GEOLOGY 422K (#26795-26810) – PALEOBIOLOGY (W & Flag)

INSTRUCTOR - Dr. James Sprinkle - e-mail echino@mail.utexas.edu
Office - JGB 4.106; mailbox in JGB 2.112; office phone 471-4264
Office Hours - TuThF 12-1 PM, MW 1-2 PM; other times by appointment

TAs – Kyle Womack (bahlhornin@gmail.com) and Rachel Simon (rsimon@mail.utexas.edu)
Offices in JGB 3.314B & A; Office hours in Paleo. Lab, JGB 3.202; hours to be selected.

PREREQUISITES - Grades of C or better in GEO 404C or 405, in GEO 416M, and in 3-4 hours of introductory biology courses (preferably BIO 301M, or BIO 212 + 213); requirement for GEO 416M usually waived for non-Geology majors.

COURSE TOPICS and OBJECTIVES - See Course Schedule, Goals & Objectives sheet, and Lecture Outlines at GEO 422K Blackboard website <https://courses.utexas.edu/webapps/portal/>

TEXTBOOKS - Lecture - Prothero, 2003, Bringing Fossils to Life (2nd ed., PB): McGraw-Hill.
Lab - Walton & Sprinkle, 1984, 2002, Lab Manual for Paleobiology (PB): Jenn's Copy & Binding (on the Drag)

COURSE READING - Other reading assignments are at the Geology Library (JGB 4.202) Front Desk (books on reserve) or in the Open Files in the back corner of the Reading Room (separates).

FIELD TRIPS - 1. Austin & Waco area Cretaceous field trip, Sat., Sept. 25th, all day (home game)
2. Brownwood area Pennsylvanian field trip, Sat., Oct. 23rd, all day (home game)
Students must have health insurance to go on Geology Dept. field trips.

COURSE GRADES AND EXAMS - Grades will be determined in the following manner:

Lecture	- 1st Hour Exam - Thurs., Sept. 30th	14% \
	- 2nd Hour Exam - Tues., Nov. 2nd	14% } = 52%
	- Final Exam - Mon., Dec. 13th, 2-5 PM	24% /
Lab	- Midterm Exam – 2nd week of Oct.	9% \
	- Lab Final - week of Nov. 30th	9% \
	- 2 Field Trip Reports & Faunal Lists	10 + 8% } = 48%
	- Laboratory Assignments & Quizzes	5% /
	- Abstract project & Student grading	4 + 3% /

Lecture exams and the final may include any of the following types of questions: multiple choice, matching, complete-the-answer, definitions, problems, drawings or charts, short- to intermediate-length essays, and text-editing. Exams are closed-book, are medium in difficulty, and typically are graded by comparing your answer to a written-out key and assigning points accordingly. Lecture exams will be cumulative, covering all previous work up to the time of that exam. A make-up exam for a missed lecture exam may be given at the instructor's discretion up to the time of the next lecture period when the corrected exams are usually returned. Marks will be carried through as numbers, added up at the end of the course, and then curved to get a final letter grade.

GEO 422K - Course Goals and Objectives

GEO 422K Course Goals - The course is set up as a one semester survey of the entire subject of paleobiology, the use of once-living fossils now preserved in rocks to interpret the history of the earth's surface and its biota. The lecture part of the course (3 hrs./week & 52% of the grade) covers the more general and theoretical parts of the course material. Lectures use a topical approach to describe what fossils are, how they are used to date geologic features, interpret past environments, and study changes observed in the history of life. We will do this by discussing theories, looking at examples, and debating controversial topics. The laboratory part of the course (4 hrs./week & 48% of the grade) should give you more practical and "hands-on" experience working with actual fossils. It includes a phylum-by-phylum survey of important fossil groups of invertebrates, vertebrates, plants, and microfossils that emphasizes the identification, morphology, way-of-life, and geologic record of these groups. The two field trips allow you to collect fossils in the field, then prepare, identify, and interpret the collected specimens back in the lab, and write reports summarizing the information you have learned. The course has enough written work with two field trip reports and an abstract project to qualify as one of the Writing Component (W) or Flag Courses you will need to graduate. Paleobiology will help prepare you for a career in soft-rock geology where you may need to use or evaluate paleontological data.

GEO 422K Course Objectives (Lecture) -

1st lecture - You should learn what fossils are, how and where they are preserved, major biases that affect the fossil record, how fossil and living organisms compare, how many fossil taxa are known from different groups, and how good the stratigraphic ranges of fossil species are for correlation.

Next 3 lectures (Biostratigraphy) - You should learn why fossils are useful for telling time, how biozones differ from teilzones and range zones, what index and facies fossils are and how they differ, how accurate correlation is using biostratigraphic zones, how time and time-rock units differ from rock units; how regional zones and their boundaries are set up and named, how correlation indices (such as Simpson's Index) are used, what Shaw range diagrams show about deposition in local sections; what major problems hinder correlation between widely-separated areas, what biomeres are and how they originated in Cambrian trilobites, and what the ranges of major groups are in the fossil record.

Next 3 lectures (Organisms and Environments) - You should learn the basic needs of organisms, what a niche is, where organisms live and how they acquire nutrients and energy, how "way-of-life" descriptors are used; what environments are available for organisms, where do different marine organisms live in a ramp or platform setting; what are the objectives and methods of paleoecologic analysis and how is this type of analysis done, and how homology, analogy, and the paradigm method are used.

Next 4 lectures (Communities, Trace Fossils, Reefs, and Biogeography) - You should learn what communities are, how to recognize them in the fossil record, how r-selection generalists differ from K-selection specialists, how ecologic succession works, what processes happen in ecologic vs. geologic time, where different fossil communities are found on a marine shelf using different models (Ziegler vs. Broadhead); what trace fossils are, what they indicate about the organisms that made them, how the different types are correlated with different water depths; how do banks, reefs, and mud mounds form, what framework organisms have built them, and how do you tell core from flank facies; what factors controlled the geographic distribution of fossil organisms; how diversity gradients have been used to interpret past climates, how the island equilibrium model works and how it has been applied to the fossil record, and what happened to organisms living on a terrane or continent that had a glancing or head-on collision with another continent during plate movement.

Next 2 lectures (Classification and Speciation) - You should learn how organisms are classified in a Linnaean hierarchy, how biological species are defined, how the correct name of a fossil organism is determined; how phyletic gradualism differs from punctuated equilibrium, and which of these speciation models is most common in the fossil record.

Next 2 lectures (Evolution and Extinction) - You should learn how higher taxa are chosen, how classification philosophies (phenetic, cladistic, and evolutionary) differ from each other, how monophyletic, paraphyletic, and polyphyletic groups differ, how higher taxa originate during an adaptive radiation, what large-scale evolutionary patterns are commonly found in fossil groups, what living fossils are; when mass extinctions occur in the fossil record, how they differ from normal background extinction, and what causes have been proposed for different mass extinctions.

Next 2 lectures (Size, Shape, and Growth) - You should learn how skeletons grow during ontogeny, why surface-to-volume problems appear during growth and how organisms have solved these problems, how the allometric equation $Y = CX^k$ works and what the various values of k imply, how ontogenetic changes (recapitulation and paedomorphosis) occur during phylogeny and why these may be important; how Raup modeled the growth of a geometrically coiled shell using 4 factors (W, T, D, and S), what range of shell shapes can be produced by varying these factors, and how closely real organisms agree with or deviate from this simple model.

Next 2 lectures (Precambrian Life and Models in Paleobiology) - You should learn how early organisms appeared and diversified in the Middle and Late Precambrian as the environment changed, how eucaryotes may have originated from procaryotes by endosymbiosis, when metazoans first appeared in the Ediacaran and then underwent a huge radiation (the 'Cambrian Explosion') at the beginning of the Phanerozoic; what features a scientific model should have, the range of models used in paleobiology, and how Raup, Gould, Schopf, and Simberloff modeled diversity of lineages in the fossil record as a stochastic process

Five lectures near end (Paleontologists and Their Work and Extraordinary Fossils) - You should learn how early echinoderms diversified during their two initial Paleozoic radiations (Sprinkle's work); how Sepkoski modeled the diversification of marine metazoans and the sequential replacement of 3 different evolutionary faunas, and how Sepkoski and Sheehen modeled colonization of marine shelf environments as repeated onshore to offshore migrations; what extraordinary fossils are, where they occur in the fossil record, and what special conditions produced these rare occurrences; why Bakker thinks dinosaurs were warm-blooded and the evidence for and against this controversial idea; and Martin's overkill model for how human migrations caused the extinction of large mammals and birds in the latest Pleistocene.

Last fall's average mark was a 75 (top mark 86, lowest mark 56), and there were 6 A's, 11 B's, 15 C's, 1 D, & 1 Q out of a class of 34, for a 2.66 overall class GPA.

ACADEMIC DISHONESTY - Although students are encouraged to work together in the field and lab, all written work turned in for a grade (exams, reports, lists) must be your own work; this is especially important for a Writing Component Course. There are severe penalties for cheating (on exams), plagiarism (using someone else's ideas or written work without citation credit in a report), or collusion (turning in another student's work as your own in a faunal list or report). See the UT Honor Code at <http://registrar.utexas.edu/catalogs/gi09-10/ch01/index.html>

ACADEMIC POLICIES - No special policy on drops, incompletes, or time extensions; see General Information Catalog, Part V. The last day to drop the course without possible academic penalty is Sept. 22, 2010; the last day to drop the course for academic reasons is Oct. 20, 2010.

STUDENTS WITH DISABILITIES may request appropriate academic accommodations from the Division of Diversity and Community Engagement, Services for Students with Disabilities, 471-6259, or http://www.utexas.edu/diversity/ddce/ssd/

ACCOMMODATIONS FOR RELIGIOUS HOLIDAYS – By UT Austin policy, a student must notify the instructor of a pending absence from class at least fourteen days prior to the date of observance of a religious holy day. If you must miss a class, an examination, a lab assignment, or a project in order to observe a religious holy day, you will be given an opportunity to complete the missing work within a reasonable time after the absence.

GEOLOGY 422K - PALEOBIOLOGY
FALL, 2010 - DR. SPRINKLE

Thursday, Aug. 26 — Introduction to the study of fossils; how good is the fossil record?
- Prothero, p. vii-viii, p. 5-8, p. 18
- Paul, 1985, p. 7-14

Tuesday, Aug. 31 — Fossils and time – basic definitions
- Prothero, p. 169-185
- Eicher, p. 60-65, p. 99-104

Thursday, Sept. 2 — Biostratigraphy – specific examples
- Raup & Stanley, p. 209-225
- Eicher, p. 104-110

Tuesday, Sept. 7 — Correlation problems, biomeres, and ranges of major groups
- Raup & Stanley, p. 225-229
- Eicher, p. 68-75
- Simpson & Beck, p. 727-737

Thursday, Sept. 9 — Fossils and environments – basic parameters
- Beerbower, p. 33-34
- McAlester, p. 44-52, p. 69-70
- Laporte, p. 68-78
- Extra - read Ager, p. 3-12 for introduction to paleoecology

Tuesday, Sept. 14 — Ancient environments and their preserved organisms
- Prothero, p. 119-122, p. 124-129
- Laporte, p. 2-11

Thursday, Sept. 16 — Abstract Project passed out + Paleoecologic analysis – specific examples
- Raup & Stanley, p. 239-245, p. 338-342
- Ager, p. 57-72

*Tuesday, Sept. 21 — First draft of Abstract due in class + Fossil communities – structure and evolution
- Ziegler, p. 680-685
- Bretsky, p. 1231-1233
- Broadhead, p. 263-277

*Thursday, Sept. 23 — Edited Abstracts returned + Preview of 1st field trip + Paleontologists & their work I – Seilacher, Chamberlain, Droser, and Bottjer's trace fossils
- Prothero, p. 403-432
- Bottjer and Droser, p. 130-141

*Saturday, Sept. 25 — 1-day field trip in Austin and Waco to collect Cretaceous fossils for a biostratigraphy project (1st field trip report)

*Tuesday, Sept. 28 — Final draft of Abstract due in class + Banks, reefs, and mud mounds
- Prothero, p. 227-229
- Laporte, p. 29-34, p. 45-47

Newell, p. 54-65

*Thursday, Sept. 30 1st Hour Exam (14%)

Tuesday, Oct. 5 Pass back and discuss corrected exams + Paleobiogeography and plate tectonics
Prothero, p. 149-167

*Thursday, Oct. 7 1st Draft of Field Trip Report due in class + Classification and study of fossils – species and genera
Prothero, p. 39-40, p. 47-49
Raup & Stanley, p. 114-117, p. 124-128
Gould, l975, p. 824-826
Extra - see Mayr & Ashlock, p. 23-28 for more information on species.

*Tuesday, Oct. 12 Students return Field Trip Report 1st drafts in class + Speciation in the fossil record
Eldredge & Gould, p. 82-114
Gould, 1991, p. 12-18
Freeman & Herron, 2000, p. 521-526
Extra - see Gould and Eldredge, l977 and 1986, and Ruse, 1989, for more recent work.

Thursday, Oct. 14 Instructor returns Field Trip Report 1st drafts + Evolution of higher taxa
Prothero, p. 49-55
Raup & Stanley, p. 129-138, p. 363-369
Stanley, l975, p. 646-650

*Tuesday, Oct. 19 Final Draft of Field Trip Report due in class + Extinctions in the fossil record
Raup & Sepkoski, p. 150l-1502
Raup, 1986, p. 1528-1533
Prothero, p. 81-92(top), 92(bottom)-95

Thursday, Oct. 21 Preview of Brownwood field trip + Size and growth in evolution
Raup & Stanley, p. 59-66, p. 352-356
Foote & Miller, 2006, p. 44-48 (+ Fig. 2.22)

*Saturday, Oct. 23 All-day field trip to Brownwood, Texas, area to study several Pennsylvanian marine faunal communities (2nd field trip report)

Tuesday, Oct. 26 Paleontologists and their work II – Raup's shell coiling
Raup & Stanley, p. 165-177

Thursday, Oct. 28 Precambrian life and atmospheric evolution
Schopf, p. 51-58
Stanley, l973, p. 1486-1488
Knoll, 2003, p. 89-98, p. 122-135

*Tuesday, Nov. 2 2nd Hour Exam (14%) **(GSA)**

*Thursday, Nov. 4 — First draft of 2nd Field Trip Report due in class + Ediacaran appearance & 'Cambrian Explosion' of metazoans
- Glaessner, p. 50-69
- Gould, 1998, p. 20-22, p. 58-65
- Freeman & Herron, 2000, p. 511, p. 514-521

*Tuesday, Nov. 9 — Edited 2nd Field Trip Reports returned in class + Pass back and discuss corrected exams + Paleontologists and their work III – Sprinkle's early echinoderms
- Sprinkle, p. 15-26
- Guensburg & Sprinkle, p. 407-410

Thursday, Nov. 11 — Paleontologists and their work IV – Sepkoski's evolutionary faunas
- Sepkoski, p. 246-255
- Prothero, p. 141-145

*Tuesday, Nov. 16 — Final Draft of 2nd Field Trip Report due in class + Models in paleobiology
- Raup, Gould, Schopf, & Simberloff, p. 525-539
- Ross & Allmon, 1990, p. 1-17

Thursday, Nov. 18 — Extraordinary fossils
- Baird, p. 15-21
- Nitecki, p. 22-26
- Conway Morris & Whittington, p. 122-133
- Chen, Bergstrom, Lindstrom, & Hou, p. 8-18

Tuesday, Nov. 23 — Paleontologists and their work V – Bakker's 'warm-blooded' dinosaurs
- Bakker, 1971, p. 636-637, p. 645-656 (general sections)
- Bakker, 1975, p. 58-78
- Extra - see Bakker (1986) for additional information

THANKSGIVING VACATION

Tuesday, Nov. 30 — Paleontologists and their work VI – Martin's Pleistocene-Recent mammal extinctions
- Martin, p. 969-974
- Foote & Miller, 2006, p. 305-311

Thursday, Dec. 2 — Catch up + Review for Final Exam (24%) + Course evaluation

GEOLOGY 422K - PALEOBIOLOGY

READING AND REFERENCE LIST

Lecture Textbook: *Prothero, D.R. 2003. Bringing Fossils to Life: An Introduction to Paleobiology (2nd ed.). McGraw- Hill, New York, 503 p. (paperback).

Lab Manual: Walton, A.H. and Sprinkle, J. 1984, 2002. Lab Manual for Paleobiology. Jenn's Copy & Binding, Austin, 119 p. (paperback).

Other Readings (* contains reading assignment):

*Ager, D.V. 1963. Principles of Paleoecology. McGraw-Hill Book Co., New York, 371 p.

Ausich, W.I. and Lane, N.G. 1999. Life of the Past (4th Ed.). Prentice-Hall, Inc., Upper Saddle River, NJ, 321 p. (paper.).

*Baird, G.C. 1978. Mazon Creek Census. Field Mus. Nat. History Bull., v. 49, no. 8, p. 15-21.

*Bakker, R.T. 1971. Dinosaur physiology and the origin of mammals. Evolution, v. 25, no. 6, p. 636-658.

*Bakker, R.T. 1975. Dinosaur rennaissance. Scientific American, v. 232, no. 4, p. 58-78 (April).

Bakker, R.T. 1986. The Dinosaur Heresies. Zebra Books, New York, 482 p.

*Beerbower, J.R. 1968. Search for the Past (2nd Ed.). Prentice-Hall, Inc., Englewood Cliffs, N.J., 512 p.

Benton, M.J. (ed.). 1993. The Fossil Record 2. Chapman and Hall, London, ~832 p.

Black, R.M. 1988. Elements of Palaeontology (2nd Ed.). Cambridge University Press, Cambridge, England, 404 p. (paperback).

Boardman, R.S., Cheetham, A.H., and Rowell, A.J. (eds.). 1987. Fossil Invertebrates. Blackwell Scientific Publcations, Palo Alto, CA, 713 p.

*Bottjer, D.J. and Droser, M.L. 1992. Paleoenvironmental patterns of biogenic sedimentary structures, p. 130-141. In: Maples, C.G. and West, R.R. (eds.), Paleontological Society Short Courses in Paleontology no. 5, 238 p.

Briggs, D.E.G. and Crowther, P.R. (eds.). 2001. Palaeobiology II. Blackwell Scientific Publications, Oxford, 583 p.

*Bretsky, P.W. 1968. Evolution of Paleozoic marine invertebrate communities. Science, v. 159, no. 3820, p. 1231-1233.

*Broadhead, T.W. 1976. Depositional systems and marine benthic communities in the Floyd Shale, Upper Mississippian, NW Georgia, p. 263-278. In: Scott, R.W. and West, R.R. (eds.), Structure and Classification of Paleocommunities. Dowden, Hutchinson and Ross, Inc., Stroudsburg, PA, 291 p

Broadhead, T.W. (ed.). 1980-88. Notes for a Short Course. Univ. Tenn. Dept. Geol. Sciences, Studies in Geol. nos. 3 (Echinoderms, 1980), 5 (Lophophorates, 1981), 6 (Foraminifera, 1982), 7 (Sponges & Spongiomorphs, 1983), 8 (Mammals, 1984), 13 (Molluscs, 1985), 15 (Land Plants, 1986), 18 (Procaryotes & Protists, 1987), and 19 [Short Courses in Paleontology no. 1] (Molecular Evolution, 1988).

*Chen, J., Bergstrom, J., Lindstrom, M., and Hou, X. 1991. The Chengjiang Fauna - oldest soft-bodied fauna on earth. Research and Exploration, v. 7, no. 1, p. 8-19, no. 2, p. 238-239.

Clarkson, E.N.K. 1993. Invertebrate Palaeontology and Evolution (3rd ed.). Chapman and Hall, London, 434 p. (paperback).

Conway Morris, S. 1998. The Crucible of Creation: The Burgess Shale and the Rise of Animals. Oxford University Press, Oxford, 242 p.

*Conway Morris, S. and Whittington, H.B. 1979. The animals of the Burgess Shale. Scientific American, v. 241, no. 1, p. 122-133 (July).

Culver, S.J. (ed.). 1989-95. Paleontological Society Short Courses in Paleontology, nos. 2 (Age of Dinosaurs, 1989), 3 (Arthropod Paleobiology, 1990), 4 (Analytical Paleontology, 1991), 5 (Trace Fossils, 1992), 6 (Taphonomic Approaches to Time Resolution ..., 1993), 7 (Major Features in Vertebrate Evolution, 1994), 8 (Siliceous Microfossils, 1995).

Donovan, S.K. (ed.). 1989. Mass Extinctions: Processes and Evidence. Columbia University Press, New York, 266 p. (paperback).

*Eicher, D.L. 1976. Geologic Time (2nd Ed.). Prentice-Hall, Inc., Englewood Cliffs, N.J., 150 p. (paperback).

*Eldredge, N. and Gould, S.J. 1972. Punctuated equilibria: an alternative to phyletic gradualism, p. 85-115. In: Schopf, T.J.M. (ed.), Models in Paleobiology. Freeman, Cooper and Co., San Francisco, 250 p.

Fairbridge, R.W. and Jablonski, D. (eds.). 1979. The Encyclopedia of Paleontology. Dowden, Hutchinson & Ross, Inc., Stroudsburg, PA, 886 p.

Finsley, C. 1996. A Field Guide to Fossils of Texas (2nd Ed.). Gulf Publishing Company, Houston, 211 p. (paperback).

*Foote, M. and Miller, A. I. 2006 (2007). Principles of Paleontology (3rd ed.). W. H. Freeman and Co., New York, 354 p.

*Freeman, S. and Herron, J.C. 2001. Evolutionary Analysis (2nd Ed.). Prentice-Hall, Inc., Upper Saddle River, NJ, 704 p.

*Glaessner, M.F. 1984. The Dawn of Animal Life. Cambridge University Press, Cambridge, England, 244 p. (paperback).

*Gould, S.J. 1975. Review of: Stauffer, R.C. (ed.), Charles Darwin's Natural Selection. Science, v. 188, no. 4190, p. 824-826.

*Gould, S.J. 1991. Opus 200. Natural History, v. 100, no. 8, p. 12-18 (August).

*Gould, S.J. 1998. On embryos and ancestors. Natural History, v. 107, no. 6, p. 20-22, 58-65 (July-August).

Gould, S.J. and Eldredge, N. 1977. Punctuated equilibria: the tempo and mode of evolution reconsidered. Paleobiology, v. 3, no. 2, p. 115-151.

Gould, S.J. and Eldredge, N. 1986. Punctuated equilibrium at the third stage. Systematic Zoology, v. 35, no. 1, p. 143-148.

*Guensburg, T.E. and Sprinkle, J. 1992. Rise of echinoderms in the Paleozoic Evolutionary Fauna: significance of paleoenvironmental controls. Geology, v. 20, no. 5, p. 407-410 (+ cover photo).

Jablonski, D., Erwin, D.H., and Lipps, J.H. (eds.). 1996. Evolutionary Paleobiology. University of Chicago Press, Chicago, 484 p. (paperback).

*Knoll, A. H. 2003. Life on a Young Planet. Princeton University Press, Princeton, NJ, 277 p.

Laporte, L.F. (ed.) 1978. Evolution and the Fossil Record. W.H. Freeman and Co., San Francisco, 222 p. (Scientific American articles by Glaessner, Seilacher, Newell, and Bakker).

*Laporte, L.F. 1979. Ancient Environments (2nd Ed.). Prentice-Hall, Inc., Englewood Cliffs, NJ, 163 p. (paperback).

Levi-Seti, R. 1993. Trilobites (2nd Ed.). Univ. of Chicago Press, Chicago, 342 p.

Margulis, L. 1971. Symbiosis and evolution. Scientific American, v. 225, no. 2, p. 48-57 (August).

*Martin, P.S. 1973. The discovery of America. Science, v. 197, no. 4077, p. 969-74.

Matthews, W.H. III. 1960. Texas Fossils: an Amateur Collector's Handbook. Bureau of Economic Geology, Univ. of Texas, Austin, 123 p. (paperback).

*Mayr, E. and Ashlock, P.D. 1991. Principles of Systematic Zoology (2nd Ed.). McGraw-Hill Book Co., Inc., New York, 475 p.

*McAlester, A.L. 1977. The History of Life (2nd Ed.). Prentice-Hall, Inc., Englewood Cliffs, NJ, 167 p. (paperback).

McKerrow, W.S. (ed.). 1978. The Ecology of Fossils. The MIT Press, Cambridge, MA, 384 p. (paper.).

Moore, R.C., Teichert, C., Robison, R.A., Kaesler, R.L. , and Seldon, P.(successive eds.). 1953-2009. Treatise on Invertebrate Paleontology, vols. A-X. Geological Society of America and University of Kansas, New York or Boulder, CO, and Lawrence, KS (now 41 vols.).

Murray, J.W. (ed.) 1985. Atlas of Invertebrate Macrofossils. Halsted Press, New York, 241 p.

*Newell, N.D. 1972. The evolution of reefs. Scientific American, v. 226, no. 6, p. 54-65 (reprint 901).

*Nitecki, M.H. 1978. Mazon Creek studies. Field Mus. of Nat. History Bull., v. 49, no. 8, p. 22-26.

*Paul, C.R.C. 1985. The adequacy of the fossil record reconsidered. Special Papers in Palaeontology, No. 33, p. 7-15.

*Raup, D.M. 1986. Biological extinction in earth history. Science, v. 231, no. 4745, p. 1528-1535.

*Raup, D.M. and Sepkoski, J.J., Jr. 1982. Mass extinctions in the marine fossil record. Science, v. 215, no. 4539, p. 1501-1503.

*Raup, D.M. and Stanley, S.M. 1978. Principles of Paleontology (2nd Ed.). W.H. Freeman and Co., San Francisco, 481 p.

*Raup, D.M., Gould, S.J., Schopf, T.J.M., and Simberloff, D.S. 1973. Stochastic models of phylogeny and the evolution of diversity. Journal of Geology, v. 81, no. 5, p. 525-542.

*Ross, R.M. and Allmon, W.D. (eds.). 1990. Causes of Evolution, a Paleontological Perspective. University of Chicago Press, Chicago, 479 p.

Ruse, M. 1989. Is the theory of punctuated equilibria a new paradigm?, p. 118-145. In: The Darwinian Paradigm. Routledge, 299 p.

*Schopf, J.W. 1975. The age of microscopic life. Endeavour, v. 34, no. 122, p. 51-58.

*Sepkoski, J.J., Jr. 1984. A kinetic model of Phanerozoic taxonomic diversity. III. Post-Paleozoic families and mass extinctions. Paleobiology, v. 10(2), p. 246-267.

*Sepkoski, J.J., Jr. and Sheehan, P.M. 1983. Diversification, faunal change, and community replacement during the Ordovician radiations, p. 673-717. In: Tevesz, M.J.S. and McCall, P.J. (eds.), Biotic Interactions in Recent and Fossil Benthic Communities. Plenum Publishing, New York, 812 p.

*Simpson, G.G. and Beck, W.S. 1965. Life, an Introduction to Biology (2nd Ed.). Harcourt, Brace & World, Inc., New York, 869 p.

*Sprinkle, J. 1980. An overview of the fossil record, p. 15-26. In: Broadhead, T.W. and Waters, J.A. (eds.), Echinoderms, Notes for a Short Course. University of Tennessee Studies in Geology, no. 3, 235 p.

*Stanley, S.M. 1973. An ecologic theory for the sudden origin of multicellular life in the Late Precambrian. Proceedings of the National Academy of Science USA, v. 70, no. 5, p. 1486-1489.

*Stanley, S.M. 1975. A theory of evolution above the species level. Proceedings of the National Academy of Science USA, v. 72, no. 2, p. 646-650.

Stanley, S.M. 1979. Macroevolution: Pattern and Process. W.H. Freeman and Co., San Francisco, 332 p.

Taylor, T.N. and Taylor, E.L. 1993. The Biology and Evolution of Fossil Plants. Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 982 p.

Valentine, J.W. 1973. Evolutionary Paleoecology of the Marine Biosphere. Prentice-Hall, Inc., Englewood Cliffs, NJ, 511 p.

Valentine, J.W. (ed.). 1985. Phanerozoic Diversity Patterns. Princeton University Press, Princeton, NJ, 441 p. (paperback).

Various Editors. 1996-2008. Paleontological Society Papers, Vol. 1 (Paleobiology and Biology of Corals, 1996), Vol. 3 (Geobiology of Echinoderms, 1997), Vol. 4 (Isotope Paleobiology and Paleoecology, 1998), Vol. 5 (The Evolution-Creation Controversy II, 1999), Vol. 6 (Phanerozoic Terrestrial Ecosystems, 2000), Vol. 7 (Brachiopods Ancient & Modern, 2001), Vol. 8 (The Fossil Record of Predation, 2002), Vol. 9 (…Trends in the Ostracode Biological and Geological Sciences, 2003), Vol. 10 (Neoproterozoic–Cambrian Biologi-cal Revolutions, 2004), Vol. 12 (Geochronology: Emerging Opportunities, 2006), Vol. 13 (Pond Scum to Carbon Sink: Geological & Environ. Applications of the Diatoms, 2007), Vol. 14 (From Evolution to Geobiology, 2008).

Whittington, H.B. 1985. The Burgess Shale. Yale Univ. Press, New Haven, 151 p.

*Ziegler, A.M. 1970. Silurian marine communities and their environmental significance, p. 680-685. In: Cloud, P.E. (ed.), Adventures in Earth History. W.H. Freeman and Co., San Francisco, 992 p.

Ziegler, A.M., Walker, K.R., Anderson, E.J., Kauffman, E.G., Ginsburg, R.N., and James, N.P. 1974. Principles of Benthic Community Analysis. University of Miami Comparative Sedimentology Laboratory, Sedimenta IV, 175 p. (paperback).