

Version of 5 January 2024

*Syllabus*

**Earth's History of Global Change**

GEOL 1122 (CRN 61231) University of Georgia Spring Semester, 2024  
9:35-10:50 Tu&Th (TR2) Room 142 GG

Professor: Dr. L. Bruce Railsback, Professor, Department of Geology, University of Georgia  
B.A. U. of Iowa 1980; B.S. U. of Iowa 1981; M.S. U. of Iowa 1983; Ph.D. U. of Illinois 1989.

email: rlsbk@uga.edu Office: 133 GG Department of Geology Office phone: 706-542-2652

Office Hours: 1:15-3:15 Tuesday. Railsback will also meet with students at times of mutual convenience, as arranged via email to him at rlsbk@uga.edu.

Like almost all professors at the University of Georgia, and at any major state university, Railsback's employment contract calls for him to devote part of his effort to research and part to instruction (in his case, 50% and 50%). Like almost all professors at the University of Georgia, he is evaluated each year on the basis of his acquisition of grant funding for the University, his generation of technologies and products that can be patented by the University, his publication of new research, his participation at scholarly meetings, his supervision of graduate students, and his teaching of undergraduates. Only his conviction that an educated citizenry is essential to a functioning democracy causes him to give top priority to the last of these.

Student resources:

Lectures in Room 142 GG during scheduled class periods.

Powerpoint files of lecture illustrations, available via eLC.

Lecture summaries specific to this course, a ~239 page pdf document available via eLC.

Flashcards (>200 general ones and 12 about proxies), designed specifically for this course.

*Creation Stories From Around the World*, a 49-page pdf document available via eLC.

Individual meetings with the professor (see "Office Hours" above).

Email with the professor at rlsbk@uga.edu.

Paper textbook: none

Web resources: UGA's eLC system at <https://uga.view.usg.edu/d2l/login> will be the main interface for course resources and completion of course requirements. To access documents like the textual resources listed above, go to eLC's "content" for GEOL 1122. To access check-ups and exercises, go to eLC's list of "Tools" for GEOL 1122 and select "Quizzes".

Official UGA course description: Geologic record of global change, including measurement of geologic time, global geochemical cycles, sea-level and climate change, biodiversity, evolution, ecological changes and extinctions.

\*Course objectives: To acquaint students with the history of Earth and its life, with emphasis on large-scale patterns of global change and how we know about that change. We've inherited control of \* a planet and, to make intelligent decisions, we need an understanding of how that planet works,

\* how it has gotten to its present condition, and how and why humans have caused global change.

Course promises/caveats: During this course, students will be presented with much information about how the Earth has changed and how we think about the history of the Earth. This material may induce students to think about why the world around them is the way it is, about whether the human milieu around them could be different than it is, and about why they believe the things that they believe.

Course format: This course will meet face-to-face in Room 142 GG during its scheduled time unless the UGA administration directs otherwise.

Course Requirements:

	Proportion of Final Grade
Ten exercises (see page 2 for description; see page 6 for due dates and times)	40%
Seven check-ups (see page 2 for description; see page 6 for dates and times)	28%
Final Exam (see page 2 for description; see page 6 for date and time)	<u>32%</u>
Students who have other prior commitments so that they cannot complete exercises or take check-ups or the final exam on the scheduled days should not take the class.	100%

This syllabus, including the schedule on page 6, is subject to change as posted via eLC's "Course announcements" function.

Exercises: With one exception (Exercise 2), these eLC-based functions will consist of simulated sets of geologic data and questions arising from those data. Exercises have due dates and times but have no other time constraints, so that students can use any amount of time prior to the due date and time. Analogs of the exercises will appear on check-ups and the final exam. GroupThink is commonly not good thinking, and dependence on it leads to disaster on the solo-effort final exam.

Check-ups: These eLC-based functions will consist of questions about all material covered in the lectures listed on the course schedule (p. 6) for that check-up, and about all prior exercises, and about the creation story designated for that check-up. They will be given on Wednesdays and will be available for much of the day, but the time allowed for completion by any given student will end one hour after that student begins.

Check-ups are called that because they are a student's opportunity to find out what they don't know sufficiently well. Evidence of not knowing sufficiently well is having to look something up to answer a question or missing (not getting credit for) a question. A wise student notes the topics in those two categories and places extra focus on them in preparing for the final exam.

Final exam: The final exam will be given in Room 142 GG during the final exam period set by UGA at <https://reg.uga.edu/general-information/calendars/final-exam-schedule/> and shown on the course schedule (p. 6). The exam will consist of multiple-choice questions about lectures, readings, and exercises, and it will have one essay question selected from a distributed list of questions. It will be a closed-book closed-note exam with no access to social media platforms or members of study groups. More specifics about the final exam are available in the eLC Content folder designated "Final Exam".

A study guide is not provided for final exam because it would be the same as the lecture summaries, the lecture outlines in students' class notes, and the exercises.

The general rule at most universities is that a student should expect to do at least two hours of work (reading or studying) outside class for every hour spent attending class. That level of preparation, in addition to studying for the exam, should leave the student well-prepared.

*Flow chart of course business:* Lectures  $\begin{matrix} \leftarrow \\ \rightarrow \end{matrix}$  Exercises  $\begin{matrix} \rightarrow \\ \leftarrow \end{matrix}$  Check-ups  $\rightarrow$  Final exam

Make-up policy: All graded submissions (exercises, check-ups, and exams) can be made up in the documented event of illness, death in family, or jury duty, so long as the professor is informed no more than eight hours after submission is due. Car trouble, visits by friends or relatives, weddings, travel, forgetfulness, oversleeping, and other exigencies beyond serious illness, death in family, or jury duty will not be treated as reasonable excuses for missing submission deadlines. Make-up exams will be essay exams, because essay exams can be much more easily prepared on short notice. Make-up exams will be administered in the Geography-Geology building, not at a distance.

Creation Stories from around the World: This course examines multiple creation stories for two reasons: (1) some students reject this course's explanation of Earth history in favor of their culture's creation story; these stories demonstrate that there are many such stories, all contradicting each other; (2) the different creation stories carry very different messages about how the Earth should be treated, an important thought about why and how some humans have induced global change. Questions about the stories will appear on the seven check-ups, so that each story should be read and assimilated prior to the check-up covering it. Check-up questions will commonly include comparisons with Creation Stories 14 and 15, and thus familiarity with those stories will be required too.

Final Grades: All exam and other grades are recorded as numbers, not letter grades. At the end of the course, final numerical averages are used to determine final letter grades. Percentages used to divide letter grades will be at or below the following values: A 92.00%, A- 90.00%, B+ 87.00%, B 83.0%, B- 80.0%, C+ 77.0%, C 73.0%, C- 70.0%, D+ 67%, D 63%, D- 60%. The actual dividing points vary from year to year because the dividing points are often lowered to allow a reasonable distribution of letter grades. Students are assured that there will always be at least one "A" (and usually several) as a "curve" is developed to fit the distribution of final grades.

Your instructor wants students to learn the material, to do well on the exams, and to receive good grades in the course. Low grades are not a necessity - there will be no problem with giving nothing but As and Bs if all the students do A and B work. For example, from 2015 to 2019, 38% of students got As and 48% got Bs - but 10% dropped the course or got Ds or Fs.

Lecture and Laboratory: GEOL 1122 is a lecture course, and GEOL 1122L is the corresponding lab course providing hands-on experiences and **activities** in a smaller class. GEOL 1122 and GEOL 1122L function independently. Students in GEOL 1122L receive a separate grade for that course.

Student Athletes: Students wishing that their course grades be released to advisors in the UGA athletics program must give the professor a signed dated letter indicating that wish and indicating the name and campus address of the person to whom the grades should be sent. The course eLC page has a sample letter or template.

Students with learning disabilities certified by UGA's Disability Resource Center must inform the professor of measures needed to account for those disabilities by the end of the third class meeting. Students for whom the University provides a note-taker are reminded that note-takers are required to not deliver notes for any lecture that the disabled student does not attend.

The geologic time scale will appear repeatedly on check-ups and exams. See page 4 of this syllabus.

Time: Lectures will begin promptly at 9:35 and end no later than 10:50. If you must come in late or leave early, please sit at the sides of the room so as to not distract your colleagues by walking in front of them.

Classroom etiquette: Class meetings are intended for lecture on and discussion of the subject matter, and for students to ask questions about that material. Students are strongly encouraged to ask questions and to remember that there are no stupid questions.

To allow the students to hear all the lectures and participate in all the discussions for which they are paying, no private personal conversations can take place during class. Failure to adhere to this basic maxim of civilized behavior may result in administrative withdrawal from the class. In this regard, seating may be assigned at the discretion of the instructor.

Closing notebooks, putting on coats, and talking while the lecture or discussion ends are rude behaviors. Many students will still be trying to follow the lecture or discussion that they have paid to attend.

Students not paying attention to the lecture will be asked to do so or to leave the room. Repeated requests of this nature to any given student will lead to that student's course letter grade being lowered one full letter (e.g., from B+ to C+).

#### Required statements:

As a University of Georgia student, you have agreed to abide by the University's academic honesty policy, "A Culture of Honesty," and the Student Honor Code. All academic work must meet the standards described in "A Culture of Honesty" found at: [www.uga.edu/honesty](http://www.uga.edu/honesty). Lack of knowledge of the academic honesty policy is not a reasonable explanation for a violation. Questions related to course assignments and the academic honesty policy should be directed to the instructor.

Course Plans: The course syllabus is a general plan for the course; deviations announced to the class by the instructor may be necessary.

Accommodations due to disability: Students who seek special accommodations due to a disability should contact the Disability Resource Center (706-542-8719, <http://drc.uga.edu/>) to provide appropriate accommodations.

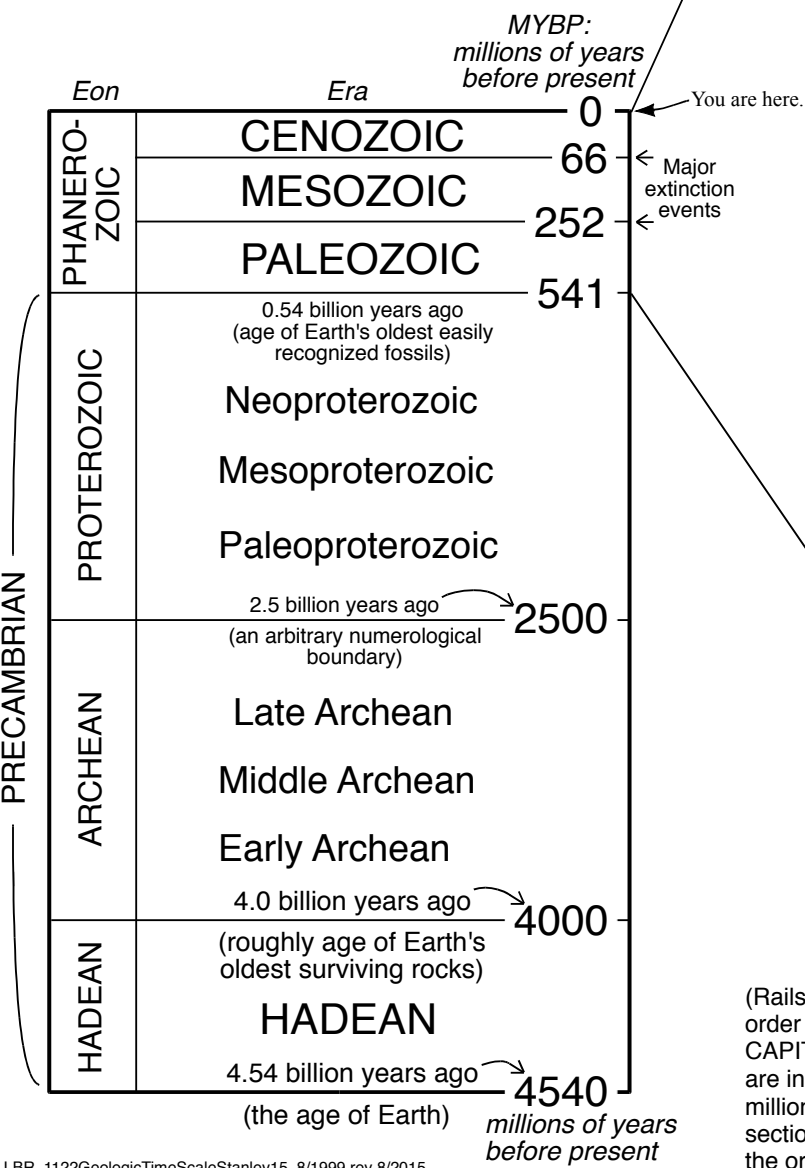
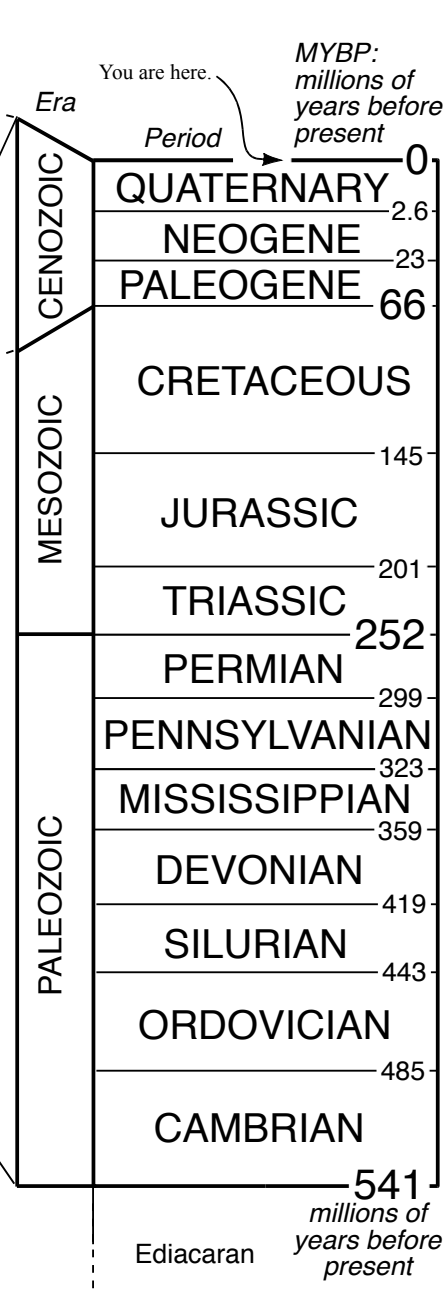
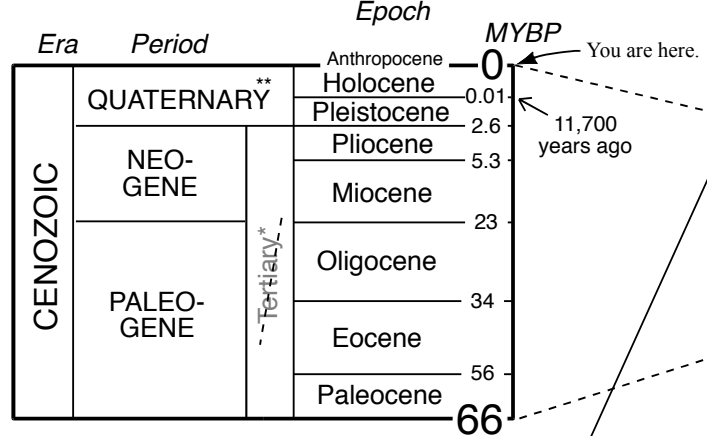
Mental Health and Wellness Resources: If you or someone you know needs assistance, you are encouraged to contact Student Care and Outreach in the Division of Student Affairs at 706-542-7774 or visit <https://sco.uga.edu>. They will help you navigate any difficult circumstances you may be facing by connecting you with the appropriate resources or services. UGA has several resources for a student seeking mental health services (<https://www.uhs.uga.edu/bewelluga/bewelluga>) or crisis support (<https://www.uhs.uga.edu/info/emergencies>). If you need help managing stress anxiety, relationships, etc., please visit BeWellUGA (<https://www.uhs.uga.edu/bewelluga/bewelluga>) for a list of FREE workshops, classes, mentoring, and health coaching led by licensed clinicians and health educators in the University Health Center. Additional resources can be accessed through the UGA App.

FERPA Notice: The Federal Family Educational Rights and Privacy Act (FERPA) grants students certain information privacy rights. FERPA allows disclosure of directory information (name, address, telephone, email, date of birth, place of birth, major, activities, degrees, awards, prior schools), unless a [https://reg.uga.edu/\\_resources/documents/imported/FERPARequestForRestriction.pdf](https://reg.uga.edu/_resources/documents/imported/FERPARequestForRestriction.pdf) is submitted to the Registrar's Office.

Emergencies: During emergencies requiring evacuation from the building (e.g., fire), students should leave Room 142 GG and exit via the multiple doors in the center of the building (for example, the door near the large rock). During emergencies requiring sheltering (e.g., tornado), students should leave Room 142 GG and descend via the large central stairway to the building's basement. During an active shooter event, students should remain in Room 142 GG at the front of the room but away from the door.

"In the first decade of the 21<sup>st</sup> Century, the International Commission on Stratigraphy divided the Cenozoic period previously known as the "Tertiary" into "Paleogene" and "Neogene". Much useful surviving literature still contains the word "Tertiary" and the letter "T" as its abbreviation. Many Earth scientists also continue to refer to the boundary at the end of the Cretaceous as the "K-T" boundary, even though it would be the "K-P" boundary in the new usage.

\*\*The same action by the International Commission on Stratigraphy eliminated the term "Quaternary", folding the last 2.6 million years of Earth history into the Neogene. However, those last 2.6 million years of Earth history are so unique that, in response to scientific outrage, the Quaternary period was later restored to the system by the ICS. As a result, however, some documents generated in the early 2000s persist without the Quaternary in their time scales.



# The Standard Geologic Time Scale

after Stanley and Luczaj (2015)

(Railsback's GEOL 1122 students need to know the order and hierarchical level of the names that are in CAPITAL letters, and the seven numerical ages that are in large print. All of the ages are expressed in millions of years. Earlier times are lower in each section, and later times are higher, as follows from the order of sedimentary strata.

**Schedule of GEOL 1122 (61231 - TR2) lectures for Spring 2024 - Version 1**

Class	Lxr	Topic and required reading				
Mtg	Day	Month	Date	No.	Area*	For each lecture, the corresponding lecture summary is required reading. Link-
<i>Basic stuff</i>						
1	Tues	Jan	9	1	S	Syllabus; minerals <i>Required Reading #1 below</i>
2	Thurs	Jan	11	2	S	Igneous rocks, metamorphic rocks, isotopes ◆
3	Tues	Jan	16	3	S	Sedimentary rocks
4	Thurs	Jan	18	4	P	Movement of rock: Structural geology and plate tectonics
<i>Time</i>						
5	Tues	Jan	23	5	M	Goals and theories <i>Required Reading #2 below</i>
6	Thurs	Jan	25	6	M	Correlative and relative dating ■
7	Tues	Jan	30	7	M	Absolute dating ○
8	Thurs	Feb	1	8	H	Age of the Earth and geologic time scales
9	Tues	Feb	6	9	H	Evolution of the Earth
<i>Life</i>						
10	Thurs	Feb	8	10	P	Biological evolution
11	Tues	Feb	13	11	H	Precambrian evolution
12	Thurs	Feb	15	12	H	Phanerozoic life & chordate evolution I
13	Tues	Feb	20	13	H	Phanerozoic life & chordate evolution II +
<i>Environment</i>						
14	Thurs	Feb	22	14	P	Greenhouse effect
15	Tues	Feb	27	15	M	Estimating past atmospheric CO <sub>2</sub> ○
16	Thurs	Feb	29	16	H	Atmospheric history ↓ Spring Break March 4-8, 2024
17	Tues	Mar	12	17	M, P, H	Estimating past sea level ★
18	Thurs	Mar	14	18	P	Climate & Ocean circulation
19	Tues	Mar	19	19	M	Estimating past temperatures ○
20	Thurs	Mar	21	20	H	Major extinction events
<i>Climate History</i>						
21	Tues	Mar	26	21	H	The Phanerozoic, Cretaceous and PETM
22	Thurs	Mar	28	22	H & P	The Cenozoic / Glaciation
23	Tues	April	2	23	H	Quaternary glaciation
24	Thurs	April	4	24	H	The last glacial cycle
x				25	H	Holocene 1 - Changing the world
25	Tues	April	9	26	H	Holocene 2 - the last 11,700 years
26	Thurs	April	11	27	H	Holocene 3 - the 20-21st Century environment ▲
x				28	H	Holocene 4 - Resources
27	Tues	April	16	29	H	Holocene 5 - Part 1 - Greenhouse effect & warming
28	Thurs	April	18	30	H	Holocene 5 - Part 2 - Greenhouse effect & warming
x				31	H	Holocene 6 - Alternatives
29	Tues	April	23	32	H (P)	Holocene 7 - Changing ecologies
30	Thurs	April	25	33	M&H	Summation <i>Required Reading #3 below</i>
	Tues	April	30			Reading Day - no class meeting
	Thurs	May	2			Final exam: Thursday, May 2, 2024, 8:00-11:00 am

Required Reading #1: *Lecture Summaries'* preface and seven figures following "Seeing the world like a geologist"  
 Required Reading #2: "What is Science?" Sections 1 to 4 – [http://railsback.org/railsback\\_1122science1.html](http://railsback.org/railsback_1122science1.html)  
 Required Reading #3: The Land Ethic - <http://railsback.org/1122landethic.html>

x: On-line presentation only \* Areas: S=Stuff/materials M = Methods P = Processes H = History

Everything on this schedule is subject to change as announced via eLC announcements.

**Schedule of due-dates and times for GEOL 1122 for Spring 2024**

Check-ups are every other Wednesday and must be completed by 9:00 pm.

Day	Month	Date	Time	Entity due (see note below for "CS n")	
◆	Thurs	Jan	18	9:00 PM	Exercise 1 - Igneous rocks
A busy week:					
	Mon	Jan	22	9:00 PM	Exercise 2 - Scientific literature
	Wed	Jan	24	9:00 PM	Check-up 1 (Lectures 1-4, Exercise 1, & CS 1)
◆	Thurs	Jan	25	9:00 PM	Exercise 3 - Plate tectonics
■	Thurs	Feb	1	9:00 PM	Exercise 4 - Age relations & strata
	Wed	Feb	7	9:00 PM	Check-up 2 (Lectures 1-8, Exercises 1-4, & CS 3)
○	Thurs	Feb	8	9:00 PM	Exercise 5 - Radiometric ages
	Wed	Feb	21	9:00 PM	Check-up 3 (Lectures 1-12, Exercises 1-5, & CS 7)
+	Tues	Feb	27	9:00 PM	Exercise 6 - Evolutionary lineages
	Wed	Mar	13	9:00 PM	Check-up 4 (Lectures 1-16, Exercises 1-6, & CS 10)
★	Tues	Mar	19	9:00 PM	Exercise 7 - Sea level
	Wed	Mar	27	9:00 PM	Check-up 5 (Lectures 1-20, Exercises 1-7, & CS 11)
○	Thurs	Mar	28	9:00 PM	Exercise 8 - CO <sub>2</sub> and temperature
	Wed	Apr	10	9:00 PM	Check-up 6 (Lectures 1-25, Exercises 1-8, & CS 13)
○	Thurs	Apr	11	9:00 PM	Exercise 9 - Planet Thera 1
▲	Thurs	Apr	18	9:00 PM	Exercise 10 - Planet Thera 2
	Wed	Apr	24	9:00 PM	Check-up 7 (Lectures 1-31, Exercises 1-10, & CS 4)
	Thurs	May	2	8:00 AM	Final Exam

Check-ups and exercises are to be completed via eLC → Tools → Quizzes; the final exam is administered in Room 142 GG on paper.

"CS n" indicates a numbered story in *Creation Stories From Around The World*

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age

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○	Thurs	Feb	8	9:00 PM	Exercise 5 - Radiometric ages
	Wed	Feb	21	9:00 PM	Check-up 3 (Lectures 1-12, Exercises 1-5, & CS 7)
+	Tues	Feb	27	9:00 PM	Exercise 6 - Evolutionary lineages
	Wed	Mar	13	9:00 PM	Check-up 4 (Lectures 1-16, Exercises 1-6, & CS 10)
★	Tues	Mar	19	9:00 PM	Exercise 7 - Sea level
	Wed	Mar	27	9:00 PM	Check-up 5 (Lectures 1-20, Exercises 1-7, & CS 11)
○	Thurs	Mar	28	9:00 PM	Exercise 8 - CO <sub>2</sub> and temperature
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