AST 248 : Search for Life in the Universe

Fall 2022

**General Information**

Lectures: TuTh 1:15-2:35 PM
Harriman 137

**Instructor**: [Prof. Frederick M. Walter](http://sbast3.ess.sunysb.edu/fwalter/plan.html) (ESS 459; 632-8232; frederick.walter at stonybrook.edu)
Office Hours: MWF 9-10, or by appointment

*Updated 11 August 2022*

Note: all this information is subject to change up until the first day of the semester.

**Course Structure**: Astronomy 248 is a first course in Astrobiology. As such, it is a free-ranging examination of our universe as a habitat for life. We will cover aspects of physics and astronomy (the physical conditions in the universe; extrasolar planets), information theory (how do we recognize signals from alien intelligences?), biology (how does intelligent life evolve?), and chemistry (where does life come from in the first place?). We will answer the question "Where are they?" Among the goals of this course are to train the student in estimation and critical thinking.

This course consists of two weekly lectures. Attendance at lectures is strongly encouraged. Part of each lecture may be set aside for discussions of current topics of interest in the news.

Students are encouraged to use the world-wide-web to explore topics covered in this course, but the web must be explored with caution.

**Pandemic Contingencies**: As of this writing, Stony Brook University will hold most classes in person. But CoViD-19 infection rates are climbing nationwide, and the SARS-CoV-2 delta variant is a major concern. Official University Policy is stated on [this SBU page](https://www.stonybrook.edu/commcms/strongertogether/latest.php).

* All students should be vaccinated, but the university has not required this.
* Because social distancing is not possible while in the lecture hall, the wearing of masks is encouraged.

Note that the SARS CoV-2 virus is highly transmissible. Young and healthy persons are catching the virus. Vaccination does not prevent you from catching and spreading the virus, hence the need for masks. Vaccination does not prevent infection, but greatly lessens the likelihood that the virus will make you sick. Vaccinated persons rarely need to be hospitalized. Masks lessen the likelihood that you will become infected, whether or not you have been vaccinated. If you become infected and must quarantine, lectures will be recorded on the [Echo360 system](https://it.stonybrook.edu/services/echo360-lecture-capture) and uploaded to Blackboard. Lecture notes (powerpoint) are available through the AST248 web page.

**Prerequisites**: One *SBC* SNW or one *DEC* category E course. You are expected to understand the concepts behind scientific reasoning. Your exact background (e.g., biology, chemistry, physics, astronomy) may help you in certain areas of the course. We will use some mathematical reasoning, using algebra, and will introduce physical principles as they are needed.

**Expectations**: This is a rigorous science course at the college level. Students are expected to do all assigned readings prior to lecture, and to participate in class. Students should expect to spend 6-9 hours per week outside of class reading the material and doing the homework. Astrobiology is a quantitative science; students in this course will be expected to be able to solve problems and answer quantitative questions. But this topic lies astride both the humanities and the sciences. We will delve into the humanistic side of science when appropriate.

**Learning Objectives:** Mastery of this course does not mean remembering facts. It means knowing how to think scientifically. A student who masters Astronomy will be able to think critically about data (observations), and synthesize disparate facts to reach a conclusion in almost any area where the data can be quantified. More specifics can be found [here](http://www.astro.sunysb.edu/fwalter/AST248/lo.html).

If passed, this course satifies *DEC* H or *SBC* STAS requirements.

**Required Books**:

* *Life in the Universe*, by J. Bennett, S. Shostak, N. Schneider, & M. MacGregor (Princeton University Press 2022). The 5th edition is current; earlier editions are acceptable if you pay close attention in lecture. Homework problems may be different.

The book is available through the campus bookstore. It can also be ordered on-line from various sources.

**Suggested Books**:

* *Rare Earth* (Copernicus 2000), by Ward & Brownlee, is a popular level science book that is appropriate for this class.
* *The Science of Aliens*, by C. Pickover (Basic 1998), is a speculative romp through the possibilities of alien biology and psychology.
* *Astrobiology*, by K.W. Plaxco & M. Gross (Johns Hopkins University Press, 2021), is a somewhat higher level introduction, focusing more quantitatively on the biochemistry of life. This is appropriate for those of you who have some background in biochemistry.

**Grading**:
Grades will be based on:

* two **midterm examinations**, each worth 20% of your grade. Midterms will be given in class, on dates given [here](http://www.astro.sunysb.edu/fwalter/AST248/dates.html). More specifics are given in the [course syllabus](http://www.astro.sunysb.edu/fwalter/AST248/syllabus.html).
* a cumulative **final examination**, worth 25% of your grade.
* spot **quizzes** in lecture. There will be about 10 weekly quizzes. The lowest two quiz grades will be dropped. The quizzes will account for 15% of your grade. Quizzes will be based on the assigned readings and the lecture material.
* **term paper, on a topic listed in the**[**guidelines**](http://www.astro.sunysb.edu/fwalter/AST248/paper.html)**. The paper will be due no later than the start of class on Tuesday November 22. The term paper will account for 20% of your grade.**[**The excruciating details are available here**](http://www.astro.sunysb.edu/fwalter/AST248/paper.html)**. Papers may be turned in early.**

**This tests will be graded on a curve. All students who do A work (90% or better) will receive A grades. However, from past experience typical grades will be lower. If the median grade is less than 80%, grades will be curved such that the median test grade is C+, and the top 10% of the students will get A grades.**

**The raw and curved grades will be**[**posted on-line**](http://www.astro.sunysb.edu/fwalter/AST248/grades.html)**. You will receive a 5 digit PIN when your first quiz is returned. This PIN will be used only for identification for your grades. Do not share it.**

Lectures:
The lecture hall will be nearly full. Students attending lectures are asked to exhibit common courtesy.

* If you arrive early, please take a seat near the center of the lecture hall. Otherwise late-coming students will be forced to crawl over you.
* Please do not arrive late. This is discourteous and disruptive. And you may miss spot quizzes given at the start of the lecture.
* Please do not leave early. This is discourteous and disruptive. And you may miss spot quizzes given at the end of the lecture.
* Please do not carry on conversations with your friends during lecture.
* Please turn off cell phones and pagers during lecture. If you must use the phone, please leave the room. We do not want to know about your emergencies.
* Students must be masked.
* Students who are disruptive will be asked to leave.

Students are encouraged to ask questions at any time during the lectures.

The power point presentations are usually placed online, but lecture notes will not be available. You are responsible for taking notes. In fact, note-taking is encouraged, as it helps you sort and retain the material we discuss.

Attendance Policy:
Attendance will not be taken. Students who know in advance that they will miss a test because of university-related activities (including athletics) or civic obligations (e.g., jury duty) should contact the instructor as soon as possible in advance of the date of absence. Students so-engaged, who inform the instructor in a timely manner, will not be penalized, and will be allowed to make up any work missed. There are no makeups on quizzes, as the lowest two will be dropped.

Homework: [Homework problems](http://www.astro.sunysb.edu/fwalter/AST248/homework.html) from the textbook will be assigned weekly, but will neither be collected nor graded. I often repeat these questions on the quizzes and tests.

Testing Policy:
Testing is an important way of assessing whether or not you are learning anything from this class. There will be two mid-term examinations and a final examination. The final examination will be designed to take about 1.5 hours to complete, and will be cumulative. All exams are closed-book. However, each student is allowed to bring one sheet of paper, no larger than 8 1/2 x 11 inches in size, containing whatever information the student deems useful.

During an examination:

* All books and other material, except the one crib sheet described above, must be placed under your seat.
* No one is allowed to wear a cap with a bill.
* Sunglasses are not allowed.
* Headphones are not allowed.
* No electronic devices are allowed, including calculators, cell phones, and pagers.
* For your protection, do not sit near your friends during exams. Try to avoid even the appearance of impropriety.

No electronic devices of any kind are allowed during examinations. Cell phones and pagers must be turned off. Students who disrupt the examination because of an audible phone or pager, or by answering a call, will be asked to leave and will have their exam confiscated. Students who have a legitimate need to be on-call during an examination should discuss this with the instructor in advance.

Students are responsible for coming to the tests prepared. The instructor does not supply pens, pencils or answers. Tests should be completed in pen (any color except red).

Attendance policy for midterms and final: Students will not be permitted to leave for the first 30 minutes (midterms) or the first 45 minutes (final). No students will be admitted after anyone leaves.
Students should have a picture ID to present upon handing in their exams.

Students who leave the exam for whatever reason will not be allowed to return. Plan ahead.

Makeup policy: Midterm and final examinations may be made up only with a valid medical excuse and a doctor's note attesting that the student could not take the exam, or for a sanctioned university event. Students seeking a makeup must contact the instructor as soon as possible.

There will be no makeups on quizzes (the lowest 2 are dropped).

Requests for extra credit assignments will not be entertained.

Academic Dishonesty:
Students suspected of cheating in exams, of plagiarizing their writing assignments, or of any other form of academic dishonesty, will be assigned an F grade for the course and will be reported to the [academic judiciary](https://www.stonybrook.edu/commcms/academic_integrity/).

Students who suspect others of cheating are encouraged to report them. Reports will be kept confidential. Dishonest students make things that much harder for the majority of students, who are honest.

Americans with Disabilities Act/ Student Accessibility Support Center Statement:

If you have a physical, psychological, medical or learning disability that may impact your course work, please contact Student Accessibility Support Center, ECC (Educational Communications Center) Building, Room 128, (631) 632-6748. They will determine with you what accommodations, If any, are necessary and appropriate. All information and documentation is confidential.

Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and Student Accessibility Support Center. For procedures and information go to [this website](http://www.stonybrook.edu/ehs/fire/disabilities) (http://www.stonybrook.edu/ehs/fire/disabilities).

Critical Incident Management:
Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Student Conduct and Community Standards any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Until/unless the [latest COVID guidance](https://www.stonybrook.edu/commcms/strongertogether/latest.php) is explicitly amended by SBU, during Fall 2021 "disruptive behavior” will include refusal to wear a mask during classes.

For the latest COVID guidance, please refer to: <https://www.stonybrook.edu/commcms/strongertogether/latest.php>.

Student Support Services:
Updated for the Semester of COVID-19

* To access mental health services, call Counseling and Psychological Services at 631-632-6720; Counselors are available to speak with 24/7.
* For updated information on the Academic Success and Tutoring Center please check [www.stonybrook.edu/tutoring](https://www.stonybrook.edu/commcms/academic_success/) for the most up-to-date information.
* For IT Support: Students can visit the Keep Learning website at <https://sites.google.com/stonybrook.edu/keeplearning> for information on the tools you need for alternative and online learning. Need help? Report technical issues at <https://it.stonybrook.edu/services/itsm> or call 631-632-2358.
* For information on Library services and resources please visit the [Continuity of Library Operations guide](https://guides.library.stonybrook.edu/continuity).

Course Materials and Copyright Statement:
Course material accessed from Blackboard, SB Connect, SB Capture or a Stony Brook Course website is for the exclusive use of students who are currently enrolled in the course. Content from these systems cannot be reused or distributed without written permission of the instructor and/or the copyright holder. Duplication of materials protected by copyright, without permission of the copyright holder is a violation of the Federal copyright law, as well as a violation of Stony Brook's Academic Integrity.

**Lecture Schedule**

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| **Week** | **Date** |  | **Topics** | **Reading** |
| **1** | **Aug 23Aug 25** |  | **IntroductionWhat is Science?You Live HereThe Drake Equation** | **BS 1, 2, 3, 12.1, Appendix C**[**6/25/21 UAP Report**](http://www.astro.sunysb.edu/fwalter/AST248/Prelimary-Assessment-UAP-20210625.pdf)[**Preliminary Assessment:  Unidentified Aerial Phenomena    (redacted)**](http://www.astro.sunysb.edu/fwalter/AST248/UAP_DEOM-2021-00006.pdf.pdf) |
| **2** | **Aug 30Sept 1** | **N\*** | **Our SunThe Influence of the Sun on EarthWhy the Sun Shines** | **BS 2, 3, 10.1** |
| **3** | **Sept 6Sept 8** | **N\*fs** | **The Stars: Other SunsThe Lives of the Stars** | **BS 2, 3, 10.1, 11.1** |
| **4** | **Sept 13Sept 15** | **fsfp** | **Just Enough PhysicsOverview of the Solar System** | **BS 3.3, 3.4, 10.1** |
| **5** | **Sept 20Sept 22** | **fl** | **Just Enough Chemistry and BiologyThe History of The World** | **BS 4, 5** |
| **6** | **Sept 27Sept 29** | **fpfl** | **Life on EarthLooking for Life in all the Wrong Places** | **BS 6, 7** |
| **7** | **Oct 4** |  | **Midterm 1** | **BS 1 - 7, 10.1, 11.1** |
| **7** | **Oct 6** | **nh** | **Barsoom. I.** | **BS 8** |
| **8** | **Oct 13** | **nhfl** | **Barsoom. II.** | **BS 8, 9** |
| **9** | **Oct 18Oct 20** | **flnh** | **Europa and the Icy MoonsTitan** | **BS 9, 10** |
| **10** | **Oct 25Oct 27** | **fpnh** | **Rare EarthThe Dispassionate Galaxy** | **BS 11** |
| **11** | **Nov 1Nov 3** | **fpnh** | **Exoplanets** | **BS 11** |
| **12** | **Nov 8** |  | **Midterm 2** | **BS 1-11** |
| **12** | **Nov 10** | **nhfl** | **Intelligence and Aliens** | **BS 11** |
| **13** | **Nov 15Nov 17** | **fifcL/T** | **Lifetimes of CivilizationsSETI** | **BS 12,13** |
| **14** | **Nov 22** | **fc** | **Can't Get Theyah From Heyah** | **BS 13** |
| **15** | **Nov 29Dec 1** | **N** | **Where Are They: The Fermi ParadoxClose Encounters: Consequences of ContactSummary** | **BS 12.4, 13, Epilogue** |
|  | **TBD** |  | **Final Exam** | **BS 1-13, Epilogue** |

\*\*\* note: this plan is subject to change \*\*\*

**Readings**

Readings from the [textbook](http://www.astro.sunysb.edu/fwalter/AST248/general.html#textbook) should be done **BEFORE** the lecture. That way the lecture can be used to clarify, and not just introduce, concepts.

**BS** refers to chapters in Bennett's **Life in the Universe**, 5th edition. Chapter topics in the 4th are identical.