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**
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Office Hours: **W 4:00–6:00 & R 2:00-4:00**

Teaching Assistant: **Kevin Stack**
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Required Materials:

- **Text:** Monroe and Wicander, 2009. The Changing Earth: Exploring Geology and Evolution, 5th edition. Brooks/Cole.
- **i >clicker:** i>clickers will be checked out to students for a $25 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 27**!

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 will 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 printed 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.

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. **Attendance in lab 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 of three, 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 **Saturday, 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 Dr. Bill Witte (email: fnwkw@uaf.edu). Be sure to explain that you are enrolled in Geos 112, and include your UAF login (typically fs + your initials), which will be your account login. Bill will send you a temporary password.

Large Format Printer: As a student of geology, you are each allowed to print one 3'x3' color poster on the large format printer housed in the Department of Geology & Geophysics. If you wish to use this printer for your poster, sign up for a printing time as soon as possible, because the printing schedule fills up quickly. Go to **http://www.uaf.edu/geology/facilities/computer/poster_print.htm** to schedule your printing time and review the list of supported sizes and graphics programs.

E-Reserves: Course graphics will be available through the UAF electronic reserve system (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: **Archean**.

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. 47-48 in the UAF 2009-2010 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%	Laboratory Exercises:	30%
Midterm Exam 2:	10%	Research Project/Poster:	15%
Final Exam:	10%	Participation/Attendance:	10%
Friday Quizzes:	5%		
Homework:	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

Date	Topic	Reading Assignment
	Sediment, Rocks, and Geologic Time	
1/22 (F)	Introduction: Geology as a 4D science	Chapter 17 (434-438)
1/25 (M)	Sedimentary rocks and the geologic record	Ch 6 (147-163)
1/27 (W)	Mountains, rivers, deserts, and sandstone	Ch 12 (300-315); Ch 15
1/29 (F)	Coral reefs, carbonate platforms, and limestone	Ch 9 (222-241)
2/1 (M)	Relative ages and the principles of stratigraphy	Ch 17 (438-449)
2/3 (W)	Construction of the relative geologic time scale	
2/5 (F)	Earth's age: Radioactivity and the absolute time scale	Ch 17 (449-465)
2/8 (M)	Dates vs. ages: What's the difference?	
	Fossils, Evolution and Extinction	
2/10 (W)	Fossilization: Preservation sans formaldehyde	Ch 18 (488-489)
2/12 (F)	Evolutionary theory before Charles Darwin	Ch 18 (468-472)
2/15 (M)	Natural selection: The blind watchmaker	Ch 18 (472-474)
2/17 (W)	Genetics and the ''inheritance problem''	Ch 18 (474-482)
2/19 (F)	Fossils and the ''paleontological problem''	Ch 18 (482-487)
2/22 (M)	**Exam #1**	
	Continental Drift vs. Plate Tectonics	
2/24 (W)	Drifting continents	Ch 2 (28-35)
2/26 (F)	Paleomagnetism and polar wander	Ch 2 (35-39)
3/1 (M)	Seafloor spreading	Ch 2 (39-57)
	The Precambrian: Earth's First 3.5 BY	
3/3 (W)	Starting with a bang: A universe is born	
3/5 (F)	Archean protocontinents	Ch 19 (492-500; 507-511)
3/6-3/14	**Spring Break, No Classes!!**	
3/15 (M)	The origin of life	Ch 19 (512-513)

3/17 (W)	Rocks, microbes, and atmospheric oxygen	
3/19 (F)	Proterozoic cratons and supercontinents	Ch 19 (500-504)

Date	Topic	Reading Assignment
3/22 (M)	Snowball Earth and the emergence of animals	Ch 19 (504-507; 514-520)
	The Paleozoic Era: Old Life, Old Hills	
3/24 (W)	Invertebrates and the Cambrian explosion	Ch 21 (560-571; 572-573)
3/26 (F)	Epicontinental seas and orogenies	Ch 20 (522-546)
3/29 (M)	Assembling Pangea	Ch 20 (546-556)
3/31 (W)	Carboniferous wetlands: Scale trees and big bugs	Ch 21 (581-590)
4/2 (F)	**Exam #2**	
4/5 (M)	Amphibians: Stepping fin onto land	Ch 21 (571-581)
4/7 (W)	Amniotes gain reproductive freedom	
	The Mesozoic Era: Monsters & Mountains	
4/9 (F)	Birth of the Atlantic Ocean	Ch 22 (594-601)
4/12 (M)	Mountains rise in the west	Ch 22 (601-612)
4/14 (W)	Reptiles, dinosaurs, and birds (*Guest Speaker*)	Ch 22 (613-620)
4/16 (F)	Sea monsters (*Guest Speaker: Pat Druckenmiller*)	Ch 22 (620-624)
4/19 (M)	Mammalian innovations	Ch 22 (624-627)
4/21 (W)	**Poster Session**	
4/23 (F)	**UAF SpringFest - No Class!!!**	
4/26 (M)	First flowers and flourishing foraminifera	Ch 22 (611-613)
4/28 (W)	Meteorites and mass extinction	Ch 22 (627-629)
	The Cenozoic Era: Feathered and Furry	
4/30 (F)	Origin of modern mountain ranges	Ch 23 (634-648)
5/1 (S)	**Field Lab: Evolution of Alaska 8AM-5 PM**	
4/3 (M)	Birds are terrible lizards, too	Ch 23 (654-672)
4/5 (W)	Icehouse vs. greenhouse: Glaciers come and go	Ch 23 (648-654)

5/7 (F)	Where have all the Pleistocene giants gone?	Ch 23 (672-674); Ch 24
5/10 (M)	**Final Exam: 10:15 AM - 12:15 PM**	

Laboratory Schedule

Dates	Topic
January 26/27	Deep Time and the Geologic Time Scale
February 2/3	Sedimentary Structures and Environments
February 9/10	Sequencing Geologic Events
February 16/17	Fossils: Symmetry, Diversity, and Preservation
February 23/24	Rocks, Facies, and Correlation
March 2/3	Seafloor Spreading and Plate Tectonics
March 9/10	Spring Break! No Labs!
March 16/17	Tectonics on Other Planets
March 23/24	Paleozoic Life I: Shallow Seas
March 30/31	Geologic Maps I: Folds, Faults, and Unconformities
April 6/7	Paleozoic Life II: Primeval Wetland Forests
April 13/14	Geological Maps II: Tectonic and Environmental Reconstruction
April 20/21	Mesozoic Life: Predators and Burrowers
April 27/28	Tour of the Fox Permafrost Tunnel (bring your winter coat!)
May 1	Field Lab: Evolution of Alaska SATURDAY 8AM-5 PM