The GB3D Type Fossils Database

By Mike P. A. Howe (Head, National Geological Repository, British Geological Survey)

Life has just gotten easier for palaeontologists working with British macrofossil types. The UK has a history of palaeontological research extending back over two centuries, including major contributions to taxonomy. This has included defining many thousands of species and subspecies, and their associated type specimens. Current procedures for defining a new taxon require the selection of a single holotype specimen and publishing its registration number and repository. In the early nineteenth century, common practice was more variable and less precise. It was unusual to select a single specimen as ‘type’, but the author’s collection from the type locality might be referred to as the ‘type specimens’. Specimen registration numbers were rare, and frequently figured specimens were simply referred to as “from the collection of Mr. ....” Often there was no way of knowing the present whereabouts of such material.

The British Geological Survey has been working with partners the National Museum Wales, Cardiff; the Sedgwick Museum, Continued on Page 2...

Patricia Kelley Recognized with the Nation’s Highest Undergraduate Teaching Honor

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The University of North Carolina Wilmington’s Patricia Kelley, professor of geology, has been selected to receive one of four U.S. Professors of the Year awards, the University announced today. Sponsored by the Carnegie Foundation for the Advancement of Teaching and administered by the Council for Advancement and Support of Education (CASE), the awards recognize professors for their excellence in undergraduate teaching and mentoring.

“It is a great honor to be selected for this award,” said Kelley. “The world of higher education has changed since I began teaching, but since my first day in the classroom, I’ve always worked to inspire my students to think critically and encourage their personal and professional growth.” Continued on Page 3...
Cambridge; the University Museum of Natural History, Oxford; and the Geological Curators’ Group, representing a number of regional, national and university museums, in a major project to overcome this. The GB3D Type Fossils project (http://www.3dfossils.ac.uk/) is an online database of British type macrofossil specimens held by most of the main British paleontological type repositories. Entries may be searched for by taxonomy, type status, age, lithostratigraphy, locality, institution and registration number. The results also include collector and/or donor, bibliography and other comments. More significantly, the project has involved high resolution photography of all the specimens (typically 4,368 x 2,912 pixels), and stereophotography – the results of which are being made available as red-cyan anaglyphs. In addition, two thousand of the more suitable specimens have been laser scanned and captured as 3d digital models.

The inclusion of over 2000 downloadable 3d digital models is the truly innovative part of the project. The models may be viewed on the website, or downloaded in .OBJ or .PLY format for other applications, including 3d printing. They are ideal for viewing in apps such as MeshLab® on an iPad®, iPhone® or Android (see http://gb3dtypefossils.blogspot.co.uk/2013/08/launching-gb3d-fossil-types-virtual.html) for detailed instructions. The ability to download and make 3d prints of type specimens has reduced the need for researchers to travel, or to loan fragile and irreplaceable specimens.

The project was funded by Jisc from 2011 to 2013, and continues as part of the UK’s National Geoscience Data Centre (NGDC), part of the British Geological Survey (BGS) (http://www.bgs.ac.uk/). Jisc is a charity championing the use of digital technologies in UK education and research (http://www.jisc.ac.uk/).

Work continues on the development of upload facilities for new entries and an API (Application Programming Interface), which will allow the direct linking of third party applications. We are currently seeking the resources to extend the database to microfossils, and to European and International type material. For current news, please visit the project blog (http://gb3dtypefossils.blogspot.co.uk/).

Mike Howe publishes by permission of the Director of the British Geological Survey. Email: mhowe@bgs.ac.uk
Kelley Receives Top Teaching Honor

...continued from Page 1

During a luncheon today in Washington, D.C., at the National Press Club, Kelley and professors from Stanford University, Pennsylvania State University Berks, and Monroe Community College were announced as the Professors of the Year for the following categories: master’s universities; doctoral and research universities; baccalaureate colleges; and community colleges. The Carnegie Foundation for the Advancement of Teaching and CASE also named 31 state-level winners.

Once nominations are submitted, CASE assembles a panel of judges comprised of deans, professors, education reporters, and government and foundation representatives who select 100 preliminary winners. A second panel then narrows these finalists to 24. The Carnegie Foundation for the Advancement of Teaching then appoints members of a third panel that selects the professors for the national categories and state winners.

Earlier this year, Kelley received the 2014 Board of Governors Award for Excellence in Teaching, the highest honor given to faculty in the UNC System for teaching excellence. Kelley is also the recipient of the Association for Women Geoscientists Outstanding Educator Award, as well as UNCW’s Chancellor’s Teaching Excellence Award, Distinguished Teaching Professorship Award and Distinguished Faculty Scholar Award. She also was named a fellow of the American Association for the Advancement of Science, 2006.

ANNOUNCEMENTS

12th International Symposium on the Ordovician System

The 12th International Symposium on the Ordovician System will be hosted on the campus of James Madison University in Harrisonburg, Virginia, June 8-11, 2015. Visit the web site at http://www.jmu.edu/2015ISOS/.

The scientific sessions in Harrisonburg will be preceded and followed by geological excursions to study the Ordovician successions of the Appalachian Mountains of the Eastern U.S. A field excursion is also planned for the Ordovician carbonate and siliciclastic deposits of Oklahoma (site of the Katian GSSP), and a field excursion is planned to the spectacular succession of dark shale in Idaho.

Themes for the 12th ISOS include Ordovician climate, isotope stratigraphy, biostratigraphy, regional stratigraphy, paleoecology and paleobiogeography, and we welcome contributions on all aspects of Ordovician geology.

The deadline for registration, abstracts, and payments is March 7, 2015. We look forward to seeing you in Virginia in 2015!

Steve Leslie and Dan Goldman, on behalf of the organizing committee
P a g e 4

**Sepkoski Grants**

Paleontological Society International Research Program (*PalSIRP*)

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 2015, the Paleontological Society will award fifteen grants of US $1000. These grants will be made directly to individuals and not to institutions. Grantees will be selected by a committee of the Paleontological Society based on the quality and feasibility of the proposed research. Consideration will be given to paleontologists of all levels ranging from graduate student research to research by active retirees. *PalSIRP Sepkoski Grants* are named in honor of Dr. J. John Sepkoski, Jr., founder of the program. Dr. Sepkoski died at age 50 in 1999.

**Applications for a PalSIRP Sepkoski Grant** must include the following, four items, all typed in English. See website ([paleosoc.org](http://paleosoc.org)) for further information.

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

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

3. **Research proposal**, no longer than two pages, single-sided divided into the following sections: (I) A project title; (II) A brief description of proposed research; (Iia) The significance of the research, both regionally and globally, and (III) The general uses funds from the *Sepkoski Grant*.

The subject matter covered by grant proposals may be in any field under the discipline of paleontology/paleobiology. Applicants should look over the *Journal of Paleontology* as a guide to acceptable topics. Appropriate ancillary uses of *Sepkoski Grant* funds include (but are not limited to) salary support, domestic and foreign travel, and equipment purchase. Requests for field expenses, publication costs, attendance at scientific meetings, and related aspects to any of these areas is acceptable. If you receive a grant we ask that a brief accounting of how the funds were spent be sent a year after the grant is received.

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

The cover sheet and items (2-4) must be sent by e-mail (in Microsoft Word or plain-text) as a single attachment, (not in multiple separate attachments), to the following address:

parsley@tulane.edu

Please do not submit proposals by post!

Proposals must be received by April 1, 2015 to be considered for 2015 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. Awards are usually made in November and December.

Applicants for the 2015 grant program should contact their North American or European Community referees by e-mail to determine their willingness to act as recommenders. It is also suggested that applicants send a copy of their proposal to their referees for informational purposes. We stress on the strongest terms the importance of this.

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

Dr. Ronald L. Parsley,

*PalSIRP Sepkoski Grants*

Department of Earth & Environmental Sciences
Tulane University, New Orleans, LA 70118 USA
Sepkoski Grant Awardees for 2014


Bannikov, Alexander, Borisyak Paleontological Inst., RAS, Moscow, *Field excavations of marine fishes from the Paleocene/Eocene boundary deposits in the North Caucasus.*


Bratishko, Andriy, Luhansk Taras Shevchenko University, Ukraine, *Miocene teleostean fish fauna (otoliths) from the Zavetnoe, Crimea, Ukraine.*


Ivanov, Aleksandr, Dept. Sedimentary Geology, Inst. Earth Sciences, St. Petersburg University, Russia, *Late Paleozoic neoselachian sharks: dental morphology, diversity, distribution and phylogenetic relationships.*

Nemyrovska, Tamara, Inst. Geological Sciences, Nat. Acad. of Sciences of the Ukraine, Kiev, *Analysis of the conodont succession in the Donets Basin, Ukraine, to evaluate potential biostratigraphic markers for GSSP at the Moscovian/Kasimovia (Middle/Upper Pennsylvanian) boundary.*

Novikov, Igor, Borissiak Paleontological Inst., RAS, Moscow, Russia, *Differentiation of the amphibian faunas in the Early Triassic of Eastern Europe.*

Perkovsky, Evgeny, Schmalhausen Inst. of Zoology, National Acad. of Sciences of the Ukraine, Kiev, *Sakhalinian amber, an exceptional window to the temperate Eocene of Asia (primitive ants vs. advanced dipterans).*

Rosina, Valentina, Borissiak Paleontological Inst., Laboratory of Mammals, RAS, Moscow, *Postcranial morphology of bats (Chiroptera, Mammalia) from the Late Eocene localities of Ukraine: implications to paleoecology and evolution.*

Sirenko, Olena, Inst. of Geological Sciences, Nat. Acad. Of Sciences of the Ukraine., Kiev, *Palynological studies of Sarmatian deposits of Ukraine for purpose of their stratification, correlation and reconstruction of the paleogeographic formation conditions.*

Tolokonnikova, Zoya, Kuban State University, Geological Faculty, Regional and Marine Geology, Krasnodar, Russia, *Late Devonian-Mississippian Bryozoans from Eurasia.*

Sennikov, Andrey, Borissiak Paleontological Inst., RAS, Moscow, Russia, *Coprolites of tetrapods – the window in the Vyaznikovian pre-crisis Terminal Permian continental ecosystem.*

Wagner, Jan, National Museum in Prague, Czech Republic, *Ursine bear origin: phenotypic characteristic and taxonomic status of the earliest representatives of subfamily Ursinae.*
Second Circular.—The congress follows the invitation by the International Commission on Stratigraphy (ICS) of the International Union of Geological Sciences (IUGS) to be held in Graz (Austria), July 19-23, 2015. The congress will be open to all topics in stratigraphy. The technical program will range from the Archean to the Holocene, across all techniques and applications of stratigraphy and the discoveries that the stratigraphic record reveals about the Earth system. In addition, it will also serve as the primary venue for ICS business, for ICS subcommisions to meet and awarding the ICS stratigraphy prizes.

Venue and organization.—The congress will take place on campus of the University of Graz, Austria. It will be organized by the Institute of Earth Sciences at the University of Graz in cooperation with other Austrian Earth Sciences institutions representing the Austrian Earth Science community (e.g., Geological Survey of Austria). The chair is Werner E. Piller, Professor at the University of Graz, chair of the Austrian National Committee of Geosciences, the Austrian Commission on Stratigraphy and the Austrian National Committee for the IGCP. The organization and logistics will be guaranteed by the local organizing committee.

Location.—Graz is the second largest city of Austria and a well-suited location for organizing international conferences. Graz is also well-known for cultural highlights, which is reflected in its status as a UNESCO World Culture heritage site. Graz is located about 200 km south of Vienna and can be reached by plane (from Vienna, Munich, Frankfurt, Berlin, Stuttgart and Zurich) or by train.

### Important dates

<table>
<thead>
<tr>
<th>Deadline</th>
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<tr>
<td>Abstract submission</td>
<td>24 April 2015</td>
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<tr>
<td>Conference registration and payment:</td>
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<tr>
<td>Early registration:</td>
<td>29 May 2015</td>
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<tr>
<td>Standard registration:</td>
<td>from 30 May 2015</td>
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<td>Field-trip registration and payment:</td>
<td>30 April 2015</td>
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### Registration rates

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<td>Euro 400.--</td>
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<tr>
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<td>Euro 150.--</td>
<td>Euro 200.--</td>
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<tr>
<td>Seniors (65 &amp; Retired)</td>
<td>Euro 220.--</td>
<td>Euro 300.--</td>
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<tr>
<td>Accompanying persons</td>
<td>Euro 50.--</td>
<td>Euro 70.--</td>
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### Social program

A variety of social activities will be offered: [http://strati2015.uni-graz.at/programme/](http://strati2015.uni-graz.at/programme/)

### Accommodation

The organisation of accommodation for the congress participants will be managed by the Graz Tourist Office, the official tourism unit of the city of Graz: [http://www.graztourismus.at/](http://www.graztourismus.at/)

Contact: Ms. Gabriella Reindl T: +43 / 316 / 8075 – 60; F: +43 / 316 / 8075 – 55
strati@graztourismus.at

### Contact

If there are any conference inquiries please contact us:
Payment inquiries: strati@graztourismus.at
Conference homepage: [http://strati2015.uni-graz.at/](http://strati2015.uni-graz.at/)
Conference e-mail: strati2015@uni-graz.at
Personal contact conference chair: werner.piller@uni-graz.at
Postal address: 2nd International Congress on Stratigraphy - Strati 2015
c/o: Institute of Earth Sciences, Department of Geology and Palaeontology
Outreach and Education Grants for 2015

The Paleontological Society works to increase the public’s awareness and understanding of paleontology by enhancing formal and informal educational opportunities. The Paleontological Society Outreach and Education Grant provides support to our members for programs and activities involving educational outreach and community engagement.

Potential fundable projects include, but are not limited to, field trips to fossil sites and/or museums for teachers and pre-college students, educator training and curriculum development, participation in local community initiatives, development of educational materials for classroom use, and website or other online material development.

The subject matter covered by outreach proposals may fall within any subdiscipline of paleontology/paleobiology. Particularly encouraged are projects that (1) include opportunities for undergraduate students to become involved in paleontological outreach to younger students or the public, (2) create new educational “apps” or other technologies, and/or (3) produce educational materials that could be distributed more widely through the PS website.

Prior recipients of a PS Outreach and Education Grant must wait one year before being eligible to submit another application (e.g., a 2014 grant recipient must wait until 2016 to submit another proposal). Prior recipients must also submit their required final report on the funded project before being eligible to apply for a second award.

1. A project proposal, three to five pages in length, which must include: a project title, names and contact addresses of participating personnel, the proposer’s Paleontological Society Member Number, a brief synopsis of the project, target audience (e.g., grade level, in-service teachers, the public), project description, goals of the project, expected outcomes (including how they will be assessed), timeline, a discussion of the significance to the science education community.

2. A detailed, itemized budget with justification of the uses of the PS Education & Outreach funds. We cannot pay overhead or indirect costs. Matching funds from other sources are strongly encouraged.

3. A one page CV for each of the project personnel.

Deadline: Deadline for submission is Friday, March 27, 2015.

Submissions: Email all application materials to Peg Yacobucci, Chair, PS Education & Outreach Committee: mymover@bgsu.edu. Electronic files should be in .pdf, .doc, or .docx format.

Review Process: Grantees will be selected by a subcommittee of the Paleontological Society’s Education & Outreach Committee. Evaluation criteria include the goals, significance, feasibility, creativity, and likely impact of the project, and the soundness of the budget. Recipients will be notified by May 15, 2015.

Grant Award Procedures: Grant awards can be made directly to individuals or to institutions. Please be advised that if a grantee opts to receive the funds directly, the Paleontological Society is required to issue an IRS 1099 form at the end of the calendar year. The grant funds may or may not be taxable; grantees must make that determination themselves. The Society cannot offer tax advice.

Grantees are required to submit a follow-up project report by March 2016 detailing the project’s outcomes. Details on the reporting requirements will be sent to all grantees.

To assist PS members interested in doing public outreach, the PS Education Committee has written a short pamphlet, “A Guide to Outreach: Engaging the Public with Paleontology”. This short guide will help you plan your own outreach efforts, from identifying key ideas to include to finding a venue and developing a specific activity. Bringing paleontology to new audiences can be tremendously rewarding for you and have a real impact on your participants. It’s also great fun! We hope you will be inspired to get out there and share your love of paleontology! You can find the guide in the “Educational Resources” section of the PS website: http://paleosoc.org/ed_resources.html.
Society Awards for 2014

Strimple Award

HÉCTOR GERARDO PORRAS MÚZQUIZ

Schuchert Award

SHANAN PETERS
University of Wisconsin

Paleontological Society Medal

ERLE KAUFFMAN
Indiana University

Thanks to those who served as Society committee members, liaisons, representatives, and managers:

Program Coordinator: Thomas Olszewski, tomo@geo.tamu.edu
Education & Outreach Committee: Margaret (Peg) Yacobucci, mmyacob@bgsu.edu
Membership Committee: Margaret Fraiser, Chair, mfraiser@uwm.edu
Distinguished Lecture Series Coordinator: Peter Wilf, pwilf@psu.edu
Auditing Committee: Greg Dietl, dietl@museumoftheearth.org
Committee on Fellows: Michael Foote, Chair, foote@geosci.uchicago.edu
Financial Management and Investments Committee: Roy Plotnick, Chair, plotnick@uic.edu
Nominating Committee: David L. Fox, Chair, dlfox@umn.edu
PALSIRP–Sepkoski (Paleontological Society International Research Program) Committee: Ronald L. Parsley, Chair, parsley@tulane.edu
Student Research Grants Committee: Marc Laflamme, Chair, marc.laflamme@utoronto.ca
Paleontological Society Medal Committee: Philip D. Gingerich, Chair, gingeric@umich.edu
Charles Schuchert Award Committee: Philip D. Gingerich, Chair, gingeric@umich.edu
Strimple Award Committee: Steven M. Holland, Chair, stratum@uga.edu

Pojeta Award Committee: Steven M. Holland, Chair, stratum@uga.edu

AAAS Representative to Sections E and G: Roger D. K. Thomas, roger.thomas@fandm.edu
AGI Advisory Committee Members: Sandy Carlson, sjcarlson@ucdavis.edu
AIBS Representative: Sandy Carlson sjcarlson@ucdavis.edu
ANAPS Representatives: Douglas H. Erwin, erwind@si.edu and Roger D. K. Thomas, roger.thomas@fandm.edu
Archives Liaison: William Maher w-maher@illinois.edu
Ballot Canvass Committee: Stephen T. Hasiotis, hasiotis@ku.edu and Paul Selden, selden@ku.edu
Best paper, Journal of Paleontology. Committee appointed by Editors, Steve J. Hageman, hagemansj@appstate.edu, and Brian Pratt, brian.pratt@usask.sa
By-Laws Revision Committee (activated as needed): Roger D. K. Thomas, roger.thomas@fandm.edu
Web Manager: Leif Tapanila, tapaleif@isu.edu
Priscum Editor: Matt Powell, powell@juniata.edu
Social Media Editor: Phoebe Cohen Phoebe.A.Cohen@williams.edu

Thanks to those who served as Society committee members, liaisons, representatives, and managers:
Are you taking advantage of all your membership benefits?

The Society is pleased to announce that all members are eligible for substantial discounts on books published by many university presses, as well as the Treatise on Invertebrate Paleontology and publications of the Palaeontological Association. We are grateful to the publishers for their generosity!

Log into the Members-Only PS page (rock.geosociety.org/membership/paleo/) for discount codes. Note that these discounts are for Society members only. Please do not distribute!

Indiana University Press: Receive 30% off list prices of Indiana University Press books (sale items excluded). Enter the discount code at checkout. View their paleontology titles here: www.iupress.indiana.edu/paleontology

Johns Hopkins University Press: Receive a 25% discount when you use the discount code. This applies to all publications marketed by JHU Press. Website: www.press.jhu.edu


University of Chicago Press: Receive a 30% discount when you use the discount code. This applies to all publications marketed by the University of Chicago Press books division. Website: www.press.uchicago.edu

Treatise on Invertebrate Paleontology: Members are eligible for a 20% discount on hard-copy volumes of the Treatise on Invertebrate Paleontology. To receive

Journal of Paleontology & Paleobiology: 40% off the cost of Gold Open Access. PS members pay only $1,500; non-member rate is $2,500.

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your discount, you will need to order by fax (785-864-3636) or phone (785-864-3338) and provide the code Paleosociety2010. See the Treatise website www.paleo.ku.edu/treatise for prices and availability.

Palaeontological Association: Discounted member rates on publications of the Palaeontological Association (www.palass.org).


Interested in requesting funds for your conference session or fieldtrip?

Organizers of Paleontological Society sponsored events can request funds from the Society to support students attending fieldtrips and speakers (who would not normally attend) of conference sessions. Contact Program Coordinator Tom Olszewski (tomo@geo.tamu.edu) for details.

Reviewer: Joshua S. Slattery (Univ. of South Florida)

The lacustrine deposits of the Green River Formation of Wyoming, Utah, and Colorado preserve one of the most extraordinary early Cenozoic fossil records in North America, if not the world. This is especially true for the Fossil Butte Member (FBM) of the Green River Formation exposed in southwestern Wyoming, which is renowned by paleontologists, private fossil collectors, commercial fossil dealers, and even politicians for its excellent preservation of fossil vertebrates, invertebrates, and plants that lived during the early Eocene adjacent to and within Fossil Lake. The geology, history, fossil collection methodology, fossil preparation techniques, paleontology, and paleoecology of the FBM is documented in detail by Lance Grande, one of the foremost experts on the Green River Formation and its faunas, in his new book The Lost World of Fossil Lake: Snapshots from Deep Time. In this book, Grande offers a glimpse into a single fossil community during the early Eocene and explains the importance of its fauna and flora to understanding the paleoecology and evolution of Cenozoic biotas.

The Lost World of Fossil Lake begins by introducing the reader to the Green River Lake system and the FBM by discussing their ages, paleogeographic changes, stratigraphic relationships, and depositional environments. The various full-color diagrams, paleogeographic maps, and photographs accompanying the text help visualize the concepts being discussed. Chapter 2 examines the scientific and commercial history of the fossils from the FBM as well as the numerous individuals and families that have been involved in the collection and study of its biota. This chapter also provides a detailed synopsis on the methods used to collect fossils from the FBM, which transitions into a discussion in Chapter 3 on how the well-preserved fossil material from the FBM is prepared for study and presentation.

In Chapter 4, Grande briefly covers the classification of fossil organisms, which leads into Chapters 5–23 that systematically review the fossils documented from the FBM including bacteria, mollusks, arthropods, fish, reptiles, birds, mammals, green algae, plants, and trace fossils. With each description, Grande includes a detailed discussion about their classification, closest modern relatives, biogeographic relationships, paleoecology, and what these fossils can tell us about the paleoenvironment and paleoecology in and around Fossil Lake during the early Eocene. The attractive full-color photographs of each organism that accompany the text description makes this book an excellent resource for the identification of fossils from the FBM by any student or collector of this biota. The use of this book as an atlas is also facilitated by the clear and concise manner in which the chapters are systematically organized.

In Chapter 24, which is the final chapter to discuss the FBM in detail, Grande brings together the paleoecological and paleoenvironmental information presented in the previous chapters to form a comprehensive picture of the early Eocene ecosystem that existed in and around Fossil Lake. In addition to discussing paleoecology, Grande also delves into the taphonomy of this
Konservat-Lagerstätten and discusses how the various fossil organisms from different habitats came to be preserved in the FBM. The book is then rounded off by various appendices, a glossary of terms, list of references, and indices for both taxa and subjects.

Overall, The Lost World of Fossil Lake is a well written, well organized, and concise overview of the FBM and its fossils, which is paleontologically the most significant unit of the Green River Formation. The full-color diagrams, maps, and photographs throughout each chapter make this book a marvelous display, which will make anyone that opens it appreciate the scientific and aesthetic value of the fossils from the FBM. Lance Grande has created an admirable piece of work that is highly recommended to anyone interested in the FBM, Green River Formation, Early Cenozoic biotas, exceptional preservation, or even just paleontology.


Reviewer: Cynthia D. Crane (Aurora Fossil Museum)

What an enjoyable read! This book begins with a background of the history of Mexican paleontological research. From the pre-Hispanic Aztec belief of “Quinametzin” to modern-day discoveries, this book combines a variety of paleontological sub-disciplines into a multi-faceted reference volume of Mesozoic paleontology in Mexico.

I really enjoyed reading this book and learning about the Cretaceous fauna of Mexico. I particularly liked the utilization of location maps included in most of the chapters. These maps not only show the reader the geographic location of the studies addressed in the book, they also give the reader a visual account of what regions have been explored and documented. Furthermore, the location maps also provide the reader with a sense of potential research areas and possibilities in the Mesozoic strata of Mexico.

I particularly liked the chapter on the history of Mexican paleontology and discovery. The fact that this history only extends back eighty years is intriguing, and Guzman-Gutierrez and Rivera-Sylva’s detailed account of the stories behind Mexico’s major discoveries is very entertaining and engaging. Another chapter I found very interesting was the research presented on the Plesiosauria, including the account of the discovery of the first plesiosaur with extensive soft tissue preservation. Other chapters focusing on paleogeography and paleoenvironment, turtles, lepidosauromorphs, crocodyliforms, ichthyosaurs, pterosaurs, saurischian and ornithischian dinosaurs, vertebrate tracks, and a recent study on the Cretaceous-Paleogene boundary round out this volume.

In closing, I would suggest Dinosaurs and Other Reptiles from the Mesozoic of Mexico to those who are interested in Mesozoic paleontology. The layout, content, and chapter lengths flow well making this book easy to read and the material easy to absorb.

Reviewer: Danita Brandt (Michigan State Univ.)

Is there a more enviable person on Earth than Riccardo Levi-Setti? Professor Emeritus of physics at the University of Chicago, former director of the Enrico Fermi Institute, Guggenheim Fellow, Fellow of the American Physical Society, recipient of the Order of Merit of the Italian Republic, and the Leonardo da Vinci Award of the Order Sons of Italy in America, inventor of the high-resolution scanning ion microprobe...and author of three photo-rich volumes on the subject of his avocation, trilobites. Levi-Setti’s first book, Trilobites: A Photographic Atlas (1975) is a classic, a revelation in its time for lavish full-page high-resolution black-and-white photographs and its cross-over appeal to both professionals and enthusiasts. The Atlas included up-to-date summaries on trilobite classification, morphology, behavior, and in a felicitous collaboration with trilobitologist Euan Clarkson, the definitive treatment of the physics of the trilobite eye. A second, expanded edition of the Atlas appeared in 1993. Now, nearly four decades after the first Atlas, Levi-Setti has published the book says he has long wanted to but could not because of the prohibitive production costs—a full-color compilation of trilobite photos. The Trilobite Book: A Visual Journey is not a third edition of the original Atlas. It is instead a very personal tour of trilobites the author has known and the expeditions he took in collecting them.

Why color? Levi-Setti addresses this question in his first chapter, but all one has to do is open the original Atlas and Visual Journey side-by-side to appreciate the “wow factor” that color adds to the images. Levi-Setti offers a physicist’s justification for the use of color, invoking the physics of the eye (naturally!), but justification for the use of color is not needed—the images speak for themselves. This is not the book for basic facts of trilobite paleobiology, ecology or systematics; Levi-Setti refers those readers to the internet. A Visual Journey contains tidbits for those with an interest in the history of trilobite research—Levi-Setti followed in Joachim Barrande’s footsteps through Prague, offers first-hand account of the evolution over 11 years of dealing with Moroccan trilobite collectors and trilobite artisans, and pays homage to the Tucson Gem and Mineral Show as a showcase for amazing trilobites. Levi-Setti is not formally trained in geology, so he can marvel at the “zig-zag” pattern of strata, and his brief written accounts are accessible to the non-specialist reader. The book’s chapters are organized geographically by expedition: Bohemia, Morocco, Western North America (more accurately “North America”, as many examples come from east of the Mississippi River), Eastern Newfoundland, UK, Russia, and the Tucson Gem and Mineral Show. In the last chapter, “The eyes of trilobites”, Levi-Setti revisits the topic that gained him credibility among paleontologists three decades ago. For a discussion of the physics of the trilobite eye, see either edition of the Atlas.

Now that Levi-Setti has fulfilled his bucket-list wish of assembling a color trilobite compendium, his readers can assemble their wish list for any future editions of A Visual Journey.

The emphasis in this volume clearly rests on aesthetic
Book Reviews

appeal. A statement of scale is given in each figure caption, usually given as the length in mm of the entire specimen. A scale bar might have detracted from the aesthetics, but it would be easier for the reader to process the difference between the largest trilobite (*Acadoparadoxides briareus*, at 327 mm) and the smallest (*Daguinaspis ambroggii*, 14 mm) at a glance by comparing the relative sizes of a scale bar. In the absence of a scale bar, the largest and smallest trilobites occupy the same space on a page, a perception that the brain is likely to erroneously processes as “same size.”

A number of the specimens will be familiar to readers of the earlier Atlases, but their rendition in color makes them new. Most of the trilobites are from Levi-Setti’s personal collection, which is considerable, and most are beautifully prepared, which makes the rare exceptions all the more jarring. Why include unprepared specimens of *Flexicalymene meeki* when so many beautifully prepared specimens are readily available?

Despite referring readers to the internet for details of trilobite paleoecology, one unattributed interpretation is included in the figure caption to Plate 42, a suggestion that the assembled trilobites massed in order to fertilize deposited eggs.

Levi Setti does not explain how the images were manipulated for publication, but several instances of uncommented-upon-photoshoppy blips of color attest to digital interventions (e.g., Plate 148).

Some photo captions contain outdated specimen information.* Ideally, the author or publisher would host an “updates” webpage. Lacking the facility to do that (I asked), perhaps another website (e.g., Sam Gon’s www.trilobites.info) could accommodate a “supplemental information” feature where trilobite workers could submit updates.

Every reader of *A Visual Journey* will identify their own “OMG” image. For this reviewer it was Plate 47, a slab of Upper Ordovician Ktauoa Formation from Morocco covered with sea stars and ophiuroids, and featuring five *Selenopeltis buchii*. A Visual Journey would be a great gift for anyone who answers “Trilobite!” to the question, “What is your favorite fossil?”

*For trilobite geeks, corrections to captions (thanks to David Rudkin, Mario Cournoyer, and Kevin Brett):

Plate 130: Upper Ordovician, Neuville Formation, Grondines Member, Neuville, Québec, Canada. The specimens of *Flexicalymene* are *F. senaria*.

Plate 134: Collingwood Member, Cobourg Formation

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**Reviewer: Phil Novack-Gottshall (Benedictine Univ.)**

If jellyfish had brains, they would welcome how humans have screwed up the world’s oceans and climate. And Lisa-ann Gershwin’s *Stung* is an ideal platform to treat recent jellyfish outbreaks as the proverbial canaries in the coalmine that is the world’s oceans.
Gershwin is a marine biologist raised and educated in California, now Director of the Australian Marine Stinger Advisory Services, and she knows her jellies, both harmless and fatal. (Note that here I use “jellyfish” in the casual sense, although the book covers ctenophores, cubozoans, siphonophores, scyphozoans, and a host of different gelatinous cnidarians and early metazoans, many with—to me at least—delightful names such as coronates, Irukandjis, and blubbers).

The book is a quick read, full of amazing anecdotes on jellies and their impact, well-studied case studies on jellyfish blooms, and their relationships to broader discussions of the full gamut of Anthropocene anthropobscenities: climate change, ocean acidification, overfishing, eutrophication, exotic invasions, red tide, you-name-it. A sample of such anecdotes: jellyfish blooms have shut down nuclear warships and nuclear and coal-fired electric plants because they blocked cooling intakes, they have capsized boats, they have prevented fisheries hauls by disabling nets, and of course they have caused many vacationers to curse the beach. And these are just from the first few pages.

A poster child of such blooming jellies, the comb jelly *Mnemiopsis* can produce up to 10,000 eggs per day (each hatching within an additional day), blossoming to 500 jellies per cubic meter, each eating ten-times its body mass per day (doubling its size in the process), and voraciously ingesting more than 30% of the available stock of zooplankton (including eggs, larvae, and immature fish) per day. After all that, they will become cannibalistic on their own larvae when all other food is exhausted. Not surprising, such blooms can wreak enormous, and seemingly overnight, havoc on marine ecosystems, both by consuming important links in the food chain, by outcompeting other consumers, by disrupting cohorts of future populations, and ultimately by moving (sometimes irrevocably) the ecosystem into an alternative state simply more suitable to jellyfish than to fishes and other marine animals. The transformation of the Black Sea by this (and other) exotic species ranks as one of the most powerful and best-studied catastrophes, and is described powerfully in the book. "By 1993, *Mnemiopsis* comprised up to 95 percent of the total wet weight bio-

mass" of all life in the Black Sea, an amount "ten-times the weight of all fish caught" worldwide that year (page 54). Optimistically, Gershwin also illustrates how this crisis has rebounded to some extent (although far from complete), and by extension, the forces needed to ameliorate similar crises worldwide.

The largest issue remains—and it is the resounding theme of the book—that jellies are simply the benefactors of nearly all impacts that humans have pummeled to the world’s waterways. And once introduced, largely because of their opportunistic larval and polyp-cloned lifecycle, jellies help drive such crises much faster and toward more calamitous states. Overfishing? Jellies benefit from the lack of predators and competitors. Eutrophication, low-oxygen zones, and pollution? Jellyfish have much higher tolerances than other metazoans for such "toxic" conditions. Warmer oceans? Jellyfish reproduce faster in warmer waters, and the decay of their copious "slime" stimulates CO2-producing microbes. Acidification? Less well studied with regard to jellies, but they apparently benefit from the reduction in high-energy predators. All these changes and more are discussed in the book, and they all connect in some way, often quite directly, to the burgeoning jellyfish problems being experienced worldwide.

As vivid as Gershwin’s writing often is—in part because of the alarming facts at her disposal but also because she writes with a personal, often casual tone—it is sometimes bogged down by this very laundry-list-approach to facts, anecdotes, and quotes from other scientists (and sometimes celebrities such as Dr. Phil and Pete Seeger). Many pages are little more than bulleted lists, lacking from their implication and connection to the larger argument. My gut impression is that Gershwin at times ran out of steam (she apparently wrote the book in 5½ months) and relied a bit too heavily on her research notes. This "disconnect" is more noticeable in the book's second half, where she turns from a stronger focus on her familiar jellyfish to broader connections with climate change, eutrophication, overfishing, and acidification. For readers searching for in-depth and authoritative books on these topics, I would recommend looking elsewhere.
But for those readers who prefer briefer exposés on these and other anthropogenic crises and their broader connections to jellyfish, this is the book to choose. The book also has some wonderful (by which I mean alarming) photographs, such as historical archive photographs of "typical" fisheries catches from the nineteenth and early twentieth centuries (always much more "productive" than anything seen today), jaw-dropping catches facilitated by a combination of modern fisheries technology and a ravenous global marketplace, and the dramatic reduction in the body size of "trophy" fishes captured in three delightful photos from a single charter boat in the past five decades. Nothing new to anyone familiar with Jeremy Jackson and colleagues' work on historical overfishing, but the photographs are excellent ones to marshal out for friends resistant to concerns of overfishing.

In all, Gershwin tells a gripping story of how our global actions have wrought peril to the world's ecosystems, and how weedy jellyfish stand to benefit at nearly every stage. As Jeremy Jackson has noted, all of our changes are helping contribute to the "rise of slime," and this book describes in often-terrifying detail how we're likely already there.


**Reviewer: Gerhard C. Cadée (Royal Netherlands Institute for Sea Research)**

More than 100 years ago the famous Scottish geologist and writer of geology textbooks A. Geikie wrote in his The Founders of Geology (1905, 2nd ed., p. 471): "I am only too painfully aware how increasingly difficult it is to find time for a careful study of the work of predecessors, and to keep pace with the ever-rising tide of modern geological literature." Geikie complains almost to be driven to become a specialist and confine his reading to one particular branch of geology. His advice to publish less was obviously not followed, and now even in many branches of paleontology it is impossible to read all recent papers; one has to specialize. Prothero’s textbook, therefore, is very welcome as it gives not only for students but for every geologist a nice and up-to-date overview of the wide field of paleobiology. He has done an excellent job. Moreover, his 34 years of experience instructing undergraduates has taught him how to give them a sense of the excitement of the field and the reason why so many people find fossils fascinating. Hopefully, most of them already got hooked as a child by fossil collecting (as I did) or succumbed to dinomania (as did Prothero, see p. 465).

He stresses the change in paleontology since the 1970s from a purely descriptive approach to newer questions such as: the quality of the fossil record and what we can read from it, patterns in mass extinctions, distribution of fossils in relation to plate tectonics, tempo and mode in evolution, punctuated equilibria, etc. The theoretical journal Paleobiology was founded in 1975, and this theoretical approach showed to be more attractive for the new generation of paleontologists. However, paleobiology, or bringing fossils to life, is not a new invention of the 1970's. It has old roots, for instance in Othenio Abel's books such as Grundzüge der Palaeobiologie der Wirbeltiere of 1912 and the journal he founded, Palaeobiologica (1928–1946).
New is the more theoretical approach with its emphasis on pattern recognition and the use of quantitative modeling and hypothesis testing.

The book attempts (and succeeds) to bridge the gap between purely theoretical paleobiology and purely descriptive paleontology. Part 1, The fossil record, has ten chapters dealing with what fossils are, how they vary, what a species is, evolution, extinction, functional morphology, paleoecology, biogeography and biostratigraphy. It stresses the newer developments in paleobiology. Part 2, Life in the past and present, also has ten chapters. It starts with life’s origin and early evolution and continues with chapters on micropaleontology, the different invertebrate groups and vertebrates. Trace fossils (fossilized behavior) and paleobotany form the last chapters of this section. Each chapter gives a short history and ends with a conclusion and further-reading section. For unknown reasons, not all these references are also collected in the long list (c. 1300 refs) at the end of the book.

The well-balanced overview of mass extinctions gives a good example of Prothero’s critical study of the existing literature of the subjects dealt with. His conclusions that mass extinctions show no clear periodicity and have probably no common cause are well documented. He did not include the fact that we are now living in the last mass extinction which we ourselves are responsible for. Humans will probably never see how this mass extinction becomes documented in the fossil record.

I liked the author’s historical introductions to each chapter. These give the reader insight on how interests and ideas have changed with time, and also teach us that our successors probably will have different opinions and ways of studying the fossil record. Quotations from a wide range of authors such as da Vinci (c. 1500), Linnaeus, Oppel, d’Orbigny, Voltaire, de Candolle, Cuvier etc. illustrate this long history. These quotes are all given in English; this might give readers the impression they all wrote in English. Who made the translations we are not told. For Cuvier’s (1806) paper on elephants, the reference list gives an English translation of 1806, but Rudwick (1997, Georges Cuvier, fossil bones and geological catastrophes, p. 254) warns us that translations of Cuvier in that period were not always trustworthy. In some cases I wanted to read more from the authors than only the quotes. I noticed that some quotes (I did not check all) from Darwin’s Origin (1859) were in fact from the 6th edition of 1872, the last changed (and softened) by Darwin and therefore often markedly different from the first. Ernst Mayr (1964) discusses the changes in the several editions in his introduction to the Harvard University Press facsimile edition of the Origin.

Understandably, in quotes Prothero regularly left out part of the original text, but this is not clearly indicated with brackets [] and leaving out only one word can already alter the meaning.

Geologists have learned now that papers in languages other than English are hardly read anymore. Rich sources are now closed. This is also shown in this book, where less than two percent of the references are to German and French sources and none to other languages.

Are there subjects missing in this book? I think it gives an excellent overview, but not always up-to-date. Prothero writes (p. 251) that Archaea are found in extreme environments, but they are now discovered practically everywhere, forming for instance an important part of the marine picoplankton. On p. 275 we read that paleoclimatologists use foraminiferans and in particular oxygen and carbon isotopes in their shells to read the changes in climate. Paleoclimatology has expanded enormously in the last decades in its use of different chemical fossils as ‘proxies’. Alkenones produced by *Emiliania huxleyi* and membrane lipids of the Archaea (Thaumarchaeota) are used for estimating paleotemperature; the relative abundance of deuterium (the heavy form of hydrogen) in alkenones of *E. huxleyi* can be used to reconstruct palosalinities. These studies help us to use the past as a key to the future: does the warming of our oceans have parallels in the past? Were these chemical fossils, sometimes the only remnants of the organism that produced them, left out because this is not paleobiology? Anyway, it shows the importance of such studies for the history and future of our planet.
Although as a reviewer one can always make some critical remarks, I also want to state again: it is an excellent, well written and nicely illustrated textbook. Almost an impossible task for one author: Briggs & Crowther used 164 authors to write Palaeobiology II in 2000!


Reviewers: J Bret Bennington & Russell Burke (Hofstra Univ.)

Pterosaurs are trending! A major exhibit at the American Museum of Natural History wrapped up in January of 2015, having introduced native New Yorkers and tourists to this fascinating clade of the original vertebrate flyers. As proclaimed on a tee shirt for sale in the inevitable gift shop at the exhibit exit, “When they bring back Pterosaurs, I’m so getting one!” We couldn’t agree more—who wouldn’t want to get personally acquainted with these graceful dragons of the Mesozoic?

Which brings us to the book Pterosaurs by Mark P. Witton—the latest effort to update both scientists and laypeople on the natural history, evolution, and anatomy of pterosaurs. Does Pterosaurs succeed in its mission? Well, yes and no. Certainly, there is much to like. The author is both an enthusiastic pterosaur specialist and a talented artist. He is fluent in the latest scientific literature of pterosaur discoveries and debates and he fairly represents conflicting theories while weighing in gently with his own opinions. Witton’s illustrations of fleshed-out pterosaurs provide a significant helping of eye candy to compliment the skeletal diagrams and discourses on pterosaur paleobiology. His style is painterly rather than photorealistic, which works to downplay the inevitable aura of certainty conveyed by photorealism. Witton’s images suggest that his scenes are educated guesses, subject to revision as new data emerge. The overall organization of the book provides an initial overview of the pterosaur clade, focusing on hard- and soft-part anatomy, the biomechanics and evolution of flight, and general aspects of pterosaur behavior, ecology, and evolution. This is followed by a more detailed discussion of individual clades within Pterosauria, which encompasses the majority of chapters within the book.

In the opening chapters of his book, Witton discusses just enough history of pterosaur paleontology and vertebrate phylogeny to provide a context for current scientific debates, before moving on to the pterosaur skeleton and soft-part anatomy. It is here that the book begins to show its underlying weakness, which is an almost bipolar seesawing between the colloquial and the technical. Is this book to be an accessible overview of pterosaur natural history for educated general readers or a technical compendium of pterosaur paleontology for biologists and paleontologists? Witton tries to satisfy both audiences, a difficult, perhaps impossible, task. For example, the introduction to Chapter 4, “The pterosaur skeleton,” includes a short primer on anatomical orientation, suitable for an educated reader not well versed in vertebrate anatomy. This is followed by a detailed tour of pterosaur skeletal anatomy that is dense with the technical language of descriptive anatomy. Although well educated in the subject, we found our eyes glazing over, in part because of an insufficiency of detailed diagrams and
photos to illustrate the features being discussed. Another example is that the fairly technical discussions of trace fossils in chapters 7 and 8 are illustrated with redrawn, simplified two-tone diagrams, rather than illustrated with original photographs from the published literature. Perhaps the untrained eye appreciates the simple clarity of the diagrams, but the advanced reader wants to see the actual trackway specimens! Finally, Witton’s writing style itself veers from formal-scientific to casual, mixing sober observations with colloquialisms and slangy exclamations, often in the same sentence. We don’t mean to be stuffed shirts—we do enjoy the occasional light-hearted remark—but Witton’s overly casual tone comes across often as more jarring than witty. A good editor should have smoothed out these bumps.

One of the hardest things to make sense of regarding pterosaurs is their natural history, a key focus of this book. Our understanding of pterosaur ecology has evolved from thinking of them only as cliff-dwelling fish skimmers to a much more nuanced analogy to a large diversity of flying animals, encompassing much of the ecological range of modern birds and bats. We now know pterosaurs included small forest dwelling insectivorous anurognathids, vulture-like ictiodactylids, and frugivorous tapejarids. Perhaps some pterosaurs, like rain forest birds, relied on loud distinctive vocalizations to communicate, because visual cues are usually obscured in dense forest. Frugivorous birds and bats are limited to the tropics, and generally have good memories and a good sense of smell. One wonders if there were pterosaurs with similar attributes. Better comparisons of pterosaurs to known extant analogues would have done much to help visualize how these strange animals might actually have made a living. And what of those remarkable crests, which among all pterosaur features strike us as most in need of explanation? Modern birds have crests, but they are much smaller both absolutely and relatively, and birds generally fold them down to make them aerodynamic in flight. This is generally true for bat ornamentation as well. But pterosaurs, which seem like improbable fliers to begin with, apparently carried their crests mostly erect during flight. Crests must have been extraordinarily valuable to have warranted such a large investment of metabolic energy, and a fuller treatment of this topic in the book would have been interesting.

Overall, we feel that Pterosaurs is certainly enjoyable and enlightening reading for anyone interested in flying reptiles, but that this book would have benefited greatly from a stronger editorial hand and a broader treatment of pterosaur ecology.


Reviewer: Mike Meyer (Bucknell Univ.)

Seahorses are a unique group of fishes that have captivated humans since antiquity. The authors point to numerous examples throughout history of humans’
interest in these creatures; from the Romans and Victorians to the more recent documentaries of Jacques Cousteau, David Attenborough, and Steve Zissou. While the main focus, and crescendo, of the book is the fossil seahorses, there is a gradual build-up to them as we learn about the history of the Tunjice Hills and its associated fossils. Throughout the book there are a plethora of well thought-out diagrams and high-definition pictures of fossils and their associated locales that make understanding the Tunjice Hills easy. I cannot recommend the first chapter ("Seahorses as a form of life") enough. It is one of the most interesting pieces of writing I have ever seen in any academic book, not just a paleontological one; it’s a little out-there at times, but stick around for the last paragraph—that’s where it all comes together.

After the first chapter the book delves into the Eocene–Miocene history of the Tunjice area and lists and describes the notable fauna and flora found in the region. The diversity of organisms and their varieties of preservation found in the Tunjice Hills is rather astounding. From petrified wood to carbonaceous compressions, and from terrestrial insects and vertebrates to marine plants and animals, there is a representative of just about every facet of paleontological interest (including jellyfish!). The early ant and wasp fossils are of particular note, with primitive features and amazing preservation; they are amazing examples of the evolutionary process in such a familiar organism. Again, all of the fossils discussed in the book have large, high-resolution photographs that really let you see the fine details of each specimen. However, though the authors state the length of each pictured specimen, scale bars would likely have been a more elegant solution in most cases.

Despite their placement on the title, the seahorses take up less than 20 percent of the book’s pages, but those pages have, potentially, the greatest amount of fossil seahorse you may ever see! I was amazing by the number of specimens that come out of the Tunjice Hills, given that seahorses do not generally preserve well. Additionally, these are the oldest seahorses in the fossil record and have illuminated the process by which they separated from the pipe fish (their closest ancestor). This book is the result of 20 years of work by the authors and others on the fossils of the Tunjice Hill region, and it shows. Overall, the book is well illustrated, informative, and delivered in an easy-to-read prose; a great addition to any paleontological book collection.


Reviewer: Ephraim Nissan (London, England)
early cetacean ancestor that could walk on land, but it
hunted in rivers the way crocodiles do. Thewissen’s
vivid and colourful recollections of episodes from
some of his more than ten field expeditions to Paki-
stan and India (and trips in America and Japan) look-
ning for fossil whale ancestors, flesh out delightfully the
narrative trajectory in which he interleaves rigorous,
yet readable discussions (sometimes in dialogue form)
of anatomy, physiology, reconstructed ecology and
behaviour, and, tantalisingly, molecular biology.

The book comprises 15 chapters, each comprising be-
tween two and four sections. Subsections (some of
them in boxes in smaller type: insets with a border,
but in regular sequence as other subsections) are not
listed in the table of contents. The cover illustration—
a composite painting, showing animals from different
times and habitats—is an important element in mak-
ing this book so vivid: the mouse-deer-like artiodactyl
Indohyus, the wolf-like Pakicetus, the crocodile-like
Ambulocetus, the otter-like remingtonocetid Kutch-
icetus, and the snake-like Basilosaurus (while no pro-
tocetid). The back flap of the jacket has a glitch: “see
copyright page for details”, but there is no such page.
Instead of a cumulative alphabetised bibliography,
literature is cited in endnotes to the chapters (pp. 213
– 231), followed by a detailed index (233 – 245).

A footnote to the table of contents explains a few as-
terisked section titles (“Basilosaurid Whales” in Ch. 2,
“Ambulocetid Whales” in Ch. 4, “Remingtonocetid
Whales” in Ch. 8, “Pakicetid Whales” in Ch. 11,
“Protocetid Whales” in Ch. 12, and “Indohyus” in Ch.
14): “These six headings summarize the biology of the
six fossil groups that form the transition between
whales and their terrestrial ancestors”, with a pointer
to Fig. 66 on p. 202, showing “[t]heir relationships to
each other and to the living families of cetaceans” (ix),
and to artiodactyls. Some uniformity of format results
from some subsection headers appearing in the vari-
ous chapters for zoological groups in roughly the same
form. For example, the box “Smell and taste” on pp.
166–167 in Ch. 12 (“Whales conquer the world”) is
followed by brief subsections: “Vision and hear-
ing” (168), “Brain” (168–169), “Walking and swim-

Chapter 1, “A wasted dig”, relates Thewissen’s being
“excited beyond belief!” (in the very first line), as a
fresh Ph.D., he obtained funds for his first very own
field project, in Pakistan in January 1991. He remi-
niscs that when he “first went there as a paleontology
student in 1985”, from his hotel room he could see
the courtyard of the police station next door, where a
line of charred, exploded mini-busses were evidence”
of a successful terror campaign related to the war in
Afghanistan (p. 1). In January 1991, Thewissen was
looking for land mammals, not whales (a field he had-
n’t entered yet), and was “very aware that failing to
deliver on a first grant can sink a career. On day five
the dream collapses” (p. 3), because the U.S., about to
intervene in Kuwait, “is worried about the safety of its
citizens” (p. 3). Back to Duke University, with “meagre
fossil finds” (p. 3), Thewissen finds he has a whale
tympanic bone—one with a thick wall, the involucrum,
shared by cetaceans and their ancestors, but no other
animals (p. 6)—and even one of the ossicles, the anvil,
of Pakicetus (p. 8). The involucrum is going to feature
prominently, as a thread, throughout his career re-
searching whale ancestors. Ear ossicles “are rarely
preserved in fossils because they are so tiny and easily
lost” (p. 6). This yielded a paper in Nature: “our wast-
ed dig vindicated itself although in an unexpected
way” (p. 6).

Chapter 2, “Fish, mammal, or dinosaur?”, begins with
a survey of the history of ideas about whales, from
Aristotle to Herman Melville’s Moby Dick (1851) and,
eight years later, Darwin’s Origin of Species: on the
evidence of black bears “swimming for hours with
widely open mouths, thus catching, like a whale, in-
sects in the water” (Darwin’s words), Darwin suggest-
ed that natural selection produced whales from bears. Having drawn ridicule, Darwin shortened and finally dropped that statement from subsequent editions (p. 11). “In Darwin’s time, the oldest cetaceans known were basilosaurids” (p. 12), but when first found, in 1832 in Louisiana, Richard Harlan claimed in 1834 that the animal was a giant lizard. Richard Owen however, consulted by Harlan, felt it was a whale, and renamed *Basilosaurus* as *Zeuglodon*. Renaming is now frowned upon, as a name being stable is more important than its being an accurate descriptor (p. 12).

Thewissen digresses to teach lay readers about conventions of scientific names, but in Table 1 on p. 14, in the column for word endings, beneath “oidea” for a superfamily, the typo “idea” for a family, instead of “idae”, occurs. (I only found one other typo in this book: a missing blank space between “/” and “http:” in the last line of p. 213, the first page of the endnotes.)


Section “Basilosaurid whales” discusses the “two subfamilies: Basilosaurinae, giant, elongated snake-like forms, and Dorudontinae” (p. 19), which resembled a dolphin body with a crocodile head. Then, Ch. 2 turns to a discussion of teeth: basilosaurids and other early whales where not homodontic, i.e., their teeth were not all alike (e.g. as the peg-like teeth of killer whales) (p. 21). A subsection “Brain” begins with Egypt’s “Zeuglodon Valley, or Wadi al-Hitan (Valley of the Whales)” (p. 23): endocasts, “lumps of hard sediment that preserve the shape of the cavity they once filled”, show “that basilosaurids had tiny brains” (p. 23). A full-page box, “Brain size”, follows (p. 24)—much later in the book, we are told that unlike in mammals, in basilosaurids “the cerebellum is much larger and higher, towering over the cerebrum” (p. 168)—then we find subsections “Vision, smell, and hearing” and “Walking and swimming”, which asks: “Why do basilosaurids’ ribs weigh them down?” (p. 26); if they lacked a (non-fossilised) dorsal fin, perhaps their thick ribs were an anti-rolling device (p. 26), like in seacows (p. 38). “Clearly, this animal could not bend its toes” (p. 30). This is followed by speculation about social behaviour and considerations on late Eocene’s warmth. Thewissen comes back to the ribs later on: “In *Pakicetus* and *Ambulocetus*, the extra bone is probably used as ballast” (p. 169), whereas the heavy ribs of protocetids and basilosaurids “may have functioned as a stabilizer” (p. 170).

Chapter 3, “A whale with legs”, begins with Thewissen’s return to Pakistan in December 1991. “Last year’s trip” should be “Last January’s trip” (p. 35), but it wasn’t an error after all, because “Fieldwork starts on January 2” 1992 (p. 38). Dialogue is lively. Life was harsh: “With three companions with diarrhea, I stay away from it [the bathroom], holding my business until we are in the hills collecting fossils” (p. 37); a peacock keeps pecking at a collaborator’s soap bar. “The Kala Chitta Hills have preserved their history: the story of an ocean that disappeared and was replaced by a massive river system (the precursor to the Indus), and the high mountains to the north” (p. 39). A herder asks if they find gold, and this is alarming (p. 44). A local collaborator puts up a sign: “danger, explosive”, and nobody disturbs the specimen they left there (p. 45). This was the discovery of *Ambulocetus*, which “spent most of its life in water, but was able to come onto land, too” (p. 49): “it is a whale that walked” (p. 48).

Chapter 4, “Learning to swim”, traces the trajectory “from dog-paddle to torpedo” (p. 52, section title). Figure 20 shows “the evolution of swimming modes in mammals” (p. 55). Unlike the quadrupedal paddling
of hippo, mink, and Pakicetus, pelvic paddling typifies Ambulocetus and the river otter, but the latter also paddles, and both also practised the dorsoventral pelvic undulation of the sea otter and perhaps remingtonocetids. The latter probably also practised (like the giant freshwater otter) dorsoventral caudal undulation, the precursor of the caudal undulation of the basiosaurid cetaceans (p. 55). “Ambulocetus looked like a crocodilian with its long snout, compact body, short forelimbs, and powerful, straight tail” (p. 59). Ambulocetus was “probably an ambush predator” (p. 59), “lifting just its eyes out of the water” (p. 61). A box, “Swallowing”, takes most of pp. 60–61. A controversy is first introduced on p. 65: “Paleontologists assume that cetaceans are closely related to an extinct group of hoofed carnivorous mammals called mesonychians, but molecular biologists note many similarities between the DNA and proteins of cetaceans and those of even-toed ungulates (artiodactyls) in particular hippopotamids”. Thewissen shows in Ch. 14 why a relation to the Eocene raoellid Indohyus is most cogent.

Chapter 5, “When the mountains grew”, begins with an expedition in 1994, relates how the Himalayas rose, discusses the 1938–1958 research of Richard Dehms, and finally introduces Ashok Sahni, the father of Indian vertebrate palaeontology. Chapter 6, “Passage to India”, begins with a 1992 expedition, with Thewissen stranded at Delhi’s airport, interactions with Sahni, and field work in Kutch in 1996. Back in Kutch a year later, they discover “the most beautiful whale skull that Kutch has ever produced” (p. 91), a skull of Remingtonocetus.

Chapter 7, “A trip to the beach”, on watching dolphins in South Carolina, 2002, and on the fossilised coast of western Kutch in the Eocene, is followed by Ch. 8, “The otter whale”, on the diverse family Remingtonocetidae, which “were probably fish eaters, and were able to walk around on land” (p. 107), their size ranging from a sea otter’s to a male sea lion’s (p. 109), their chronology being from 48 to 38 million years old. The body of Kutchicetus “looked like that of an otter”, but the long, narrow snout is like a gharial’s (p. 109). “If Ambulocetus lived like a crocodile, capturing large, struggling prey, remingtonocetids were more delicate, lashing out quickly with their sharp teeth when a fish came close [...] good for piercing and checking slippery prey on a dash” (p. 109).

Chapter 9, “The ocean is a desert”, begins with isotope chemistry (explained through a dialogue), and what oxygen isotopes in tooth enamel can tell about what a fossil used to drink. Then, sections “Drinking and peeing” and “Fossilized drinking behavior” lead to “Walking with Ambulocetus”, on how the BBC documentary series Walking with Beasts (having consulted Thewissen) got the animal right, but deliberately, stubbornly made it live half a world away, in Messel, a German fossil site of a lake with toxic fumes. Why that? “To tell a good story [...] Don’t believe everything you see on television” (p. 125).
over the water-line for unsuspecting and thirsty prey” (p. 144) “in shallow streams” (p. 145). Teeth are discussed on pp. 146—150. “The sense of smell of these first whales was limited” (p. 150). Many small holes near the tip of the snout indicate nerves, so possibly pakicetids had whiskers, which modern seals use to detect vibrations in the water (p. 151).

The narrative of Ch. 12, “Whales conquer the world”, is, like Ch. 13, set in Japan, where opposing whale-hunting risked preventing access to an abnormal living dolphin with rear flippers (photo on p. 176). A dialogue explains a “special kind of DNA: short interspersed nuclear elements, or SINEs” (p. 157). There is a section on protocetid whales, which “include a dazzling variety of genera” (p. 163), even though complete skeletons are known for only four of these (p. 163), and even so, with limbs often missing. Protocetids “might easily have been the predators of the smaller, fish-eating, remingtonocetids” (p. 163), the otter-like whales. “Protocetids were the first whales to colonize the world’s oceans” (p. 164). “The strangest protocetid face is certainly that of Makaracetus, which has jaws that are not straight, but bent down” (p. 166). “We can only speculate what Eocene whales used their sense of smell for, but a reproductive function is possible” (p. 167), like in sea lions. Like sea lions, they “hunt[ed] fast-swimming prey and power[ed] their bodies with their limbs” (p. 163), “had ties to the land, and probably went there for functions related to reproduction such as mating, giving birth, and nursing” (p. 163). “The surface of the brain of all Eocene whales is relatively smooth, a condition called lissencephaly” (p. 168). Protocetid short limbs “had fully mobile joints, with well-developed fingers and toes, tipped by short hooves” (p. 170). Presacral vertebrae, 26 in Eocene artiodactyls and most protocetids, were 31 in Ambulocetus and 30 in Kutchicetus, 42 in Basilosaurus, 41 in Dorudon: “whales made a fundamental change in mammalian design” (p. 170).

Chapter 13, “From embryos to evolution”, is about “Haruka, the [individual abnormal] dolphin with small rear flippers” (p. 176), and about what can be gleaned from cetacean embryos concerning how ceteceans shed hind limbs. Chapter 14, “Before whales”, begins with “Driving on the Gangetic Plain in India, March 12, 2005” (p. 191). It relates the extraordinary story of the outsider paleontologist Anne Range Rao (“Anne”, but a man) and his elderly widow, Friedlinde Obergfell, also a palaeontologist, and how she finally let Thewissen examine fossil-containing rocks that Ranga Rao had excavated and removed to his estate, after a powerful scholar had sent a student to dig at the site he was studying. It was a breach of etiquette, and Ranga Rao and his wife reacted by becoming very diffident of other palaeontologists for the rest of their lives.

Raoellidae, an artiodactyl family named after Ranga Rao (by the scholar he considered his nemesis), is paraphyletic, “a somewhat chaotic assemblage” (p. 200)—as Thewissen says, avoiding the technical term—and includes Indohyus, a genus only known from bones in “the blocks in Ranga Rao’s yard in Dehradun” (p. 199). It “looked like a tiny, somewhat heavyset deer” (p. 200). From the reconstruction shown in a figure, you could tell that seen from above its snout, its cheeks and distant eyes made it look rather swinish. “The thickened lip of the tympanic bone, the involucrum, gave us a clue that Indohyus is closely related to whales” (p. 200), and Thewissen’s cladistic analysis “shows that whales were indeed more closely related to Indohyus than to any other artiodactyl, including hippos” (p. 200), which are “the closest relatives of the raoellid-cetacean group” (p. 200). Thewissen opposes changing the denotation of names such as artiodactyl (to include Cetacea) or Cetacea (to include Indohyus), as it would be confusing (p. 203). Indohyus “is so different biologically that it would render the term Cetacea meaningless in any sense except systematically” (p. 203). “Overall, the skeleton of Indohyus resembles that of unspecialized artiodactyls” (p. 204). It had “five fingers and four or five toes” and was digitigrade, like a dog (p. 204). Yet, there is evidence that this land mammal always lived near freshwater, jumping there to hide if in danger, like mouse deer (p. 205). Chapter 15, “The Way Forward”, is the conclusive one in this beautiful book.

Reviewer: Claire H. Milne (Stockton, CA)

Two extinctions in the Devonian came very close to wiping out life on the continents and in the seas. The lucky surviving species formed a nucleus for the subsequent recovery of biodiversity and populations, as all extinction events follow this basic pattern of extinction followed by recovery. The author, however, has presented extinctions and recoveries in the metaphor of the activities of army invasions, with plants, arthropods and vertebrates in the role of aggressive invaders. We read of advances and retreats, or final assaults, and finally of victorious conquerors of the continents, who turn out to have been vertebrates and insects. Writers for scientific journals or for a non-professional readership strive mightily to present the material as unambiguously and accurately as possible. The invasions our own species inflict on each other destroy whatever is in their path, while periods of recovery from an extinction event are times of replenishment and growth. Presenting plants and animals adapting to life on land as invading armies might make a good science-fiction story, but it is essentially a misrepresentation. As it is very plain that the book is the result of many years of good research by himself and by others, it is indeed regrettable that the author chose to present the material in the guise of fiction. This is, I believe, a disservice not only to himself, but to those who also had contributed to the science.

Chapter 1, “The evolution of life on land,” provides useful background information for anyone new to palaeontology, touching briefly on the adaptations required for the transition from the seas to land, a description of the three life forms existing on earth today, the stromatolites, and introducing the earliest invaders of all, microbial biofilms. A discussion of the Ediacaran fauna follows, and the reason why life spent 3,050 million years evolving from single-celled organisms to the Metazoa. The blame, it seems, falls on iron having grabbed the oxygen atoms the cyanobacteria were producing, until the bacterial production increased enough so there was some left over to contribute to the atmosphere.

At this point, the author deserts our planet for a rather interesting discussion on the possibility that life had evolved on Mars earlier than it had on earth. Martian plate tectonics, it seems, brought less iron to the surface than tectonics had done on earth and with less iron present to bond, oxygen accumulated in the atmosphere more quickly to support life. The oxygen source is not identified. The author asks if multicellular life had evolved on Mars 4,560 to 3,500 million years ago, but had become extinct when Mars lost its atmosphere? It seems we will have the answer when we send fossil-hunting expeditions to Mars. As space travel is going forward with great speed, this does seem a viable goal, although it does not seem that Martian fossils have much direct bearing on the Devonian extinctions.

With "The plants establish a beachhead", chapter 2,
we are back on earth. Establishing a beachhead is a phrase bringing to mind landing craft and beaches with heavily fortified bunkers, and it is difficult to associate the word with the filamentous green alga that made the necessary adaptations to life on land from freshwater ponds and lakes. There would, of course, have to have been a previous adaptation from sea water to fresh water, but this is not mentioned.

In chapter 3, "The first animal invasion," the troops making up this first invading army consisted of soft-bodied worms and worm-like animals, molluscs and Panarthropoda. The worms and molluscs were a success as invaders, but it is astonishing to learn that "The first major animal group to make a concerted effort to invade the land was the Panarthropods.....". Attempts to understand how this came about fail. Millipedes, centipedes, velvet worms, spiders and insects did what? Throughout the book, the author assigns abilities to animals which we associate primarily with our own species. The anthropomorphic approach is stretched thin, and was a distraction as I read the text. It is in this chapter that the author begins using the words and terms that cladistics employs. Even those who have read widely in his or her own fields of interest may not be familiar with its special vocabulary. In the discussion of arthropods taking part in the land invasion, we come across "derived form", "ghost arthropod lineages" and "plesiomorphic". There is no glossary, unfortunately.

Apparently there had been serious environmental deterioration in the seven million years following the Devonian extinctions, as no tetrapod fossils appear from this time, and plants and marine organisms were also affected. The author asks "What went wrong?" He presents possible causes in a list of eight facts, with Fact 1 suggesting major mountain-building and plate-tectonic movements might be the culprits. Fact 3 offers climatic instability as the cause. Each possibility is thoroughly discussed, and Fact 8, "The loss of biodiversity in both marine animal and land plant groups in the late Frasnian was triggered by two separate phenomena acting in concert: an increase in extinction rates but also a decrease in speciation rates" is intriguing.

With chapter 5, "The second animal invasion," we have to remember that the author's second invasion is equivalent to the period of recovery after the first extinction event. During this time, many new tetrapod species appeared, many fishlike characteristics disappeared such as internal gills, and tetrapod populations dispersed widely.

In chapter 6, "The second catastrophe and retreat", again, known tetrapod species did not survive the extinction, and recovery would have been due to the ghost-lineage species. Although this is disputed, it seems very likely that the primary cause of this extinction were the glaciers that covered the continents.

Chapter 7, "Victory at last," notes that until the Early Carboniferous, tetrapods laid their eggs in water as fish, as amphibians still do. The evolution of the amniotic egg containing the water necessary for reproduction freed tetrapods from reliance on any outside water source. It is difficult to connect the amniote egg and the evolution of insect wings with invading armies and conquest. However, in the context of the narrative, hailing tetrapods and insects as victors and conquerors of the continents provides a happy ending to the saga.

Chapter 9, "The legacy of the Devonian extinctions," describes how during the Devonian, three tetrapodomorph lineages evolved convergently with tetrapods. However, the three tetrapodomorph lineages did not survive the extinctions. The author asks what if all or any of the tetrapodomorphs had survived the extinctions, and had survived, along with tetrapods, the subsequent great Permian extinction? Certainly, the author writes, our world today would be much different.

There is one more invasion to go. Under the heading "The next invasion..." it seems we tetrapods are looking for new worlds to invade and conquer. Our moon is considered first for colonization, but even though the constant sunlight in the polar regions would be great for growing crops in sealed greenhouses, near-weightless conditions caused by the moon’s low gravity would cause brittle bones and weak muscles. To quote, “We could not have children there, and watch them grow and prosper as conquerors of a new
world.” Well, that lets out the moon. Mars is a much better prospect. Water is present in the polar ice caps and frozen ground and the carbon dioxide atmosphere would be useful for growing crops in sealed greenhouses. Carbon dioxide could even fuel our shuttle craft on trips from one colony to another. Mars would not seem strange to us, as the length of the Martian days are the same as ours and there are four seasons. With all that going for it, we would not miss the lack of oxygen in the atmosphere.

I am completely baffled by the inclusion of this bit of science fiction at the end of a book which, despite the presentation, is the result of much good research. The last few lines conclude: “Life succeeded in invading the hostile terrestrial world of the Earth. It did not fail, even given the serious setbacks of the Devonian extinctions. Will a member of one clade of these conquerors, the synapsid amniote Homo sapiens, succeed in the invasion of the hostile Martian world, be victorious in bringing plant and animal life to our sister planet? Or will it fail? Time will tell....”

Matt Kaplan is a London-based science journalist. That finding dinosaur skeletons in antiquity gave rise to mythical dragons was already claimed by the Stanford scholars in classics and history of science (c.f., Mayor 2000). Kaplan combines science history, especially paleontology, with folklorist skills, showing how some ancient motifs reappear in science-fiction films, or then in Renaissance art. In his introduction, Kaplan muses about the persistence of scary monster stories: “one answer to this question lies with research on why people like spicy food” (p. 2). “Like lion cubs play-fighting in the safety of their den, monsters may be allowing threats to be toyed with in the safe sandbox of the imagination” (p. 6).

Chapter 1 is on myths of giant animals. The Nemean lion was imagined in ancient Greece as large, quite mean, but not gigantic: “just a somewhat large lion with seemingly weapon-deflective skin” (p. 12). “European lions lived in and around ancient Greece” (p. 12). The boar of Calydon was claimed to be gigantic, and based on artwork on pottery in relation to depicted humans, “it would have been about a length of 11 feet (3.4 meters)” (p. 11), as opposed to up to 5 feet (1.5 meters) in real-life male wild boars. Any human unlikely survivor of a night-time attack by a lion “would have seen glimpses of action” (p. 13), but could not accurately describe the predator. “This is probably where the concept of invulnerability set in” (p. 13): lions could survive wounds, and then attack later on. Or did hunters make up the story to save face? (p. 17, in a note). Kaplan speculates on whether in colder climates, non-fossilized small populations of Eurasian cave lions could have been even larger than the 25% by which they exceed “the lions of Africa and the recently extinct European lions” (p. 14), albeit they no longer occur in the fossil record much after 13,000 ago, when human cultures presumably possessed oral storytelling. Kaplan is sober about the occurrence of gigantism: pituitary tumors in animals have different effects than in humans (p. 20). Various “animals all have huge populations, yet try finding any giant versions of them in museum exhibits. There aren’t any” (p. 21). Also sobering is the 2004 “Hogzilla” hoax from Alabama (p. 17, in a note) about a 12-feet boar that when dug up was found to be only 7 feet (2 me-


Reviewer: Ephraim Nissan (London, England)
in the recently churned-up tar where the lion and goat died. All three, the goat, the lion, and the snake, slowly slide into the tar together, get preserved, and their bones are ultimately found in stinky blackened rock by people who can only wonder at what sort of creature would have left such a skeleton behind” (p. 41–42). There are no tar pits in “Greece (and the rest of Europe)” (p. 43), though these exist in Russia and the Near East. Kaplan thinks of Greek colonies along the coasts of the Black Sea as a conduit for the myth of beastly blends. Homer located the Chimera in Lycia, and Homer and Hesiod claimed it was capable of breathing fire. “Lycia is one of a few places where natural gas slowly leaks out”, and when lighted by people, “the flame never goes out” (p. 44).

Chapter 3, interprets as earthquakes “the ‘cruel belowing’ that Callimachus describes as having come from belowground” (p. 54), and associated with quake-prone Crete’s mythical Minotaur. Kaplan interprets Medusa’s petrifying gaze as how ancient people found a cause for fossils, “transformed from their original biological materials into stone” (p. 66): “they tried to explain their findings by concluding there was a monster capable of turning things to stone” (p. 67). Moreover, “the mineral pyrite, more commonly known as fool’s gold, can accumulate inside bone and transform it into a glittering replica of its original form” (p. 67, in a note); Kaplan wonders “if the discovery of such transformed bones inspired the story of Midas, the mythical king whose touch could transmute objects into gold (ibid.).

Chapter 5 is on dragons. May I signal here that the ubiquitous myth of the cyclical snake (the ouroboros) was cogently explained as the appearance, in the late Neolithic, of an intense, writhing annular aurora at latitudes other than boreal (van der Sluijs and Peratt 2009). What makes the hypothesis all more credible is the authoritativeness of Anthony Peratt, who is a physicist and a journal editor in plasma science.

Chapter 9, “Terror resurrected—Dinosaurs”, is concerned not only with the modern media, but also the recovery of amber-preserved insects’ DNA is discussed. Chapter 10, “Extraterrestrial threat—Aliens” (about science-fiction films) is also about biol-
ogy: the human botfly of Central America is “[p]erhaps the parasite that most closely resembles the monster in Alien” (p. 206). Even worse are “fungi belonging to the Ophiocordyceps genus that stick to [ants’] exoskeletons, inject themselves inside their bodies, and mess with their minds by releasing chemicals into their brains” (p. 206), so the prey positions itself so as to infect many other ants when exploding. “Aliens raises a challenging evolutionary question that borders on being a story flaw” (p. 207, in a note): I omit how, not to spoil readers’ expectations.

**Works Cited**


**Fossil Insects of the Purbeck Limestone Group of Southern England**

*Palaeontomology from the Dawn of the Cretaceous*

Robert A. Coram & James E. Jepson


Reviewer: Thomas A. Hegna (Western Illinois Univ.)

Fossil Insects of the Purbeck Limestone Group of Southern England is really the first of its kind: a true field guide for palaeontology. While others specialize in a locality, and treat the insects as a part of that totality, this book showcases only the insects from the Purbeck in their entirety—not just pretending that the handful of best-preserved species are all there is to see. Personally, I see this as an unfinished book on the pancrustaceans from the Purbeck Limestone Group (but, perhaps, this is my own personal axe to grind).

The book is essentially divided into three parts: A) The Purbeck sedimentary environment and taphonomy, B) systematics, and C) palaeoecology. All are thoroughly referenced and illustrated with black-and-white drawings and pictures. The first section has a great summary of the geology, and the taphonomy section extends beyond work previously published by the lead author (Coram, 2003).

The systematic section opens with a brief discussion on how fossil insects are described. I personally found this section very useful in penetrating the often-impenetrable nomenclature for insect wings! The systematic section contains a picture or drawing of each species along with a thorough taxonomic history. It is a true catalog of the diversity without the complexity of taxonomic quibbles or esoteric prose on a given morphological feature. Though the synonymy lists may be confusing for the non-specialist, they provide a ready place to look for more ‘meaty’ information on a species. Locality and horizon information is included as well. However, most of the drawings and pictures lack specimen-repository information—making it potentially difficult for a future researcher to track...
down an important specimen (although in the beginning of the systematic section, it states that much of the undescribed material is presently in the collection of the lead author).

The paleoecological section is ‘meaty’ and rewarding—extending far beyond the work by Coram and Jarzemowski (2002). As a whole, this book makes an excellent complement to the Palaeontological Association’s Special Publication Life and Environments in Purbeck Times.

Siri Scientific Press (SSP) has quickly made a name for itself in producing high-quality scientific books and monographs that deal with natural history. Admitted, SSP has a niche product, but one that they excel at producing.

Works Cited


Reviewer: Roy E. Plotnick (Univ. of Illinois at Chicago)

The last detailed review of the arachnid fossil record appeared in 1955, in one of the earliest published volumes of the Treatise on Invertebrate Paleontology. Written by Alexander Petrunkevitch, it accompanied his earlier volumes on Paleozoic arachnids (1949) and Paleozoic and Mesozoic arachnids of Europe (1953). Since then, our knowledge of modern and fossil arachnids has increased exponentially. It has also become clear that many of Petrunkevitch’s original descriptions and interpretations were flawed, as pointed out in Kjellesvig-Waering’s 1986 monograph on fossil scorpions and confirmed by my own observations and those of the authors of these volumes. These two books, which comprise volumes 1 and 2 of the Monograph Series of Siri Press, are thus long overdue and exceedingly welcome. They provide an important preview of the (finally!) in-process update of the Treatise.

The first volume, by David Penney and Paul Selden, focuses on the spiders and draws heavily from their numerous published papers. It begins with a brief overview of modern spider diversity and classification and the potential importance of fossil spiders. This is followed by a survey of the spider fossil record, contrasting the amber and non-amber fossil records, as well as an excellent summary of potential biases. I have one quibble here; the tables of localities are not very useful or consistent; for example, one locality is given as “Solite Quarry, Virginia”, whereas another is “South Korea.” My favorite part of the book comes next; a very clear and up-to-date survey of methods for studying fossil spiders, which would be of equal interest to fossil insect workers. I was therefore disappointed in the next section, on “Identifying and naming fossil spiders.” It is more a litany of errors committed by others than a guide to best practices. A short review of named spider families reveals the truly dreadful state of published taxonomies. In contrast, Penney and Selden combine a well-established phylogeny of modern spider families with the known fos-
silts of these groups to produce a phylogenetic tree of spider evolution, demonstrating the potential importance of this fossil record for calibrating key evolutionary events and processes, including the impact of mass extinctions and the co-evolution of plants, insects, and spiders.

The second book, by Jason Dunlop and David Penney, is a broader overview of the entire range of fossil arachnids. You might want to purchase it just for the beautiful color photos of the specimens, in particular those from amber (the photos in the spider volume are all in black and white). After a brief review of arachnid morphology and study methods, the bulk of the book is comprised of detailed overviews of the sixteen fossil and extant arachnid orders. For each group, they summarize current debates on classification, provide a list of diagnostic characters, roughly outline the diversity history (at the era level!), cursorily summarize fossil localities and those families recorded as fossils, provide an overview of the paleoecology, and summarize what they consider to be important studies. These chapters thus provide an invaluable starting place for the new student of any of these groups. The book concludes with a far-too-brief overview of the potential significance of this undervalued and understudied part of the fossil record. If I had one request, it would have been for more detailed comparisons with other chelicerate groups, such as horseshoe crabs and eurypterids.

The best comparison to these excellent monographs is the magisterial volume by Grimaldi and Engel on the History of Insects. They likewise should be in the library of every student of fossil arthropods and modern arachnids and of anyone interested in the evolution of terrestrial biotas.


**Reviewer: Lee Hsiang Liow (Univ. of Oslo)**

Evolutionary developmental biology (Evo-Devo) is a fascinating field that potentially acts as one of the much sought-after bridges between macroevolution and microevolution. Its rapid evolution from its ancestral field, comparative embryology of the 19th century, is likely triggered by the discovery of HOX (Lewis 1978) and other developmental genes shared among phylogenetically disparate organisms.

How easy is it to write an engaging, informative and concise textbook about Evo-Devo for “students who are taking a course in evolution at a university” and specifically to teach them “about how Evo-Devo can be integrated with other approaches to evolutionary biology, giving us a more complete view of evolution...” (Preface)? Wallace Arthur, an arthropod evolutionary-developmental biologist and a founding editor of Evo-Devo’s leading journal, *Evolution and Development*, wrote a beautifully and richly figured textbook in 335 pages that is about the size of a hardcover novel. It is so easy to read (because of its much praised conversational style) and so pleasurable to peruse (with its visually appealing figures), that I am loath to say anything negative about it. Yet, I am more likely to recommend it as a biology department coffee-table book than as an undergraduate Evo-Devo text.

In the four introductory chapters, written to please rather than to educate, this book skims the surface of
the relationship of Evo-Devo to evolutionary biology. Then it goes on to describe the categories of developmental repatterning (heterochrony, heterotopy, heterometry and heterotypy) before visiting topics in Evo-Devo, including developmental bias, plasticity and the origin of novelties. Each chapter is as unadorned with depth as it is embellished with conversational familiarity (such as “This is the easy bit; well, in relative terms anyhow”, p. 319). What does a student gain from reading this textbook? Definitions of some terminology (all conveniently bolded in textbook style), a quick introduction to buzz words useful for impressing other students in the pub (MADSbox, exaptation, evolvability), and a few dinner-table stories of scientific discoveries in Evo-Devo. To be more specific, a student who has taken a full-fledged undergraduate course in evolutionary biology might sneer at the evolution taught here but will not learn more about Evo-Devo than from one of the several good, engaging popular-science books about the same.

To be fair, Arthur gave himself a difficult job: to write a short, easy-to-read textbook about the interface (Evo-Devo) of two vast and old fields within biology, namely evolution and development, both of which are rapidly accumulating information in their own right. I am not sure if anyone else would have done very much better, given the page and style constraints, but at the very least, one could have put labels and scales on figures where it might have been appropriate, and not least informative. For instance, a naïve student might have little idea how large/old the stained embryo on Fig 1.6 is. One might also discuss the process of science instead of stating historical facts, especially if the book is “about how Evo-Devo can be integrated with other approaches to evolutionary biology.” A concrete example of this is the discussion on the Cambrian explosion, where Arthur simply stated that there were deep conflicts in various estimates of divergence times between protostome and deuterostomes in the 1990s. A better approach is to discuss why inferences from molecular and paleontological approaches were disparate and how those differences were resolved, and, more importantly for the book, how Evo-Devo contributed to the debate.

Evolution: A Developmental Approach has succeeded in dispelling with the gene-centric view of evolution while raising the prominence of Evo-Devo and macroevolution for a student audience. Does it then deserve the smashing reviews that several prominent biologists, older and wiser than I, have given it? Yes, on the condition that my disappointment in its lack of depth can be remedied by a second edition without sacrificing the two superb traits of the book: readability and beauty.

Works Cited


A recent report on rates of sexual harassment and sexual assault among field scientists was widely covered by the popular and scientific press. The survey indicated that 72% of respondents had observed or had been told about inappropriate behavior; 64% had personally experienced sexual harassment (71% of women, and 41% of men); and 20% had personally experienced sexual assault at a research field site (26% of women, and 6% of men). Targets of harassment and assault overwhelmingly tended to be students and postdocs. Most respondents reported that they were unaware of whether their field site had a code of conduct or sexual harassment policy, and only 20% were aware of a mechanism to easily report harassment or assault.

What Can You Do? The study suggests that field site managers can:
• raise awareness of hostile work behaviors (the full article is available for free, online)
• create guidelines for respectful behavior (and ensure that they are distributed widely)
• adopt independent reporting and enforcement mechanisms

Books Available for Review

The following volumes are available to Paleontological Society members in exchange for writing a review for *Priscum*. Reviews should be informative, engaging, and 400–800 words long. The tone can be informal and casual, appropriate to recommending or critiquing a book to friendly colleagues. (Longer reviews are allowed, but please request ahead of time.) Reviews should be submitted by May 1 for inclusion in the Spring/Summer issue or Dec. 1 for inclusion in the Winter issue. Reviewers must be a current member of the Paleontological Society before beginning review. If interested in reviewing one of these volumes, please contact book review editor Phil Novack-Gottshall ([pnovack-gottshall@ben.edu](mailto:pnovack-gottshall@ben.edu)). Reviews will be assigned on a first-claimed basis to individuals with appropriate knowledge and experience with book content.


Copestake, P. and B. Johnson. 2014. Lower Jurassic Foraminifera from the Llanbedr (Mochras Farm) Borehole, North Wales, UK. Monograph of the Palaeontographical Society No. 641.


Mohibullah, M., M. Williams, and J.A. Zalasiewicz. 2014. Late Ordovician Ostracods of the Girvan District, South-West Scotland. Monograph of the Palaeontographical Society No. 640.


Penney, D. and J.E. Jepson. 2014. Fossil Insects: An Introduction to Palaeoentomology. Siri Scientific Press, Manchester. (See David Penney e-mail on 4/23/13 for details.)


Do you have any ideas for content for the Priscum newsletter? If so, please contact Matthew Powell (powell@juniata.edu). We are interested in including a wide range of content of possible interest to members of our Society. Consider anything from a short description of a future GSA symposium or field trip you are planning to an op-ed sharing a cantankerous viewpoint on a topical issue, an idea for a regular Priscum feature, or memorable photos of fossils or fieldwork.