History of Earth and Life

4 Credits
Prerequisites: Geos 101 or GE 261

Geos 112 Course Syllabus

Lectures: MWF 10:30-11:30 am
202 Reichardt

Labs: T 9:45 am - 12:45 pm
W 6:00-9:00 pm
229 Reichardt

Professor: Dr. Sarah J. Fowell
Office: 326 Reichardt
Phone: 474-7810
E-mail: sjfowell@alaska.edu
Office Hours: W 4:00–6:00 & R 3:00-5:00

Teaching Assistant: TA: Eric Hutton
Office: 312 Reichardt
Phone: 316-518-0996
E-mail: emhutton@alaska.edu

Required Materials:
• i-clicker: i-clickers will be checked out to students for a $30 deposit (cash only).
  You will get your deposit back when you return the clicker at the end of the semester. If you lose your clicker or fail to return it, the department will retain your deposit and put it toward the purchase of a replacement. Go to the Geology Department office (308 Reichardt) to pay your deposit and check out a clicker. Scored clicking will begin on January 28!

Historical geology is about evolution. This course will explore the evolution of planet Earth and the degree to which geological and biological processes have influenced each other throughout the history of our planet. This is a subject that is deeply concerned with time - large amounts of time. Geological events are typically measured in millions or billions of years. This time scale, geologic time, vastly transcends human experience. Events that are exceedingly rare during a human lifetime may be frequent and inevitable at geological time scales. If you take this course seriously, it will change your frame of reference to incorporate a sense of geologic time, a concept that will transform your understanding of the landscape, the biota, and your place in history.

Course Objectives: The primary mission of this course is to provide you with the tools and skills necessary to reconstruct physical and biological events that occurred deep in Earth’s past. To meet this goal, there are three primary course objectives: 1) Explore the ways in which plate tectonics, erosion, and climate change modify the size and topography of continents, using North America as the prime example. 2) Examine the sequence of organic evolution, from the triumphant trilobite to the mighty mammoth. 3) Understand the interrelationships between physical and biological processes and events.
Learning Outcomes: Ultimately, you will learn to think like a historical scientist. Labs will allow you to practice interpreting geological data (rocks and fossils) and using basic tools (maps and microscopes), while class discussions and homework assignments will encourage you to think critically. Upon completing this course, you will be able to:

- Use sedimentary rocks to reconstruct past climates and environments
- Identify fossil organisms and use them to reconstruct past habitats
- Reconstruct the tectonic and climatic history of a region based on a geologic map
- Explain the origin of the major physiographic features of North America
- Outline major “breakthroughs” in the history of life on Earth
- Evaluate historical data in terms of quality, reliability, and interpretation
- Investigate a geological topic and display your findings on a poster

Lecture Format: Not just “I talk, you take notes.” The best way to learn and retain the material is by actively participating. In addition to lectures, I will encourage you to participate in class activities, including group discussions and individual “clicker questions”. Your participation will be rewarded with a better grasp of the material and credit toward your participation/attendance grade.

Class Participation and Attendance: Participation in class discussions and activities enhances your understanding and retention of the material. Therefore, class attendance is required and 10% of your final grade will be based on participation. Please try to remain punctual! You can’t participate if you aren’t here. If you arrive late, you may miss activities that will document your presence. In other words, if you are late, you may be counted absent. Because attendance is highly correlated with performance on labs and exams, students with a midterm attendance record of less than 65% will be removed from the course by faculty-initiated withdrawal.

Labs: Hands-on experience in the lab is essential to a complete understanding of rock types and fossil organisms. Labs also provide an opportunity for you to make your own interpretations of the history contained in the rock record, using geological techniques. In other words, the lab is where you will practice doing science. Consequently, labs form an important component of your grade. The final lab grade will be a sum of all your lab scores, so you cannot afford to miss a lab. Completion of all lab exercises is absolutely required. Failure to attend lab or to turn in all lab exercises will result in an incomplete. So that you will not have to spend additional time on “lab homework,” each lab can be completed during the scheduled lab period. However, this will require that you commit yourself for most or all of the three hours. Do not schedule other activities during any portion of the lab period.

Posters: Working in teams, each of you will research a topic and prepare a poster to display your findings. You may research any subject your team chooses, so long as it pertains to Earth history. Your job is to explore the subject in greater depth than course lectures or textbooks permit, so be sure to select your topic accordingly. The final poster should contain both a concise summary of your findings and some informative graphics. Completed posters will be displayed for the class in mid-April. Note that one class period is reserved for poster displays. During this period, you’ll have a few minutes to briefly summarize your findings. Teams will be expected to choose a topic shortly after the first exam. If you have partners that you wish to work with, please let me know at that time.

Quizzes: A very short, 3-5 point quiz will be given during class on Fridays. These quizzes are not intended to be difficult. Instead they will focus on main points of the week's lectures. The Earth is 4.6 billion years old, and the topic of its history necessarily covers lots of material. Quizzes will help you keep on top of the information and evaluate your understanding of the week’s subjects. Since we will go
over the quizzes in class, it is not possible to make up a missed quiz. However, your two lowest scores will be dropped from your final quiz grade.

**Field Trip:** A field trip to observe exposures of sedimentary rocks and fossils is scheduled for **Sunday, May 1.** This is a capstone experience that will allow you to apply your understanding of both physical and historical geology to reconstruct the geologic evolution of Alaska’s interior. Vans will depart the Natural Sciences parking lot promptly at 8 AM and return at approximately 5 PM. Students should bring the following: Warm clothes, hiking boots, raincoat, field notebook/pencil, and a lunch. If you own them, you should also bring a hand lens and a rock hammer. **As for all other labs, field trip attendance is mandatory.**

**Disability Services:** The Office of Disability Services implements the Americans with Disabilities Act (ADA) and ensures that UAF students have equal access to the campus and course materials. I will work with the Office of Disability Services (474-7043) to provide reasonable accommodation to students with disabilities. Please let me know at the beginning of the course if accommodations should be provided.

**Support Services:**

**Geology Computer Lab:** The Department of Geology & Geophysics computer lab is located in 316 Reichardt. If you wish to use these computers to complete course work or design your poster, you can obtain a computer account from Instructor Chris Wyatt (email: chris.wyatt@alaska.edu). Be sure to explain that you are enrolled in Geos 112, and include your full name and UAF login (typically your initials+last name), which will be your geology computer lab login. Chris will send you a temporary password, which you will change the first time you log on.

**Large Format Printer:** As a student of geology, you are each allowed to print one 36 inch x 40 inch color poster on the large format printer housed in the Department of Geology & Geophysics. Go to [http://www.uaf.edu/geology/facilities/computer/poster-printing/](http://www.uaf.edu/geology/facilities/computer/poster-printing/) to view the printing schedule and review the list of supported sizes and graphics programs. To schedule a printing time, e-mail Instructor Chris Wyatt (chris.wyatt@alaska.edu). Be sure to explain that you are printing a poster for Geos 112, include the full names of all team members and the day/time you would like to print (allow 1 hour).

**E-Reserves:** Course graphics will be available through the UAF electronic reserve system ([http://eres.uaf.edu/](http://eres.uaf.edu/)). Go to “Electronic Reserves and Course Materials”, enter the course number and instructor information, and select Geos 112 from the list. The password is: **Proterozoic**

**Course Policies:** The final exam will be given only on the day and time scheduled by the university, so make travel and work plans accordingly. Make-up examinations will be given only under extenuating circumstances; a written explanation from your doctor or dentist will be required in the case of a medical emergency. It is not possible to make up missed quizzes, but under some circumstances it may be possible to take the quiz a day early if you know that you will be absent on a given Friday.

The **Student Code of Conduct** (p. 49 in the UAF Catalog) outlines your rights and responsibilities, as well as prohibited forms of conduct. Please be aware of the contents of the code.

**Grading:** Grades will be weighted as follows:

- Midterm Exam 1: 10%
- Midterm Exam 2: 10%
- Final Exam: 10%
- Friday Quizzes: 5%
- Homework: 10%  
- Laboratory Exercises: 30%
- Research Project/Poster: 15%
- Participation/Attendance: 10%
**Grade Scale:** Quizzes, homework, laboratory exercises, research projects, and participation/attendance will be graded according to the following scale: 100-91% = A, 90% = A-, 89% = B+, 88-81% = B, 80% = B-, 79% = C+, 78-71% = C, 70% = C-, 69% = D+, 68-61% = D, 60% = D-, <60% = F. Midterm exams, final exams, and final weighted scores will be graded on a curve.
# Lecture Schedule

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Reading &amp; Homework</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/21 (F)</td>
<td>Introduction: Geology as a 4D science</td>
<td>Chapter 17 (434-438)</td>
</tr>
<tr>
<td>1/24 (M)</td>
<td>Sedimentary rocks and the geologic record</td>
<td>Ch 6 (147-163)</td>
</tr>
<tr>
<td>1/26 (W)</td>
<td>Mountains, rivers, deserts, and sandstone</td>
<td>Ch 12 (300-315); Ch 15</td>
</tr>
<tr>
<td>1/28 (F)</td>
<td>Coral reefs, carbonate platforms, and limestone</td>
<td>Ch 9 (222-241)</td>
</tr>
<tr>
<td>1/31 (M)</td>
<td>Relative ages and the principles of stratigraphy</td>
<td>Ch 17 (438-449)</td>
</tr>
<tr>
<td>2/2 (W)</td>
<td>Construction of the relative geologic time scale</td>
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<tr>
<td>2/4 (F)</td>
<td>Earth’s age: Radioactivity and the absolute time scale</td>
<td>Ch 17 (449-465)</td>
</tr>
<tr>
<td>2/7 (M)</td>
<td>Dates vs. ages: What’s the difference?</td>
<td>HW 1 Due</td>
</tr>
<tr>
<td>2/9 (W)</td>
<td>Fossilization: Preservation sans formaldehyde</td>
<td>Ch 18 (488-489)</td>
</tr>
<tr>
<td>2/11 (F)</td>
<td>Evolutionary theory before Charles Darwin</td>
<td>Ch 18 (468-472)</td>
</tr>
<tr>
<td>2/14 (M)</td>
<td>Natural selection: The blind watchmaker</td>
<td>Ch 18 (472-474)</td>
</tr>
<tr>
<td>2/16 (W)</td>
<td>Genetics and the “inheritance problem”</td>
<td>Ch 18 (474-482) HW 2 Due</td>
</tr>
<tr>
<td>2/18 (F)</td>
<td>Fossils and the “paleontological problem”</td>
<td>Ch 18 (482-487)</td>
</tr>
<tr>
<td>2/21 (M)</td>
<td><strong>Exam #1</strong></td>
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<tr>
<td>2/23 (W)</td>
<td>Drifting continents</td>
<td>Ch 2 (28-35)</td>
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<tr>
<td>2/25 (F)</td>
<td>Paleomagnetism and polar wander</td>
<td>Ch 2 (35-39)</td>
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<tr>
<td>2/28 (M)</td>
<td>Seafloor spreading</td>
<td>Ch 2 (39-57)</td>
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<tr>
<td></td>
<td><strong>The Precambrian: Earth’s First 3.5 BY</strong></td>
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<tr>
<td>Date</td>
<td>Topic</td>
<td>Notes</td>
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<tr>
<td>3/2 (W)</td>
<td>Starting with a bang: A universe is born</td>
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<tr>
<td>3/4 (F)</td>
<td>Archean protocontinents</td>
<td>Ch 19 (492-500; 507-511)</td>
</tr>
<tr>
<td>3/7 (M)</td>
<td>The origin of life</td>
<td>Ch 19 (512-513)</td>
</tr>
<tr>
<td>3/9 (W)</td>
<td>Rocks, microbes, and atmospheric oxygen</td>
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<tr>
<td>3/11 (F)</td>
<td>Proterozoic cratons and supercontinents</td>
<td>Ch 19 (500-504)</td>
</tr>
<tr>
<td>3/12-3/20</td>
<td>Spring Break, No Classes!!</td>
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</tr>
<tr>
<td>3/21 (M)</td>
<td>Snowball Earth and the emergence of animals</td>
<td>Ch 19 (504-507; 514-520)</td>
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<tr>
<td></td>
<td><strong>The Paleozoic Era: Old Life, Old Hills</strong></td>
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<tr>
<td>3/23 (W)</td>
<td>Invertebrates and the Cambrian explosion</td>
<td>Ch 21 (560-571; 572-573)</td>
</tr>
<tr>
<td>3/25 (F)</td>
<td>Epicontinental seas and orogenies</td>
<td>Ch 20 (522-546) HW 3 Due</td>
</tr>
<tr>
<td>3/28 (M)</td>
<td>Assembling Pangea</td>
<td>Ch 20 (546-556)</td>
</tr>
<tr>
<td>3/30 (W)</td>
<td>Leaving the water: Fins, feet &amp; the greening of Gondwana</td>
<td>Ch 21 (581-590)</td>
</tr>
<tr>
<td>4/1 (F)</td>
<td>Exam #2</td>
<td></td>
</tr>
<tr>
<td>4/4 (M)</td>
<td>Carboniferous Wetlands: Scale trees and big bugs</td>
<td>Ch 21 (571-581)</td>
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<tr>
<td>4/6 (W)</td>
<td>Amniotes gain reproductive freedom</td>
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<td><strong>The Mesozoic Era: Monsters &amp; Mountains</strong></td>
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<tr>
<td>4/8 (F)</td>
<td>Birth of the Atlantic Ocean</td>
<td>Ch 22 (594-601)</td>
</tr>
<tr>
<td>4/11 (M)</td>
<td>Mountains rise in the west</td>
<td>Ch 22 (601-612)</td>
</tr>
<tr>
<td>4/13 (W)</td>
<td>Reptiles, dinosaurs, and birds</td>
<td>Ch 22 (613-620)</td>
</tr>
<tr>
<td>4/15 (F)</td>
<td>Poster Session</td>
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<tr>
<td>4/18 (M)</td>
<td>Sea monsters (Guest Speaker: Pat Druckenmiller)</td>
<td>Ch 22 (620-624)</td>
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<tr>
<td>4/20 (W)</td>
<td>Mammalian innovations</td>
<td>Ch 22 (624-627)</td>
</tr>
<tr>
<td>4/22 (F)</td>
<td>First flowers and flourishing foraminifera</td>
<td>Ch 22 (611-613) HW 4 Due</td>
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<tr>
<td></td>
<td><strong>The Cenozoic Era: Feathered and Furry</strong></td>
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6
<table>
<thead>
<tr>
<th>Date</th>
<th>Activity</th>
<th>Chapters</th>
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<tbody>
<tr>
<td>4/25 (M)</td>
<td>Meteorites and mass extinction</td>
<td>Ch 22 (627-629)</td>
</tr>
<tr>
<td>4/27 (W)</td>
<td>Origin of modern mountain ranges</td>
<td>Ch 23 (634-648)</td>
</tr>
<tr>
<td>4/29 (F)</td>
<td><strong>UAF SpringFest - No Class!!!</strong></td>
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<tr>
<td>5/1 (Su)</td>
<td><strong>Field Trip: Evolution of Alaska  8AM-5PM</strong></td>
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<tr>
<td>5/2 (M)</td>
<td>Birds are terrible lizards, too</td>
<td>Ch 23 (654-672)</td>
</tr>
<tr>
<td>5/4 (W)</td>
<td>Icehouse vs. greenhouse:  Glaciers come and go</td>
<td>Ch 23 (648-654) HW 5 Due</td>
</tr>
<tr>
<td>5/6 (F)</td>
<td>Where have all the Pleistocene giants gone?</td>
<td>Ch 23 (672-674); Ch 24</td>
</tr>
<tr>
<td>5/9 (M)</td>
<td><strong>Final Exam:  10:15 AM – 12:15 PM</strong></td>
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</tbody>
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## Laboratory Schedule

<table>
<thead>
<tr>
<th>Dates</th>
<th>Topic</th>
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<tbody>
<tr>
<td>January 25/26</td>
<td>Deep Time and the Geologic Time Scale</td>
</tr>
<tr>
<td>February 1/2</td>
<td>Sedimentary Structures and Environments</td>
</tr>
<tr>
<td>February 8/9</td>
<td>Sequencing Geologic Events</td>
</tr>
<tr>
<td>February 15/16</td>
<td>Fossils: Symmetry, Diversity, and Preservation</td>
</tr>
<tr>
<td>February 22/23</td>
<td>Rocks, Facies, and Correlation</td>
</tr>
<tr>
<td>March 1/2</td>
<td>Seafloor Spreading and Plate Tectonics</td>
</tr>
<tr>
<td>March 8/9</td>
<td>Tectonics on Other Planets</td>
</tr>
<tr>
<td>March 15/16</td>
<td>Spring Break! No Labs!</td>
</tr>
<tr>
<td>March 22/23</td>
<td>Paleozoic Life I: Shallow Seas</td>
</tr>
<tr>
<td>March 29/30</td>
<td>Geologic Maps I: Folds, Faults, and Unconformities</td>
</tr>
<tr>
<td>April 5/6</td>
<td>Paleozoic Life II: Primeval Wetland Forests</td>
</tr>
<tr>
<td>April 12/13</td>
<td>Geological Maps II: Tectonic and Environmental Reconstruction</td>
</tr>
<tr>
<td>April 19/20</td>
<td>Mesozoic Life: Predators and Burrowers</td>
</tr>
<tr>
<td>April 26/27</td>
<td>Tour of the Fox Permafrost Tunnel (bring your winter coat!)</td>
</tr>
<tr>
<td>May 1</td>
<td>Field Lab: Evolution of Alaska SUNDAY 8AM–5 PM</td>
</tr>
</tbody>
</table>