

Geology 203 – Fossils and the History of Life (4)
Course Outline **GE B5**

Prerequisites for GEOL 203 – None. 3 lectures, 1 discussion. Fulfills GE B5.

Fossil record. Geologic time scale. Evolution and the fossil record. Evolution – creation controversy. Early earth and early life. Features, lifestyles, origins, and histories of major invertebrate, vertebrate, and plant groups. Mass extinctions.

Learning Objectives and Criteria:

Upon completion of the course the student is expected to:

- 1) Know the role of fossils in establishing the concept of an old and always changing earth.
- 2) Know how fossils are used in deciphering earth history.
- 3) Know that the fossil record is generally supportive of the theory of evolution and inconsistent with the ideas of the so-called "strict creationists."
- 4) Know of the many strange and wonderful kinds of organisms that have lived on earth, how they made a living, and what their worlds were like.
- 5) Know of major turning points in the history of life, such as periods of rapid diversification and mass extinctions and their possible causes.

Text and References:

"Evolution of the Earth" (7th edition), by D. R. Prothero and R. H. Dott

Content and Method:

Content: GEOL 203 will adhere to the following topics:

Week 1 Lecture: The scientific method; fundamentals of evolution; origin of the universe and solar system; plate tectonics; controls on global climate.

Week 1 Activity: Radiometric dating.

Week 2 Lecture: Linnean hierarchy; the origin of life; K. Monera and K. Protista (prokaryotes and eukaryotes); banded iron formation; first metazoans (multicelled/specialized-cell organisms).

Week 2 Activity: rocks and the rock cycle. Layered sedimentary rocks; facies and biostratigraphy.

Week 3 Lecture: Neoproterozoic and early Paleozoic life.

Week 3 Activity: sedimentology of clastic sedimentary rocks; sketching early Paleozoic-time fossils.

Week 4 Lecture: middle Paleozoic life; early vertebrates; early fishes; early amphibians; early land plants.

Week 4 Activity: carbonate sedimentary rocks; sketching middle Paleozoic-time fossils.

Week 5 Lecture: late Paleozoic; amphibians and mammal-like reptiles; land plants.

Week 5 Activity: sketching late Paleozoic-time fossils.

Week 6 Lecture: therapsids and other late Paleozoic-time life.

Week 6 Activity: Walther's law; sketching fossils of late Paleozoic-time plants.

Week 7 Lecture: Triassic reptiles; Dinosaurs.

Week 7 Activity: paleoecology and paleogeography; sketching Mesozoic-time fossils.

Week 8 Lecture: Dinosaurs cntd., late Mesozoic life; Marine reptiles and evolution of flight. Cretaceous extinctions.

Week 8 Activity: sketching Mesozoic and Cenozoic-time fossils.

Week 9 Lecture: Evolution of mammals in the Cenozoic.

Week 9 Activity: review for fossil identification exam.

Week 10 Lecture: Evolution of mammals in the Cenozoic; emergence of the Hominoid lineage; evolution of *Homo sapiens neanderthalensis* and evolution of *Homo sapiens sapiens*.

Week 10 Activity: fossil identification final exam.

Method:

GEOL 203 is a 4-unit course with 3 hours of lecture and 1 hour of recitation per week.

Students taking GEOL 203 (Fossils and the History of Life) learn how life evolved on Earth. Subject matter constituting the course includes the processes and environments that gave rise to organic molecules, and concludes with the evolution of modern *Homo sapiens sapiens*. Recognition and identification of fossils is learned through sketching fossils and a fossil identification exam. Students also learn about factors that influenced how life evolved on Earth, and learn how scientists deduce the history of life from the fossil record. Achieving these objectives requires a survey of the following topics: the principles of radiometric dating; formation of the universe, solar system, and Earth; plate tectonics; mechanisms controlling global climate; mechanisms causing mass extinction of species; and the difference between ideas put forth by dogma and ideas arising from the scientific method. The course includes a field trip to collect fossils and/or study mammal evolution.

Methods of Assessment:

There will be three 45-minute exams. Each of which is about 80 percent objective and about 20 percent short answer/short essay. The short answer/short essay questions are based mainly on slides. There will also be one or more short quizzes. There will be two or three fossil exercises using real fossils that will provide practice in observation and discernment, the use of systematic keys for identification, and inferring habits and life-styles from characteristics of the fossils.

Altogether with tests and fossil exercises, the course will include about 6 pages of writing, which will account for about one-third of the grade. The optional (for extra credit) reports could add another 1-3 pages of writing.