

HONP210 Honors Seminar in Science Fall 2008 Course Information

This class examines the concept of "life" from a biology, geology, and astronomy perspective. We will discuss what constitutes life, the requirements for life, life's history on Earth, and the search for life in the universe. We will cover a variety of tools, techniques, and case studies in all three disciplines, with the common goals of encouraging you to design and execute scientific experiments, understand what constitutes "evidence," and encourage you to think independently about scientific controversies. You should be able to discriminate between scientific and pseudo-scientific claims about evidence for extraterrestrial life.

Professors:

Dr. Stefanie Brachfeld, 253 Mallory, 973-655-5129

Earth & Environmental Science, 973-655-4448

Office Hrs for September, November, December: M 11:30-12:30, 4-5 and by appointment

Office Hrs for October: M 11:30-12:30, T 1:30-2:30 and by appointment

e-mail: brachfelds@mail.montclair.edu,

www.csam.montclair.edu/earth/eesweb/brachfeld/Brachfeld_home.html

Dr. Judy Shillcock, 124 Science Hall, 973-655-7172

Biology & Molecular Biology, 973-655-4397, Office Hrs: TR 11:15-12:15, F 9-10

e-mail: shillcockj@mail.montclair.edu

Dr. Mary Lou West, 244 Richardson, 973-655-7266

Mathematical Sciences/Physics, 973-655-5132, Office Hrs: T 1:30-2:30, W 11:30-12:30, R 4-5

e-mail: westm@mail.montclair.edu, www.csam.montclair.edu/~west

Meeting times and locations

Meetings: Lecture meets Tuesday and Thursday, 2:30-3:45 in University Hall 1050

Labs meet on Monday 1-3 or M 3:15-5:15 in Science Hall room 210

Textbook: "Life in the Universe" by J. Bennett, S. Shostak, 2nd edition, 2007

Assessment

Assessment will consist of:

- Three mandatory exams
- Weekly laboratory assignments
- A field trip with written report
- Completion of a research project and a 2000-word paper presenting the results of the project, and a group oral report on the project

Exams

Three mandatory exams will be given on the following dates:

October 2

October 30

December 4.

Labs

Laboratory meets every week, except where noted otherwise. When you registered for class you signed up for either the 1:00-3:00 or the 3:15-5:15 session on Mondays. Please attend the section for which you are

registered. The lab rooms have a limited number of seats and materials. Switching sections from week to week is NOT allowed.

Each week you will have a laboratory assignment to complete. The assignment may be due in class by the end of the period, or the following week. Each week may be different depending on the nature of the experiment and materials, and the length of the lab. The professor will announce each week when the exercise is due.

The importance of the laboratory

Attendance at all laboratories is mandatory. HONP210 satisfies the GNED laboratory science requirement. You must pass the laboratory portion of this class in order to pass the course.

Do not miss lab. Make-ups will ONLY be allowed in the case of legitimate, documented extenuating circumstances.

Field Trip

We will visit Jenny Jump State Park and other localities on Saturday, September 27. We will examine the geologic history of New Jersey during the afternoon. In the evening we will hear Dr. Robert Search present: "Searching for Life in the Solar System: How Missions like "Cassini" are being used to look for the existence of life forms in our neighborhood of space." Following the presentation we will have the opportunity to use the telescopes at the United Astronomy Clubs of NJ Astronomical Observatory on the grounds of Jenny Jump State Park, weather permitting.

Research Project

The class will divide into 3 groups to conduct research projects on either an astronomy, biology, or geology theme. We will discuss the project themes and form groups during our first lab meeting on Monday September 8. The project will consist of fieldwork and/or lab work over the course of the semester. An independently-written 2000-word paper will be submitted by each group member, due on Monday December 1. There will be a group presentation during class on Thursday or Friday December 11 or 12.

Final grades:

The final course grade you earn will be calculated as follows:

Exam 1: 19%

Exam 2: 19%

Exam 3: 19%

Lab reports and class participation: 20%

Field trip and report: 3%

Research project, paper, and oral presentation: 20%

Courteous, mutually respectful behavior is expected in class

Please arrive to class on time and remain in class for the entire class period. It is disruptive to your classmates and to the professors when people arrive late and leave early, climbing over each other to reach the last empty seat. If you know that you must leave early for personal reasons, please sit near the door to avoid disrupting your classmates as you leave the room.

Please turn your cell phone ringers off. A ringing phone is nearly impossible to ignore. Please do not text-message during class. It is rude, and the clicking of buttons is louder than you think.

Please refrain from whispering with your neighbors. We are happy to answer questions during class, so feel free to raise your hand, or speak up if we don't spot your hand right out. PLEASE refrain from talking with your

neighbor – it is distracting to the professors and to other students. Similarly, please do not whisper with your neighbors when one of your classmates is asking or answering a question. Please be courteous to whomever “has the floor.”

Academic Honesty

We expect everyone in this class to give their best effort. Please don't cheat, don't plagiarize from the Internet or any printed sources, don't copy answers from a classmate, and don't help anyone else do these things. MSU students work tremendously hard, juggling 5-6 classes each semester along with employment and family obligations. We have no patience for anyone who tries to gain an unfair advantage over their hard-working classmates. We encourage you to work and study with your classmates and brainstorm together, but understand that all labs, all exam questions, and research reports must be your own work, expressed in your own words. If you find a source that expresses an idea so well that you want to quote it, you are most welcome to do so. Please put the sentence(s) inside quotation marks and provide the source of the quote in a bibliography. We are happy to show you the proper way to cite references if you have any questions on this.

High quality work

All sciences require some memorization of names, places and processes. However, memorization of buzz-words is not enough to earn an A or B in this course. We will focus on **how** and **why** processes in the Universe operate the way they do, and how to evaluate and interpret scientific evidence. The grades you earn depend only in part on “getting the right answer.” We are very interested in **HOW** you arrived at your answer, and seeing your thought process. We want you to earn as much credit as you can, so show us all your work. On essay questions, an A-quality answer is one that is thorough and complete, is focused on the question that was asked, avoids unrelated or irrelevant “filler”, and demonstrates that you truly understand the concepts involved.

Tentative Schedule, subject to change

Monday date	Laboratory (Monday)	Lecture Topics and Readings
Sept. 1		First class meeting is September 4. Introduction to the scientific method. What is life?
Sept. 8	Lab begins September 8: Introduction to research projects 1:00 (Shillcock and West), 3:15 (Brachfield and West)	Life and membranes. Ch. 5 and handouts
Sept. 15	Lab 1, Shillcock: Prokaryotes	Structure and function of prokaryotic cells Ch. 5-6 and handouts
Sept. 22	Lab 2, Shillcock: Antibiotic sensitivity	Structure and function of eukaryotic cells; Origin of eukaryotic cells, viruses and prions Ch. 5-6 and handouts
	SATURDAY September 27 , field trip to Jenny Jump State Park and Astronomical Observatory	
Sept. 29	Lab 3, Shillcock: Eucaryotes	Biology of evolution, Ch. 6 EXAM 1: Thursday October 2
Oct. 6	Lab 4, Brachfeld: Minerals and rocks	Geologic Time, how do we know what happened when? What kinds of samples can and cannot be dated? Ch. 3-5 and journal article 1
Oct. 13	Lab 5, Brachfeld: Fossil Record I	Physical conditions on the early Earth; Earliest evidence of life on Earth; direct remains vs. circumstantial evidence. Ch. 3-5 and journal article 2
Oct. 20	Lab 6, Brachfeld: Fossil Record II	3 billion years of simple life, then a sudden “Cambrian Explosion” of diversity. What happened? Snowball Earth, life and climate Ch. 3-5 and journal article 3
Oct. 27	NO LAB.	Boom and bust. What allows a new organism to thrive? What causes mass extinctions? EXAM 2: Thursday, October 30
Nov. 3	Research Projects Bring all of your data and materials to lab	The Solar System Ch. 7
Nov. 10	Lab 7, West: Cratering	Mars Ch. 8
Nov. 17	Lab 8, West: Global Warming	Moons of Jupiter, Habitability Ch.9, 10.1
Nov. 24	Lab 9, West: Exoplanets	Other Solar Systems, Ch.11 THANKSGIVING HOLIDAY. NO CLASS on Thursday, Nov. 27

Dec. 1	<i>Practice research presentations</i> Research Papers due Monday 12/1	SETI, Ch.12 EXAM 3: Thursday December 4
Dec. 8	Lab 10, Shillcock: Detection of prokaryotic cells on environmental surfaces	Review, Messages, Group research reports on Thursday and Friday, 12/11, 12/12