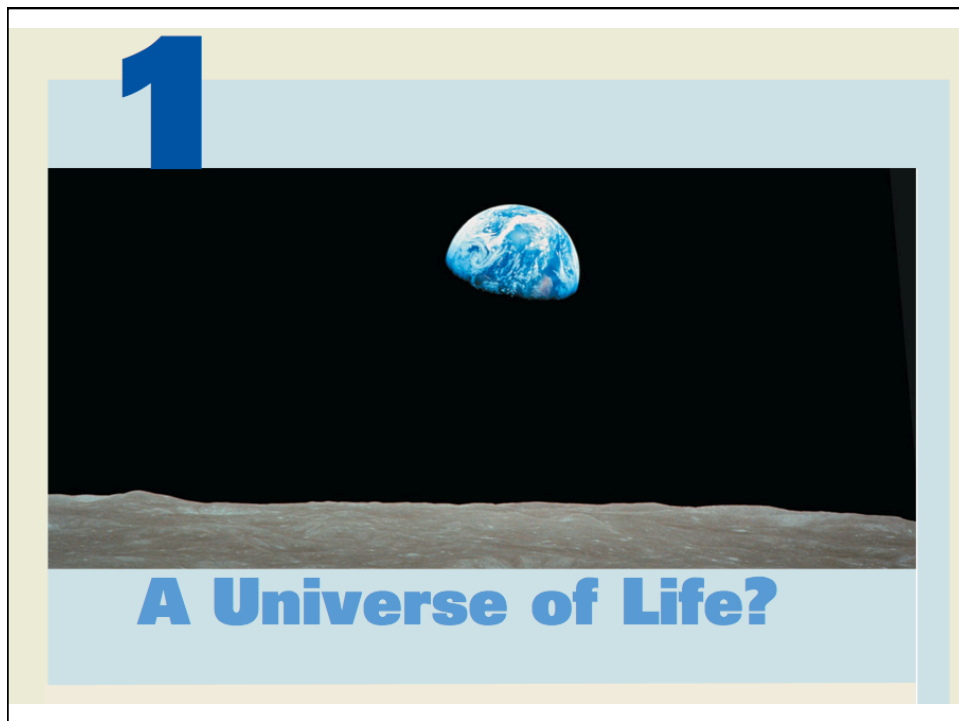


ASTR 305V NMSU

Dr. Chris Churchill

Astronomy Building Room 105
Contact via Canvas messaging
646-1913

<http://luminarydaily.com/stunning-short-film-with-carl-sagan-voice-over-envisions-the-future/>



A Universe of Life?

LEARNING GOALS

- | | | | |
|--|--|---|--|
| 1.1 THE POSSIBILITY OF LIFE BEYOND EARTH <ul style="list-style-type: none"> • What are we searching for? • Is it reasonable to imagine life beyond Earth? | 1.2 THE SCIENTIFIC CONTEXT OF THE SEARCH <ul style="list-style-type: none"> • How does astronomy help us understand the possibilities for extraterrestrial life? • How does planetary science help us understand the possibilities for extraterrestrial life? • How does biology help us understand the possibilities for extraterrestrial life? | 1.3 PLACES TO SEARCH <ul style="list-style-type: none"> • Where should we search for life in the universe? • Could aliens be searching for us? | 1.4 THE NEW SCIENCE OF ASTROBIOLOGY <ul style="list-style-type: none"> • How do we study the possibility of life beyond Earth? |
|--|--|---|--|

These are some of the major **LEARNING GOALS** for the semester

We are searching for ANY kind of "life", so this means we will need a working definition of life before we know how and where to search for it! Of course, this limits us to.....
life as we know it.

ASTROBIOLOGY

Astronomy -- study of objects in the cosmological setting

Astronomy teaches us about the cosmic ecosystem, such as how many and what types of stars there are, how many planets and what types there are. It teaches us the ecological relationships between these objects and the cycles of their creation and destruction. We can learn how life is connected to these processes and how many environments there are where life may be capable of persisting.

Biology -- study of organic chemistry and organic life

Biology teaches us about the chemical processes of life and how to define what life is. In the context earth's ecosystem, we learn about where in an ecosystem life persists and how it persists and is sustained. By studying the geological record and biological variation and similarity we learn about how life changes and evolves.

Astrobiology -- study of organic life in cosmological setting

Astrobiology combines astronomy and biology and is the branch of science designed to develop knowledge from which we can make predictions about how common life is and about where life may reside in the universe, and for developing search strategies to find life "out there".

The Central Astrobiology Questions:

1. How/Where does the universe make and/or harbor the raw chemical ingredients for "life"? How abundant/common are these ingredients throughout the universe?
2. How/Where in the universe can and/or do these raw chemical ingredients partake in the biological processes we call "life"? Theoretically, can life exist elsewhere in the universe? Observationally, does life exist elsewhere in the universe?
3. For earth, what is life's origin, history and future? For life elsewhere, what is life's origin, history, and future?

How do We Study The Possibility of Life Beyond Earth?

1. Study the environments conducive to the origin and ongoing existence of life. Start with earth and the solar system, then move out to other solar systems, and then out to the universe at large.
2. Learn how common these environment are in our solar system, in our galaxy, and in the universe, and determine how long they persist.
3. Currently, we are now performing experiments looking for such conditions on other planets in our solar system and on planets orbiting around other stars.

On Mars, we are currently looking for direct evidence of life present or past life; we are just beginning to look for indirect evidence around planets in other solar systems.

Some things you will learn from this class...

1. There is no evidence for life beyond Earth – yet.
2. There are a multitude of good reasons to believe life is widespread in the universe.
3. Life *may* exist elsewhere in our solar system, but most likely it will be microbial life.
4. We are “**star stuff**” –the universe readily builds all the most critical ingredients and building blocks of life. And yes, what happened billions of years ago made us what we are today.

Reasoning that organic biology is common throughout the Universe

(this is mostly based upon earth history... astronomy corroborates this!)

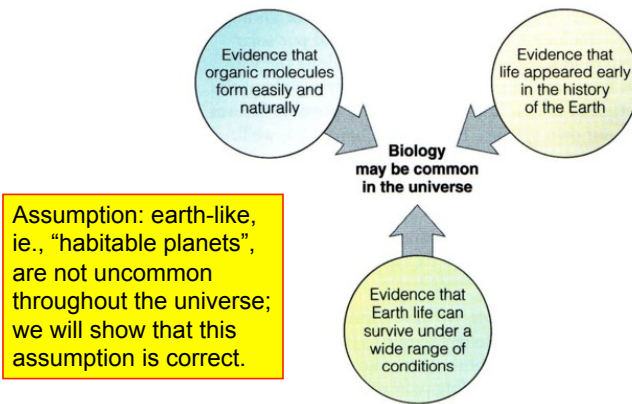


FIGURE 1.24 Three important lines of evidence suggest that biology may be quite common in the universe.