SIO 104: PALEOBIOLOGY AND HISTORY OF LIFE
SYLLABUS SPRING 2017

Lectures TTh 12:30-13:50 Vaughan Hall 100
Laboratories TTh 10:30-12:30 & 14:00-15:55 VH 147

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Course Description and Organization

The course introduces basic biological and environmental patterns and processes that have shaped the history of life. The laboratories introduce the diversity of the fossil record as well as basic biostratigraphy, taxonomy, and systematics. There will be one overnight week-end field trip to the Mojave Preserve that stresses Precambrian-Cambrian fossils and Cenozoic vertebrate fossils and another day trip to La Brea Tar pits and the LA County Museum that stresses the composition of the Pleistocene vertebrate community of California and dinosaur morphology. There are three required texts: *Life on a Young Planet: The First Three Billion Years of Evolution on Earth* by Andrew Knoll, that is closely linked to the lectures for the first half of the course, *Paleontology: a brief history of life* by Ian Tattersall, that addresses mainly issues in the last half of the class, and *The Earth After us: what legacy will humans leave in the rocks?* By Jan Zalasiewicz that is not only a fun read, but also addresses fundamental themes about how fossils are preserved, the nature of trace fossils and body fossils, and the paleoenvironmental indicators of ecosystems. I also highly recommend (but do not require) "Made to Stick: (Heath & Heath 2007) as one of the best books I know on effective communication. Additional readings for the lectures and the weekly essays will be available electronically on “TED”. [https://ted.ucsd.edu/]

Course Requirements and Grading

Lecture Midterm Exam 20%
Lab 40%
Essays on weekly readings/lectures 10%
Final Exam 30% (Monday, June 12, 11:30 am-2:30 pm)

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SCHEDULE

Comment [ecs1]: General Comment: I made the essays due the next class after they were assigned. If you want to extend them to a week out, please do so. I forgot to change them when I did the initial date shifts, sorry!

4 April. T	Lecture 1: Introduction to course; Time, Life, Fossils and Major transitions in the history of life Reading: *The Earth After Us* (first couple chapters) Lab: 1: Fossils and Fossil Preservation
6 April Th	Lecture 2: Geological evidence for the history of life Demonstration: Time averaging and "better dead than alive" Reading: *The Earth After Us* (a couple more chapters) Lab 2: Beach Walk: How to measure a section and Geologic Time
11 April T	Lecture 3: Earliest life on Earth Demonstration: Oldest Rocks, Chert and Modern Stromatolite Reading: *Life on a young planet* Chapts 1-5 (but particularly 3-5) Lab 3: Cyanobacteria, stromatolites and algae protists Essay: Summarize the observational evidence for life before 3.5 Ga in 250 words and again in 48 words (I will count!). There are papers in "TED" that may be of service although you are not obligated to cite them. (due 18 April)
13 April Th	Lecture 4: The "Universal Tree of Life" Demonstration: Types of fossils & Donut Phylogeny Reading: *Life on a young planet* Chapts 1-2 Lab 4: Cladistics
18 April T	Lecture 5: Cyanobacteria, stromatolites, and the rise of oxygen Demonstration: Examples of oxic and anoxic sediments Reading: *Life on a young planet* Chapts 6-7 Lab 5: Protists Essay: What is the evidence for when free oxygen was first produced on Earth and why doesn't the Earth immediately develop an O2-rich atmosphere? (250 words, max); then give a two sentence summary of your essay (points for being concise) (due 25 April)
20 April Th	Lecture 6: Origin and Diversification of Eukaryotes Demonstration: How organelles get multiple sets of membranes Reading: *Life on a young planet* Chapts 8-9 Lab 6: Sponges, archeocyathids, and cnidarians
22-23 April	***Mojave National Preserve: Cambrian-Precambrian Boundary and Miocene fossil mammals***
25 April T	Lecture 7: Ocean chemistry and Snowball Earth Reading: *Life on a young planet* Chapt 12 Demonstration: Glacial sediments, lichens, clay and oxidized soils

	Lab 7: Bryozoans
27 April Th	Lecture 8: Origin of Animals and Body Plans Reading: *Life on a young planet* Chapts 10-11 Demonstration: Fun with balloons…and Ediacaran Fossils Lab 8: Brachiopods Essay: Briefly (1 page max—could be less! Points for being concise.) Is the "Cambrian Explosion", really an explosion? Briefly summarize the biological and environmental evidence that tells how long the fuse burned and how rapidly animal diversification unfolded. Finish with a one sentence summary of your article. (due 4 May)
May 2 T	Lecture 9: Pelagic Ecosystem Evolution Demonstration: Chalk, Paleozoic limestone, and siliceous ooze Reading: *Life on a young planet* Chapts 11 & 13 Lab: **MIDTERM LAB EXAM (covers labs 1-8)**
4 May Th	Lecture 10: Pelagic Ecosystems II-Marine vertebrates Demonstration: Mososaurs and delphinids Lab 9: Mollusks I
9 May T	Lecture 11: Benthic Ecosystems Reading: *Paleontology: a brief history of Life*, Chapt 5 Demonstration: incumbency Lab 10: Mollusks II
11 May Th	Lecture 12: Evolution of Forests and Animals Demonstration: Early plants—lichens, horsetails and cycads Reading: *Paleontology: a brief history of Life*, Chapt 5 Lab 11: Plants Essay: Compare the molecular and fossil evidence for the diversification of land plants with the molecular and fossil evidence for the diversification of animals. Think here about the big picture—how do these two radiations compare in similarities and differences? (1 page max—could be less! Points for being concise.) (due 18 May)
16 May T	Lecture: **MIDTERM LECTURE EXAM** Lab 12: Arthropods
18 May Th	Lecture 13: Evolution of Dinosaurs and Mammals Reading: *Paleontology: a brief history of Life*, Chapt 6-7 Lab 13: Vertebrate skull morphology
20 May Saturday	***DAY FIELD TRIP (Saturday)-La Brea Tar Pits & LA County Museum Dinosaur Hall***
23 May T	Lecture 12: Extinctions Demonstration Coin-flips & the Signor-Lipps effect

	Reading: *Schulte et al 2010 and Discussion/Reply* Lab 14: Vertebrate teeth
25 May Th	Lecture 14: Radiations Demonstration: Sabertooths and how they work Lab 15: Deuterostomes: Echinoderms and protochordates
30 May T	Lecture 15: Speciation and Mammal Diversification Reading: *Paleontology: a brief history of Life*, Chapts 8-10 *Norris and Hull: 2011: The temporal dimension of speciation* Lab 16: Biostratigraphy and Climate Proxies
1 June Th	Lecture 16: The Late Neogene World Lab 17: The Works—Lab review Essay: (One page, max) Research your "Fascinating Fossil" and write about its geologic and geographic distribution, paleoecology, and morphology; your primary job is to get across what makes it 'fascinating'. (due 8 June; in addition to the essay, you will be presenting a powerpoint slide set on this fossil on 8 June)
6 June T	Lecture 17: Human evolution **LABORATORY FINAL EXAM (cumulative)**
8 June Th	Lecture 18: Our Legacy Demonstration: Thought experiment: what would our time look like in 10 my? Reading: *The Earth After Us* (if you have not finished it) Lab 18: **Fascinating Fossils Day**

12 JUNE (MONDAY) **FINAL EXAM (11:30AM-2:30PM)**

SIO 104: Paleobiology and the History of Life Laboratory

Location: Hubbs 3300

Time: Every Tuesday and Thursday following Lecture (2-3:50pm)

Professor: Dr. Richard Norris, rnorris@ucsd.edu

Teaching Assistants

Elizabeth Sibert - esibert@ucsd.edu
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Office Hours: 2-3 PM MONDAY
10:30-11:30 PM THURSADAY

Michelle Zill – mzill@ucsd.edu
Office: Vaughan Hall 1XX
Office Hours:

NOTE: Office hours are held in Ritter Hall 154. Additional times by appointment

Grading

The laboratory portion of SIO 104 is worth 40% of your final grade. This includes completion of all laboratory exercises and field trips (65%), two practical laboratory quizzes (midterm - 10% and final - 15%), and participation (10%).

Attendance

Attendance is mandatory at all laboratories*. Missed labs must be cleared with us ahead of time (email is fine, but please let us know). Please be on time for labs – we will be keeping attendance. Not arriving on time will affect your participation grade. You will be allowed a maximum of two make up labs during the quarter*.

Laboratory Exercises

Laboratory exercises are designed to be completed during the 2 hour lab session. You are welcome to turn them in when you finish. **Labs are due at the beginning of the following lab session.** Late labs will have a penalty, but we will accept them, so it is always better to hand them in than not.

Field Trips

Field trips are an integral part of the course, and are mandatory*. They are also incredibly fun, and we highly recommend doing your best to be there. If you have a known conflict with any of the trip dates, please let us know as soon as possible, so we can determine the appropriate make-up work for you. You will hand in 1) your field trip guidebook and notes, and 2) a write-up with the results of each field trip, which will be assigned at the time of the trip. **Field trip assignments are due the Thursday after the field trip** (see schedule on next page).

Office Hours

Office hours will be held in Ritter Hall 154 – go to the basement of Ritter Hall, and walk south (towards Vaughan 100). 154 is the double doors on the left of the hall. You can use this time to make up missed labs, finish labs, ask us questions, or review the specimens at your leisure. If you cannot make the assigned times, please feel free to set up an alternate time with one of us.

A note about lab safety

We share the teaching lab space with biology classes that use toxic chemicals and biological agents. This means that no food or drink can be consumed in lab.

SIO 104 Laboratory Schedule

24 Sept Th	Lab: 1: Fossils and preservation
29 Sept T	Lab 2: Beach Walk: how to measure a section and Geologic Time
1 Oct Th	Lab 3: Cyanobacteria, stromatolites and algae protists
6 Oct T	Lab 4: Cladistics
8 Oct Th	Lab 5: Protists
13 Oct T	Lab 6: Sponges, archeocyathids, and cnidarians
15 Oct Th	Lab 7: Bryozoans
20 Oct T	Lab 8: Brachiopods
22 Oct Th	Lab 9: Arthropods
24-25 Oct	**OVERNIGHT FIELD TRIP (Saturday & Sunday)** **Mojave National Preserve: Cambrian-Precambrian Boundary and Miocene fossil mammals**
27 Oct T	Lab 10: Mollusks I
29 Oct Th	**MIDTERM LAB QUIZ (covers labs 1-8)**
3 Nov T	Lab 11: Mollusks II
5 Nov Th	Lab 12: Anza Borrego Fossils and Rocks
16 Nov SUNDAY	**DAY FIELD TRIP (Sunday)** **Anza Borrego proto-Gulf of California invertebrates**
10 Nov T	Lab 13: : Plants
12 Nov Th	Lab 14: Vertebrate skull morphology
17 Nov T	Lab 15 Deuterostomes: Echinoderms and protochordates
19 Nov Th	Lab 16: Biostratigraphy and Climate Proxies
24 Nov T	Lab 17: The Works—Lab review
26 Nov Th	*THANKSGIVING BREAK*
1 Dec T	**LABORATORY FINAL QUIZ (cumulative)**
3 Dec Th	Lab 18: **Fascinating Fossils Day**

Comment [ecs2]: We'd do geologic time first, then beach walk second, for optimal tidal efficiency and because the beach walk is something that students can come back if they don't finish, but geologic time isn't really…

Comment [ecs3]: Should stay as "lab 4", to go with "lecture 4, tree of life"

Comment [ecs4]: October 14th is "National Fossil Day"

Comment [ecs5]: I like this one before the

Comment [ecs6]: Need new dates!

Comment [ecs7]: Thursday before lecture midterm, during "week 5"

Comment [ecs8]: This lab should be the class before the day trip. This was conveniently the afternoon after the lecture midterm, which worked really well.

Comment [ecs9]: New date!

Comment [ecs10]: Should stay with "evolution of forests" or "invasion of land" lecture

Comment [ecs11]: This is a nice relatively light lab that goes well with the "right before Thanksgiving".

Comment [ecs12]: Maybe…