Major Events in the History of Life

Six-Week Online Course
(17 Lectures + 7 Laboratory Sessions)

Instructor:
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Required Text:

Optional Texts:

Exam Schedule:
MID-TERM LAB & LECTURE EXAMS: Week 4, Monday 6pm to Tuesday 6pm
FINAL LAB & LECTURE EXAMS: Week 6, Thursday 6pm to Friday 6pm

Grading:
Online Laboratory Sessions
Mid-term Laboratory Exam: ___________________________ 15%
Final Laboratory Exam: ___________________________ 18%
Laboratory Reports (due weekly):____________________ 7%

Online Lecture Material
Mid-term Lecture Exam: ___________________________ 20%
Final Lecture Exam ___________________________ 40%
100%

Final Laboratory and Lecture Exams are "cumulative" (include entire course)
Median course grade (Laboratory + Lecture) will be placed at C+/B-
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OVERVIEW OF THIS COURSE

It's fair to ask why virtually all colleges and universities are subdivided into discrete, discipline-defined units -- "academic departments," in standard parlance -- when the knowledge they address is itself not constrained by such boundaries. Consider, for example, the nature of Nature. The natural world is neither entirely physical, nor wholly biological, yet academia has traditionally divided this world into two great camps -- the Physical Sciences and the Life Sciences -- populated by tribes that have such different backgrounds and divergent interests they barely speak the same language. On most college campuses, UCLA included, the tribes even occupy separate "homelands," and though their shared borders are said to be open, they actually are seldom crossed, only occasionally by foraging students, even more rarely by faculty. Each group stresses its own specialized brand of learning, and as each prods its students to master more and more about less and less, knowledge becomes increasingly fragmented.

There's little doubt that this tribalism makes things simpler for all -- learning the ropes in a single discipline is far easier than grappling with many. But it also costs, and the price is high for those exploring the real world -- which, by its nature is a dynamic interlocking mix of the physical and life sciences. Unlike universities, Nature is not compartmentalized!

By considering life on Earth from a Cosmic perspective, and using as its prime exemplar the interconnected evolutionary histories of our planet's geology, biology, and its atmosphere-ocean system, this course seeks to break down the traditional fragmented view of the natural world. In doing so, the course will (1) explore topics drawn from diverse academic disciplines -- in the Physical Sciences, from Physics & Astronomy, Chemistry & Biochemistry, Earth, Planetary & Space Sciences, and Atmospheric and Oceanic Science; and in the Life Sciences, from Cell & Molecular Biology, Microbiology & Molecular Genetics, and Organismal & Evolutionary Biology; (2) use historical vignettes (e.g., NASA's 1996 announcement of "evidence of fossil life on Mars") to illustrate the humanness of scientists and how science actually is done; and (3) introduce knowledge and concepts that should be of lasting value to an educated citizen:

♦ the age of the solar system, of Earth, of life, and how they have been deciphered;
♦ the overall structure of our planet, how it formed, and how Earth compares to nearby neighbors in the solar system;
♦ why life is made of "starstuff" (the chemical elements CHONSP) and why these elements rather than some more exotic mix;
♦ how life emerged from inanimate matter, why it is made up of cells, and how the few basic kinds of living systems originated then flourished and evolved;
♦ why the ecosystem is structured into eaters and eatees and is made up of air-breathers and forms of life for which oxygen is a deadly poison;
♦ how heredity operates, what its roots are, and why it took so long for sexual reproduction to rise to prominence;
♦ how evolution actually works, how its workings have been discovered, and how evolution itself evolved over the geological past;
♦ how and when life arose on land, and why seed plants and backboned animals (dinosaurs, mammals) rose to dominate the land environment;
♦ how humans fit it, and how what we call intelligence is actually rooted very deeply in the Universal Tree of Life.
NOTES REGARDING THIS COURSE

It will help you -- immeasurably -- to read the lecture outline in this Syllabus for each and every lecture before you view the online presentation. The key points of each lecture are highlighted and the new technical terms are defined.

Be sure also to read the assigned reading in Cradle of Life. You will actually enjoy it! It is not overly technical. It was written at a level that you can understand; it has lots of pictures; and parts of it read like a novel with some really good stories, for example:

- The visit to UCLA of the world famous origin-of-life scientist A.I. Oparin;
- A once-in-a-lifetime sojourn to the home of the surrealist painter Salvador Dalí;
- The preserved bones of one of the "sinful ones" buried in the 40 days and 40 nights of the Biblical Noachian flood;
- The greatest fraud in the history of natural science, dating from 1725; and
- The "real story" of NASA's 1996 claim of the discovery of past life on Mars. (Moreover, questions from the assigned readings are likely to be on the mid-term and final lecture exams.)

This is a broadly interdisciplinary course, including material from diverse fields of understanding -- geology, biology, paleontology, atmospheric science, comparative planetology, evolution, and even aspects of the history of science and how science is done. It is intended to be interesting and educational, a course that will give you a basic understanding of life's long history on Earth and that will introduce knowledge and concepts of lasting value to an educated citizen. Above all, this course should be enjoyable -- it should be good fun!
# WEEKLY SYLLABUS

## WEEK #1
- **LECTURE 1** -- Earth Science: Rocks, Minerals, and Geologic Time
- **LECTURE 2** -- Biology Past and Present: How Do Cells Work?
  - **LAB 1:** The Nature of Geologic Time

## WEEK #2
- **LECTURE 3** -- How Does Evolution Work?
- **LECTURE 4** -- Beating the Odds: How Fossils Are Preserved
- **LECTURE 5** -- How Did Life Get Started?
- **LECTURE 6** -- Origins of the Global Ecosystem
  - **LAB 2:** Fossils and Their Preservation

## WEEK #3
- **LECTURE 7** -- The Oldest Records of Life
- **LECTURE 8** -- Earth's Oldest Living Fossils
- **LECTURE 9** -- Life Like Us Has Cells Like Ours
  - **LAB 3:** What Was the Early Environment Like?
  - **LAB 4:** Precambrian Life

## WEEK #4
- **MID-TERM LAB EXAM** Monday 6pm to Tuesday 6pm
- **MID-TERM LECTURE EXAM** Monday 6pm to Tuesday 6pm
- **LECTURE 10** -- Plants Conquer The Land
- **LECTURE 11** -- From Spore Plants to Seeds and Flowers
  - **LAB 5:** Plants Conquer The Land

## WEEK #5
- **LECTURE 12** -- How Plants Changed the Planet: An Overview
- **LECTURE 13** -- "Sea Shells" and Their Kin
- **LECTURE 14** -- The Lineage Leading to Humans
- **LECTURE 15** -- Backboned Animals Take Over the Earth
  - **LAB 6:** Animals Without Backbones

## WEEK #6
- **LECTURE 16** -- Take-Home Lessons About the History of Life
- **LECTURE 17** -- How Is Science Done?
  - **LAB 7:** Backboned Animals Like Us
- **FINAL LAB EXAM** Thursday 6pm to Friday 6pm
- **FINAL LECTURE EXAM** Thursday 6pm to Friday 6pm