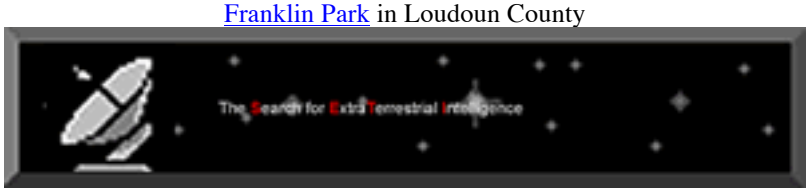
HNRS 353-010 [Spring 2017]

Technology in the Contemporary World
Life in the Universe
with Professor Dr. Harold Geller

Subject to change and revisions throughout semester without prior notice

Twitter @AstroBioProf :: Observatory Observing Sessions and Talks :: Planetary Habitability Laboratory
History of the Universe :: The Astrobiology Web :: Astrobiology Magazine :: Ad Astra Astrobio Special Issue
Astronomy Picture of the Day :: Earth Picture of the Day :: Space Calendar :: NASA Image Sites
Space related news (at NASA and others): NASA Watch :: SPACEREF :: Space.com :: Universe Today
NASA Astrobiology :: Astrobiology Institute :: Center for Computational Astrobiology :: UW Astrobiology
Mars/life/meteors :: Society of Amateur Radio Astronomers :: Bad Astronomy
Help the Analemma Society establish an observatory in Fairfax County :: Learn about The Barns at Franklin Park in Loudoun County



Synopsis

In this course we will critically analyze emergent technologies and their impact on contemporary culture as our species seeks to understand its place in the universe. The core concepts surrounding the technologies and their legal, social, and ethical issues will be considered. Students will develop a significant research project related to the search for life in the universe which, communicated through written, oral and digital means, demonstrates a critical understanding of the technologies and their impact via multiple disciplinary perspectives. Students will communicate their findings, both verbally and non-verbally, through ethically and culturally aware critical thinking and scientific reasoning.
Major Topics to be Included:
** The physical and chemical basis of the universe and its origins.*
** The birth, life and death of galaxies and their stars.*
** The geology of solid celestial objects.*
** The biochemistry of life on Earth and possibly elsewhere.*
** The diversity and similarity of life on Earth and implications for the universe.*
** The search for planets outside our own solar system.*
** The exploration and colonization of space and its extraterrestrial planets.*

TENTATIVE SCHEDULE

- Week 1
  Chapter 1 - A Universe of Life
  24 January 2017 - Introduction to Class

Introduction to Class Notes
26 January 2017 - Discuss Chapter 1
Lecture 2 notes

- Week 2
  Chapter 2 - The Science of Life in the Universe
  31 January 2017 - Discuss Chapter 2
  Lecture 3 notes
  2 February 2017
  Discussion of Chapter 2 Material
- Week 3
  7 February 2017 - Finish Chapter 2 and Start Chapter 3 discussion
  Discussion of Chapter 3 Material
  Chapter 3 - The Universal Context of Life
  9 February 2017 - Finish Chapter 3 discussion
  Chapter 3 Notes
  Star Formation Game Comments - Was then an app called Star Seed
  See an old screen capture here
- Week 4
  14 February 2017 - Start Chapter 4 discussion
  Chapter 4 Notes
  Chapter 4 - The Habitability of Earth
  16 February 2017 - Complete Chapter 4 discussion
  Chapter 4 Notes
  Geology of Virginia
  Plate Tectonics by Adam Simon UMCP :: Mafic vs. Felsic
- Week 5
  21 February 2017 - Start Chapter 5 discussion
  Chapter 5 Notes
  Chapter 5 and 6 - Life on Earth and its Origin and Evolution
  23 February 2017 - Continue Chapter 5/6 discussion
  Chapter 5 Notes

HOMEWORK DUE 2 March 2017:
On 1-Sheet of paper (single-spaced)
Top Half is 1-paragraph outline (abstract) regarding the topic of your paper
Bottom Half is a list of references (APA formatted), minimum of 3 peer-reviewed references that you will be using in your research paper

- Week 6
  28 February 2017 - Chapter 6 discussion (Origins and Evolution)
  Notes for Chapter 6:: MP1 :: MP2 :: MP3 :: MP4 :: Creationism :: Dating the Earth :: Dendrochronology :: Geologic Time
  Chapter 7 - Searching for Life in Our Solar System
  2 March 2017 - Chapter 7
  Notes for Chapter 7
- Week 7
  7 March 2017 - REVIEW FOR MID-TERM EXAMINATION

9 March 2017 - Mid-Term EXAM on this date

- Week 8
  14 March 2017 -- SPRING BREAK
  16 March 2017 -- SPRING BREAK
- Week 9
  Chapter 8 - Mars
  21 March 2017 - Discuss Chapter 8
  Geller notes on Mars
  23 March 2017 - Finish Chapter 8
  Geller notes on Mars
- Week 10
  Chapter 9 - Life on Jovian Moons
  28 March 2017 - Discuss Chapter 9
  Chapter 9 Lecture Notes :: Titan and Dunes :: Supplemental Material on Outer Planet Satellites
  30 March 2017 - Finish Chapter 9 discussion

2nd HOMEWORK DUE 6 April 2017:
On 1-Sheet of paper
Outline of term paper to at least 2 levels
For example:
1. Introduction
1.1 Where in the Universe is Carmen Sandiego?
1.2 Who is Carmen Sandiego?
1.3 What is the universe where Carmen Sandiego can be?
2. Searching for Carmen Sandiego
2.1 What can be used to search for Carmen Sandiego?
2.2 Where do you search?
3. Background of Other Searches for Carmen Sandiego
3.1 The American Search for Carmen Sandiego
3.2 The British Search for Carmen Sandiego
3.3 The Chinese Search for Carmen Sandiego
4. Discussion of Current Search for Carmen Sandiego

4.1 Search in the Solar System
4.2 Search in the Milky Way Galaxy
5. Conclusion
5.1 Did we find Carmen Sandiego in this Galaxy?
5.2 Did we find Carmen Sandiego in this Universe?
6. Future Research
6.1 New Technolgy for Searching
6.2 Future Searches for Carmen Sandiego

Chapter 9 Lecture Notes :: Titan and Dunes :: Supplemental Material on Outer Planet Satellites

- Week 11
  Chapter 10 - The Evolution of Habitability
  4 April 2017 - Discuss Chapter 10
  Habitabiliy Notes
  6 April 2017 - Finish Chapter 10 discussion
  Habitabiliy Notes
- Week 12
  Chapter 11 - Distant Abodes for Life
  11 April 2017 - Discuss Chapter 11
  Section 1 Notes on Stars (very large file)
  13 April 2017 - Finish Chapter 11 discussion
  Part 1 Notes on Stars (very large file)
- Week 13
  Chapter 11 and 12 - The Search for Extraterrestrial Intelligence
  18 April 2017 - Discuss Chapter 12
  Star Formation Game Comments
  Planetquest Link at JPL :: Chapter 11 Part 2 Notes
  20 April 2017 - Finish Chapter 12 discussion
  PowerPoint Presentation on SETI
- Week 14
  25 April 2017 - Discuss Chapter 13
  Chapter 13 - Interstellar Travel
  PowerPoint Presentation on Space Travel
  Look in "Through the eyes..." for Eagle Nebula animation
  27 April 2017 - Chapter 13 discussion
  Chapter 13 - Interstellar Travel
  PowerPoint Presentation on Space Travel
  Look in "Through the eyes..." for Eagle Nebula animation
- Week 15
  2 May 2017 - Discuss Chapter 13
  Chapter 13 - Fermi Paradox Chapter 13 - The Fermi Paradox
  4 May 2017 - Complete Discussion of Chapter 13
  Final Paper Presentations - Share Out Presentations
  Epilogue - Implications of the Search and Discovery
    - U.N. Office for Outer Space Affairs
    - A version of SETI Guidelines

Dr. Ehrlich's Relativity Presentation
Summary of Astrobiology

TERM PAPERS AND TAKE HOME FINAL DUE 11 May 2017 1:30 PM

Regarding Term Paper:

*** Turned in via e-mail attachment (save trees and cost) as a DOC file to hgeller@gmu.edu**
*** Structured (6000 words minimum) with numbered sections**
*** Abstract (1-page summary; not numbered section)**
*** Introduction (first numbered section)**
*** Body (numbered sections with in-text references in APA)**
*** Conclusion and Suggested Future Research (numbered section)**
*** References (final numbered section using APA format)**
**** N.B.- References from peer-reviewed journal articles**

Other SPRING 2017 Semester Information

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Classes begin                                                  23 January
2017 Last day to drop with no tuition liability                       30
January 2017 Last day to add classes                                          30 Januar
classes                                        6 May 2017 FINAL
EXAMINATION for HNRS 353                                       11 May
2017
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Instructor:

- Professor Dr. Harold A. Geller
  - Office: Research Hall Room 216
  - Telephone: 703-993-1276
  - E-mail: hgeller@gmu.edu
  - Office Hours: 3:00-4:30PM Tuesday/Thursday and by appointment (on campus 5 days/week)

- **Lecture Meetings:** Tuesday/Thursday 12:00-1:15PM (T2022)
- **Textbook:** Life in the Universe (2nd edition) by Jeffrey Bennett and Seth Shostak

Grading Policy

Homework assignments	20 %
Participation	20 %
Mid-Term Examination	15 %

Honor Code Adherence

Students are expected to follow the George Mason University rules of student honor. As noted in the catalog:

> "George Mason University shares in the tradition of an honor system that has existed in Virginia since 1842. The Honor Code is an integral part of university life. On the application for admission, students sign a statement agreeing to conform to and uphold the Honor Code. Therefore, students are responsible for understanding the provisions of the code. In the spirit of the code, a student's word is a declaration of good faith acceptable as truth in all academic matters. Therefore, cheating and attempted cheating, plagiarism, lying, and stealing of academic work and related materials constitute Honor Code violations. To maintain an academic community according to these standards, students and faculty must report all alleged violations of the Honor Code to the Honor Committee. Any student who has knowledge of, but does not report, an Honor Code violation may be accused of lying under the Honor Code."
>
> [Source: http://www.gmu.edu/catalog/apolicies/index.html]

Course Format - Socratic Discussion

Discussions will consist of various forms of presentation material including videos, computer displays, demonstrations and transparencies. Questions are acceptable at any time during the lecture. Students should be alert during the lecture and prepared to answer queries posed as they arise.

Entry level Competencies

The course is a conceptual-based course using a minimal amount of algebra and geometry. Students should have English composition skills.

Course Objectives

1. Describe the origins of life in the universe and on Earth.
2. Explain the scientific method and the philosophy of science, as related to the study of astrobiology.
3. Describe the physical laws that govern the interaction of matter, energy, time, and space in the cosmos.
4. State how astrobiologists utilize electromagnetic radiation to gain the knowledge of the mechanics of the birth, life, and death of stars from the distant past.
5. Appreciate the magnitude of the scientific problem of the search for extraterrestrial life in the universe.
6. Exploration of biochemical properties of living systems that are essential to all life.
7. The physical, chemical and biological constraints underlying the exploration of the universe and the habitation of other planets.

Major Topics to be Included

1. The origins of the universe.
2. The origins of solar and planetary systems.
3. The physics of light, gravity, matter, energy, magnetism, radioactivity, nuclear energy, and relativity.
4. The geology of volcanism, plate tectonics, and erosion as applied to all planets.
5. The birth and death of stars and galaxies.

6. The H-R diagram for stars including the location of the main sequence, red giants and white dwarfs.
7. The "Big Bang" theory of universal creation, pulsars, neutron stars, and black holes.
8. Stellar and galactic evolution.
9. Cosmology and life in the universe.
10. The biochemical principles of all living systems.
11. The evolution of life on Earth and its biochemical principles.
12. The physical, chemical and biological aspects of space exploration and the habitation of extraterrestrial planets.
13. Laboratory work dealing with measuring instruments of the astrobiologist, and drawing conclusions from astrobiological data.

Additional Topics Regarding Classwork

As deemed appropriate, the course may be supplemented with homework, guest speakers and discussions of new discoveries.