

Astronomy 310:

Astrobiology and the Search for Extraterrestrial Life

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Four Main Course Topics

1. Understanding Our Universe

The Rules and Tools of Astronomy

The Origin and Large-scale Structure of the Universe

Galaxies and Stars

The Solar System

The Earth

2. Basic Earth Biochemistry

DNA, RNA, proteins, ATP, and all that

Extremophiles

The Tree of Life

Ideas regarding the origin of life on Earth

Bacteria, Archaea, and the Eukaryotes

Thoughts on the Origin of Life

(Evolution, Natural Selection and) Extinction

3. The Search for Extraterrestrial Life

Mars and the Icy Moons: Europa, Titan, and Enceladus

Extrasolar Planets

Habitable Zones

The Drake Equation

The SETI Project

The Rare Earth Hypothesis

Past, Current, and Future spacecraft missions: *Viking, Mars Exploration Rovers, Curiosity; Cassini; Kepler, TESS, etc...*

4. Developing Critical Thinking Skills

How does science work?

- science is not a *subject*, it is a *method*.

- what is good science vs. pseudoscience?

The Principle of Occam's Razor

The mind is a complex and complicated thing!

Be skeptical of extraordinary claims.

Specific case: UFOs

What is “astrobiology”?

Also called “exobiology” and “bioastronomy”.
Literally means “the study of life in the universe”

NASA’s Astrobiology Roadmap:

- How does life begin and evolve?
- Does life exist elsewhere in the universe?
- What is the future of life on Earth and beyond?

NASA Astrobiology Institute

Mission: “to study the origin, evolution, distribution, and future of life on Earth and in the Universe”

Study biology as planetary phenomenon:

- how astrophysical processes give rise to planets
- how planetary processes lead to the emergence of life
- how planetary processes sustain or inhibit life
- the discovery, characterization, and habitability of extrasolar planets
- the extreme limits of life & environments capable of supporting life
- how to search for and identify extraterrestrial life
- whether Earth life is a subset of a greater diversity of life

For this Astr 310 course, we will study/investigate:

- astrophysical processes leading to planet formation
- connections between life and the environment
- search for extraterrestrial habitable environments
- origin, evolution, limits, and the biochemistry of life on Earth
- search for extraterrestrial life