GEOS1234: Historical Geology Lecture

Spring 2022, Section 101

Lecture: M W F 11:00-11:50 AM | **Location:** BO 127

Instructor Information

Professor:	Anna M. Weiss, Ph.D.
Please call me:	Anna; Dr. or Professor Weiss (Pronounced like "Rice" but with a "W")
Pronouns:	(she/her)
Email:	anna.weiss@msutexas.edu (expect a response in 24-36 hours)
Office Location:	Office hours will be held virtually on Zoom ID: 974 2271 9769
Office Hours:	M, W, F 10 - 11 AM; Th 12:30 – 2:30 PM; by appointment (email me!)
Ask me about:	anything related to the class, doing STEM research or outreach, graduate school, geology or environmental science careers

I strongly encourage students to come to me with questions during office hours and/or by email. If you are having trouble with a concept or a section of the class, please see me before it becomes a bigger problem.

Course Description

Formation of the Earth and the evolution of its origins to the present, plate tectonics, mountain building, and major evolutionary events. Special focus is placed on integrating geologic and biologic concepts through Earth history.

Course Goals

An understanding of the history of Earth and life has important implications for fields as diverse as medicine, material science, engineering, philosophy and the creative arts. In lecture and in lab, we will discuss evidence for changes in life and the planet over time, and what this means for us today. Specific themes that will frequently arise are: the scientific process and interpreting and communicating scientific data; "deep time"; the connection between the geosphere, biosphere and atmosphere.

While this is a geoscience course and I hope you cultivate an appreciation for geology, my overall goal is *scientific literacy* and an understanding of how science works. In this class you will think critically, learn how to interpret and communicate data, work in groups, and become a strong communicator. These skills are important not only in geosciences, but in any major.

Student responsibilities

1. In order to pass this course, students will be expected to develop an understanding of ancient life and important geological events.

2. Class participation: This course is not a passive lecture course. I will use a variety of classroom activities, student presentations and discussions to ensure students take an active role in learning. Students are expected to participate to the best of their ability. Additionally, students are expected to be respectful of one-another in their interactions in the classroom, lab and on-line.

3. Class preparation: The lectures, discussions, and activities for this course are designed to build on and synthesize knowledge that students glean from the assigned texts, primary literature readings, and assignments. These discussions and activities will be more meaningful when everyone shows up prepared. Students are expected to complete readings and assignments ahead of class.

4. Group projects: In lab and lecture, there will be assignments where you will work as a team. Please be a good team-mate, be respectful of one another, complete assigned tasks and help others when needed. Failure to work with your teammates will result in a failing grade for the project.

5. If you are struggling in class, please ask for help! If you cannot attend office hours, email me to make an appointment.

Instructor responsibilities

1. To provide an inclusive, equitable environment conducive to active learning and discussion.

2. To introduce students to the process of scientific inquiry.

3. To enhance students' understanding of historical geology, the fossil record and the history of life.

4. To assess students' knowledge through in-class questions, assignments and exams, and to provide timely feedback.

Course Materials

Required Text

- "*The Story of the Earth*" by Robert Hazen (ISBN 0670023558)
- "*The Ends of the World*" by Peter Brannen (ISBN 0062364820)

Both books are available as e-books and audiobooks and are available in the library course reserves. All other required reading will be posted as a PDF on D2L.

Lecture

Pencil/pen
Notebook (or laptop to take notes)
All assigned reading should be done in advance of class. Bring your notes, and be prepared for discussion!

Desire-to-Learn (D2L)

All readings, assignments, etc. will be announced in class and posted on D2L. Extensive use of the MSU D2L program is a part of this course. Each student is expected to be familiar with this program as it provides a primary source of communication regarding assignments, examination materials, and general course information. You can log into D2L through the MSU Homepage. If you experience difficulties, please contact D2L directly.

Grading

Table 1: Points allocated to each assessment

Assignments	**Percentage of grade**
Class Participation and Discussions	10%
Quizzes	10%
Exams	20%
Final Exam	20%
Lab Overall Grade	40%

Table 2: Total points for final grade.

Grade	**Points**
A	90 + %
B	80 to 89.9%
C	70 to 79.9%
D	60 to 69.9%
F	Less than 60%

Class Structure and Attendance

This semester, I will be employing a flipped classroom. This means I will pre-record lectures and post them on D2L approximately 48 hours ahead of class. During class I will play the lecture and answer questions. We will also work on activities as a group. Attendance is not mandatory, however, you must still complete the daily in-class quizzes and any activities by the due date (see “In-class quizzes” below).

If you are feeling sick or have been exposed to someone with COVID-19, please do not come to class or lab. I am happy to work with you to make up any missed work for that reason.

In-class quizzes

Specific questions will be discussed in class each day (for example, as "Road Checks" or "Concept Tests"). To ensure participation from students, the questions will be posted as quizzes on D2L. Completing these quizzes will count toward your Class Participation and Discussions grade (up to 10 points per day for 10% of your final grade). They can be completed as we go through class, up to 48 hours after.

Quizzes

A short quiz will be open on D2L for 24 hours every Friday and will consist of approximately 5 questions. Quizzes may be short answer, fill-in-the-blank, diagram labeling, etc, with occasional few multiple-choice questions. The quiz should take approximately 15-20 minutes.

Exams

Three exams will be given in-class during the semester. The exams will be cumulative and will generally be short and long answer, with some diagram labelling, drawing or other task. Do not expect a multiple-choice test. Exams will last the length of the class period. The exam dates are as follows:

Exam 1: Monday 2/21; *Exam 2: Monday 3/21;* *Exam 3: Monday 4/25*

Exam scores will be returned with the exams the week following the exam. If you feel there was an error made in the evaluation of your exam, **you must bring this up within 10 days of the return of the mid-term exams or immediately in the case of the last exam.** If you wish to check on your current lab, quiz, and exam points at any point during the semester, check the D2L website or come to office hours. It is preferred that you email me (or your TA) and indicate you would like to see this summary before meeting so we can have the information ready to go.

Final Exam

The final exam will be cumulative. It will take place on Monday 5/2 from 10:30 am -12:30 pm on D2L. The exam will be a combination of short and long answer, with some diagram labelling, drawing or other problem solving. Do not expect a multiple-choice test.

Exam scores will be returned with the exams the week following the exam. If you feel there was an error made in the evaluation of your final exam, **you must bring this up immediately.**

Late Work

Late work will be accepted with **a 5-point penalty per day** it is late **up to one week (7 days) past the due date**. I am willing to work with students on late work, especially given extenuating circumstances **but you need to contact me before the assignment is due**. If you are having trouble keeping up or need extra time on an assignment, please contact me as early as possible. Again, this needs to be done in advance of the due date.

Make Up Work/Tests

I do not allow make-up work or exams without an official university excuse. If you need to miss work, quizzes or exams due to extenuating circumstances, **please see me as soon as possible to discuss a new deadline. This needs to be done in advance of the due date**.

Extra Credit

I do not accept individual extra credit assignments. Do not ask, the answer will be no. However, I will provide several opportunities for everyone to get extra credit throughout the semester (such as in class, on exams, as take-home assignments, for pertinent seminars) and will provide ample advanced notice of the assignments.

Instructor Class Policies

Attendance

Attendance will not be taken, however there will be daily in-class quizzes and discussions that will make up 10% of your final grade. Religious holy days sometimes conflict with class and examination schedules. If you must miss an examination, work assignment, or other project due to the observance of a religious holy day you will be given an opportunity to complete the work missed within a reasonable time after the absence. Please notify me at least fourteen days prior to the classes scheduled on dates you will be absent to observe a religious holy day.

Cell phones and Computers

Cell phones and computers may be used in specific contexts, such as when taking notes, but I ask you to respect myself and your fellow students and not text, use social media, email or other non-class related websites. If you are found doing this during lecture or lab, a warning will be given, then you will be asked to leave.

Services for Students With Disabilities

In accordance with Section 504 of the Federal Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990, Midwestern State University endeavors to make reasonable accommodations

to ensure equal opportunity for qualified persons with disabilities to participate in all educational, social, and recreational programs and activities. After notification of acceptance, students requiring accommodations should make application for such assistance through Disability Support Services, located in the Clark Student Center, Room 168, (940) 397-4140. Current documentation of a disability will be required in order to provide appropriate services, and each request will be individually reviewed. For more details, please go to Disability Support Services.

Grade Appeal Process

Students who wish to appeal a grade should consult the Midwestern State University Undergraduate Catalog

Academic Misconduct Policy & Procedures

Academic Dishonesty: Cheating, collusion, and plagiarism (the act of using source material of other persons, either published or unpublished, without following the accepted techniques of crediting, or the submission for credit of work not the individuals to whom credit is given). Specifically,

"a. The term "cheating" includes, but is not limited to:

(1) use of any unauthorized assistance in taking quizzes, tests, or examinations;

(2) dependence upon the aid of sources beyond those authorized by the instructor in writing papers, preparing reports, solving problems, or carrying out other assignments; or

(3) the acquisition without permissions, of tests or other academic material belonging to a member of the university, faculty, or staff.

b. The term "plagiarism" includes, but is not limited to, the use by paraphrase or direct quotation, of the published or unpublished work of another person without full and clear acknowledgement. It also includes the unacknowledged use of materials prepared by another person or agency engaged in the selling of term papers or other academic materials.

c. The term "collusion" means collaboration with another person in preparing work offered for credit if that collaboration is not authorized by the faculty member in charge." From Student Handbook 2019-20

I do not tolerate academic dishonesty of any kind. If you are caught cheating, colluding or plagiarizing, you will be given a zero on the assignment and a written warning. If you are caught twice, you will receive an F in my class.

Additional guidelines on procedures in these matters, including appeals, may be found in the Office of Student Conduct.

Refer to: https://msutexas.edu/student-life/_assets/files/handbook.pdf

Notice

Changes in the course syllabus, procedure, assignments, and schedule may be made at the discretion of the instructor. Modalities of instruction may change given developments in COVID-19. Instructor will inform students in writing of any changes to be made prior to making them.

Course Schedule*

** This schedule represents my current plans and objectives. As we go through the semester, the plans may need to change to enhance learning opportunities. Please check for announcements on D2L and your email regularly. Readings MUST be completed before class on the day they are due.*

UNIT 1: FUNDAMENTALS FOR THE STUDY OF THE HISTORY OF LIFE

Week	Day	Topic	Reading
1	M 1-10	Course goals and Overview	Syllabus
	W 1-12	The Nature of Science Part !: What is science?	• Open Geology Textbook Chapter 1: Understanding Science https://opengeology.org/textbook/1-understanding-science • 106 Scientific claims and a truckful of Baloney. Popular Science. Speed Weed • Optional Reading: On Bulls**t, Harry Frankfurt
	F 1-14	The Nature of Science Part II: Presentation and interpretation of data, models	• How to Sell Pseudoscience, Pratkanis • Cognitive Biases and Logical Fallacies posters • Beware Spurious Correlations Harvard Business Review https://hbr.org/2015/06/beware-spurious-correlations • Using Graphs and Charts to Illustrate Quantitative Data, CDC https://www.cdc.gov/healthyyouth/evaluation/pdf/brief12.pdf • How Data Visualization Supports Communication, Eva Murray https://www.forbes.com/sites/evamurray/2019/01/28/how-data-visualization-supports-communication/#326ef4a82cce
2	M 1-17	No Class	
	W 1-19	Visualization in historical geology	• The facts and fiction behind Hollywood's depiction of dinosaurs https://news.usc.edu/100071/the-facts-and-fiction-behind-hollywoods-depiction-of-dinosaurs • Jurassic art: how our vision of dinosaurs has evolved over time, Brian Choo • https://theconversation.com/jurassic-art-how-our-vision-of-dinosaurs-has-evolved-over-time-42998

	F 1-21	Rocks and minerals; Sedimentary processes	• Open Historical Geology Textbook Chapter: Earth Materials – Minerals Sections 1 - 4.4 and Sections 6-7 https://opengeology.org/historicalgeology/earth-materials/ • Open Historical Geology Textbook Chapter: Earth Materials – Rocks Sections 1, 2, 4 and 6.1 - 6.2 https://opengeology.org/historicalgeology/earth-materials-rocks/)
3	M 1-24	Reading the Rocks: Interpreting ancient environments	Open Historical Geology Textbook Chapter: Sedimentary Structures Sections 1 & 3 https://opengeology.org/historicalgeology/using-sedimentary-structures-to-interpret-ancient-environments/ • Extremadura: interpreting a geological cross-section https://opengeology.org/historicalgeology/case-studies/extremadura/
	W 1-26	Fossils and Fossilization	• Open Historical Geology Textbook Chapter: Taphonomy: The Science of Death and Decay Sections 1 - 3 https://opengeology.org/historicalgeology/tools-of-historical-geology/fossil-taphonomy/ • How to make a fossil part 1. Karen Carpenter. pp. 1-10
	F 1-28	Stratigraphy I	• Open Historical Geology Textbook Chapter: Stratigraphy: Reading the Pages of Earth History Sections 1-2 and Sections 4-6 https://opengeology.org/historicalgeology/stratigraphy-reading-the-pages-of-earth-history/
4	M 1-31	Stratigraphy II	
	W 2-2	Strat Activity	

	F 2-4	Geological time and telling time	• Open Historical Geology Textbook Chapter: Geologic Time https://opengeology.org/historicalgeology/geologic-time/ • Atomic Bombs and Oil Addiction Herald Earth's New Epoch https://www.sciencemag.org/news/2016/08/atomic-bombs-and-oil-addiction-herald-earth-s-new-epoch-anthropocene • What Is the Anthropocene? Lucy Edwards https://eos.org/opinions/what-is-the-anthropocene • Optional Reading: The "Anthropocene" epoch: Scientific decision or political statement? Finney et al, 2016
5	M 2-7	Geological time activity	
	W 2-9	The plate tectonics revolution	• Open Geology Textbook Chapter 2: Plate Tectonics Sections 2.1-2.5 https://opengeology.org/textbook/2-plate-tectonics/ • Seeing Is Believing: How Marie Tharp Changed Geology Forever. Erin Blakemore https://www.smithsonianmag.com/history/seeing-believing-how-marie-tharp-changed-geology-forever-180960192/ • Piece of crust stolen from Texas found in Antarctica.: S.K. Johnson https://arstechnica.com/science/2011/08/piece-of-antarctica-related-to-texas/
	F 2-11	Structure	
6	M 2-14	Plate tectonics Activity	
	W 2-16	A crash course in evolution	• Open Historical Geology Textbook Chapter: Evolution Part I The Theory Sections 1 - 4.4 and Sections 6-7 https://opengeology.org/historicalgeology/evolution/ • Open Historical Geology Textbook Chapter: Evolution Part II Fossils as Evolutionary Tools Section 1 https://opengeology.org/historicalgeology/tools-of-historical-geology/evolution-part-ii-fossils-as-evolutionary-tools/ • HW: Evolution Misconceptions due 9/24

	F 2-18	Classification and systematics	• How species save our lives. Conniff. R. 2/27/2011. New York Times. • Allergy Recapitulates Phylogeny Agapakis. C. 2011
7	M 2-21	Exam 1	
	W 2-23	Measuring speciation, extinction, and community Part II	• Open Historical Geology Textbook Chapter: Diversity in the fossil record •https://opengeology.org/historicalgeology/case-studies/diversity-in-the-fossil-record/

UNIT 2: PRE-PHANEROZOIC: THE BEGINNING

Week	Day	Topic	Reading
7	F 2-25	Origin of the universe and planet formation	• Hazen Ch 1-2
8	M 2-28	Continents and oceans	• Hazen Ch 3-4 • Marsquake
	W 3-2	Pre-Cambrian Geology	Wiccander and Monroe PDF 1
	F 3-4	The Archean-Paleoproterozoic & first evidence of life	• Hazen Ch 5-6 • Meet Luca the Ancestor of all living things. Wade, N. 2016; 7-25- 2016 New York Times. https://www.nytimes.com/2016/07/26/science/last-universal-ancestor.html • Under the sea, a missing link for the evolution of complex cells. Zimmer C. 2015. New York Times 5-6-2015.2 pages https://www.nytimes.com/2015/05/07/science/under-the-sea-a-missing-link-in-the-evolution-of-complex-cells.html • Optional Reading: Open Historical Geology Textbook: Innovations of Life Through Time: Life Finds a Way Pt. 1 The Beginning https://opengeology.org/historicalgeology/innovations-of-life-through-time/

9	M 3-7	Mesoproterozoic and the Great Oxygenation Event ; How early life shaped the atmosphere (and vice versa), The Neoproterozoic: Snowball Earth and life gets complicated;	• Hazen Ch 7-9 • Poisoned Planet by Phil Plait https://slate.com/technology/2014/07/the-great-oxygenation-event-the-earths-first-mass-extinction.html • Hazen Ch 9 • Watch: The other explosion you should know about https://www.youtube.com/watch?v=Jpi2VJj5PhY • Optional Watch: Eons: The time oxygen almost killed everything (https://youtu.be/qERdL8uHSgI)

UNIT 3: THE PALEOZOIC: THE START OF LIFE AS WE KNOW IT

Week	Day	Topic	Reading
9	W 3-9	Geology of early Paleozoic	Wiccander and Monroe PDF 2
	F 3-11	Geology of late Paleozoic	Wiccander and Monroe PDF 3
	M 3-14	No Class	
	W 3-16	No Class	
10	F 3-18	No Class	
11	M 3-21	Cambrian Radiation, Ordovician Radiation & Extinction	• Brannen Intro and Ch 1-2 • This Is the Way the Animals Arose: Not With a Bang, but With a Bunch of Bangs Ed Yong https://www.theatlantic.com/science/archive/2019/04/did-cambrian-explosion-actually-happen/587830 • Oxygen levels link to ancient explosion of life, researchers find. Finder, C., 2017 https://source.wustl.edu/2017/11/oxygen-levels-link-ancient-explosion-life-researchers-find/ • Open Historical Textbook: The Taconic Orogeny https://opengeology.org/historicalgeology/case-studies/taconian-orogeny/
	W 3-23	Exam 2	

	F 3-25	The Silurian and the 'Great Greening', Devonian: "Age of Fishes" and a Mass extinction	• Brannen Ch 3 • Humble moss helped create our oxygen-rich atmosphere https://www.sciencedaily.com/releases/2016/08/160815185610.htm • The First Jaws Long, J. 2016., Science 354 280-281 • From Fins Into Hands: Scientists Discover a Deep Evolutionary Link. Zimmer, 2016. https://www.nytimes.com/2016/08/18/science/from-fins-into-hands-scientists-discover-a-deep-evolutionary-link.html • Optional Watch: How did plants change our planet? https://youtu.be/SaiAdBUcFrc • Optional Watch: When Fish First Breathed Air https://www.youtube.com/watch?v=E1h4kgt2520&list=PLvhH17PZ-Rf0xMy1VeghOsrq9ZRCMsxEG&index=9 • Optional Watch: When Fish Wore Armor https://www.youtube.com/watch?v=5pVTZH1LyTw&list=PLvhH17PZ-Rf0xMy1VEghOsrq9ZRCMsxEG&index=7
12	M 3-28	Carboniferous and Permian + Permo-Triassic Mass extinction	• Brannen Ch 4 • Why Giant Bugs Ruled The Earth https://www.nationalgeographic.com/news/2011/8/110808-ancient-insects-bugs-giants-oxygen-animals-science • Our ancestors were already warm-blooded just before the Permian-Triassic extinction event http://www.cnrs.fr/en/our-ancestors-were-already-warm-blooded-just-permian-triassic-extinction-event • How Did Life Recover After Earth's Worst-Ever Mass Extinction? https://eos.org/articles/how-did-life-recover-after-earths-worst-ever-mass-extinction

UNIT 4: THE MESOZOIC: MORE THAN JUST DINOSAURS

Week	Day	Topic	Reading
	W 3-30	Geology of the Mesozoic	Wiccander and Monroe PDF 4

12	F 4-1	The Triassic and the Archosaur Revolution	• Revealed: the terrifying 9ft-long crocodile that walked upright https://www.theguardian.com/science/2015/mar/20/revealed-the-terrifying-3m-long-crocodile-which-walked-like-a-human • Researchers Find Clues to Geological Dark Age in Ancient History https://www.courthousenews.com/researchers-find-clues-to-geological-dark-age-in-ancient-history
13	M 4-4	End-Triassic Mass Extinction and the Jurassic, MMR and Mesozoic Ocean	• Brannen Ch 5 • Global oceanic dead zones persisted for 50,000 years after end-Triassic extinction event https://phys.org/news/2017-08-global-oceanic-dead-zones-persisted.html • Primer: Emergence of modern marine ecosystems Pincelli Hull, Nature • How Jurassic Plankton Stole Control of the Ocean's Chemistry Christie Wilcox https://www.quantamagazine.org/how-jurassic-plankton-stole-control-of-the-oceans-chemistry-20191001/ • Why the Octopus Lost Its Shell Laura Geggel https://www.livescience.com/58063-why-the-octopus-lost-its-shell.html
	W 4-6	Dinosaurs and Their Relatives; The K-Pg Mass Extinction	• Open Historical Geology Textbook: Dinosaur Classification https://opengeology.org/historicalgeology/case-studies/dinosaur-classification/ • Watch: What might dinosaurs sound like? https://www.youtube.com/watch?v=X8E-oAgaLk4 • Brannen Ch 6 • A Rapid End Strikes the Dinosaur Extinction Debate https://www.quantamagazine.org/pincelli-hull-explains-how-an-asteroid-killed-the-dinosaurs-20200325

UNIT 5: THE CENOZOIC: SHAPING THE MODERN

Week	Day	Topic	Reading

13	F 4-8	Geology of the Cenozoic; Cenozoic - Paleogene Climate and the PETM	•Wiccander and Monroe PDF 5 •Earth may be 140 years away from reaching carbon levels not seen in 56 million years https://news.agu.org/press-release/earth-may-be-140-years-away-from-reaching-carbon-levels-not-seen-in-56-million-years/ • When Global Warming Made Our World Super Hot Colin Barras http://www.bbc.com/earth/story/20150914-when-global-warming-made-our-world-super-hot
	M 4-11	No Class	
	W 4-13	No Class	
14	F 4-15	No Class	
15	M 4-18	The age of mammals: the evolutionary history of our clade + Adaptive radiations in the Cenozoic: Whales, grasses, and giant mammals	• Colorado Fossils Show How Mammals Raced to Fill Dinosaurs' Void https://www.nytimes.com/2019/10/24/science/fossils-mammals-dinosaurs-colorado.html • When dinosaurs went extinct, mammals came out of the dark https://www.sciencemag.org/news/2017/11/when-dinosaurs-went-extinct-many-animals-literally-came-out-dark • How events in Panama created the modern world (millions of years ago) https://theconversation.com/how-events-in-panama-created-the-modern-world-millions-of-years-ago-58357 • Watch: What happened when continents collide? https://www.smithsonianofi.com/blog/2015/08/28/the-great-american-biotic-interchange/
15	W 4-20	Activity: measuring climate change	

UNIT 6: HUMANS AND THE ANTHROPOCENE

Week	Day	Topic	Reading
15	F 4-22	Humans in the Earth system: Human evolution; Megafauna overkill and the anthropocene: human evolution and impact	• Brannen Ch 7 • World's oldest Homo sapiens fossils found in Morocco https://www.sciencemag.org/news/2017/06/world-s-oldest-homo-sapiens-fossils-found-morocco • Skull Fossils in Cave Show Mix of Human Relatives Roamed South Africa https://www.nytimes.com/2020/04/02/science/skulls-africa-caves.html • Changing environment influenced human evolution https://www.bbc.com/news/science-environment-43401157 • Assessing the causes of Late Pleistocene extinctions on the continents. Barnosky et al. 2004. Science, Vol. 306, pp. 70-75 • Ancient genomes suggest woolly rhinos went extinct due to climate change, not overhunting https://phys.org/news/2020-08-ancient-genomes-woolly-rhinos-extinct.html
	M 4-25	Quaternary Climate	Wiccander and Monroe PDF 6
	W 4-27	Exam 3	
16	F 4-29	Timefulness, The future of Life and Earth	• Brannen Ch 8 & 9 • Excerpt from "Timefulness" by Marcia Bjornerud