



Course **Astrobiology**
SCI 5320
Professor Mary L. Urquhart
Term Fall 2008
Meetings Monday evenings (5:30-8:15) in BE 3.102. Some course work will be online.

Professor's Contact Information

Office Phone 972-883-2499
Other Phone 972-883-2496 (main office)
Office Location FN 3.308F
Email Address urquhart@utdallas.edu
Office Hours Mondays 1:30-2:30 pm, Wednesdays 4:00-5:00 pm, immediately after class and by appointment.
Other Information Assignments should be submitted through WebCT, or on paper when necessary. Other correspondence with the instructor should be by regular email.

General Course Information

Pre-requisites, Co-requisites, & other restrictions Prior physics experience is not required. Course assumes students have an interest, and preferable experience, in pre-college teaching.

Course Description

Astrobiology is arguably the ultimate integrated science. Over the past decade the discovery of planets around other stars and the announcement of possible evidence for life in an ancient Mars meteorite have combined with discoveries of increasingly diverse habits for microorganisms on Earth to spur widespread interest in this emerging field. Astrobiology brings together the fields of planetary science, astronomy, geology, biology, and chemistry into an exploration of age-old questions on the frontiers of science. How did life begin on Earth? What is the history and future of terrestrial life? What is the possibility of life beyond our planet? Are we alone in the universe?

Learning Outcomes

At the completion of this course, the successful student will:

- Demonstrate an understanding of the *concepts* related to the relationships between changes in the Earth system and life through time to an 80% level on written responses on thought questions and post-instructional journals.
- Apply critical thinking skills to reasoned arguments in quizzes and in class discussions.
- Show an ability to utilize and critically evaluate classroom applications of the integrated science content in astrobiology, including hands-on activities that can be used with pre-college students, through instructor-observed performance in small group work and class discussion and written journals to an 80% level.
- Demonstrate an awareness of how new discoveries drive changes in scientific understanding in responses on applicable quiz questions to within 80% of possible points in the rubric.

- Design a final project that demonstrates the ability to synthesize and apply course content to at least 80% of possible points in the project rubric.
- Required Text: *Life on a Young Planet* by Andrew Knoll.

Required Texts & Materials

- Also Required: Additional journal articles as assigned.
- Access to a computer and the Internet outside of class.

These resources are recommended to extend your learning in the course:

Suggested Texts, Readings, & Materials

1. *Life in the Universe* by Seth Shostak, Bruce Jakosky, and Jeffery Bennett
2. *Rare Earth* by Peter D. Ward and Donald Brownlee
3. *Earth, Evolution of a Habitable World* by Jonathan I. Lunine

Assignments & Academic Calendar

[Topics, Reading Assignments, Due Dates, Exam Dates]

- | | |
|---------------------|--|
| August 25 | <ol style="list-style-type: none"> 1. Why Astrobiology? <ul style="list-style-type: none"> • Introduction to the Drake Equation • Major discoveries in the late 20th century and the birth of Astrobiology |
| September 8 | <ol style="list-style-type: none"> 2. Defining Life <ul style="list-style-type: none"> • <i>Is it alive?</i> • Life as a special form of chemistry • Requirements of life • Why water? Why carbon? <p><i>Reading Assigned: Chapter 1-2</i></p> |
| September 15 | <ol style="list-style-type: none"> 3. Nature of Life on Earth <ul style="list-style-type: none"> • We're all in this together: introduction to the Tree of Life • The mechanics of life: RNA, DNA, and proteins • North paw, south paw: peculiarities of the chemistry of life on Earth <p><i>Reading Assigned: Chapters 3-4</i></p> |
| September 22 | <ol style="list-style-type: none"> 4. Origins <ul style="list-style-type: none"> • RNA and the first organisms • Hell on Earth – the first billion years • Earliest fossil evidence for life (no rocks, no record) • Written in the genes: extremophiles and the root of the Tree of Life <p><i>Reading Assigned: Chapters 5-6</i></p> |
| September 29 | <ol style="list-style-type: none"> 5. We are Living in a Microbial World <ul style="list-style-type: none"> • Bacteria, Archea, and energy • Modern microorganisms • Pushing the limits- extremophiles • Bacterial communities now and in the past <p><i>Reading Assignment: Chapters 7-8</i></p> |
| October 6 | <ol style="list-style-type: none"> 6. Visible Diversity <ul style="list-style-type: none"> • Oxygen and energy |

- An evolving planet – atmosphere, climate, and mass extinctions
- The adaptation of life to a changing world

Reading Assignment: Chapters 9-10

- October 13**
7. The Nature of Evolution
- Cambrian Diversity – the Rise of the Animals
 - Rulers of the World

Reading Assignment: Chapters 11-12

- October 20**
8. Possibilities for Life Elsewhere in the Solar System
- Energy from the Sun, energy from within
 - Worlds tour

Reading Assignment: Chapter 13

- October 27**
9. Habitable Zones and Habitability
- Meeting the requirements for life
 - Water worlds? Mars and Europa

A changing Sun – from faint early Sun to a scorched Earth

- November 3**
10. A Hundred Billion Stars: Is there Other Life in the Galaxy?
- Introduction to stars
 - Comparing stellar lifetimes to the history of life on Earth
 - Sun-like stars

- November 10**
11. Planets and the Galaxy
- An inventory of extrasolar planets
 - NASA’s plans for finding other “Earths”
 - Galactic Habitable Zones

- November 17**
12. Return to Earth: the Rise of Intelligence
- Hominid to human
 - Defining intelligence

- November 24**
13. Civilizations and Communications
- The rise of human civilization – conditions and attributes
 - Communication between species

- December 1**
14. Terrestrial Planet Finder, SETI, and the Drake Equation
- Current searches for intelligent extraterrestrial life
 - Searches planned for life without radio technology
 - The Drake Equation revisited

December 8 **Project Presentations**

Exams Weekly thought questions will serve as mini-exams. Our final exam period will be used for post-tests and student project presentations.

Course Policies

Grading (credit) Criteria	Pre-Journals, Discussions, and Group Work (20%): Much of the class will be done in the style of an educator workshop. You will be expected to be an active participant in all activities and in class and online discussions and contribute to the learning environment for your classmates. The quality of your contributions and the evidence of deep thinking and development of
----------------------------------	---

understanding will be part of this grade.

Post-Journals (20%): Post-journals should be considered mini-exams and will be used to determine your understanding of content. They may be given in class or through WebCT.

Weekly Quizzes (also called Thought Questions) (40%): Every class meeting, one or more thought questions will be asked of the class to probe each student's understanding of the topics discussed. Answers to the questions must be in your own words. Questions will generally be take home and due by the next class meeting unless otherwise specified. All quizzes will be graded on a 10 point scale:

Content:

4 point: Excellent. Complete, correct and clear. Little or no corrections are necessary.

3 points: Good. Minor problems with the answer in content, completeness, or clarity.

2 points: Fair. Requires at least one major correction or revision. Consider redoing the quiz.

1 point: Poor. Serious flaws in the answer. Turning in a redo of the quiz is strongly recommended.

0 points: Did not address the question asked. Please try again.

Thoroughness (not length!):

4 point: Excellent. Answer is thorough and demonstrates the student has thought critically deeply about the question.

3 points: Good. Answer is acceptable and demonstrates a reasonable amount of critical thought about the question.

2 points: Fair. Answer is not thorough.

1 point: Poor. Answer does not demonstrate sufficient thought or effort.

0 points: Did not address the question asked. Please try again.

Other:

1 point: Readability: Answer is clear, legible, understandable, and does not ramble.

1 point: References are given when necessary and are accurate.

Note: these quizzes are generally given in place of exams. An initial grade of 50% or less on three or more quizzes may result in you being required to take a final exam.

	<p>Final Project (20%): Each student is required to select, complete, and present a final project to the class. You may partner with a classmate with approval from the instructor. Examples of projects:</p> <ul style="list-style-type: none"> • A unit of 3-4 complete lesson plans, with necessary background information ,related to astrobiology. • A “proposal” for a new astrobiology space-based mission. • A creative project such as a game or children’s book on astrobiology that demonstrates solid understanding of the science content and would assist students in developing their own scientific understanding of an astrobiology topic appropriate to the intended developmental level. • A term paper <i>and</i> accompanying poster or PowerPoint presentation on an astrobiology topic. <p>Revisions: Whenever reasonable, you may redo take-home quizzes, and post-journals to earn back up to half of your missed points, unless otherwise stated by the professor. Such revisions must be submitted in a timely manner, and will be held to the same standards as the original assignment. We will discuss assignments, including quiz questions, in class. Revisions must demonstrate an individual understanding of the material rather than a summary of the class discussion. If a redo of your project is necessary, it may result in a grade of incomplete in the course.</p>
Make-up Exams	By arrangement with the professor
Extra Credit	NA
Late Work	Accepted only at the discretion of the professor
Special Assignments	If you need special arrangements, talk with the instructor as soon as possible.
Class Attendance	Attendance of all classes and is required! You <i>must</i> get all absences excused by the professor, in advance if possible.
Classroom Citizenship	This is a graduate class and students are expected to behave accordingly. Your presence should enhance rather than detract from the learning of your classmates. Your classroom citizenship is part of your participation grade.
Field Trip Policies	Both field trips are day or evening trips, and will require you to arrange your own transportation.
Student Conduct and Discipline	<p>The University of Texas System and The University of Texas at Dallas have rules and regulations for the orderly and efficient conduct of their business. It is the responsibility of each student and each student organization to be knowledgeable about the rules and regulations which govern student conduct and activities. General information on student conduct and discipline is contained in the UTD publication, <i>A to Z Guide</i>, which is provided to all registered students each academic year.</p> <p>The University of Texas at Dallas administers student discipline within the procedures of recognized and established due process. Procedures are defined and described in the <i>Rules and Regulations, Board of Regents, The University of Texas System, Part 1, Chapter VI, Section 3</i>, and in Title V, Rules on Student Services and Activities of the university’s <i>Handbook of Operating Procedures</i>. Copies of these rules and regulations are available to students in the Office of the Dean of Students, where staff members are available to assist students in interpreting the rules and regulations (SU 1.602, 972/883-6391).</p>

	<p>A student at the university neither loses the rights nor escapes the responsibilities of citizenship. He or she is expected to obey federal, state, and local laws as well as the Regents' Rules, university regulations, and administrative rules. Students are subject to discipline for violating the standards of conduct whether such conduct takes place on or off campus, or whether civil or criminal penalties are also imposed for such conduct.</p>
Academic Integrity	<p>The faculty expects from its students a high level of responsibility and academic honesty. Because the value of an academic degree depends upon the absolute integrity of the work done by the student for that degree, it is imperative that a student demonstrate a high standard of individual honor in his or her scholastic work.</p> <p>Scholastic dishonesty includes, but is not limited to, statements, acts or omissions related to applications for enrollment or the award of a degree, and/or the submission as one's own work or material that is not one's own. As a general rule, scholastic dishonesty involves one of the following acts: cheating, plagiarism, collusion and/or falsifying academic records. Students suspected of academic dishonesty are subject to disciplinary proceedings.</p> <p>Plagiarism, especially from the web, from portions of papers for other classes, and from any other source is unacceptable and will be dealt with under the university's policy on plagiarism (see general catalog for details). This course will use the resources of turnitin.com, which searches the web for possible plagiarism and is over 90% effective.</p>
Email Use	<p>The University of Texas at Dallas recognizes the value and efficiency of communication between faculty/staff and students through electronic mail. At the same time, email raises some issues concerning security and the identity of each individual in an email exchange. The university encourages all official student email correspondence be sent only to a student's U.T. Dallas email address and that faculty and staff consider email from students official only if it originates from a UTD student account. This allows the university to maintain a high degree of confidence in the identity of all individual corresponding and the security of the transmitted information. UTD furnishes each student with a free email account that is to be used in all communication with university personnel. The Department of Information Resources at U.T. Dallas provides a method for students to have their U.T. Dallas mail forwarded to other accounts.</p>
Withdrawal from Class	<p>The administration of this institution has set deadlines for withdrawal of any college-level courses. These dates and times are published in that semester's course catalog. Administration procedures must be followed. It is the student's responsibility to handle withdrawal requirements from any class. In other words, I cannot drop or withdraw any student. You must do the proper paperwork to ensure that you will not receive a final grade of "F" in a course if you choose not to attend the class once you are enrolled.</p>
Student Grievance Procedures	<p>Procedures for student grievances are found in Title V, Rules on Student Services and Activities, of the university's <i>Handbook of Operating Procedures</i>.</p> <p>In attempting to resolve any student grievance regarding grades, evaluations, or other fulfillments of academic responsibility, it is the obligation of the student first to make a serious effort to resolve the matter with the instructor, supervisor, administrator, or committee with whom the grievance originates (hereafter called "the respondent"). Individual faculty members retain primary responsibility for assigning grades and evaluations. If the matter cannot be resolved at that level, the grievance must be submitted in writing to the respondent with a copy of the respondent's School Dean. If the matter is not resolved by the written response provided by the respondent, the</p>

	<p>student may submit a written appeal to the School Dean. If the grievance is not resolved by the School Dean's decision, the student may make a written appeal to the Dean of Graduate or Undergraduate Education, and the dean will appoint and convene an Academic Appeals Panel. The decision of the Academic Appeals Panel is final. The results of the academic appeals process will be distributed to all involved parties.</p> <p>Copies of these rules and regulations are available to students in the Office of the Dean of Students, where staff members are available to assist students in interpreting the rules and regulations.</p>
<p>Incomplete Grades</p>	<p>As per university policy, incomplete grades will be granted only for work unavoidably missed at the semester's end and only if 70% of the course work has been completed. An incomplete grade must be resolved within eight (8) weeks from the first day of the subsequent long semester. If the required work to complete the course and to remove the incomplete grade is not submitted by the specified deadline, the incomplete grade is changed automatically to a grade of F.</p>
<p>Disability Services</p>	<p>The goal of Disability Services is to provide students with disabilities educational opportunities equal to those of their non-disabled peers. Disability Services is located in room 1.610 in the Student Union. Office hours are Monday and Thursday, 8:30 a.m. to 6:30 p.m.; Tuesday and Wednesday, 8:30 a.m. to 7:30 p.m.; and Friday, 8:30 a.m. to 5:30 p.m.</p> <p style="text-align: center;">The contact information for the Office of Disability Services is: The University of Texas at Dallas, SU 22 PO Box 830688 Richardson, Texas 75083-0688 (972) 883-2098 (voice or TTY)</p> <p>Essentially, the law requires that colleges and universities make those reasonable adjustments necessary to eliminate discrimination on the basis of disability. For example, it may be necessary to remove classroom prohibitions against tape recorders or animals (in the case of dog guides) for students who are blind. Occasionally an assignment requirement may be substituted (for example, a research paper versus an oral presentation for a student who is hearing impaired). Classes enrolled students with mobility impairments may have to be rescheduled in accessible facilities. The college or university may need to provide special services such as registration, note-taking, or mobility assistance.</p> <p>It is the student's responsibility to notify his or her professors of the need for such an accommodation. Disability Services provides students with letters to present to faculty members to verify that the student has a disability and needs accommodations. Individuals requiring special accommodation should contact the professor after class or during office hours.</p>
<p>Religious Holy Days</p>	<p>The University of Texas at Dallas will excuse a student from class or other required activities for the travel to and observance of a religious holy day for a religion whose places of worship are exempt from property tax under Section 11.20, Tax Code, Texas Code Annotated.</p> <p>The student is encouraged to notify the instructor or activity sponsor as soon as possible regarding the absence, preferably in advance of the assignment. The student, so excused, will be allowed to take the exam or complete the assignment within a reasonable time after the absence: a period equal to the length of the absence, up to a maximum of one week. A student who notifies the instructor and completes any missed exam or assignment may not be penalized for the absence. A student who fails to complete the exam or assignment within the prescribed period may receive a</p>

	<p>failing grade for that exam or assignment.</p> <p>If a student or an instructor disagrees about the nature of the absence [i.e., for the purpose of observing a religious holy day] or if there is similar disagreement about whether the student has been given a reasonable time to complete any missed assignments or examinations, either the student or the instructor may request a ruling from the chief executive officer of the institution, or his or her designee. The chief executive officer or designee must take into account the legislative intent of TEC 51.911(b), and the student and instructor will abide by the decision of the chief executive officer or designee.</p>
<p>Off-Campus Instruction and Course Activities</p>	<p>Off-campus, out-of-state, and foreign instruction and activities are subject to state law and University policies and procedures regarding travel and risk-related activities. Information regarding these rules and regulations may be found at http://www.utdallas.edu/BusinessAffairs/Travel_Risk_Activities.htm. Additional information is available from the office of the school dean.</p>

These descriptions and timelines are subject to change at the discretion of the Professor.