

Dr. Constance M. Soja  
Office: Lathrop 306-307, x 7200

Lectures: 0900-1020 T Th  
Office Hours: 1030-1200 T Th

Textbook: Ausich, W.I. and Lane, N.G. 1999. Life of the Past. (4th edition).  
Prentice Hall.

|                                   |   |  | Readings        |
|-----------------------------------|---|--|-----------------|
| <b>I. THE GEOLOGIC CALENDAR</b>   |   |  |                 |
| Jan 24                            | M | Course introduction  | Preface         |
| 25                                | T | Fossils and geologic time<br><i>using fossils and time concepts to introduce scientific myths and methods--hypothesis &amp; theory--certainty and uncertainty in exploring the Earth's past</i>  | 1-7             |
| 27                                | H | <u>Discussion Exercise #1</u> : Age of the earth<br><i>create models to true scale to hypothesize and test ideas about the chronology of events in Earth history</i>   | 7-18            |
| Feb 1                             | T | The evolution-creationism controversy<br><i>is creationism science?--should creationism be taught in science courses? can scientists believe in God?--an open discussion &amp; critique of Wise's article</i>                          | Wise article    |
| 3                                 | H | <u>Discussion Exercise #2</u> : Preservation of fossils<br><i>examination of fossils to test ideas about preservation and completeness of the fossil record--insights into how geologists work with an incomplete record</i>           | 33-47           |
| 8                                 | T | <u>Discussion Exercise #3</u> : Solving geologic puzzles<br><i>form hypotheses about geologic sequences and apply geologic "laws" to test ideas while learning about the value &amp; limitations of relative age dating techniques</i> | 47-54           |
| <b>II. ORIGINS</b>                |   |  |                 |
| Feb 10                            | H | Birth and evolution of a planet<br><i>did the planets in our solar system and the Earth's moon form simultaneously or independently?--compiling and debating the evidence</i>  | 55-58;S:285-297 |
| 15                                | T | <u>Discussion Exercise #4</u> : Dissecting Planet Earth<br><i>create a model to true scale to test preconceived notions about the internal structure of the Earth and influence on processes at Earth's surface</i>                    |                 |
| 17                                | H | Inevitability of life  | 58-62;M:3-12    |
| 22                                | T | Earth's earliest inhabitants   | 19-32, 109-120  |
| 24                                | H | Evolution and extinction   | 63-78           |
| 29                                | T | <b>Hour Exam I</b>   |                 |
| <b>III. THE MOBILE EARTH</b>      |   |  |                 |
| Mar 2                             | H | <u>Discussion Exercise #5, Part I</u> : The Cambrian 'explosion'<br><i>using a futuristic web-based exercise to compile evidence about the causes and consequences of life's "big bang"</i>  | 114-132         |
| 7                                 | T | Plate tectonics and global change  | 79-108          |
| <b>IV. PALEOZOIC PERSPECTIVES</b> |   |  |                 |

|         |   |                 |
|---------|---|-----------------|
| Mar 9 H | <u>Discussion Exercise #5, Part II: The Cambrian 'explosion'</u><br><i>using a futuristic web-based exercise to debate the causes and consequences of life's "big bang"</i> | 179-181         |
| 14-16   | SPRING BREAK  |                 |
| 21 T    | <u>Discussion Exercise #6: Fossil invertebrates</u><br><i>examination of fossils to compare and contrast invertebrate phyla</i>   | 133-178         |
| 23 H    | Predators!  | 181-192         |
| 28 T    | Life emerges from the sea   | 198-204         |
| 30 H    | Greening of the continents  | 193-198,205-231 |
| Apr 4 T | Video and review  |                 |
| 6 H     | <b>Hour Exam II</b>   |                 |

#### IV. GLOBAL TRANSITIONS IN THE MESOZOIC & CENOZOIC

|          |   |                 |
|----------|---|-----------------|
| Apr 11 T | Dinosaurs!  | 233-253         |
| 13 H     | Origin of birds and mammals   | 255-262         |
| 18 T     | <u>Discussion Exercise #7: Asteroids and global catastrophe</u><br><i>compiling evidence to debate causes of the K/T mass extinction</i>                | 253-254         |
| 20 H     | <u>Discussion Exercise #8: Environments, diet, &amp; teeth</u><br><i>examination of fossil and modern skulls to test ideas about dentition and diet</i> | 262-277         |
| 24 Sat   | <b>Required field trip</b>  | Sat. a.m. only  |
| 25 T     | Perspectives on primates  | M:137-154       |
| 27 H     | Environmental context of hominid evolution  | 281-292         |
| May 2 T  | Mass extinctions: past, present, & future?  | 277-280,292-294 |
| 4 H      | Reflection and review   |                 |
| 8-12     | <b>Final Exam</b>   | comprehensive   |

#### Required Readings (on reserve in the Science Library):

- (M): McAlester, A.L. 1977. The History of Life. (2nd ed.) Prentice-Hall, Inc.  
 (S): Stanley, S.M. 1999. Earth System History. W.H. Freeman & Co.  
 Wise, D.U. 1998. Creationism's geologic time scale. American Scientist, v. 86:160-173.

#### Course Goals & Philosophy:

This course considers within an environmental context the evolution of life on Earth from its origin to the present. Lectures, discussion exercises and debates, a web-based project, and a field trip will enable us to explore the link between dramatic physical (tectonic), climatic, and evolutionary events that occurred on our planet in the past 4.5 billion years. These include the origin of life on Earth (and possibly elsewhere), the Cambrian "explosion," the transition to life on land, and the influence of meteorite impacts, volcanism, and climate on mass extinctions. As a final theme of the course, a perspective on primates will allow you to prepare presentations about controversies concerning human evolution as well as the role that *Homo sapiens* may have played in

recent extinctions. Understanding the Earth's past will enable us to forecast the future diversity of life on a human-dominated planet.

The overall framework for the course is to explore the rich history of life on Earth. You will use scientific methodology to experience for yourself *how* geologists reach conclusions about the Earth's history. You will have numerous opportunities to formulate and test hypotheses so that you become more fully aware of the "myths and methods" involved in the scientific process and gain an appreciation for the ways in which "conventional wisdom" in science (geology, in particular) can be overturned with technological advances in scientific techniques or the discovery of new evidence. In this way, you will gain important insights into the ways in which scientific knowledge evolves as well as why or how theories are revised or discarded.

By the end of the semester, your preconceptions about the evolution and extinction of life on Earth, *Homo sapiens* and the state of the world, and Earth history should have been challenged while considering a variety of scientific viewpoints. Furthermore, you should have a deep understanding of the scientific process by having collected your own data during our field trip, having your ideas or scientific results challenged by other students in the course, and giving a major presentation to the class about new discoveries in human evolution.

### **Discussion Sessions:**

The "Discussion Exercises" are purposely constructed so that you will have the opportunity to work collaboratively on designing hypotheses and using real geological specimens or math to test ideas or questions posed. For example, these discussion periods will reveal *how* fossils are preserved, *why* differing preservational potentials have an impact on what we know about the Earth's past inhabitants, and *how* geologists work with a partial record of the Earth's past. These reinforcing exercises will demonstrate how the scientific process works, especially in the face of an incomplete data set. In other exercises, you will become experienced in applying principles of scientific reasoning by undertaking what geologists must to reconstruct Earth history. In essence, these exercises are designed to give you direct experience with fossils and geologic samples as well as the opportunity to debate and critique major concepts in earth science. These classroom sessions will also be opportunities to explore how scientific conclusions are reached, the relevance of science to contemporary issues, and illuminate why the *same body of evidence* can generate heated debates in science.

### **Office Hours:**

I will be available to discuss any aspect of the course during office hours or at other mutually convenient times, which can be arranged by appointment. Please take advantage of these discussion opportunities, which many students have found useful in the past for gaining information through individual instruction and informal chats.

**Grade Assessment:**

The course grade will be determined from the cumulative score you earn on two hour exams, discussion exercises, field trip, comprehensive final, and participation. Discussion exercises and the Saturday morning field trip are designed to complement the material covered in lecture and to help you gain experience with fossils and other geological materials. Points will be awarded as follows:

|                      |     |                 |
|----------------------|-----|-----------------|
| Hour Exam I          | 100 | points          |
| Hour Exam II         | 100 | "               |
| Final Exam           | 150 | "               |
| Discussion Exercises | 40  | "               |
| Field trip           | 10  | "               |
| Participation        | 40  | "               |
| <hr/>                |     |                 |
| 440                  |     | points possible |

Exams will consist of a variety of questions, including essays, multiple choice, definitions, short answers, and sketching or labeling diagrams. These academic opportunities are designed to test your understanding and application of knowledge explored in lectures, readings, and discussions.

**Classroom as Community:**

The success of this class depends in large part on you, particularly your interest, enthusiasm, and dedication to learning. Consistent class attendance and being up-to-date with reading assignments are the two most important ways in which to demonstrate your commitment to the class and to the other students enrolled. Those of you who are consistently late for class or absent on a regular basis (Thursday mornings, in particular) diminish the classroom experience for all involved by sending a message that the course is not a high priority in your academic life. Since this is *not* a required course, I ask that those of you who have elected to take this class do so as a willing and dedicated member of a learning community. Thus *class attendance*, participation in classroom discussions, debates, and exercises, enthusiasm, and improvement in performance through the semester will also count in your favor when deciding the final grade. Please note that those who miss more than a couple of "sick days" (points drop off sharply after a couple missed classes), are consistently late or unprepared for class, or are drowsy/inattentive in class will receive a *poor* evaluation for participation, which will have a negative impact on the overall course grade (see above).

**Make-up Policy for Quiz, Exams, and Discussion Exercises:**

No make-up exams will be given for a student absent from the midterm unless extraordinary circumstances (serious illness or family emergency; both must be confirmed by Class Dean) are involved. *This policy also applies to the discussion and web exercises, which cannot be made up.* You must notify me, either directly or by

leaving a message at ext. 7200, *before* the exam or web exercise if your absence is to be excused with no points deducted. This ensures that all academic opportunities are handled fairly for all students in the course. It is your responsibility to make arrangements with me to take a make-up quiz or exam, which must be scheduled *within two lectures* of the original quiz or exam date. No make-up will be offered for the final exam (Colgate policy).