

Paleoecology

Fall 2018 ~ Block 4

“HOW AND WHERE? How and where animals and plants lived in the past is the concern of paleoecology. In other words, paleoecology is the study of the habits and habitats of living organisms from the time they first appeared on the earth up until yesterday.”

— Derek Ager, *Principles of Paleoecology*

Instructor:

Prof. Madeline S. Marshall, Norton 102, mmarshall@cornellcollege.edu (Office phone: 319.895.4309)

Class meeting times & location:

9-11 am and 1-3 pm (Monday-Friday) in Norton Geology 303; meeting times within those time blocks may change during the term as in-class discussions, activities, and projects fluctuate in relative importance, with afternoons often used for project work.

Office Hours:

By appointment (or before/after class). I will respond to emails as promptly as possible, but please plan ahead that I will not generally check or answer emails between 8pm and 8am, or as frequently on the weekends. **If you are confused, struggling, or want to learn more, please do arrange to meet with me — there is not time for you to “wait and see” on the block plan.

Textbook:

Principles of Paleoecology (Ager, 1963); other relevant readings will be posted on the course Moodle website. You are responsible for all assigned readings and content; please check Moodle daily for readings and assignments.

*You should have a basic set of colored pencils for class. You are welcome to share with a friend. Please come prepared to class every day with paper and a writing utensil, as there will be some in-class questions or drawings. Additionally, you will need to print out assignments to complete them; hard copies are required to be turned in.

*I would advise you to complete readings assigned in the syllabus before the class period covering that topic, so that you can have your questions answered then and participate more. The textbook was carefully chosen, as it is highly readable, presents a big-picture view of paleoecological questions, and will provide fodder for discussion.

*We will also be utilizing websites with APIs (application program interfaces), such as the Paleobiology Database (PBDB: paleobiodb.org) and Macrostrat (macrostrat.org), and likely R (<https://www.rstudio.com>), so set your bookmarks and make your downloads now.

Prerequisites:

GEO 217. Prior knowledge of sedimentology and stratigraphy, chemistry, biology, and some experience with data analysis are highly recommended (if you do not have this background, please be prepared to spend more time reading and put in more time out of class and with the QRS to ensure you are confident with all of the Paleoecology material and your research).

Field Trips:

Unfortunately, with the prospect and uncertainty of December weather, this key part of paleoecology remains TBD. Please let me know ASAP if there are any days (MWF) when you definitely would not be able to be away from campus over lunch, in case we are able to take a short field trip.

Course Description & Objectives:

In this course you will explore communities of the past, their relationships with their abiotic (physical and chemical) environments, and interrelationships among themselves. Your previous course in Invertebrate Paleontology addressed such topics as the common invertebrate fossil groups, their anatomy and functional morphology, taphonomy and bias in the record, ichnofossils, and records of biodiversity. You may have conducted some statistical analyses of these fossils, or deciphered why their morphologies are ideally suited to their environments. (When it comes to Sedimentology and Stratigraphy, don't hesitate to ask questions and look things up!)

Paleoecology will take those tools you acquired and build upon them, applying this knowledge to new and novel situations. Thus, we will address such topics as depositional and environmental gradients, functional guilds of organisms, relationships between species, how taphonomic clues vary and are linked to environments, faunal assemblages vs. communities, fossil concentrations (shell and bone beds), and others. We will also dedicate time to topics that are at the forefront of paleoecology today, especially Conservation Paleobiology.

You will each be undertaking a research project! You will build this project up over the entirety of the course, and the project will emphasize the use of big data to examine questions of paleoecology. You will be digging into different environmental variables, investigating how they influenced diversity records of the past — you will have the opportunity to take the reins on this, diving as deep as possible, and assessing the statistical significance of your results. I encourage you to use R (via RStudio) for your analyses, as this is the primary software used in paleoecology and ecology; however, if you are confident using MiniTab, you may use that. Basic tests can be performed using Excel, though you must make a serious attempt to use R before choosing Excel.

During this course, you will read numerous papers derived from the primary literature (journals), in addition to your textbook. There is much jargon associated with the discipline, and you will need to add a variety of technical / morphological terms into your memory. Concepts are important, and so are the highly specific terms that allow us to effectively communicate with each other about the same topic.

Students who take this course will:

1. Gain a detailed understanding of paleoecological principles;
2. Learn methods of paleoecological analysis and how to ask and research appropriate questions of the fossil record;
3. Read and evaluate the primary literature in paleoecology through student-led seminar discussions;
4. Be exposed to the big questions/themes in paleoecological research, e.g., diversity, time-averaging, conservation paleobiology, paleo-communities, etc.;
5. Understand that science is a continual process of investigation and interpretation, and that scientific knowledge progresses via the evaluation of competing hypotheses;

6. Hone their skills relating to research, data analysis, writing, and the presentation of information, and be able to critically assess the content value of different types of scientific information.

This course supports the Educational Priorities and Outcomes of Cornell College with emphases on knowledge, inquiry, reasoning, ethical behavior, and communication.

What I expect from you:

You should come to class on time, prepared to learn. Be engaged and actively participate in discussions and activities. Ask lots of questions! I am always happy to speak with you about class or other issues. Remember, you should be working a solid 8 hours/day, both for your own learning and to fulfill the requirements for this program's accreditation — spending at least 150 hours/course; most days we will have ~2-4 hours in class, so however you spread out the rest is up to you. Of course, you will likely end up needing to do more (or perhaps less), depending on your own learning pace and style, and the effort you put into your research project. Read to understand, not to speed through (though some articles or methods sections may warrant skimming) — this means that sometimes you might not finish all of the reading. That happens. I understand. But, be well prepared with what you did read.

Evaluation

As this is an upper-level course, the assessment tools in this course will be seminar/discussions and a final project (in three parts), in addition to your daily participation and attendance. Your project will serve will combine your significant research, data collection, synthesis, evaluation, and communication as you create and present your final products. Proper spelling and grammar are expected, and will be worth a portion of your points for written submissions.

Success in the Course

My goals for you upon completing this course are for you to have a solid understanding of how and where organisms have lived throughout geologic time, be comfortable reading journal articles, and be able to thoughtfully analyze paleoecological data to communicate your findings. Some useful guidelines for succeeding in this course:

1. Push yourself to become fluent in the foundational material and ask questions to ensure you fully understand concepts in class. (Try explaining a topic to a friend or roommate who is not in the class to make sure you know can clearly articulate your ideas.)
2. This course may present new challenges related to spatial reasoning or mathematical concepts, and it is imperative that you leave behind your aversions to those subjects and skills in order to succeed.
3. Have some fun as you learn how to analyze data in programs such as R. I will supply you with some guided exercises, and it's something you can treat as a game in itself — it won't help to rush through it, because your goal is to be able to apply these skills in the future too.
4. Revise your writing assignments — a first draft is not the final copy. Proper spelling, grammar, and punctuation are expected.
5. Take advantage of your textbook, readings, classmates, and the instructor as key resources — each will add more depth and another avenue of learning to your experience.

6. The library offers one-on-one tutoring services in geology through the Office of Academic Support and Advising. Contact Brooke Paulsen ([bpaulsen](#)) to request a tutor.
7. Amy Gullen ([agullen](#)) is our Science Reference Librarian, and she is an excellent research- and paper-writing resource.
8. The QRS may also be a key resource for you, and Jessica Johanningmeier (QRS director; [jjohanningmeier](#)) and several student workers there are familiar with R (and other data analysis tools) — reach out to them for assistance!

Grade Breakdown	
Participation/Attendance	10%
Seminars/Discussions	30%
Final Research Project (in 3 parts)	60%

Grading Scale	
95-100 90-94.9	A A-
86-89.9 83-85.9 80-82.9	B+ B B-
76-79.9 73-75.9 70-72.9	C+ C C-
66-69.9 60-65.9	D+ D
59.9 or below	F

Class Attendance and Participation Policy

You are expected to attend all class meetings. If you have an unavoidable obligation, you must notify the instructor as soon as possible, and we can discuss how to help you make up and keep pace with the class. While there is a textbook and readings for the course, you will also derive great benefit through the activities and discussions that happen in class. It is your responsibility to know anything I say in class (including changes in the schedule, etc.) and for having any handouts or assignments passed out in class — most important information will also be on Moodle, but do not rely solely on Moodle! If you do miss a class, you should get notes from a classmate and handouts/ assignments from me the day you return to class. Attendance will factor into your participation grade.

****You are required to participate.** Silently waiting as your classmates answer questions or discuss topics is not acceptable. Your contributions should be substantive — it's **always** possible to find (a) something you learned, (b) something that surprised you, and/or (c) something that confused you or that led to more questions. Finally, do not sleep/doze off during class. You will be asked to leave. If you are feeling sleepy, please do feel free to stand up and move around; you can also let me know it's time for a short break.

Email Etiquette

It's always worth a reminder of acceptable email practices: I will only respond to your emails if they include a descriptive subject line, a salutation (not “hey” or “sup, dude”), proper spelling and grammar, and a signature or closing.

<https://www.insidehighered.com/views/2015/04/16/advice-students-so-they-dont-sound-silly-emails-essay>

Late Work and Make-Up Policy

Due to the fast-paced nature of the class, policies are necessarily strict. I will **not** accept late assignments for a grade. If an assignment is listed in the syllabus (or on Moodle) as due on a certain day, be prepared with it at 9 am. When in doubt, ask! If you require an extension, please see me before the assignment deadline. There are very few assignments for this course, so realize that your grade mostly is based upon discussions and your final project — budget your time accordingly, and put in your maximum effort.

Academic Integrity

All members of the Cornell College community are expected to act with academic integrity; an important aspect of this is respecting the work of others. Students must explicitly acknowledge ideas, claims, observations, or data of others, unless generally known. When a piece of work is submitted for credit, a student is asserting that the submission is her or his own work unless there is a citation of a specific source. If there is no appropriate acknowledgement of sources, whether intended or not, this may constitute a violation of the College's requirement for honesty in academic work and may be treated as a case of academic dishonesty. The procedures regarding how the College deals with cases of academic dishonesty appear in The Catalogue, under the heading "Academic Honesty."

This is different from working with a partner on a project or discussing a paper together, which is encouraged. Learning how to communicate your scientific thinking to others is an important skill, and discussing hypotheses with others is an excellent way to further your understanding of a subject. However, that does **not** mean that work product from group collaboration should be anywhere close to identical — you should both come away having learned more from talking to each other, and have new ideas. Make sure that you write up your assignment or report **independently** though, using your own words and conclusions, and always acknowledge your collaborator(s). Any evidence of plagiarism will result in a zero for that assignment. If it happens more than once, you will be reported to the Dean.

Technology Policy

Cell phones must be off (silent, not vibrate) and put away during all class periods. I do NOT want to hear or see them. If I see your cell phone out during class, you will be asked to leave. Do not take pictures of the chalkboard, slides, or specimens — write or sketch; pictures do much less to serve your education. When using laptops or tablets for class activities, I expect you to use them responsibly and respectfully. If you are using them for non course-related activities, I will give you a verbal warning. If this behavior continues, I will ask you to leave and your grade will be affected.

*You are highly encouraged to take notes and sketch diagrams by hand during class. This is proven to promote better listening and synthesizing of information, and results in a deeper understanding and longer memory of the material. (<https://www.scientificamerican.com/article/a-learning-secret-don-t-take-notes-with-a-laptop/>)

Academic Accommodations

Cornell College is committed to providing equal educational opportunities to all students. Students should notify the Coordinator of Academic Support and Advising and their course instructor of any disability-related accommodations within the first three days of the term for which the accommodations are required, due to the fast pace of the block format. For more information on the documentation

required to establish the need for accommodations and the process of requesting the accommodations, see <http://www.cornellcollege.edu/academic-support-and-advising/disabilities/index.shtml>.

*Please do discuss with the instructor if you are a person with CVD (color vision deficiency), so that course material can be made accessible (and more enjoyable) for you.

Add/Drop/Withdrawal

This course may be added or dropped within the first three days of the block, as per College policy, with the permission of the instructor. A withdrawal may be granted on the 15th day, provided that you have completed all assignments, participated fully in course activities, and attended all class sessions (1 *excused* absence permitted). NOTE: A 15-day drop will not be granted to students who, in my estimation, have not made a good faith effort to learn and/or complete the course material. A health withdrawal (WH) may be obtained if health issues are serious enough to interfere with course completion. To qualify, you must speak with a health professional either on or off campus and receive written documentation.

See **Schedule** on Moodle (subject to change)