Astrobiology Understanding Life In The Universe

2025-11-01

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1 Introduction

[A] BOOK for Cockell_AULITU_ED2_2020.

[T] Look up other MOOCs in astrobiology to include on the awesome-astrobiology GitHub page (pg. Acknowledgements)

[R] Routinely, undercurrents of urgency and a general sense of anxiety puncture your halcyon. Reading calms you and clears away some of this jitteriness. Reading for several hours per day seems as though it would be on par with physical exercise w.r.t. it's positive efficaciousness. Walks w/ "Today I Learned" (TIL) phone calls or real-space conversations might also be positively transformative. In quizzing others you would also further solidify your recent learnings.

[R] Start 11:25 PM EST, 2025-11-01.

2 Chapter 01: Astrobiology

[E] What is astrobiology concerned with and what does it investigate?

…with the origin, evolution, and distribution of life in the Universe and …life in the cosmic context. (pg. 1)

[T] Define astrobiology, Earth, planet, …

[E] What four large-scale questions does astrobiology concern itself with?

(1) How did life originate and diversify on Earth? (2) How does life co-evolve with a planet? (3) Does life exist beyond Earth? (4) What is the future of life on Earth and its capacity to move beyond the home planet? (pg. 1)

[T] A question to mull over: "Why study biology in a cosmic context?" (pg. 1) …astronomical factors influence life.

[T] Define Sun, greenhouse effect, galaxy, Cretaceous, dinosaur, star, Red Giant, …

[R] See the section from pg. 2-3 BOOK for a description of the value of the term astrobiology over just biology.

[Q] How many stars and galaxies are there in the observable Universe?

[R] See pg. 5 BOOK for a table of topics that you would like to be able to lecture about in astrobiology.

[T] Define molecule, Big Bang, exoplanet, solar system, …

[R] See pg. 4 BOOK column 2 for questions on the limits of life.

[>] "How did the elements required for life (which we identified in the first part of the textbook) form, and where did they come from." (pg. 4)

[R] In general, Chapter 1 BOOK contains many of the fundamental questions in astrobiology.

[R-Q] In reading this text, you can image someone, insulated from education, taking umbrage with the claim there are around 10^{22} stars. How can we know that? Can one trust our instruments of measurement or truly, accurately interpret these instruments?

[R] The sequential nature of life on Earth… successive openings — irreversible — of Pandora's box, evolutionarily speaking… is utterly amazing and, to some extent, frightening. The question of inevitable is a huge one.

[Q] How is the emergence of life on a planet "frought with difficulties"?

[R] The study of GCRs and X-risks seems quite fitting within the domain of astrobiology. You are interested in conducting research in paleontology, astrobiology, human survival (GCRs and X-risks), genetics, and statistics, among other fields. You keep thinking about all the cosmic wonder and curiosity that the field of astrobiology engenders in you. These thoughts feel pitted against a sense that Western Civilization and its institutions, along with the pursuit of knowledge via Science, is experience a steep decline.

[R] Try writing answers to the review questions without looking back at the text; explain in your notes when you cannot remember something from the text.

[T] Define Metrodorus of Chios, Democritus, …

[E] How can a historical perspective in science be useful?

…to understand how we got here and why certain questions have become prominent lines of enquiry. (pg. 10)

[R] I believe, somewhat ironically, that Metrodorus's line of reasoning was probably not unique, given how many individuals have existed on this Earth and given how often people ponder Nature. What seems unique about his thinking is that it was recorded first.

[E] Why did people believe the Earth was the center of the Universe?

…the observation that stars never moved with respect to one another. (pg. 11)

[T] Define Copernicus, heliocentric model, geocentric model, Aristarchus, Giordano Bruno, …

[R] The G. Bruno quite on pg. 11 BOOK column 1 bottom is profound, especially given how old it is. The quote has an austere character, being such a clear and concise statement about the nature of reality. You wish to make statements of this character in future research.

[R] Many planets (more than just Earth) → heliocentric view induced → notions of exoplanets with their own Suns → telescopes.

[T] Define Christiaan Huygens, Bernard de Bovier de Fontenelle, William Herschel, Camille Flammarion, Percival Lowell, Ockham's Razzor, William of Ockham, …

[R] There are probably many untold stories when it comes to microbial or calcerous nannofossil datasets.

[T] Define Viking (Mars) experiments and Gavril Tikhov, add historical entries for pg. 10-14 BOOK, and add entries on the planets and their major moons.

[E] What did the Viking biology experiments on Mars in 1976 demonstrate?

…that we can go to other planets and implement the scientific method in the search for life. (pg. 14)

[T] Define absorption spectroscopy, Joshua Lederberg, …

[T] Download sources with a (.) on pg. 15-16 BOOK.

[R] End around 1:00 AM EST, 2025-11-02.