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**Geology Seminar:**  
**Using Fossils to Understand the History of Life**  
**GEOL 4501                      Spring 2007**  
**Time: Friday 12:20 - ~1:15**  
**Calloway 120**

**Instructor:** Dr. Phil Novack-Gottshall  
**Office:** Calloway G 1-4

**E-mail:** WebCT Vista Mail  
**Office hours:** T 11-2, W 2-3, R 11-4,  
or by appointment

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### **Course Description**

Paleontology is one of the most exciting scientific disciplines because it is focused on understanding the history of life, including ourselves and our place in this history. This seminar will be an invigorating time to discuss classic articles that have used the fossil record to address important questions about the history of life. The first few weeks will address fundamental concepts while the remaining weeks will move backwards in time from the present to look at major evolutionary and ecological changes in the history of life. The main questions we will want to keep in mind as we read and discuss each article are: Why are these important questions? How is the fossil record being used to address these questions? In addition, we will want to examine how these author's designed their experiments, how they collected and analyzed their data, and how they communicated their discoveries.

### **Learning objectives**

- 1) Explain the myriad ways that paleontologists use the fossil record to address important questions about the history of life.
- 2) Explain major episodes that have shaped the history of life.
- 3) Understand the practice of paleontology through a close reading of classic paleontological articles, including the design of studies, the collection and analysis of data, and the communication of results.
- 4) Practice writing thoughtful, concise summaries of classic articles.
- 5) Practice active discussion, informed debate, and intellectual criticism.
- 6) Appreciate the progressive intellectual manner in which written communication both builds from previous knowledge while contributing to later knowledge.

### **Required textbook**

None. All articles will be posted on WebCT Vista as .pdfs. If you have not had Paleontology (GEOL4024) or want to supplement your readings, I recommend:

Prothero, D.R. 2004. *Bringing Fossils to Life: An Introduction to Paleobiology*. 2<sup>nd</sup> ed. McGraw-Hill, NYC.

## WebCT

All readings will be posted as .pdfs on WebCT (Vista). You will also post your guided questions to the Bulletin Board here. You can get to the course site using the UWG portal: <http://myuwg.westga.edu>. Once there, log-in and click on the course site. If you have problems logging in or locating the site, just follow the links, contact the Distance Learning helpdesk (678-839-6248 or [distance@westga.edu](mailto:distance@westga.edu)). You can also log-in directly through [webct.westga.edu](http://webct.westga.edu).

## A note on my office hours

The best teachers of science are those who remain active in their scientific research. In order to succeed in both arenas, it is important that I reserve Fridays as my research day. I will not be available to meet with you on Fridays except for exceptional circumstances. You are still welcome to e-mail me with questions and concerns during this time, and I will make every effort to respond in a timely manner. However, an e-mail response cannot be guaranteed until the weekend. On other days, you are welcome to call me on campus (678-839-4061), stop by when the door is open, or e-mail me ([pnovackg@westga.edu](mailto:pnovackg@westga.edu)). **I do not accept phone calls at my home.**

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## Grading Policies

You will enjoy this course the more you participate in in. Each week we will read carefully and critically discuss 1-2 classic paleontological articles each week. There will not be any formal presentations, papers, or exams. Grading will consist of a few short writing exercises, plus participation and attendance. The main amount of time involved in the class will be the readings, which should take a few hours per week.

Your grades will be assigned on a percentage scale, as follows:

≥90% = A; 80-89% = B; 70-79% = C; 60-69% = D; <60% = F

Weekly summaries	30%
Guided questions	20%
Attendance	20%
Participation	30%

## *Weekly summaries*

Each week, bring in a short, one-paragraph summary of each article you read. This assignment will be due at the start of class and will not be accepted late. Excellent summaries will be concise and clearly explain the major question addressed in the article, how it was addressed, and the implications. You are welcome to mention which issues you had difficulty with, and what questions you had. A willingness to understand the article is more important than fully understanding the article before seminar starts.

### ***Guided questions***

The best discussions are guided, meaning that we have at the onset a few key issues in mind to discuss. I will provide these guides to you for the first few seminars. After that, each of you will rotate providing approximately three lead-in questions or topics to discuss for each article. Each of you will probably be in charge of two weeks over the course of the semester. These guided questions must be posted to the WebCT Bulletin Board at least 24 hours prior to each seminar so that all class participants have some time to think over his or her responses. Late postings will be penalized 5% for every 1 hour they are late within the 24-hour pre-class window.

### ***Attendance and participation***

Because there are no exams or papers and few graded assignments, it is critical that you attend punctually and participate actively every seminar. You will earn an A for your participation grade if it is clear to me that you have read each article carefully, that you come to class prepared to discuss them, and that you enthusiastically and critically participate in class discussions. You will receive 0% credit on each seminar that you miss and at most 70% for those you are late.

## **Schedule of readings**

### **Week of January 15**

Jackson, J. B. C, and Cheetham, A. H. 1990. Evolutionary significance of morphospecies: A test with cheilostome Bryozoa. *Science* 248: 579-583.

Levinton, J. (and response by Jackson, J. B. C., and Cheetham, A. H.) 1991. Bryozoan morphological and genetic correspondence: What does it prove? *Science* 251: 319.

### **Week of January 22**

Eldredge, N. and S.J. Gould. 1972. Punctuated equilibrium: an alternative to phyletic gradualism. Pp. 82-115 in T.J.M. Schopf, ed. *Models in Paleobiology*. San Francisco: Freeman and Cooper.

### **Week of January 29**

Jablonski, D. 1996. Background and mass extinctions: Alternation of macroevolutionary regimes. *Science* 231: 129-133.

Jablonski, D. 1987. Heritability at the species level: analysis of geographic ranges of Cretaceous mollusks. *Science* 238: 60-63.

### **Week of February 5**

Kowalewski, M. 2003. Conservation paleobiology. Pp. 60-62 in E. Geller, ed. *McGraw-Hill 2004 Yearbook of Science and Technology*. New York City: McGraw-Hill.

Kowalewski, M., G.E. Avila Serrano, K.W. Flessa, and G.A. Goodfriend. 2000. Dead delta's former productivity: Two trillion shells at the mouth of the Colorado River. *Geology* 28: 1059-1062.

### **Week of February 12**

Alroy, J. 2001. A multi-species overkill simulation of the end-Pleistocene megafaunal mass extinction. *Science* 292: 1893-1896.

Jackson, J.B.C., M.X. Kirby, and 16 other authors. 2001. Historical overfishing and the recent collapse of coastal ecosystems. *Science* 293: 629-638.

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**Week of February 19**

Aberhan, M., W. Kiessling, and F.T. Fürsich. 2006. Testing the role of biological interactions in the evolution of mid-Mesozoic marine benthic ecosystems *Paleobiology* 32: 259-277.

**Week of February 26**

Knoll A.H., R.K. Bambach, D.E. Canfield, and J.P. Grotzinger. 1996. Comparative Earth history and Late Permian mass extinction. *Science* 273: 452-457.

Bambach, R.K. A.H. Knoll, and J.J. Sepkoski, Jr. 2002. Anatomical and ecological constraints on Phanerozoic animal diversity in the marine realm. *Proceedings of the National Academy of Sciences (U.S.A.)* 99: 6854-6859.

**Week of March 5**

Payne, J.L., D.J. Lehrmann, J. Wei, and A.H. Knoll. 2006. The pattern and timing of biotic recovery from the end-Permian extinction on the Great Bank of Guizhou, Guizhou Province, China. *Palaios* 21: 63-85.

**Week of March 12**

Bambach, R.K. 1993. Seafood through time: Changes in biomass, energetics, and productivity in the marine ecosystem. *Paleobiology* 19: 372-397.

**Week of March 26**

Budd, G.E. 1996. The morphology of *Opabinia regalis* and the reconstruction of the arthropod stem-group. *Lethaia* 29: 1-14.

**Week of April 2**

Butterfield, N.J. 1997. Plankton ecology and the Proterozoic-Phanerozoic transition. *Paleobiology* 23: 247-262.

Peterson, K.J. 2005. Macroevolutionary interplay between planktic larvae and benthic predators. *Geology* 33: 929-932.

**Week of April 9**

Thomas, R.D.K. and W.-E. Reif 1993. The skeleton space: A finite set of organic designs. *Evolution* 47: 341-360.

Thomas, R.D.K., R.M. Shearman, and G.W. Stewart. 2000. Evolutionary exploitation of design options by the first animals with hard skeletons. *Science* 288: 1239-1242.

**Week of April 16**

McShea, D.W. 2001. The hierarchical structure of organisms: A scale and documentation of a trend in the maximum. *Paleobiology* 27: 405-423.

**Week of April 23**

Sepkoski, J.J. Jr, R.K. Bambach, D.M. Raup, and J.W. Valentine. 1981. Phanerozoic marine diversity and the fossil record. *Nature* 293: 435-437.

Signor, P.W. 1982. Species richness in the Phanerozoic: Compensating for sampling bias. *Geology* 10: 625-628.

Alroy, J., C.R. Marshall, and 23 other authors. 2001. Effects of sampling standardization on estimates of Phanerozoic marine diversification. *Proceedings of the National Academy of Sciences (U.S.A.)* 98: 6261-6266