Strimple Award winner, the late William White, Jr., and a winner of P.R.I.'s Katherine Palmer Award, Steve Felton.

The Dry Dredgers' charter is to advance paleontologic education at all levels. We tailor our educational programs to everyone from the general public to the enthusiast. As public outreach, members present educational talks for schools and groups outside of our meetings. The Dredgers produce "kits" of identified local fossils that are made available through museums and at schools, and we participate as identification experts both at local shows and at the Cincinnati Museum Center. The Dry Dredgers web site (drydredgers.org) has provided a means to reach beyond the local area. The web pages provide identification help for some of the more interesting fossils in the area. Reviews of popular and professional books in paleontology and evolution are included to encourage learning by reading. We strive to provide scientifically accurate information on the web pages.

We are also able to contribute to education at higher levels. Monetary contributions are made annually to the Kenneth E. Caster Fund at U.C. for graduate fieldwork. In addition to this, the Dry Dredgers' Paul Sanders Award is an annual grant in aid for research leading to publication. The Paul Sanders Award is available to professionals, students, and amateurs alike. Readers interested in applying should visit our web site at <http://www.geocities.com/drydredgers> for more details.

Cincinnati and the Dry Dredgers are fortunate to have at least five professional paleontologists in the area. Most are contributing members at club meetings. We count a number of professionals outside the area as part of our extended family as well. Furthermore, Cincinnati has a first-class museum staffed with well-known professional paleontologists. Through their work, the Natural History section of the Cincinnati Museum Center is expanding the display area concerning fossils and evolution. Augmenting the existing Ice Age exhibit will be a new Dinosaur Hall now under construction. The next major project is an Ordovician Hall that will showcase the local fossils and geology. Dry Dredgers are on the Museum's planning committee for this long-awaited addition. Although this may appear as a blatant advertisement for the Dry Dredg-

ers, it is meant to illustrate what a dedicated association of amateurs and professionals can do. The combined approaches described above provide broad educational opportunities including accessibility for the child with the box of rocks.

Regression through Misinformation

Cincinnati is world famous for the quantity and quality of Upper Ordovician fossils that practically fall out of the bedrock exposures—solid evidence for evolution. Cincinnati may soon be equally world famous for contributing to the loss of 200 years of earth-science learning. The community awaits the opening of the Answers in Genesis' creation museum and education center; a Christian fundamentalist-based museum that will offer a slick, well-done alternative, "scientific" explanation of Earth history. Answers in Genesis is the creation of Ken Ham of whom many of you may be aware. If you are not, Ham is an Australian ex-biology teacher and a fundamentalist, literalist, young-Earth Christian. Needless to say, organic evolution is not within his belief system. The local Cincinnati newspaper, *City Beat,* had a four-page article concerning Ham's project (Chris Kemp, September 14-20, 2000) entitled "Attack of the Missionary Lizards." This serious article covered all sides of the issues including concerns of community impact. Opening a section in the article headed "Biblical Scientists", Kemp says:

> Once in an all-too-infrequent while, someone comes along who makes you re-evaluate your relegious and scientific ideologies and question your fundamental beliefs. Folks like Copernicus, Albert Einstein, and Ken Ham are good examples. They're all owed a debt that will probably never be collected.

You may want to read that again. Kemp's statement equating Ham with Copernicus and Einstein is beyond absurd. Yes, Biblical scientist, Ken Ham, will convincingly show the 'scientific' proofs of a 6000-year-old Earth, the Noachian universal flood, and the six-day creation story. Kemp's article also states that Ham not only believes that dinosaurs were on the Ark but also that they were contemporary with Jesus. His museum will have more dinosaur models than any facility in the United States.

So who cares? We all need to. Professional paleontologists and their amateur followers can do much to counter this type of non-science. Coordinated and continuing efforts of professional paleontologists, dedicated amateurs, and natural history museums must actively present true science to an undereducated public. Remember that the kid with the box of rocks will believe what any adult in a position of authority has to say. Let's do our part to help that curious child get the best Earth-science education possible.

Jack Kallmeyer is a graduate Mechanical Engineer currently in Consulting Engineering. He has been president of the Dry Dredgers since October of 1988. Jack was senior author of a paper published in *Northeastern Geology and Environmental Sciences* and an article in *Geology Today*. He has also co-authored a paper published in *Lethaia*. Jack's current research efforts may provide new information on two Cincinnatian crinoids. Among his speaking engagements were the first Fossil Festival in 1996 (the only amateur on the program), the Ohio Audubon Society, the Cincinnati Nature Center, Dry Dredgers program speaker, and a number of K-8 schools. Combining his photography skills with fossils, Jack has supplied slides of fossils to the Cincinnati Museum Center, the Tall Stacks festival in 1995, and has put them to use at club meetings to aid beginning collectors.

Earth Science Week Evolves*

Earth Science Week, October 7-13, is an annual grassroots effort sponsored by the American Geological Institute (AGI) and its member societies. The aim is to increase public understanding of the earth sciences. As geoscientists develop earth-science outreach programs in their local schools and communities, the collective impact of their efforts continues to grow. During Earth Science Week 2000, scores of celebrations — including field trips, demonstrations, lecture series, film series, exhibits, school visits, and open houses — took place in all 50 states, Australia, Canada, and at least 20 other countries. Eighteen AGI member societies and more than 100 state geological surveys, regional societies, academic geoscience departments, museums, libraries, and federal agencies hosted these events and activities. In addition, 30 state governors, the mayors of several cities, and former President Clinton issued proclamations and messages in support of Earth Science Week.

This year, for the first time, Earth Science Week has a general theme, "evolution in earth history." We hope that you will use our poster to help students and adults gain a better understanding of one of the fundamental underlying concepts of modern science – evolution. You can use the dramatic timeline and engaging activity on the poster to illustrate how much Earth has changed through time. The Earth Science Week information kit for 2001 includes a variety of posters, bookmarks, and other materials that illustrate this concept. The kit contains a new 32-page *Ideas and Activities* booklet that emphasizes evolution in earth history through an array of activities about rocks, fossils, and geologic time – as well as information on the upcoming PBS series, Evolution, which is to be aired in late September. Single copies of the Earth Science Week information kit are available at no charge from AGI. You may request a kit on the Earth Science Week web site, www.earthsciweek.org; by phone, (703) 379-2480; fax, (703) 379-7563; or by mail. Send your request to Earth Science Week, American Geological Institute, 4220 King Street, Alexandria, VA 22302.

***Editors Note:** This was a press release written by AGI. The PS is helping to sponsor the ESW, and members will receive the poster mentioned in the second paragraph together with Journal of Paleontology, v. 75, issue 5.

The Paleontological Society Distinguished Lecturer Program

By Christoper G. Maples, Councilor

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 2001-2003 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: cmaples@indiana.edu.

ACADEMIC YEARS 2001–2002 DISTINGUISHED LECTURERS

Roger J. Cuffey Phone: 814-865-1293
Department of Geosciences Fax: 814-863-8724
412 Deike Bldg.
Pennsylvania State University
University Park, PA 16802
E-mail: cuffey@ems.psu.edu

Bryozoan Reefs though Geologic Time
Bryozoan-built reefs are scientifically intriguing because they are rare; they represent an ecologic extreme for their phylum, and an exotic contrast to more numerous coelenterate-dominated reefs. Continuing analysis of as many bryozoan reefs as possible is furnishing data on their systematic composition, constructional roles, paleoecology, and evolution. Trends displayed thus far include widely fluctuating abundances, subordinal and specific compositions, compactness of framework, influence of surrounding sediments, and growth in both tropical and temperate waters. Most notably, their history is highlighted by trepostomes in crust-mounds in the early Paleozoic, fenestrates in mud-mounds and frame-thickets in the late Paleozoic, and cheilostomes in reef-veneers and crust-mounds in the Cenozoic. (Semi-technical talk for geologists, biologists, and related scientists.)

Dinosaur Travel in Mongolia
Vertebrate paleontologists traditionally have gone out and prospected new field areas in order to expand the hypodigm or database underpinning evolutionary understandings. However, increasingly, value is also seen in re-visiting classic localities well-collected by early workers. Recent geopolitical changes make it possible for paleontologists (individually or with expeditions) to re-visit Mongolian localities like Roy Chapman Andrews' Flaming Cliffs dinosaur-egg site, and to examine specimens mounted in the Ulan-Bataar museum. (Non-technical general talk for both the public and scientists of all kinds.)

Bryozoans, Battle Wreckage, and Artificial Reefs
Sinking hard materials to form the substrate for artificial-reef growth has recently developed as a useful technique in reef management and conservation. Discovery of sizeable bryozoan crusts on the 138-year-old Monitor shipwreck, and extensive coral heads on 56-year-old sunken ships and planes in Truk lagoon, suggest the possibility of inadvertent artificial reefs eventually developing at such sites. The introduction of metallic substrates is something new in earth and life history, but much can be predicted for future growth by applying paleoecological principles from fossil reefs. (Speculative general talk for geologists, biologists, and historians.)

The Earliest Bryozoan Reefs and the Initial Bryozoan Radiation
Bryozoans first appeared early in Ordovician time. Bryozoan-built reefs developed immediately thereafter (by mid-Early Ordovician in China), and for a while (into the mid-Middle Ordovician in the Appalachians and Mid-Continent) flourish alongside the oldest reef-building corals. These early bryozoan frame-builders are characterized by strong or sturdy or strengthened skeletal morphologies, but small colony size. In contrast, corals soon developed symbioses with certain algae, which resulted in much greater carbonate production, larger sizes, and eventual volumetric overwhelming of the other early reef-builders including bryozoans. Later in geologic history, where local environmental conditions or mass extinctions decimated corals, bryozoan reefs reappeared, sometimes with similar features as their remote predecessors. (Technical talk for paleontologists, geologists, biologists, and ecologists.)

Brian T. Huber Phone: 202-786-2658
Department of Paleobiology Fax: 202-786-2832
MRC NHB-121
Smithsonian National Museum of Natural History
10th and Constitution Ave., NW
Washington, DC 20560
E-mail: Huber.Brian@NMNH.SI.EDU

Deep-Sea Record of the Asteroid Impact that Ended the Dinosaur Era
Life on Earth was dramatically disrupted 65 million years ago when an asteroid 10 km across slammed into the Yucutan Peninsula, releasing an energy equivalent of 108 megatons of TNT. Many workers believe that extinction of numerous plants and animals, including the dinosaurs, was directly caused by this impact event. Yet others disagree, suggesting that the

mass extinctions began before the K/T layer and continued afterward, and the impact event was just one of many extinction mechanisms at that time. Deep-sea cores drilled from the ocean floor east of the Florida coast contain evidence that helps resolve this controversy. Chalk sediments determined to be latest Cretaceous in age are overlain by a 17 cm thick layer composed mostly of tektites, which are glassy globules of Earth's crust that melted in the blast and hardened as they rained down over large areas of Earth. Shocked quartz and other mineralogic indicators of the blast also occur in this tektite layer. Chalk sediments immediately above this tektite bed are composed mostly of new species of planktic foraminifera that are a fraction of the size of Cretaceous species, and much less diverse. Very rare Cretaceous species also occur, but their sporadic occurrence, abnormal size distribution, and different geochemical composition demonstrate that these specimens were reworked from older sediments. The abruptness of this biotic change leaves little doubt that the cataclysmic effects of the bolide impact were the direct cause of the marine microfossil extinctions that have been observed worldwide.

Biotic and Paleoceanographic Changes During the Mid-Cretaceous Supergreenhouse

A growing body of evidence from northern and southern high latitudes has revealed that the Cenomanian-Turonian boundary interval (CTBI; ~95–92 Ma) was a time of the warmest global paleotemperatures the Earth has experienced during at least the past 140 m.y. New oxygen and carbon isotope records from a deep-sea core drilled in the subtropical North Atlantic fully corroborate the high-latitude records. The subtropical benthic foraminiferal oxygen isotope data indicate that middle bathyal waters warmed from 16°C during the middle through late Cenomanian to 20°C during the latest Cenomanian (~95 Ma). This extreme warming of deep waters may have caused a breakdown in the vertical structure of the water column, and could explain the extinction of deep-dwelling planktonic species. On the other hand, sea-surface temperature estimates, based on planktonic foraminiferal $\partial^{18}O$ values (corrected for salinity), remain steady throughout the CTBI, varying between 23 to 26°C. The presence of volcaniclastic sediments at the level of the warmest paleotemperatures is consistent with previous suggestions that the CTBI was a time of anomalously high CO_2 flux into the atmosphere and oceans during a major phase of explosive volcanic activity and large igneous province emplacement in the Caribbean and other regions worldwide. Further investigation of the CTBI is needed to establish whether increased pCO_2 can be accepted as the primary forcing mechanism for the middle Cretaceous supergreenhouse.

Anatomy of an Early Cretaceous Oceanic Anoxic Event

Cretaceous "Oceanic Anoxic Events" (OAEs) can be correlated globally in pelagic carbonate facies by positive carbon isotopic excursions typically near or within dark marls that are enriched in organic carbon. In some cases, OAEs are accompanied by biotic turnover among select planktonic, nektonic, and benthic organisms. The cause of OAEs remains uncertain despite over two decades of intense study. Some authors suggest that tectonic events and widespread transgressions caused stagnation of deep waters and led to creation of a large number of salinity stratified marginal basins. Others suggest that bottom water dysoxia resulted from intensified surface productivity that led to rapid burial and preservation of the organic matter. An excellent record of an early Albian OAE 1b was recovered from an Ocean Drilling Program site on the flank of Blake Plateau. Presence of large pyrite nodules, fine sediment lamination, total organic carbon values above 10%, and impoverished and dwarfed benthic foraminiferal assemblages testify to the extremely low oxygen content of the upper bathyal waters during the peak of this event. Unlike other OAEs, however, benthic and planktonic foraminifera yield surpisingly enriched $\partial^{18}O$ values, suggesting that the upper bathyal and surface waters were relatively cool (~9 and 12°C, respectively) or highly saline. Planktonic foraminifer populations throughout the OAE 1b event are characterized by their unusually small shell size and low species richness, which is typical of modern assemblages from upwelling environments. However, species abundance changes across the black marl interval are minor and the vertical carbon isotope gradient is not as high as vertical gradients typically found in high productivity zones. Results from this study illustrate that the primary factors that caused the Cretaceous OAEs are still enigmatic.

Bruce S. Lieberman Phone: 785-864-2741
Departments of Geology Fax: 785-838-9664
and Ecology & Evolutionary Biology
University of Kansas
Lawrence, KS 66045
E-mail: blieber@eagle.cc.ukans.edu

The Cambrian Radiation: Understanding Biology's Big Bang

The Cambrian radiation is a key episode in the history of life when large animal taxa start diversifying in the fossil record. Geologically, the episode seems incredibly rapid, yet some evidence now seems to be accumulating that this may not be the case. What is the nature of the Cambrian radiation, what are the processes that might have contributed to make this event what it was, what are the current paleontological debates about, and was the radiation really so fast that it challenges Darwin's view on the tempo of evolution? These are some of the topics that will be considered, with special reference to our ability to trace the evolution of groups of species, and figure out what this can tell us about life 520 million years ago.

Natural Selection, Species Selection, and Trends

Natural selection is one of the fundamental mechanisms invoked to explain the trends seen throughout the history of life. This mechanism produces adaptations that govern how fit an organism is in relation to its environment. However, some have suggested selection processes need not solely be for the good of the organism, but rather may be for the good of the species. The debate about whether this process, termed 'species selection,' actually operates has been a particularly rancorous one. The potential validity of this mechanism gets to the issue of what are the evolutionary forces that drive trends. Examples from the fossil record and the extant biota are used to consider whether species selection, and the increased propensity to speciate, govern certain groups' success through

time or rather if such trends are best explained by changes in developmental timing or by using standard metaphors of organismal adaptation.

Species and Stasis: Causes and Consequences
Punctuated equilibrium is based on the recognition that species are stable throughout most of their millions of years of existence, and then diverge relatively quickly, in the space of tens of thousands of years, in small, isolated populations. The demonstration that punctuated equilibrium was a fundamental evolutionary pattern in the fossil record is one of paleontology's great recent contributions to evolutionary biology. This contribution is significant for evolutionary theory because whether or not species are stable throughout most of their history potentially has great significance for our understanding of the nature of evolutionary change and adaptation. In this talk, the nature of species as morphologically stable entities over many millions of years will be considered. Further, the processes that may contribute to this stasis will also be explored.

Charles R. Marshall Phone:617-495-2351
Department of Earth and Planetary Sciences Fax:617-495-8839
20 Oxford Street
Harvard University
Cambridge, MA 02138-2902
E-mail: marshall@eps.harvard.edu

A New Paleontological Method for Estimating Times of Origin, and Developmental Perspectives on the Nature of Evolutionary Innovations
Here I explore two aspects of the ongoing "molecular revolution" that have particular relevance to paleontology. The first concerns the attempt to reconcile the often large discrepancies between molecular clock and fossil record estimates of times of divergence of evolutionary lineages, by estimating the stratigraphic ranges of species NOT preserved in the fossil record. I then turn to give a paleontologist's view of the revolution in our understanding of the mechanistic basis of development, key to understanding the variation upon which evolutionary change depends.

More Realistic Ways of Quantifying the Incompleteness of the Fossil Record in Both Local Sections, and in Global Compilations.
Existing methods for quantifying the incompleteness of the fossil record are based on statistical assumptions that are often violated by real stratigraphic data. Here I outline a new (Bayesian) approach for quantifying the incompleteness of the fossil record, illustrated through an analysis of the trilobite extinctions across the Marjumiid-Pterocephaliid trilobite biomere boundary. I will then turn my attention to a group effort that has been working towards removing sampling biases in Phanerozoic diversity curves.

Lisa E. Park Phone: 330-972-7633
Department of Geology Fax: 330-972-7611
University of Akron
Akron, OH 44325-4101
E-Mail: lepark@uakron.edu

Little Things in a Big Lake: What Ostracodes Can Tell Us About Diversification in Rift Lake Systems
The East African lake systems have long been known as areas of megadiversity, particularly with respect to the large, endemic species flocks that originated within various lakes in this geologic and geographic setting. These aquatic island systems and their elevated biodiversity, are unparalleled for their potential to test hypotheses of comparative evolution on large scales. The sedimentary and fossil record of these lakes offers us the opportunity to resolve both evolutionary and ecological changes in their biota at decadal resolution, over hundreds of thousands to millions of years. Recent analyses of cichlid fish, thiarid molluscs, and ostracodes show that diversification patterns are often linked to environmental differences as well as incidences of multiple invasions and subsequent radiations in the lake.

By studying the long- and short-term changes in these lake environments via ostracodes, we can better understand paleoecological and speciation processes operating on many different temporal scales. Documenting and understanding what creates and maintains this incredible diversity has important implications for the longer-term paleontological record, as well as immediate implications for conservation of these extraordinary biotic systems in the face of a wide variety of environmental threats that include siltation due to the deforestation of the watershed, exotic species introduction and pollution from insecticides and fertilizers.

The Neogene of Africa: the Role of Environments in Terrestrial Evolution
Environmental change, particularly that related to climate fluctuations, is widely viewed as an important factor in the evolution of Neogene terrestrial faunas. Paleontological and stratigraphic investigations in East Africa over the last five decades have added greatly to our knowledge of Neogene faunal evolution and ecology, including insights into the origins of the human family and the character of the environments in which they lived. Most of these investigations have focused on sedimentary sequences preserved in the extensional basins of the East African Rift (e.g., Olduvai, Laetoli, Lake Turkana, Tugen Hills Sequence, Omo and the Awash Group).

From these and other studies, various hypotheses have been forwarded to explain the changes recorded in mammalian faunas (including Hominidae) in Africa during the late Cenozoic. The turnover pulse hypothesis (advanced by E. Vrba, 1980–1995) posits that species origins and extinctions were initiated by dramatic climatic change (aridity and cooling) in Africa during the late Pliocene and again in the Pleistocene. The variability selection hypothesis (advanced by R. Potts, 1996–1998) suggests that oscillations, as evidenced in global and regional sedimentary records, were responsible for these significant changes in fauna. In the case of hominids, environmental fluctuations could have had a formative impact on the origin of toolmaking, brain enlargement, and other advances in human adaptability. In the case of large mammals, there are widely documented faunal turnovers during the Late Miocene and Plio-Pleistocene in Africa that may be due to regional and global climatic (i.e. environmental) change. By examining these records, the fundamental question posed by Darwin (1859) regarding the role of physical factors in biotic evolution can

be addressed.

Judith Totman Parrish Phone: 520-621-6024
Department of Geosciences Fax: 520-621-2672
Gould-Simpson 208, P.O. Box 210077
The University of Arizona
Tuscon, AZ 85721
Email: parrish@geo.arizona.edu

Jurassic Park was not a Jungle
The Morrison Formation, which extends from the southern Colorado Plateau into Montana, is what some people think of when they think of Jurassic Park—it is an extraordinarily rich source of dinosaur fossils. Conflicting paleoclimatic interpretations of the formation have confounded interpretations of the Morrison ecosystem. Integrated work on the plants, dinosaurs, and sedimentary rocks of the Morrison Formation has made progress toward resolving this conflict. The vegetation of the Morrison Formation was predominantly herbaceous, consistent with recent conclusions that some of the largest dinosaurs were probably grazers and low browsers.

Comparison of Humid and Semi-Arid Paleoecosystems
Humid and semi-arid ecosystems differ in the abundance and distribution of plant and animal remains. Humid climates more commonly provide favorable conditions for plant preservation than do semi-arid climates, which makes understanding the vegetation particularly challenging. However, there are some surprising similarities in the preservational modes and in how the vegetation signature is recorded. A comparison of humid paleoecosystems from the Cretaceous of northern Alaska and semi-arid ecosystems from the Triassic and Jurassic of the Colorado Plateau illustrates the differences and similarities.

ACADEMIC YEARS 2002–2003 DISTINGUISHED LECTURERS

Christopher A. Brochu Phone: 319-353-1808
Department of Geoscience Fax: 319-335-1821
University of Iowa
Iowa City, IA 52242
E-mail: christopher-brochu@uiowa.edu

Simultaneous Illumination - Phylogenetic Approaches toward Crocodylian History
Crocodylians are often dismissed as "living fossils" little changed since they first appear in the Mesozoic. Although a limited number of morphotypes have arisen during the group's history, crocodylian phylogeny is much more dynamic than often acknowledged. A phylogenetic approach reveals a complex biogeographic history. By considering both fossil and molecular estimates of divergence timing, the geographic distributions of most extant crocodylian lineages require the crossing of a major marine barrier at least once—for example, three different lineages crossed the Atlantic during the Late Tertiary.

Studies of diversity over time suggest that crocodylian diversity showed two diversity peaks—one in the Eocene, and another in the Miocene. A phylogenetic perspective reveals differences between these peaks. Clades with minimum origination dates in the Cretaceous or Early Tertiary are morphologically uniform, but geographically widespread. Crocodylian faunas during the early Tertiary tend to be phylogenetically composite. In contrast, crocodylian faunas of the later Tertiary tend to be more endemic. Climate change is usually seen as the primary agent behind crocodylian diversity changes over time, but increased separation between continental land-masses during the later Tertiary may have prevented widespread dispersal of specialized clades, allowing multiple endemic radiations to occur. This suggests that tectonics may be partially responsible for an increase in crocodylian diversity early in the Neogene.

A phylogenetic perspective enhances our interpretation of temporal patterns, because the biogeographic details recovered from the calibrated phylogeny are not evident from counts of taxa over time. And re-examination of curated specimens is critical for the recovery of these patterns, as taxonomic philosophies have fluctuated over time, and published classifications may not mirror phylogenetic relationships. (Talk can be given for general, intermediate, and specialist audiences)

The Science of Sue
The skeleton of FMNH PR2081 (popularly known as "Sue") is the largest, most complete, and best preserved *Tyrannosaurus rex* ever collected. It reveals structures thought to be absent from tyrannosaurids and other derived theropods (such as a proatlas arch), but also suggests that some features thought to be present in tyrannosaurids were not present at all (such as the bony sternum). There are several abnormalities, including healed fractures in the trunk ribs and fused caudal vertebrae that appear not to result from fracture. Exostotic bone in the fused caudals grew around caudal muscular bands, preserving a natural mold of the tail musculature. None of the abnormalities on the jaw are healed bite marks.

A high-resolution computed tomographic (CT) analysis of the skull generated 748 2-mm-thick slices. Inspection of both the raw slices and 3-D models generated from them allowed the preparation team to see obscured objects before they were manually exposed. These images reveal internal details not previously accessible in intact tyrannosaurid skulls, such as the ossified medial wall of the maxillary antrum and the internal morphology of the pneumatic recesses, which may have communicated with pneumatic chambers in the neck vertebrae. They also permit the creation of a digital endocast that goes beyond those made through destructive means by preserving nerve pathways all the way through the braincase and internal details of the otic capsule. It reveals an interesting combination of ancestral and derived features relative to the brains of living dinosaurs and other archosaurs. The endocast confirms the presence of a large olfactory nerve and reveals greatly enlarged olfactory bulbs relative to those in other nonavian theropods, suggesting that smell was emphasized in the sensory repertoire of *Tyrannosaurus*.

A chevron bone was found during preparation that fits between the first two tail vertebrae. The absence of this bone was one reason "Sue" was thought to be female. A close examination of other criteria used to sex dinosaurs reveals further interesting complica-

tions. (Talk can be given for general, intermediate, and specialist audiences)

Differing Temporal Expectations for Crocodylian Phylogeny: Molecules versus Stratigraphy
Different sources of temporal information—the stratigraphic distribution of fossils and molecular distances between extant species—can yield very different estimates. These do not represent "conflict" in the same sense that different data sets may support different trees, as temporal estimates are limited by known incompleteness (the fossil record) and labile assumptions (a priori estimates of molecular evolutionary rate). Moreover, disparity may result more from failure to address the same phylogenetic question with different data sets.

Different temporal predictions for crocodylian phylogeny illustrate all of these points. In the most famous disparity, fossils have long been used to indicate a Mesozoic divergence between *Gavialis gangeticus* (the Indian gharial) and any other living crocodylian, whereas molecular distances have suggested divergences as recently as 20 million years. Reevaluation of the fossil evidence makes any divergence in the Cenozoic unlikely, and this disparity may result in large measure from an invalid assumption of clocklike evolution over the entire group. Other comparisons calibrated by fossils - especially among caimans—suggest unreasonably high rates of molecular evolution, and indicate the presence of significant ghost lineages in the fossil record. Addition of new fossil information can recalibrate hypothesized rates of evolution, and the degree of revision can depend not only on the temporal distance between fossils, but on the distance between the relevant fossils and the Recent.

Finally, some indicated disparities stemmed from a lack of rigorous phylogenetic hypotheses for some fossil groups. Molecular distances indicated a Late Tertiary divergence within the widespread genus *Crocodylus*, long thought to be an ancient group; close examination of fossils assigned to *Crocodylus* instead suggests a divergence among living *Crocodylus* no earlier than the Miocene. (Talk can be given for general, intermediate, and specialist audiences)

Lucy E. Edwards Phone: 703-648-5272
U.S. Geological Survey Fax: 703-648-6953
Reston, VA
E-mail: leedward@usgs.gov

Coastal Plain Stratigraphy: It Isn't Just Layers Any More (and Probably Never Was)
Studies over the last two decades in the stratigraphy of the Atlantic Coastal Plain have shown that simple models of stratigraphic units (and their related aquifers and confining units) being thicker downdip and pinching out updip are seldom accurate. Discontinuous lenses of sediments are as common as simple continuous layers, and wide thickness variations are the norm. Current work in South Carolina has led me to speculate that anomalous patterns of erosion preserved in Paleocene and Eocene sediments represent scour caused by an eddy system of the predecessor of the present Gulf Stream. I will also bring up any new developments in the ongoing study of the stratigraphy of the sediments filling the Chesapeake Bay impact structure. (Semi-technical, for stratigraphers and hydrologists)

Biostratigraphy, Paleoecology, and Biogeography: What's Signal? What's Noise?
Biostratigraphers love the lowest and highest stratigraphic occurrences of taxa (FADs and LADs). But not all FADs and LADs are created equal. In any given stratigraphic succession, some taxa first occur because they evolved in that area at that time. Others first occur for purely ecological reasons or due to immigration. Instead of bemoaning the ecological misfits, we should use them, but not for biostratigraphy. The technique of graphic correlation is explained. I demonstrate how it easily tests the hypothesis of synchroneity. Nonsynchronous FADs and LADs should immediately be excluded from further consideration for correlation. But they should not be excluded from the overall analysis. A diachronous event cries out for paleoceanographic, paleoecological, or post-depositional interpretation. Dinoflagellates from the Miocene of Florida illustrate concepts such as climatically influenced patterns of immigration. (Semi-technical, for geologists and paleontologists)

Dinoflagellates: My Favorite Fossils
Dinoflagellates are organisms that cause red tides in modern seas. The dinoflagellate *Pfiesteria* has been called the "cell from hell" by the news media. Dinoflagellates are common in the fossil record from the Late Triassic onward. In many instances, when the sediments are too far downdip to have good pollen and too far onshore to have a good calcareous microfossil assemblage, dinoflagellates provide key biostratigraphic and paleoecologic information. (Not too technical, for geologists and biologists, and interested amateurs—everyone will learn something)

Stanley C. Finney Phone: 562-985-8637
Department of Geological Sciences Fax: 562-985-8638
California State University—Long Beach
Long Beach, CA 90840 USA
E-mail: scfinney@csulb.edu

Is the Late Ordovician Mass Extinction an Artifact of Stratigraphic Resolution?
The Late Ordovician mass extinction was contemporaneous with rapid advance and retreat of continental glaciation in Gondwana. Integrated, multidisciplinary, high-resolution study of shelf and basin stratigraphic successions in central Nevada and comparison with data from other tropical paleo-plates indicate that, while habit loss and resulting pulses of extinction were driven by rapid glacioeustatic sea-level and associated oceanographic changes, extinctions were gradual, diachronous, and sporadic. The Late Ordovician was a time of major biotic crises, but not of sudden global extinction.

An Actualistic Model of Graptolite Biogeography
The Finney-Berry model of graptolite biogeography views graptolite biogeography from a new perspective, focusing attention on the habitat in which graptolites flourished rather than on the differentiation of faunas into provinces and biofacies. It emphasizes the dynamic and ephemeral nature of graptolite habitats, in contrast to previous models in which graptolite fau-

nas were segregated laterally by water-mass specificity or vertically by depth zonation into rather static biotopes. Moreover, the Finney-Berry model has important implications with regard to dispersal, provincialism, and the nature of the graptolite record.

Gold, Graptolites, and the Paleogeographic Affinity of the Roberts Mountains Allochthon
Graptolite faunas of the Pacific Province were first described in large part by Australian paleontologists of the late 19th and early 20th centuries, because graptolite biostratigraphy was critical for recognizing structures and thus directing exploitation of the Victorian gold fields. A similar situation exists today in the Carlin Trend of north central Nevada where annual gold production approaches 5 million ounces. Gold is hosted largely by Silurian-Devonian carbonate rocks of the lower plate of the Roberts Mountains thrust, but ore bodies in surface outcrops of lower plate rocks have largely been exploited. Future exploration efforts are now in areas where lower plate rocks are covered by the Roberts Mountains allochthon, composed of a thick, structurally complex, poorly exposed, deep-water, stratigraphic succession of Cambrian-Devonian age. Exploration efforts require that these rocks be mapped to determine depth to lower plate rocks and through-passing structures; geologic mapping is dependent on understanding the stratigraphic succession; and graptolite biostratigraphy has proven to be the most effective means of reconstructing the stratigraphy and recognizing distinctive stratigraphic intervals. Reconstruction of the stratigraphic succession and comparison with the coeval rocks of the lower plate demonstrate that the Roberts Mountains allochthon is not an exotic terrane. Its stratigraphic succession accumulated in deep-water outboard of the carbonate platform along the Cordilleran margin of Laurentia, and several distinctive sedimentological event can be recognized in both the basinal and platform successions.

Andrew Smith Phone: (0)207-942-5217
Department of Palaeontology
The Natural History Museum
Cromwell Road, London SW7 5BD
UK
E-mail: a.smith@nhm.ac.uk

Events at the Cenomanian-Turonian Boundary: The Dissection of a Mass Extinction
The Cenomanian-Turonian boundary has long been recognized as an interval of major biotic change, and is coeval with one of the largest rises in sea-level to have occurred in the post-Palaeozoic. The association between mass extinction in the marine realm and sea-level change is well documented, but perplexing, since it seems implausible that sea-level change could actually cause a major extinction. However, large scale cycles of sea-level change can and do alter the ratio of shallow to deep marine continental shelf deposits preserved in the rock record both regionally and globally. Events around the Cenomanian-Turonian boundary in western Europe are reviewed in terms of geographical and ecological patterns and a phylogenetic framework for sea urchins is used to investigate the roles of sampling and extinction in deriving these patterns. This approach introduces a surprising degree of uncertainty about the size, duration and even the reality of the mass extinction event.

Megabias in the Marine Fossil Record and Its Implications for Charting the Geological History of Diversity
Patterns of origination, extinction and standing diversity through time are inferred from tallies of taxa preserved in the fossil record. This approach generally assumes, however, that sampling of the fossil record is effectively uniform over time. Although recent evidence suggests that our sampling of the available rock record has been very thorough, there is also overwhelming evidence that the rock record available for sampling is itself distorted by major systematic biases. Data on rock outcrop area compiled for post-Palaeozoic sediments from western Europe at stage level show a strongly cyclical pattern corresponding to first and second order sequence stratigraphical cycles, and changes in standing diversity and origination rates over time-scales measured in 10s of millions of years turn out to be strongly correlated with surface outcrop area. Many of the taxonomic patterns that have been described from the fossil record conform to a species/area effect. Whether this arises primarily from sampling bias, or from changing surface area of marine shelf seas through time and its effect on biodiversity remains problematic.

The Paleobiology of Echinoids
Echinoids have a wonderfully complex endoskeleton that is a trove of information for palaeobiologists. Their skeletal ultrastructure provides a means of reconstructing soft tissue with confidence and the microarchitecture of structures such as tubercles and pore-pairs can be analyzed in terms of their biomechanical function. This talk will review the sorts of evidence that can be called upon when trying to reconstruct the autecology of fossil echinoids.

NEW BOOKS FOR REVIEW

This section of the newsletter includes lists of books and brief 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 in time for 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

Adrain, J. and Edgecombe, G.D. 1997. SILURIAN ENCRINURINE TRILOBITES FROM THE CENTRAL CANADIAN ARCTIC. Palaeontographica Canadiana, v. 14, 109 p.; $44.50 (paper).

Alexander, C. R., Davis, R. A., and Henry, V. J. (eds.) 1998 TIDALITES: PROCESSES AND PRODUCTS. SEPM Special Publication 61, 171 p: members $87.00; list $121.50 (cloth).

Berman, K. M. and Snedden, J. W. (eds.), 1999. ISOLATED SHALLOW MARINE SAND BODIES: SEQUENCE STRATIGRAPHIC ANALYSIS AND SEDIMENTOLOGIC INTERPRETATION. SEPM Special Publication 64, 362 p: members $86.00; list $120.00 (cloth).

Bookstein, F. L. 1997. MORPHOMETRIC TOOLS FOR LANDMARK DATA: GEOMETRY AND BIOLOGY. Cambridge University Press, New York, 435 p.: $34.95 (paper).

Claasen, C. 1998 SHELLS. Cambridge University Press, New York, 266 p.: $74.95 (cloth).

Culver, S. J. and Rawson, P. F. 2000. BIOTIC RESPONSE TO GLOBAL CHANGE: THE LAST 145 MILLION YEARS. Cambridge University Press, Cambridge: $95.00 (cloth).

De Graciansky, P.-C., Hardenbol, J., Jacquin, T., and Vail, P. R. 1998. MESOZOIC AND CENOZOIC SEQUENCE STRATIGRAPHY OF EUROPEAN BASINS. SEPM Special Publication 60, 786 p.: members $125.00; list $175.00 (cloth).

Dewing, K. 1999. LATE ORDOVICIAN AND EARLY SILURIAN STROPHOMENID BRACHIOPODS OF ANTICOSTI ISLAND, QUEBEC, CANADA. Palaeontographic Canadiana 17, 143 p: $62.00 (paper).

Gensel, P.G. and Edwards, D. (eds.), 2001, PLANTS INVADE THE LAND. Columbia University Press, New York, 304 p.; $65.00 (cloth), $32.00 (paper).

Harbaugh, J. W., Watney, W. L., Rankey, E. C., Slingerland, R., Goldstein, R. H., and Franseen, E. K. 1999. NUMERICAL EXPERIMENTS IN STRATIGRAPHY: RECENT ADVANCES IN STRATIGRAPHIC AND SEDIMENTOLOGIC COMPUTER APPLICATIONS. SEPM Special Publication 62, 362 p.: member $120.00; list $170.00 (cloth).

Harris, P. M., Saller, A. H., and Simo, J. A. T. 1999. ADVANCES IN CARBONATE SEQUENCE STRATIGRAPHY: APPLICATION TO RESERVOIRS, OUTCROPS AND MODELS. SEPM Special Publication 63, 421 p.: member $105.50, list $148.00 (cloth)

Jin, J., and Zhan, R.-B. 2001. LATE ORDOVICIAN ARTICULATE BRACHIOPODS FROM THE RED RIVER AND STONY MOUNTAIN FORMATIONS, SOUTHERN MANITOBA. NRC Research Press, Ottawa, Ontario, Canada. 117 p.: $C 42.95 (Canada), $42.95 (elsewhere)(paper).

Kerans, C. and Tinker, S.W. 1997. SEQUENCE STRATIGRAPHY AND CHARACTERIZATION OF CARBONATE RESERVOIRS. Society for Sedimentary Geology, Short Course Notes v. 40, 130 p.; members $34.00, $48.00 list (paper).

Kolata, D.R., Huff, W.D. and Bergström, S.M. (eds.) 1997. ORDOVICIAN K-BENTONITES OF EASTERN NORTH AMERICA. Geological Society of America Special Paper, v. 313, 90 p. $46.00 (paper).

Li Q. & McGowran, B., 2000. MIOCENE FORAMINIFERA FROM LAKES ENTRANCE OIL SHAFT, GIPPSLAND, SOUTHEASTERN AUSTRALIA. Memoirs of the Association of Australasian Palaeontologists 22, 142p.; $A44.00 (Australia); $A45.00 (elsewhere; both include postage & handling).

Lockley, M. and Hunt, A. P. 1999. DINOSAUR TRACKS. Columbia University Press, New York: $19.50 (paper).

McGhee, G.R. 1999. THEORETICAL MORPHOLOGY: THE CONCEPT AND ITS APPLICATIONS. Columbia University Press, New York, 316 p.; $20.50 (paper).

Mikhailov, K.E. 1997. FOSSIL AND RECENT EGGSHELL IN AMNIOTIC VERTEBRATES: FINE STRUCTURE, COMPARATIVE MORPHOLOGY AND CLASSIFICATION. Special Papers in Palaeontology, v. 56, 80 p.: £35 (paper).

Montañez, I.P., Gregg, J.M. and Shelton, K.L. (editors) 1997. BASIN-WIDE DIAGENETIC PATTERNS: INTEGRATED PETROLOGIC, GEOCHEMICAL AND HYDROLOGIC CONSIDERATIONS. Society for Sedimentary Geology SEPM Special Publication, v. 57, 302 p.; $101.00 (cloth).

Nowland, G. S. (ed.) PALEOSCENE: A SERIES OF PAPERS ON PALEONTOLOGY REPRINTED FROM GEOSCIENCE CANADA. Geoscience Canada Reprints 7, 308 p.: $58.00 (paper).

Pinard, S. and Mamet, B. 1998. TAXONOMIE DES PETITS FORAMINIFÈRES DU CARBONIFÈRE SUPÉRIEUR-PERMIEN INFÉRIEUR DU BASSIN DE SVERDRUP, ARCTIQUE CANADIEN. Palaeontographica Canadiana, v. 15, 253 p; $72.50 (paper).

Reitz, E.J. and Wing, E.S. 1998. ZOOARCHEOLOGY. Cambridge University Press, New York, 455 p.; $80.00 (cloth), $34.95 (paper).

Rigby, J. K. and Chatterton, B. D. E. 1999. SILURIAN (WENLOCK) DEMOSPONGES FROM THE AVALANCHE LAKE AREA OF THE MACKENZIE MOUNTAINS, SOUTHWESTERN DISTRICT OF MACKENZIE, NORTHWEST TERRITORIES, CANADA. Palaeontographic Canadiana 16, 43 p.: $34.00 (paper).

Saller, A. H., Harris, P. M., Kirkland, B. L., and Mazzullo, S. J. (eds.) 1999. GEOLOGIC FRAMEWORK OF THE CAPITAN REEF. SEPM Special Publication 65, 224 p.: member $87.00; list $122.00 (cloth).

Schumm, S.A. 1998. TO INTERPRET THE EARTH: TEN WAYS TO BE WRONG. Cambridge University Press, Cambridge (new in paperback): $19.95 (paper).

Siveter, D.J. and Williams, M. 1997. CAMBRIAN BRADORIID AND PHOSPHATOCOPIC ARTHROPODS OF NORTH AMERICA. Special Papers in Palaeontology, v. 57, 69 p.; £30.00.
Spellerberg, I.F. and Sawyer, J.W.D. 1999. AN INTRODUCTION TO APPLIED BIOGEOGRAPHY. Cambridge University Press, New York, 243 p.; $64.95 (cloth), $24.95 (paper).
Strickberger, M. W. 2000. EVOLUTION (3rd ed.). Jones and Bartlett, Sudbury, 721 p.: $74.95 (cloth).
Sturgeon, M.T., Windle, D.L., Mapes, R.H. and Hoare, R.D. 1997. PENNSYLVANIAN CEPHALOPODS OF OHIO. Ohio Geological Survey Bulletin, v. 71, 260 p.; $12.00 (paper).
Taquet, P. 1998. DINOSAUR IMPRESSIONS: POSTCARDS FROM A PALEONTOLOGIST. (translated by K. Padian). Cambridge University Press, New York, $24.95 (cloth).
Thurman, H.V. and Trujillo, A.P. 1999. ESSENTIALS OF OCEANOGRAPHY (SIXTH EDITION). Prentice Hall, Upper Saddle River, New Jersey; 527 p.; $61.33 (paper).
Wright, A.J., Young, G.C., Talent, J.A. & Laurie, J.R. (eds), 2000. PALAEOBIOGEOGRAPHY OF AUSTRALASIAN FAUNAS AND FLORAS. Memoirs of the Association of Australasian Palaeontologists 23, 515p.; $A81.95 (Australia); $A84.50 (elsewhere; both include postage & handling).
Zhuravlev, A.Y. and Riding, R. (eds), 2001, THE ECOLOGY OF THE CAMBRIAN RADIATION. Columbia University Press, New York, 576 p.; $80.00 (cloth), $40.00 (paper).

BRIEF BOOK REVIEWS

PALEOECOLOGY; ECOSYSTEMS, ENVIRONMENTS AND EVOLUTION, by P.J. Brenchley and D.A.T. Harper, 1998; Chapman & Hall, London, 402p. ; $29.99 (paper).

The last general paleoecology book that I read was that by Ager (1963), so it almost goes without saying that this book was a revelation. Of course, I have seen some of the papers referred to in the text, but to see them all brought together made this book very satisfying. As well as could be expected in a single volume, it covers the gamut of paleoecological investigation. Beginning with 'Investigating the history of the biosphere' then proceeding through 'Environmental controls on biotic distribution'; 'Taphonomy'; 'Adaptive morphology'; 'Trace fossils'; 'Fossils as environmental indicators'; 'Populations and communities'; 'Palaeobiogeography' and finally 'Evolutionary paleoecology of the marine biosphere' and 'Fossil terrestrial ecosystems'. The first chapter delves into definitions and briefly explains how the Earth operates, while the last two are brief chronological narratives of the history of the marine and terrestrial biospheres. The remainder are self-explanatory.

Each chapter concludes with a series of summary points, some suggested further reading and a couple of pages of references. The book is fairly well illustrated, mostly with diagrams, charts and tables drawn from other works, many of which are by the authors. Scattered through the book are 'boxed' articles, mostly very brief summaries of one or two recent papers, which are used to illustrate by example, or to elaborate on aspects of the chapter concerned.

If there are any annoying aspects of the book, the worst is that it gives the impression that it was hurriedly put together and that it was the victim of less than optimum copy-editing. For instance: on p. 154, the illustrations of various trace fossil classes do not tally with the text above. On p. 235, the illustration of the sampling is not explained (why is *Basilicus* mostly but not entirely in brackets?) and the last paragraph says that a number of community types have been recognized, but only lists the characters of two. On p. 241-242, the text lists in bold type the seven different trophic groups, yet in the adjacent table they are listed in a slightly different order. Furthermore, this table is poorly organized. I suspect that it had margins and a grid when submitted, but lost these during the editing process, so that the top half is badly misaligned and difficult to decipher. On p. 254, are listed, from a paper by Alberstadt et al. (1974), several stages of community succession, yet the adjacent diagram (apparently from the same source) omits the pioneer stage, adds the colonization stage and renames the climax stage! Dodgy copy-editing is represented by the occasional misspelling, repetition of the definite article, omission of verbs and a peculiar reference to bushwalking in the Precambrian atmosphere, but these are not frequent enough to engender outrage, simply mild amusement.

Overall, I enjoyed reading this book because it opened my eyes to an enormous diversity of topics in paleoecology and how they have expanded since my last foray into a similar text a couple of decades or so ago. Because of the array of topics and techniques which make up paleoecology, any single volume can only briefly cover each, but this book has attacked this problem in the best possible way, by giving an overview of each and extracting boxed examples from the literature. I suspect that it is a book which will be dipped into regularly when a quick grasp of the state of play of a method or a paleoecological interpretation, or when an entry into the literature, is needed.

John R. Laurie
AGSO, GPO Box 378
Canberra ACT 2611
Australia

TAPHONOMY: A PROCESS APPROACH, by R.E. Martin, 1999. Cambridge Paleobiology Series no. 4. Cambridge University Press; 507 pages; hardback $100.00; paperback $ 44.95.

Efremov in 1940 not only coined the word taphonomy but also linked it with the study of 'information loss'. Maybe Efremov's paper and E.C. Olson's advertising of Efremov's ideas in the USA has led to the widespread assumption that taphonomy deals mainly with information losses during death, decay and disintegration. Authors like A.K. Behrensmeyer, S.M. Kidwell and M.V.H. Wilson in the 1980s were needed to teach us (again) that the study of the processes of preservation itself can provide a rich source of information. How modern in fact was Buckland's famous research on the Kirkdale cave deposits long before Efremov! In his *Reliquiae Diluvianae* (1823) he used taphonomic arguments to explain the origin of the bones assembled on the Kirkdale cave floor. They were

not remains of carcasses brought in by the biblical deluge, but the cave had been the den of antediluvial hyenas and the assemblage of teeth and bones were the remains of their meals because the bones were mostly broken and gnawed. He even did a 'taphonomic' experiment: he fed a fresh shinbone of an ox to a Cape hyena that visited Oxford as part of a travelling collection of animals. The hyena produced gnawed bone fragments similar to those in the cave. He also collected white fecal matter in the cave and proved this to be comparable to feces of the Recent Cape hyena. Clearly Buckland already knew about 'information gain' from broken bones! (Moreover, the hyena den story helped undermine traditional diluvianism - see Rupke's "The great chain of history", 1983).

Instead of isolating taphonomy as a separate discipline, Martin in his *Taphonomy: A Process Approach* gives it a central role in the study and interpretation of the fossil record as a source of environmental information. He has done an excellent job in single-handedly combining information from about 1500 references (including ~100 books), a task nowadays usually only completed in multi-authored books. The entire field of taphonomy is dealt with. Starting with the foundations and methodology of taphonomy, chapters deal with necrolysis, transport, abrasion, dissolution and diagenesis of vertebrate, invertebrate and plant remains. Special chapters deal with such topics as bioturbation, time-averaging, exceptional preservation and the role of (mega)cycles in preservation and biomineralization. Applied taphonomy and taphonomy as a historical science conclude this book. From these contents it is already clear that this is the first time a book covers so many aspects of taphonomy as well as placing it in such a wide context.

Martin's zest to collect so much taphonomic information from the literature is incredibly useful: the book forms an excellent source for references and it is really up-to-date with a couple of references to 1999 papers added in proof at the end of some chapters. As the author states in his preface, due to the interdisciplinary character of taphonomy and the burgeoning literature it is impossible for taphonomists to pay attention to all relevant publications. We need reviews such as the one Martin has written, just as Martin needed earlier reviews. However, reading Martin's book one sometimes would like to see all this information somewhat more 'digested'; if the author had given summaries at the end of each chapter this would facilitate reading and strengthen the message of the book. However, from the preface we learn that Martin wanted, in some cases, to present contradictory data or interpretations and have the readers decide for themselves. The book is aimed at advanced students and professional earth scientists, paleontologists and biologists, but also these might wish to hear Martin's opinion (at least I do). As a kind of summary at the end of the book Martin adds ten taphonomic rules to the ten published earlier by Wilson and presented here in chapter one. I have some minor critical remarks.

Although I agree with the author on the importance of bioturbation as a process in taphonomy, I don't see the direct relevance of derivation of mathematical models for bioturbation. Do the 43 equations in this chapter help to convince the reader of the importance of bioturbation? Second, despite many publications on the role of predators in crushing shells (e.g. Vermeij, 1987, Evolution and Escalation), shell fragmentation in Martin's book is still related only to physical factors operating in high-energy environments (Table 2.4). I am quite convinced by my own studies in Recent low-energy environments such as the Ria de Arosa in Spain and the sheltered Dutch Wadden Sea that also there shell fragmentation can be very high, not related to high energy but to high predation pressure. Thanks to quantitative data present for the Wadden Sea on both predators, in particular birds and crabs, and on the amount of bivalves they consume, I estimate that at least 75% of the bivalves are crushed. This explains the high amount of fragments present in Wadden Sea sediments (1994, Palaeontology 37: 181-202). Johannes Walther (1910, also cited by Martin) stressed the role of predators based on his studies in the Mediterranean Sea near Naples. Apparently it takes a long time to integrate biological information into geology.

The book can be seen as a warning for taphonomists to publish only in English if they want to become incorporated in the mainstream of taphonomic research. Less than 1% of Martin's references are non-English papers (German and French). For example, we will not learn from this book what is going on in Russian taphonomic research nor become acquainted with the many taphonomic papers in Spanish. Language barriers seem to be increasing in importance. This has apparently nothing to do with franco-, germano- or other phobias as I once thought. However, it implies a serious 'information loss'.

Despite these minor criticisms, I wish to congratulate Martin who produced a major up-to-date review of taphonomy. It forms stimulating reading, a must for all those interested in fossils and the processes that have led to their preservation, but for a wider readership it should be a convincing plea for the relevance of taphonomy to the understanding of the nature of the stratigraphic record.

Gerhard C. Cadée,
Netherlands Institute for Sea Research
Den Burg,
Texel.
The Netherlands

PATTERNS AND PROCESSES OF VERTEBRATE EVOLUTION, by R.L. Carroll, 1997, Cambridge University Press, Cambridge, $85.00 (cloth), $39.95 (paper)

A century ago, vertebrate paleontologists such as Edward Drinker Cope and Henry Fairfield Osborn actively promoted their own, somewhat idiosyncratic ideas of evolution, based on their knowledge of the vertebrate fossil record. Fifty-five years ago, George Gaylord Simpson published *Tempo and Mode in Evolution*, which tried to show that the vertebrate record was consistent with the newly emerging Neo-Darwinian synthesis. Since that time, however, vertebrate paleontologists have not been major players in paleontologically-inspired debates over evolution (especially macroevolution and the punctuated equilibrium-species sorting debates). Although the vertebrate fossil record is not as dense and continuous as that of many invertebrates, our superior understanding of many living vertebrate groups would seem to be a solid foundation for important insights into evolutionary principles. When vertebrate paleontologists have been participants in the evolution debates in recent years, they have mostly played a reactive role, defending

Simpson and Neo-Darwinism against the challengers.

Thus, it is an important (and long overdue) event when a prominent vertebrate paleontologist such as Robert L. Carroll (whose 1988 tome, *Vertebrate Paleontology and Evolution*, is considered the successor to A.S. Romer's definitive text) examines the vertebrate record for its implications for evolution. As the dedication to Simpson indicates, however, Carroll's background and biases are on the conservative side, with a skeptical bias against many of the newer developments in evolutionary theory. This is particularly apparent in his criticisms of the punctuated equilibrium/macroevolution debate. In his first chapter, he introduces basic ideas about macroevolution, and points out that Darwin was wrong "in extrapolating the pattern of long-term evolution from that observed within populations and species" (p.8). In the next chapter, he concedes that "species that show little variability were obviously both common and long lived. Fossils showing transition between species are rare and confined to short stratigraphic intervals. Few well-studied examples from the record of fossil invertebrates show a pattern of evolution such as that predicted by Darwin, with gradual and progressive change within and between species over long periods of time" (p. 26). It would seem from these statements that he has just agreed with the basic ideas of punctuated equilibrium. Yet later in the chapter, he trots out the tired old arguments about incompleteness of the fossil record (ignoring the fact that stasis can be detected even in an incomplete record), the difficulty in assessing the relative prevalence of punctuation and gradualism (ignoring many recent examples that survey entire faunas), and the complaint that there is no mechanism to explain the long-term stability of species (which is not a liability, but a major challenge suggested by the macroevolutionary debate - conventional mechanisms of homeostasis, such as balanced polymorphism, or environmental stability, are insufficient to explain the stability of species over millions of years through well-documented climate changes).

He devotes the entire third chapter to reviewing examples of microevolutionary changes documented in living species (especially the Galapagos finches). Finally, in the fifth and sixth chapters, he discusses the patterns of evolution in the vertebrate record. Unfortunately, he confines his discussion primarily to late Cenozoic mammals, citing the summaries of Barnosky (1987, *Current Mammalogy* **1**:109-147), Martin and Barnosky (1993, editors, *Morphological Change in Quaternary Mammals of North America*, Cambridge University Press) and Barnosky *et al.* (1996, in *Paleoecology and Palaeoenvironments of Late Cenozoic Mammals*, edited by K.M. Stewart, University of Toronto Press). Carroll focuses on the few examples of gradual, anagenetic changes documented in these studies, while the clear message from their surveys is that the majority of Pleistocene mammals that have been studied show either stasis or random non-directional changes that result in no net change or new species. When these cases are added together, non-directional change or stasis far outweighs gradual change in Pleistocene mammals. More importantly, the classic Neo-Darwinian studies he cites in Chapter 3 are about gradual change in direct response to climatic changes. What Carroll fails to notice is that even the directional changes in Pleistocene mammals are not correlated with the frequent climate changes through the Ice Ages, and most species show no directional change through multiple climatic cycles. As Barnosky (1994, *Historical Biology* **8**:173-190) put it, " climatic oscillations on the multi-millennial scale may not stimulate speciation much."

Nor is it true that the Pleistocene is the only densely continuous, high-resolution mammalian record that could be studied in the macroevolution debate. The Eocene-Oligocene White River Group of the High Plains is equally dense and continuous on a timescale of less that tens of thousands of years, and can also be correlated with well known global climatic changes. Prothero and Heaton (1996, *Palaeogeogr. Palaeoclim. Palaeoec.* **127**:239-256) surveyed the entire White River Chronofauna over a 20 million year span of strata and found only a handful of gradual changes, and stasis in over 170 lineages. More importantly, those few gradual changes, and almost all the episodes of speciation and extinction documented in this interval do not coincide with known climatic events. In fact, during the largest climatic event of the Cenozoic (as documented by plants, soils, snails, reptiles and amphibians), 62 out of 70 lineages of mammals continue unchanged, clearly demonstrating that climatic change does not drive evolution or speciation in mammals.

Stasis is also prevalent in other areas where dense, continuous records of mammals have been documented, such as the early Eocene Bighorn Basin of Wyoming. Detailed monographs by Bown (1979, *Mem. Geol. Surv. Wyoming* **2**:151 p.), Schankler (1980, *Univ. Michigan Pap. Paleont.* **24**:99-114), and Gingerich (1989, *Univ. Michigan. Pap. Paleont.* **28**:97 p.) have shown that stasis is prevalent among most of the taxa during this interval (despite papers which feature the few apparent examples of gradualism). Although not that many complete faunas have been adequately surveyed, some exceptionally well sampled lineages, such as horses, are replete with examples of stasis and bushy, branching speciation (MacFadden, 1992, *Fossil Horses*, Cambridge Univ. Press). Instead, Carroll focuses on the gaps between lineages, and the few examples of anagenetic changes within lineages (p. 69).

In the next chapter, Carroll reviews the record of Pleistocene reptiles and amphibians, and must concede that they showed enormous stasis through the Ice Ages. But then he tries to dismiss this fact with the *ad hoc* statement that "this, however, can be seen as but one end of a spectrum of rates of changes, with certain mammalian groups on the other. It in no way supports Gould and Eldredge's assumption that most species are incapable of phyletic evolution" (p. 118). But if gradualism is rarer than Carroll admits, and reptiles and amphibians show nothing but stasis, then the spectrum is clearly weighted heavily toward stasis. This is exactly what Gould and Eldredge predicted.

Once these contentious issues have been covered, Carroll does an excellent job of reviewing many of the newer developments of evolution as exhibited in the vertebrates. Chapters 8 and 10 examine the issue of evolutionary constraints, but Carroll does not connect this to the issue of stasis in species. Chapter 9 summarizes conventional population genetics, which seems somewhat out of place in a book which focuses on mostly macroevolutionary issues. Carroll is at his best when he discusses the many exciting discoveries in development and embryology (Chapter 10), including the revolutionary implications of homeotic genes. Yet he fails to make the connection behind many of

these studies - that large-scale homeotic changes are just the kind of macroevolutionary, "hopeful monster", leaps in morphology that would lead to new species without gradual change. Such macromutations would explain the major changes in evolutionary *Baupläne* without intermediates, and their long-term stability since the major phyla and classes first appeared. He writes (p. 263) "it is not possible to demonstrate that changes brought about by mutation in developmental systems have never produced significant jumps from one phenotype to another. Many large gaps are known between the morphology of ancestral and descendant lineages, but most can be attributed to the absence of appropriate fossil-bearing beds in the intervening period". That's an *ad hoc* way to explain it, but such large homeotic changes would occur so rapidly (possibly even in a single generation) that not even the best fossil record would ever sample them. In this case, the support for the homeotic mutant-hopeful monster model would not come from the fossil record directly, but is supported by the prevalence of rapid changes followed by periods of stasis, and also by arguments about the prevalence of such changes in the living fauna, and the inviability of many intermediate forms (Frazzetta, 1975, *Complex Adaptations in Evolving Populations*, Sinauer).

The book concludes with reviews of the many excellent examples of evolutionary transitions now becoming better documented in the vertebrate record (particularly the origin of tetrapods, birds, mosasaurs and whales). The final chapter discusses major examples of evolutionary radiation in the vertebrate record, and briefly summarizes (but does not critique) research on plate-tectonic effects on evolution, and the mass-extinction debates. Unfortunately, the latest data on mass extinctions change so fast that this section has become dated already.

In summary, Carroll has written a provocative book that would be valuable for evolutionary biologists and paleontologists who wish to review the current understanding of vertebrate evolution. However, the reader should be aware that Carroll approaches the more contentious issues with Simpson-colored glasses, and sees very little merit in most of the evolution debates, because he misses the central points of the arguments, or sees only the cases that support his biases. A book such as this demonstrates that vertebrate paleontologists have too long been away from the "high table" and have been relegated to a role as minor players in the macroevolution controversy. Yet the quality of their fossil record is sufficient that vertebrates should have a much greater say in how we view evolution in the future. Hopefully, future vertebrate paleontologists will take up this challenge.

Donald R. Prothero
Department of Geology
Occidental College
Los Angeles
CA 90041

FOSSILS OF OHIO, edited by R.M. Feldmann and M. Hackathorn. 1996, Ohio Geological Survey Bulletin 70, 577 p.; $18.00 (paper)

Ohio is in the heartland of American paleontology, with such well-known fossils as Ordovician brachiopods, crinoids and trilobites around Cincinnati, the remarkable Devonian trilobites of Sylvania, Devonian fish from Cleveland and Pennsylvanian fish and amphibians of Linton. The 22 species of amphibians from Linton, including *Amphibamus* and *Ophiderpeton*, are one of the most diverse assemblages of Pennsylvanian amphibians known anywhere. *Dunkleosteus* and *Titanichthys* from the Devonian are two of the largest and most ferocious looking arthrodires known. I have seen the distinctive black *Phacops rana* from Sylvania or gray *Flexicalymene meeki* from near Cincinnati in museum displays in Tokyo, Sydney and Milan, and in rock shops in London, Toronto, Beijing, Nairobi, and Christchurch. These Ohio fossils are international ambassadors for North American paleontology.

Fossils are also in the hearts of many Ohioans, including dedicated members of the Mid-America Paleontology Society (MAPS), and this book is addressed to this largely amateur audience . Each chapter includes much introductory material, and takes pains to introduce diagnostic characters of fossil species and even keys. This is not to say that this is only a book for amateurs. The individual chapters were written by professional paleontologists. They give comprehensive species lists and numerous illustrations. It is an indispensable source for identifying fossils from Ohio, useful for amateur and professional alike. This book brought me up to date with the correct identifications of a number of common Cincinnati fossils such as the crinoid *Pycnocrinus dyeri* (no longer "*Glyptocrinus*") and the nautiloid *Cameroceras inaequale* (no longer "*Endoceras*"). Within my own specialty of paleobotany, the book includes Hans Kerp's recent emendations of Permian and Late Pennsylvanian seed fern leaves to *Autunia* and *Rhachiphyllum* (both formerly in "*Callipteris*").

The book is overly thick for a paperback, and the flimsy binding of my copy is already showing strain. This problem is exacerbated by wasteful use of space for plates and captions in the traditional style of paleontology, invented to overcome limitations of nineteenth century printing technology. A more engaging blend of text and images is now possible, and desirable.

All in all this is an indispensable reference for any one interested in fossils of the North American heartland, which of course are indigenous to rocks well beyond Ohio's borders and into Canada, and now are leading a global diaspora of fossil collectibles. With its very reasonable price, it is exceptionally good value. I recommend it highly.

Gregory J. Retallack
Department of Geological Sciences
University of Oregon
Eugene
OR 97403

COOL-WATER CARBONATES, edited by N.P. James and J.A.D. Clarke, 1997: Society for Sedimentary Geology, Tulsa, Oklahoma. SEPM Special Publication no 56; 440 p.; $79.00 (cloth, for members of SEPM), $ 111.00 (cloth, non-members).

Thomas H. Huxley, in his famous lecture "On a piece of chalk" (1868), stated: "The language of the chalk is not hard to learn, not nearly so hard as Latin, if you want to get at the broad features of the story it has to tell". In this lecture he compares the composition of the English chalk, with its numerous globigerinids and coccoliths, with the recently discovered deep-sea *Globigerina* ooze and concludes that the

English chalk must be a deep-sea deposit (and thus, we may infer, a cool-water carbonate). Of course, having learned a little bit more of "the language of the chalk", we no longer agree with all Huxley's views, nor with his statement that "the language is easy to learn", but still, reading his masterly lecture, we can understand that he was able to captivate his public.

Noel James explains, in his excellent introduction to *Cool-Water Carbonates*, that traditionally marine carbonates from the geological record became viewed as warm-water deposits and present day carbonate sedimentation was thought to be restricted to the tropics. In the "golden age of carbonate research" (1950-1980), studies of Recent marine carbonates, therefore, concentrated around such pleasant areas for diving as Florida, the Bahamas or the Great Barrier Reef. This view changed in the 1960's when information was collected on present-day calcareous sediments forming well outside the tropics, and it became clear that carbonates could form at all latitudes as long as input of terrigenous clastic sediment was low. I doubt whether the paper by K.E. Chave (1967, *J. Geol. Education* **15**: 200-204) was the turning point as James suggests. Already in the 1950's the use of oxygen isotope ratios as a paleothermometer by Urey and Emiliani had indicated that the average temperature in the Late Cretaceous was below 20°C, implying that most carbonates from that period must be of cool-water origin. Certainly the papers by A. Lees & A.T. Buller (*Marine Geol.* **13**: 67-73; & **19**: 159-198) in the early 1970's, also mentioned by James, were influential in changing our views. Cool-water carbonates were discovered on the northwest European shelf as far north as Spitsbergen, off South Africa and New Zealand, but the most extensive virtually pure carbonates were found on the shelf off southern Australia. As a consequence, some fossil limestones also were reinterpreted as cool-water deposits. Lees introduced his two widely accepted skeletal-grain associations: a "foramol" from temperate waters and a "chlorozoan" from warm water. Foramol is mainly debris of benthic forams and molluscs, as well as barnacles, bryozoans and calcareous algae. Chlorozoan includes significant contributions of hermatypic corals and calcareous green algae. Noel James, and with him probably most English-reading geologists, overlooked the fact that already in the 1940's part of the European Upper Cretaceous carbonates were interpreted as "boreal" and thus cool-water deposits (e.g. by J.A. Jeletzky, published in German), differing in faunal composition from the warmer carbonates from the Tethys area. Finn Surlyk's chapter on cool-water carbonate accumulations from the Late Cretaceous-Danian of the Danish Basin deals with part of this Boreal Realm. Gabrielle Carannante *et al.* in their contribution on Upper Cretaceous carbonates from Italy and Sardinia explain that even around the warmer Tethys, open-shelf, temperate-type foramol carbonates occurred. This book gives an up-to-date overview of our increased knowledge of cool-water carbonates.

In his introduction Noel P. James gives arguments to replace Lees' now well-known terminology (foramol by heterozoan; chlorozoan by photozoan). The term photozoan association emphasizes the light-dependent nature of biota due to their photosymbionts. These are real warm-water carbonates (bottom temperature > 22°C). He subdivides heterozoan associations (mainly biota not dependent on light) into sub-tropical, temperate, sub-polar and polar, based on their mineralogy and biota.

Of the 23 papers following James' introduction, 9 are devoted to modern environments (6 southern Australia, 1 New Zealand, 2 northern Europe). Seven papers deal with Tertiary environments (mostly from Australia) and another seven with Meso- and Paleozoic environments, with a good mixture of European and North American examples.

Many aspects of cool-water carbonates are covered. I missed the role of shell-crushing predators in the production of fragments of carbonate skeletons; very fine particles may be formed in this process as I have demonstrated (*Palaeontology* **37**: 181-202). For a discussion of the use of isotopic composition of carbonate-secreting organisms, I found the paper by Hossain Rahimpour-Bonab *et. al.* informative. It shows the many complications in using $^{18}O/^{16}O$ and $^{13}C/^{12}C$ ratios as proxies for temperature: different groups of organisms give different results. I was delighted to see *Adeona*, one of my "pet" bryozoans, secrete its aragonite skeleton almost in equilibrium with its environment. This bryozoan can thus be used in paleotemperature studies, provided diagenetic alteration is absent. But does this hold for all Bryozoa belonging to different genera, families or orders, some now extinct? Probably not.

Cool-Water Carbonates is a well-produced book, the illustrations are of high quality. (Stephen J. Gould - see his essay "Left snails and right minds" in *Dinosaurs in a Haystack* - may add fig. 7 of p. 145 to his collection of illustrations showing right-coiled gastropods as left-coiled). The book is a must for those working on carbonates, and a rich source of information for all other geologists. Despite study for more than 30 years, cool-water carbonates do not get the attention they need. In a recent textbook (*Sedimentary Environments*, edited by H.G. Reading, 3rd ed., 1996, Blackwell) they are mentioned, but the chapter on carbonate environments devotes >99% of its space to warm-water carbonates. Editors Noel P. James and Jonathan A.D. Clarke hope to change this neglect. I congratulate them on this book.

Gerhard C. Cadée
Neth. Inst. Sea Research
PO Box 59
1790 AB den Burg,
Texel,
Netherlands

EVOLUTION OF TERTIARY MAMMALS OF NORTH AMERICA: VOLUME 1. TERRESTRIAL CARNIVORES, UNGULATES, AND UNGULATELIKE MAMMALS, edited by C.M. Janis, K.M. Scott and L.L. Jacobs. Cambridge University Press, Cambridge, 691 p.: $260.00 (cloth).

This long-awaited publication is destined to become a standard reference for many years to come. At the price, it had better be. It is primarily a taxonomic summary to generic level of large mammals in the North American Tertiary (not including Quaternary, except for a very brief summary by Russell Graham) by an assembled multitude of specialists. Each chapter is very uniformly presented, surprisingly so for a multi-author volume, and includes reconstructions and illustrations of selected taxa, cladograms and range charts. An important feature is the consistent code of

localities, which gives the volume great cross-referencing capability. There is no chapter on the fauna of the Rattlesnake Formation (late Miocene, Oregon), but if you would like one (as I recently did), a list can easily be extracted from this volume by looking for the locality code (PN12) in each chapter.

The summary of North American Land Mammal "Ages" by Don Prothero is useful, but considering the way their radiometric ages and international correlation have bounced about in recent years, one wonders how long it will be good. Duchesnean is now respectable and as old as middle Eocene. Chadronian is late Eocene. The Clarkforkian has withered to only a half million years duration. The Pliocene/Pleistocene boundary is at 1.8 Ma.

Another initial summary chapter by Scott Wing provides an overview of paleobotanical evidence for mammalian habitats. It is an impressionistic vision of vegetation, limited in its application to mammals, which commonly are found in different beds, and presumably different habitats, than the fossil mammals.

Many changes in oreodont taxonomy are proposed by Bruce Lander, for whom such a perennial favorite as *Merycoidodon culbertsoni* becomes *Prodesmatochoerus periculorum*. The recommended change is based on a zealous interpretation of priority and suitability of type specimens. A traditional oreodont taxonomy has been offered by Margaret Stevens (1996, cited in this volume), and the editors have helpfully supplied an appendix of synonymous names.

The volume is graced by a large number of spirited and attractive restorations mainly by Brian Regal, with some also by Marlene Donnelly, Ted Browne, Paula Denham, Henry Galiano, Larry Martin, Wendy Zomlefer, Rick Spears, and Margaret Stevens. Otherwise it is sparsely illustrated with line drawings of teeth, cladograms and range charts. The text, however, is concise, authoritative and clearly presented. I found it a pleasure to consult, but a chore to read.

As an essential reference this book belongs in every geological library. The price will prevent its acquisition by many.

Gregory Retallack
Department of Geological Sciences
University of Oregon
Eugene OR 97403-1272

HIMALAYAN CAMBRIAN TRILOBITES, by P.A. Jell and N.C. Hughes, 1997, Special Papers in Palaeontology 58, 113 p.; $40.00 (paper)

This monograph is of the high quality that one expects from Special Papers in Palaeontology and begins with a detailed page of contents followed by the abstract. The introduction is mostly concerned with the history of geological and biostratigraphic studies of the Himalayan region and the challenges the region poses. Following this is a detailed discussion of the geologic setting of the region. The next section is on biostratigraphy, and reviews various outcrop areas and correlates them. After this is a section on provincialism and paleobiogeography that discusses the confusion of the affinities of this region and provides solutions. A short section on computer restoration of tectonically altered specimens is next. The final and longest section of the monograph (p. 18-105) is systematics.

The Himalayas have long been a poorly understood, yet important, region for paleontological correlation. Past work has often produced more problems than solutions by over splitting species, and in some cases outright fraud. The Himalayas are a key area allowing correlations between China, Kazakhstan and Australia. But the remoteness of the region, its harsh environment and structural complexity have made work in the region a slow process. This work helps bring the Cambrian trilobites of the region into the twentieth century.

The opening section is on the geologic setting of the region. This section is very interesting and imparts many of the difficulties of working in an area with such a high degree of structural complexity. The most obvious difficulty is in correlating isolated outcrop belts. However, this section could have been improved by a map that included all of the place names and regions used in the discussion. By carefully reading the text and cross referencing places it is possible to find all of the areas discussed, but it was confusing at times. Other than this problem, the section deals well with the difficult geology of the Himalayas.

Jell and Hughes have done a wonderful job of providing a biostratigraphic framework for the Cambrian of the Himalayan region by placing it into the Chinese sequence of zones. Before this revision, the framework of Himalayan Cambrian trilobite stratigraphy was that of Reed in 1910 – even in papers published this decade. This work has allowed an accurate correlation between isolated outcrop belts that was not available before.

One of the fascinating aspects of this monograph was the removal of tectonic distortion in some of the specimens. The results look so good after the corrections that if the plates did not provide before and after pictures, it would be difficult to imagine how distorted the specimens were.

This section was followed by the systematic portion of the monograph. The descriptions of the taxa are clear and concise. The corrections for tectonic distortion have allowed Jell and Hughes to synonymize many taxa, producing a realistic picture of the diversity of the region. All 32 plates are beautifully photographed and reproduced making examinations of the described details easy and straightforward. Their quality adds greatly to the utility of this monograph. Overall this monograph is of very high quality, and I would recommend it to all Cambrian trilobite workers.

Michael B. Cuggy
School of Geography and Geology
McMaster University
Hamilton, Ontario, L8S 4L8
Canada

DINOSAURS OF AUSTRALIA AND NEW ZEALAND AND OTHER ANIMALS OF THE MESOZOIC ERA, by John A. Long. Harvard University Press, Cambridge, 188 p.; $39.95 (cloth)

Of the making of dinosaur books, there is no end. Many of them like this handsome book have a "coffee table" format and are pitched at a popular audience. But "Dinosaurs of Australia and New Zealand" stands out for its intriguing subject matter, its high standard of dinosaur art and its inclusion of technical data.

Australasian dinosaurs are intriguing because

they remain so incompletely known. This book colorfully and skillfully introduces a surprising diversity of creatures, often based on a single bone or fossil tracks. Among the many surprises are Early Cretaceous ornithomimosaurs, oviraptorosaurs, ankylosaurs and neoceratopsians: all better known from much younger Cretaceous rocks in the northern hemisphere. On the other hand, Early Cretaceous Australian allosaurs and labyrinthodonts were anachronisms long extinct elsewhere in the world. Also introduced is an Australian pterosaur pelvis probably not suited to bipedal locomotion. The early Triassic therapsid *Lystrosaurus* may have been on every continent after all, with the discovery of fossil tracks in Australia. A variety of dinosaur bones are now turning up in Western Australia, far from the well-known sites of Queensland and Victoria. Among mammals, two monotreme species and a placental are now known from a handful of Early Cretaceous specimens. One can sense the excitement of research in an early phase of discovery, where new information is still rapidly accumulating. Long's book is quite up-to-date for 1998 and is littered with personal communications of work in progress.

Dinosaur art has long colored the way we look at these beasts, and has now developed very high standards indeed. Many of the reconstructions in this book are outstanding, and include several by Peter Trusler and Peter Schouten made famous as Australian postage stamps. Also notable are reconstructions of marine reptiles by William Stout and Brian Choo. Tony Windberg's memorable Aussie allosaur, snorting warm mist on a chilly fall morning, graces the dust jacket and an inside spread.

I am amazed that readers and reviewers balk at technical terms from igneous petrology, soil science or invertebrate paleontology, but acquiesce in such language as this- "the rodlike lesser trochanter is lower than the greater trochanter and separated from it by a shallow (or no) cleft, a very shallow anterior intercondylar groove distally and a thin 'sheet-like' lateral condyle." Perhaps it is acceptable because quasi-medical. Nevertheless, many professionals will enjoy such passages that give important details, all set off in special sections headed "technical data." Come to think of it, I have met a few six year olds (including my own son at that age) who enthusiastically roll off names like *Pachycephalosaurus*. Some kids get a taste for technical jargon.

The book has few flaws. A spectacular picture of a nearly complete pliosaur from Queensland is undescribed in the text. And there are other Mesozoic millipedes than the ones found with *Siderops*. Long advocates the idea that Late Cretaceous extinction of dinosaurs was presaged by decline due to a concatenation of deteriorating circumstances. My own familiarity with the North American evidence on which this view is based (Australian and New Zealand records remain inadequate) inclines me more to extinction from acid rain and other effects of asteroid impact. In this debate, however, we are both in good company.

All in all, this book is an exceptionally good value for the price, an attractive and intriguing account of discoveries in progress. It succeeds well both as a work of art for the general public and a technical reference.

Gregory J. Retallack
Department of Geological Sciences
University of Oregon
Eugene OR 97403-1272

A SHORT HISTORY OF PLANET EARTH: MOUNTAINS, MAMMALS, FIRE AND ICE, by J.D. Macdougall, 1996; John Wiley & Sons, New York, 266 p.: $14.95 (paper).

A practicing paleontologist (I haven't yet got it right) is perhaps the wrong person to review a book such as this. It is, as the cover blurb indicates, designed as an introduction for the lay reader. To incorporate a history of the Earth in a single volume, for a lay or any other audience, it is of course necessary for details to be ignored and perhaps even for uncertainties to be painted over. I am sure that this would be an irritation to many specialists, as it was to me, but the book is not targeted at a professional audience, so perhaps we should suffer in silence.

The book is essentially chronological in arrangement with a few digressions. It begins with a chapter on 'reading the rocks', which contains a brief discussion of the time scale, classes of rocks, the structure of the earth and plate tectonics. From this we progress through the 'Early Days' of accretion and differentiation and a short discussion of the Archean. 'Wonderful Life' borrows a title from Stephen Gould, but the topic predates that discussed by him; it is about the emergence of life in the Archean. We then move into the Proterozoic before digressing into a discussion of plate tectonics, geological correlation and radiometric dating. After the Cambrian Explosion, the Paleozoic and the Mesozoic we take another digression into global catastrophes (mass extinctions) before returning to the chronological trail with the Cenozoic and the Quaternary (the Great Ice Age). The final chapter is more or less about the future and concentrates on the finite nature of mineral resources as well as terrestrial and extraterrestrial hazards. A glossary and a short section on further reading follow.

To write a history of the planet requires a broad, if not detailed, knowledge of many disciplines over a wide sweep of time, something that very few geoscientists possess. Therefore, to compile a book like this most geoscientists would either depend on input from colleagues or from other printed sources. The latter course seems to have been the option preferred in Macdougall's book. This creates an immediate problem in that, because of the rate of change of knowledge near the end of the 20th century, books tend to be rather dated as soon as they hit the shops. This is particularly true in paleontology that seems to be undergoing paroxysmal paradigm perturbations unmatched for much of its history.

The book is, for the most part, fairly well written and I could detect no typographical errors (no doubt due to the advent of spell checkers). However, there is the occasional turgid and turbid sentence that requires re-reading to gain understanding. There seems to be an underutilisation of figures, with a limited number being used. In this regard, I wonder how a lay person would understand the difference between a prokaryote and eukaryote when there are no illustrations and when the glossary lists eukaryote as: "An organism with cells containing a nucleus, chromosomes, and other internal structures (eukaryotic cells). This type of cell typifies all organisms except the bacteria and cyanophytes"! This is poorly written and explains little. Furthermore, the development of the eukaryote cell

from prokaryotes is stated to have occurred when one prokaryote "engulfed another, intending, it is presumed, to consume it. Instead, the engulfed cell carried on, living in happy symbiosis and being modified along the way". Surely symbiosis preceded indigestion!

There are other problems with the paleontological side of the book, in part because of the reliance on secondary sources. For instance, a figure is reproduced from Gould's *Wonderful Life* that shows the famous Burgess Shale *Hallucigenia* upside down, an error which was corrected several years ago. Macdougall also seems to be unaware of something rather closer to home; i.e. that *Australopithecus* was certainly bipedal, with the pelvis and leg structure of Lucy and the Laetoli trackway demonstrating this rather conclusively.

It may be because of my relative ignorance of tectonics that I found the best parts of the book to be those that dealt with descriptions of the tectonic development of the Appalachians and Himalayas. I found them easy to read and straightforward enough to be able to easily visualize the processes involved. I suspect that this topic is one that Macdougall knows much more about, and it is not simply my ignorance that makes these portions of the book better than those dealing with the history of life. I also found the arrangement of the chapters sensible, in that it was essentially chronological (befitting a history), with diversions into explanations of major concepts more or less as they were required to continue the narrative. In summary, I found the book rather disappointing in its inexpert tackling of paleontological themes, but the remainder easy to read and informative.

John Laurie
AGSO, GPO Box 378
Canberra ACT 2601
Australia

FOSSILIEN IM VOLKSGLAUBEN UND IM ALLTAG: BEDEUTUNG UND VERWENDUNG VORZEITLICHER TIER- UND PFLANZENRESTE VON DER STEINZEIT BIS HEUTE, by E. Thenius and N. Vávra, 1996, Senckenberg Buch, Frankfurt, 179 p.; DM 38 (cloth).

Fossils have a strange fascination not only to paleontologists and paleobotanists, but through the ages, also to most humans. Thenius and Vávra carefully examine this long-time interest and infatuation from the perspective of modern paleontologists and paleobotanists. This beautifully illustrated book is about fossils in folklore and in our everyday life. The authors first explain the different ways fossils are preserved and summarize the many groups of organisms that are common fossils. Although the emphasis is on fossilization and fossils that have historical significance and artistic uses, such as amber, vertebrate bones and ammonoids, the excellent introduction is applicable to all fossils and is explained in simple terms that amateurs and beginning students will appreciate.

Thenius and Vávra illustrate and discuss the long history and worldwide use of fossils to create and construct many imaginary creatures that were used so effectively in early sagas and folklore, particularly Greek and Norse sagas. Extensions of these creatures into forms with some familiar human or animal traits were common and resulted in the invention of many forms such as unicorn horse-like forms, giants (based on mastodon teeth), dwarfs, one-eyed monsters, and an assortment of other wonders for the wide-eyed astonishment of listeners and readers. Perhaps one of the most universal of these creatures is the dragon, some flying, others not, which appear in many cultures around the world. Often used as a basis for sculptures in the form of griffons, gargoyles, and other statuary, they may perform useful duties as sculptured rain downspouts or water fountains, wall decorations and as signs of strength and bravery in heraldic coats-of-arms and flags.

The use of fossils has been widespread as an inspiration for works of art and many art forms. Fossils appear repeatedly on postage stamps, as decorative vases, boxes, and interest pieces, and their images are copied on buttons and jewelry. Of course, fossiliferous limestones are widely used as building stones, paving stones, clock faces, wall facades, wall-facings in lobbies, boardrooms, and other parts of buildings, and as table tops and counters. The gorgeous luster of amber has long been used in necklaces and other jewelry. Early *Homo sapiens* quite faithfully captured in cave paintings the various animals that they hunted and probably used these paintings in story-telling and teaching. Some of this fossil art is preserved in figurines on old coins and, more recently, in souvenir medals struck for special occasions and purposes.

Included in the book is a well-written, concise section of fossil fuels, their significance, and a short history of how humans have used these fuels, how they were located and excavated. In typical thoroughness, a glossary, very complete reference list, an overview of the classification of life, and an index complete the volume.

Fossilien im Volksglauben und im Alltag is beautifully illustrated and a magnificent work of art. It presents clear comparisons between a particular folklore and the fossil that served as a source for that lore. In addition to its obvious interest as a collector's discussion book, this lovely volume has many possibilities for teaching and reference. It contains an excellent coverage of how fossils, in such a great variety of ways, influence our cultural history and our everyday lives. Written in non-technical German, this readable text is ideal for those who have been away from German for a while, as it will refresh your language skills. You will be captivated by this book with its many unique photographs and illustrations.

June R.P. Ross and Charles A. Ross
Departments of Biology and Geology (respectively),
Western Washington University,
Bellingham, WA 98233.

PALEONTOLOGICAL EVENTS: STRATIGRAPHIC, ECOLOGICAL, AND EVOLUTIONARY IMPLICATIONS: edited by Carleton E. Brett and Gordon C. Baird: 1997, Columbia University Press, New York, 604 p.: $65.00 (cloth).

This welcome volume should be required reading for all paleontologists. It places great emphasis on the need to understand the detailed sedimentary and stratigraphic deposits in which fossils occur and to use that information to interpret the broader significance of fossils and the fossil record. The papers clearly demonstrate the advantages of extensive background knowledge in sedimentology, biostratigraphy, and stratigraphy, as well as paleontology. They are divisible into: biosedimentary classification (4), Mid-Cam-

brian (1), Upper Ordovician (5), Lower and Middle Silurian (4), Middle and Upper Devonian (3), Pennsylvanian (1), mid-Cretaceous (1) and Recent (1). It has a restricted stratigraphic and limited regional coverage.

The volume is divided into two parts. The first nine papers are about relatively short-term geologic events and how fossils are preserved and concentrated in thin sedimentary layers. The term Lagerstatten is used to identify a concentration of fossils in one or a few beds. Brett, Baird and Speyer recognize four types of single event fossil Lagerstatten based on factors such as mass mortality, rates of burial, types of sedimentary processes, and amount of transportation. Pemberton and MacEachern examine high-energy tempestites. Five articles by Miller, Cuffey, Schumacher and Shrake, Holland, and Frey discuss various Upper Ordovician fossil occurrences. Johnson relates evolution and ecology of Silurian pentamerid brachiopods to particular water depth zones. Brett and Taylor interpret the famous *Homocrinus* beds of western New York and southern Ontario as instantaneously buried communities. And Hickerson considers clusters of Middle Devonian trilobites on bedding planes as tools for recognizing widespread depositional events in Iowa and northwestern Illinois.

The second part of the volume (eleven papers) deals with longer-term events. The biostratigraphic interpretations are well documented and they are good examples of using sedimentary data in conjunction with paleontologic data. Eagan and Liddel explore Middle Cambrian stromatolites as bioevents. Loduca and Brett discuss the special circumstances of *Medusaegraptus* Silurian occurrences. Jeppson's thoughtful paper on the anatomy of the mid-Silurian Ireviken Event as a scenario for 'Primo episode' and 'Secundo episode' events is a particularly welcome contribution to the volume. Jeppson brings his wide interests in ocean-chemistry changes and their relationship to faunal crises, and places them in a global context that he relates to Milankovitch obliquity patterns. Wolosz looks at Middle Devonian reefs, and McGhee examines Late Devonian faunal events. West, Feldman and Maples discuss faunas of eight Upper Carboniferous event beds in Kansas. Middle Cretaceous bioevents at different scales are the subject of Sageman and coauthors. Rollins and West look at an event horizon on a recent beach in Georgia. And Ausich examines encrinite banks in the Paleozoic and Triassic.

Some terminology used in the volume poses a problem. Brett and Baird use the tem 'epibole" with a different meaning than its original definition. 'Epibole', according to the generally accepted definition (see AGI Glossary of geology) is (a) a synonym of acme-zone or (b) the deposits accumulated during a 'hemera'. A 'hemera' is (a) the geologic time unit corresponding to an acme-zone (Buckman, 1893); the time span of the acme, or greatest abundance, in a local section of the taxonomic entity (Buckman, 1902); also the period of time during which a race of organisms is at its apex of evolution; or (b) as the AGI Glossary points out, a term that is sometimes incorrectly applied to a biostratigraphic zone (body of strata) comprising the time range of a particular fossil species.

Although Brett and Baird recognize that 'epibole' is an old term, they choose to redefine it 'to denote an unusual abundance of a taxon that is normally rare to absent'. This is a completely different definition and an inappropriate redefinition of an otherwise well-understood term. Brett and coauthors have misused 'epibole' in a similar manner in a number of their earlier publications. A new term for Brett and Baird's concept is needed to avoid further confusion. They seem to be describing a 'happenstance abundance'.

Paleontologists will find this an informative and useful book. It brings together the need to detailed consideration of sediments and the stratigraphic framework in which fossils are found. It includes excellent examples, which are carefully interpreted. The writing is clear and the discussion of complex topics is well handled.

Charles A. Ross and June R. P. Ross
Western Washington University
Bellingham, WA 98225.

DINOSAURS-THE ENCYCLOPEDIA, 1997; and Supplement 1, 1999; by Donald F. Glut, McFarland & Company, Inc. Publishers, Jefferson (North Carolina) and London; 1076p. and 442p. respectively; hardback $145.00 and $60.00 respectively.

How does one bring together, in a comprehensive way, all we know about dinosaurs? Moreover, how can one possibly compile a comprehensive list of all dinosaurs when every week a new discovery increases the number of the world's dinosaur record? Perhaps the answer is that it is not possible, as the task is far too reaching, never mind daunting, for one person, or publisher, to undertake. Yet, Donald Glut, author of the far less ambitious *The Dinosaur Dictionary*, first published in 1972, has risen to the occasion and has produced the most comprehensive overview of dinosaurs ever attempted.

The book has five principle parts. Part 1 is "A Background," which gives the reader information of "The Mesozoic Era" (the "Age of Dinosaurs"), and sections on "Dinosaur Origins and Relationships", "Birds and Dinosaurs" (where he discusses *Archaeopteryx,* which is omitted in his "Dinosaur Genera" section, that, parenthetically, includes "*Protoavis*"), "Dinosaur Success," and a review of the " 'Warm-Blooded' versus 'Cold-blooded' Dinosaurs" and "Dinosaur Extinction." In all these sections, Glut provides a brief overview, touching upon the salient parts of each. The result is a brief, but relatively balanced, presentation.

Part 2 is concerned with "Dinosaurian Systematics", and here Glut presents a cladistic consensus of the higher taxonomic categories and the accepted monophyletic arrangement agreed on by most vertebrate paleontologists. Glut offers a cautionary note that the systematic arrangement of taxa is ever changing due to new discoveries and re-interpretation of data.

The "meat and potatoes" of this encyclopedia is, unequivocally, Part 3 –"The Dinosaurian Genera". Here we get a list, in alphabetical order, of all the dinosaurs known at the time of publication. Each dinosaur genus is discussed in enough detail to provide the reader with all the key facts pertaining to each taxon. Most entries include one or more photographs or drawings. Many of these illustrations have been borrowed from the original sources, yet a number of photographs have been taken by Glut himself. The result is a cornucopia of visual vignettes intertwined within the course of the text. Many of these illustrations, while not aesthetically pleasing, are nonetheless very informative. The drawings and photographs

show the reader how complete, or in many cases, how incomplete, a number of the dinosaur holotype specimens really are.

Parts 4 and 5 are concerned with "*Nomina Nuda*" and "Excluded Genera" (from the Dinosauria), respectively. Although anticlimactic, these two sections are, nonetheless, necessary in any comprehensive work such as this. A list of (institutional) abbreviations, a glossary of terms (mostly osteological, anatomical and geological) and a hefty bibliography complete the volume.

Since its publication, this tome has been faced with a conundrum: how to update or revise it to include new dinosaur genera. The thought of revising the main work by inserting new taxa, in order to maintain the alphabetical order, would be overwhelming. Fortunately, updated additions to the main volume will appear as their own "mini" volume, more like chronological appendices. Clearly there are drawbacks to this arrangement; however, the cost advantages to both the purchaser and publisher are clear.

Now, who should buy this and subsequent volumes? Certainly libraries, amateur dinosaur enthusiasts, teachers of introductory dinosaur courses (for non-science majors), and even professional dinosaur paleontologists will identify this work as a "must have". I cannot overstate the amount of important information contained between the covers of this incredible book and its first supplement. While there are shortcomings in some of the treatments of the dinosaur genera, these are certainly easily, and understandably, dismissed. On the whole this encyclopedia is an indispensable resource.

Robert M. Sullivan
Section of Paleontology and Geology
The State Museum of Pennsylvania
300 North Street
Harrisburg
Pennsylvania

GIDEON MANTELL AND THE DISCOVERY OF DINOSAURS, by Dennis R. Dean. Cambridge University Press, New York, 1999, 290p.: $69.95 (cloth).

Gideon Mantell, the country doctor who named *Iguanodon* in 1825 and described much of the geology and paleontology of the South Downs of Sussex, has long needed a well-researched scientific biography. Mantell has found his champion in Dennis Dean, who contributes a diligent and scholarly work that brings out many aspects of Mantell's long-neglected career and its records, including a cache of materials in New Zealand that is given deserved recognition.

As the title of the book suggests, much of its first half is devoted to the studies of fossil strata in England that eventually led to the discoveries of the great Mesozoic reptiles – not just dinosaurs, but ichthyosaurs, plesiosaurs, pterosaurs, and also the mosasaurs of Europe, as well as the fossil mammals in the rocks that overlay them. Dean reminds us that when Mantell first published *Fossils of the South Downs* in 1822, there was no geological system of rocks known for England, no idea of how old these rocks were, and only the beginning sense that they could be lined up stratigraphically. Extinction was accepted but its causes were unknown, and it was not accepted that new species could evolve. Mantell had a role in the most exciting time in the history of geology until the discovery of plate tectonics. Whether he was an underestimated star, as Dean argues, or merely a bit player, as historians to date have maintained, is central to the book.

The discovery of dinosaurs is a difficult problem to define. But then, so were the dinosaurs. Dean maintains that Mantell was the most important figure in recognizing that the remains of these ancient quadrupeds were reptilian, herbivorous, and different from all other animals. Dinosaurs were not named until 1842, when Richard Owen brought them outside and above the status of other reptiles. The story begins more than 20 years earlier, when isolated teeth, fragmentary limbs, and dissociated vertebrae of many quadrupeds were emerging from quarries, collected mostly by workmen. *Megalosaurus* and *Iguanodon*, the first two described animals that eventually turned out to be dinosaurs, were first known from scraps that recalled the crocodiles and other large mysterious forms that had been described by Cuvier in France as early as 1800. Cuvier, for want of a better assignment, had included these anomalous French vertebrae with those of fossil crocodiles and gavials from the same area, and so it was natural for Mantell, William Buckland, and others to compare their English bones to those of crocodiles and lizards. But these men did not then realize that they were dealing with a completely new group, and Mantell was often as wrong about what he was seeing as he was right. Cuvier was first shown a couple of Mantell's worn fossil teeth by Lyell, and pronounced them from a rhinoceros, which devastated Mantell, who thought they were reptilian. Even Buckland agreed that the teeth might have come from overlying mammal-bearing beds. But Dean shows that Lyell learned from Cuvier the next day that the baron had second thoughts, and realized that they might be quite different from anything known. Unfortunately Mantell does not seem to have known this at the time, and so the weight of Cuvier's first impression held great sway.

Eventually, however, Mantell sent a better series of teeth to Cuvier, who suggested that they might be of a giant herbivorous reptile; and Mantell, visiting the London collections, was advised by Samuel Stutchbury to consult an iguana jaw. The rest is history, perhaps, but circumstances suggest that others seem all along to have pointed the impressionable and deferential Mantell in the right directions. Cuvier may have been closer than anyone to recognizing dinosaurs, and was certainly the best scientist of the bunch; but ultimately, it matters less who "discovered" the dinosaur than how the concept developed in its scientific and cultural setting.

On this point even Dean's assiduous scholarship may not be enough to sustain the thesis of Mantell's primacy. Mantell was only one of a number of real or imagined rivals that Owen took pains to bludgeon politically and rhetorically throughout his long career. The main differences between Owen and Mantell were that Owen was smarter and better connected, more ambitious, more aggressive, and more successful. Mantell was a better writer and certainly a better friend. Owen was a superb anatomist but never a field worker; Mantell had strong local connections and much first-hand field experience, but was a less assiduous anatomist. Both men could assimilate and explain the work of others, but Owen could synthesize previous work into new paradigms for old questions,

whereas Mantell was clumsy at best with theory. Both men had ultimately unhappy home lives, but Mantell's was far the worse. (Dean sparsely covers Mantell's legendary neglect of his family, much of which was unrecorded or later obliterated.)

Mantell suffered many reversals in his life, but Dean refrains from analyzing character flaws that may have contributed to them. Dean's book is interesting in part because it doesn't accept the traditional view of Mantell but challenges it. The Mantell that emerges is more gifted and original, his works more influential and ground-breaking, his opponents overrated, his insights brilliant, his collections invaluable. Dean charitably recommends alternative assessments by Adrian Desmond, Nicolaas Rupke, and other scholars, though he largely dismisses their arguments. Perhaps some sympathy on all counts is warranted: it was a different age than ours, their issues and concerns were not framed in our terms, and they were complex people. Mantell was scarcely better or worse than the others.

Despite some historiographic problems (Owen was not sympathetic to the natural theologians, and hated being lumped with creationists) and outdated statements about current understanding of fossil vertebrates, this book is highly recommended, absorbing and readable, with fascinating details. (How many of us knew that a portion of Mantell's twisted spine was displayed in the museum of the Royal College of Surgeons until its destruction during World War II?) The main drawback to this slim but informative volume is its price, which fits a trend that is rising progressively faster than an academic's budget.

Kevin Padian
Museum of Paleontology
University of California
Berkeley

GEORGE GAYLORD SIMPSON, PALEONTOLOGIST AND EVOLUTIONIST, by Léo F. Laporte. Columbia University Press, New York, 2000, 332 p.: $16.00 (paper).

It hardly needs stating that G. G. Simpson is a legend. His name is attached to a vast number of academic and popular papers and books ("He wrote 100 papers in his first 10 years!" I was once told). He brought paleontology into the fold of the modern evolutionary synthesis. He vigorously opposed typological thinking in biology. But his presence is no longer literally or intellectually immediate, in part because many of his contributions have become so thoroughly integrated into the paleontological corpus.

In his recent biography, *George Gaylord Simpson, Paleontologist and Evolutionist*, Léo Laporte purposely takes as his subject not so much the man as his work. Laporte himself was trained as an (invertebrate) paleontologist and stratigrapher, and in this biography he has taken each of Simpson's major works—beginning with his doctoral dissertation—and placed it into its contemporary intellectual context. In other words, Laporte's goal is to explain why many of Simpson's works were so important in their time.

The ultimate result is an admirable companion to Simpson's own autobiography, *Concession to the Improbable* (1978). Although geared toward the (earth) scientific initiate, the vocabulary used in Laporte's book is not overly technical. A glossary is not provided, but most technical terms, including dated terms like "kinetogenesis," are adequately explained in the text. The writing in Laporte's book is neither as racy nor as polished as that of some other recent biographies (e.g., Desmond, A. and J. Moore, 1991, *Darwin: The Life of a Tormented Evolutionist*, and Desmond, A, 1997, *Huxley: From Devil's Disciple to Evolution's High Priest*). Nevertheless, reading the book is time well spent.

The first chapter is a "Biographical Introduction" that chronicles the broad outlines of Simpson's life and broader outlines of his achievements. The chapter is a re-writing of a previously published article by Laporte. The personal details of Simpson's life provide necessary context for later chapters. However, this first chapter is not as fully integrated with the others as one might hope and reads as if it were merely appended to the rest of the text. For example, despite the introduction in chapter one, the reader is repeatedly informed who Anne Roe was and when Simpson was married to her.

In chapter two, Laporte discusses the rise of paleobiology (by whatever name) as a field. In certain respects, this is the least satisfactory chapter. Many of Simpson's seminal, biologically oriented papers are reviewed and their relevance to the growth of paleobiology is discussed. This aspect makes the chapter excellent as summary; however, Laporte's deferral of fuller discussions of these subjects to later chapters makes for awkward and repetitious reading. I would rather have seen the entire chapter folded into the relevant parts of others.

Chapter three describes the crucial "Summer of 1924." It was during this time that Simpson became acquainted with W. D. Matthew of the American Museum of Natural History, who later secured for him a job following his graduation from Yale University. The chapter contains a wealth of interesting detail not found in Simpson's autobiography, such as the primary motivation for Matthew's sending Simpson and others into the San Juan basin (Matthew wanted to fill a gap in the record of fossil horses).

Chapter four comprises a discussion of Simpson's preoccupation with the works of Charles Darwin. Laporte charts the development of Simpson's worldview from childhood Presbyterianism to teenage apostasy. Simpson's copious writings about Darwin are examined with the aim of illustrating Simpson's own beliefs. However, one of the goals set forth in the chapter is inadequately attained. Namely, Laporte wishes to illuminate Simpson's personal "ontological and epistemological views" (p. 73). It is true that Simpson insisted on purely physical explanations for scientific questions, but this fact in and of itself does not characterize him a monist/materialist, nor is this insistence—virtually ubiquitous among practicing scientists—synonymous with logical positivism. Positivism is a rather more complex epistemological position. In summary, Laporte does little to characterize Simpson's epistemology and less still his ontology, whatever those might have been.

In chapter five, Laporte turns to Simpson's research in South America and the Paleocene of Montana, including his statistical insights into populations and the nature of fossil taxa. Anyone familiar with the Cope–Marsh legacy, wherein even the slightest variants were described as different species, will testify to the importance of recognizing that fossil species were composed of variable populations. Chapter six then builds on this background, demonstrating how

Simpson's populational viewpoint eventually led to his theoretical work on evolutionary processes.

Laporte's perspective of conceptual evolution is particularly effective as he turns, in chapter seven, to *Tempo and Mode in Evolution*, often regarded as the most important of Simpson's works. As Laporte earlier states, "The genesis of *Tempo and Mode* was itself evolutionary, not revolutionary" (p. 29). In this chapter, he takes the major themes of *Tempo and Mode* and traces their beginnings to some of Simpson's early work. Other discussions include the importance to Simpson of Dobzhansky's works on genetics and evolution. Finally, Laporte ardently opposes the notion that *Tempo and Mode* merely demonstrated that the fossil record is consistent with the theory of evolution by natural selection; rather, he argues, Simpson was both integrative and creative in his pursuit of making sense of the fossil record. In particular, as Mayr (1982, *The Growth of Biological Thought: Diversity, Evolution, and Inheritance*, p. 608) also has noted, Simpson showed that although the known fossil record does not contradict neo-Darwinian theory, population genetics is by itself insufficient to account for widely varying rates of evolution. Simpson's original contributions were especially in trying to explain this latter observation.

Chapter eight follows Simpson as a "Mentor for Paleoanthropology," from his early influence (promulgating the modern evolutionary synthesis in physical anthropology) through his later criticisms of anthropological works, especially as regards taxonomic practices, on which Simpson had already demonstrated himself an authority.

Simpson's extensive works on biogeography are critically examined in chapter nine. Laporte is an effective apologist for Simpson's early opposition to the idea of continental drift (prior to the geophysical revelations of the late 1960s). Chapter ten presents a unique analysis of Simpson's use of diagrams. Here, Laporte argues that Simpson utilized "visual induction" and "visual deduction" as species of reasoning analogous to induction and deduction in mathematical language.

The penultimate chapter describes the reasons why Simpson joined and left the several institutions where he worked during his long life, from the American Museum to the Museum of Comparative Zoology at Harvard University. It contains much personal detail that was omitted, understandably, from Simpson's autobiography. In the book's final chapter, Laporte relates the peculiar circumstances by which Simpson's novella, *The Dechronization of Sam Magruder*, came to be published and how the protagonist and his activities mirror Simpson himself. As other authors have previously pointed out, the parallels between Simpson and Magruder are intriguing.

In short, Laporte's biography is enjoyable and informative, despite some organizational difficulties. It correctly states that Simpson's autobiography left many questions unanswered, and Laporte succeeds in throwing light into dark corners. His emphasis on tracing the strands of Simpson's thought throughout his career makes for an engaging and profitable read.

Krister T. Smith
Department of Geology and Geophysics
Yale University
New Haven

Upcoming Meetings of Paleontologic Interest

2001

Oct. 13-17	IGCP 458 - Triassic/Jurassic Boundary Events: Mass Extinction, Global Environmental Change, and Driving Forces, South-west England Field Workshop http://www.pal.nhmus.hu/IGCP458/staudries_announce.html
Nov. 4	PS-Sponsored Short Course: Brachiopods, GSA Annual Meeting, Boston, MA
Nov. 5-8	Technical Program, GSA Annual Meeting, Boston, MA http://www.geosociety.org/meetings/2001/index.htm
Nov. 10-11	The Florida Paleontological Society Fall Meeting, Gainesville, FL fps@flmnh.ufl.edu
Nov. 21-24	European Palaeontological Association: 3rd European Palaeontological Congress, Leiden, NL http://www.pal.nhmus.hu/EPA/leiden.htm
Dec. 15-19	Annual Meeting of the Palaeontological Association, Copenhagen, DK http://www.palass.org

2002

Jan. 2-6	Society for Integrative and Comparative Biology in Anaheim, CA http://www.sicb.org/meetings/2002/index.php3
Feb. 4-8	Forams 2002, Perth, AUS http://www.geol.uwa.edu.au/forams/
Feb. 14-16	Taphos 2002, Valencia, ESP http:// paleopolis.rediris.es/paleontologia/Taphos2002/index.html
March 10-13	2002 AAPG/SEPM Annual Meeting, Houston, TX http://www.aapg.org/meetings/annual2002
March 24–27	GSA Northeastern Section Meeting, Springfield, MA
April 3–5	GSA North-Central – Southeastern Joint Section Meeting, Lexington, Kentucky
April 11-12	GSA South-Central Section Meeting, Alpine, TX
May 7-8	GSA Rocky Mountain Section Meeting, Cedar City, UT
May 12-15	GSA Cordilleran Section Meeting, Corvallis, OR
July 6-9	The First International Palaeontological Congress, Sidney, AUS http://www.es.mq.edu.au/MUCEP/ipc2002/index.htm
Sept. 12-22	I.U.G.S. - International Subcommission on Jurassic Stratigraphy, Sixth International Symposium On The Jurassic System http://www.dst.unito.it/6thisjs
Oct. 7-10	VIII Congreso Argentino de Paleontologia y Bioestratigrafia. Corrientes, ARG garralla@arnet.com.ar

Nov. 29-30 Reunión Anual de Comunicaciones de la Asociación Paleontológica Argentina. Diamante, ARG
cidzucol@infoshopdte.com.ar