Astronomy 330:

Extraterrestrial Life

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Office Hours:
W: 11:00-11:59 a.m.
or by appointment or email

This Class (Lecture 1):

Introductions

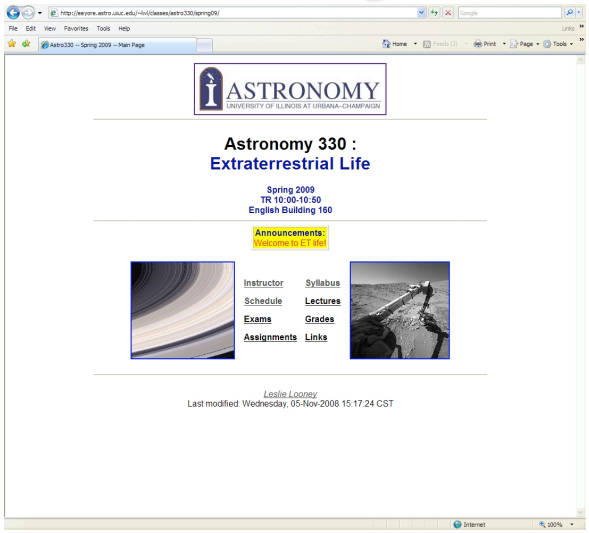
Next Class:

Size Scales & Cosmology

http://eeyore.astro.uiuc.edu/~lwl/classes/astro330/spring09/

Music: *Pets* – Porno for Pyros

Web Page



http://eeyore.astro.uiuc.edu/~lwl/classes/astro330/spring09/

Outline

- Class Introductions
- Introduction of Extraterrestrial Life
- Class Goals
- Syllabus

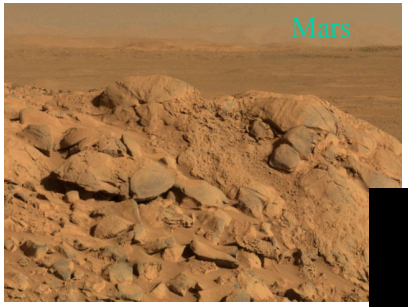
Welcome to Astro 330

- It's a great time to take this course!
- In 1995, we knew of 9 planets. Now, Jan. 2009, we know of 228 planets around numerous suns.
- In the near future, NASA missions may find life on Titan or Europa, evidence of life of Mars, or image Earth-like planets around nearby stars.
- In this course, you will get an understanding of arguably the biggest astronomical question of all time:
  Are we alone?
- We will address this question with scientific methods, but also perhaps with some philosophy, science fiction, and fun thrown in too.

Which is Mars? Which is Earth?

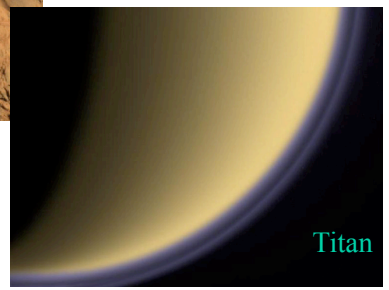
A B

Is There Anyone Out There?



Could there be life in a place like this?

Or perhaps a place like this?



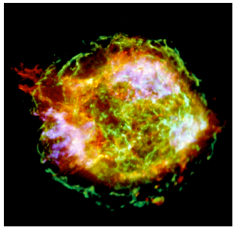
Where Do We Come From?

- How can clouds of gas and dust form stars, worlds - and us?
- … and where are we going?

Should we be *AFRAID*?

- Will giant asteroids doom the earth?
- Will gamma-rays from an exploding star irradiate us?

- Will we be swallowed by a black hole?



The Universe: Some Facts to Help you Live in it

Tell someone that there are 100 billion stars in our Galaxy and they will believe you. Tell someone a bench has wet paint and they will have to touch it.

http://astron.berkeley.edu/~kalas/disksite/learnframes.htm

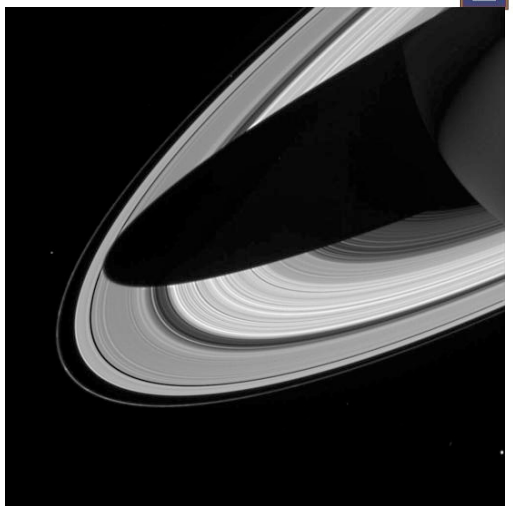
Roving on Mars

Roving on Mars:

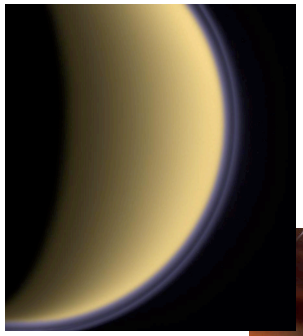
Spirit and Opportunity find evidence of water

http://antwrp.gsfc.nasa.gov/apod/image/0403/emptynest_opportunity_big.jpg

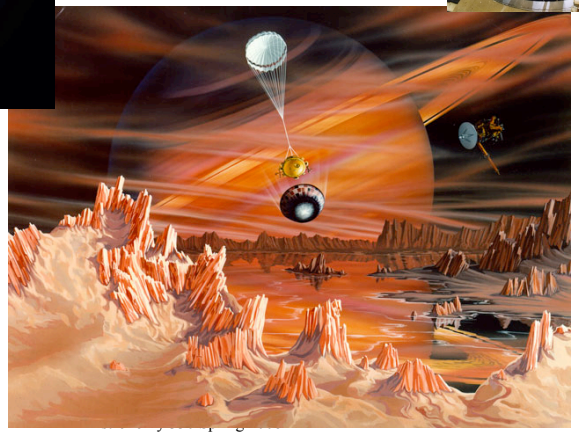
Cassini Explores the Ring World



http://saturn.jpl.nasa.gov/cgi-bin/gs2.cgi?path=../multimedia/images/rings/images/PIA05417.jpg&type=image



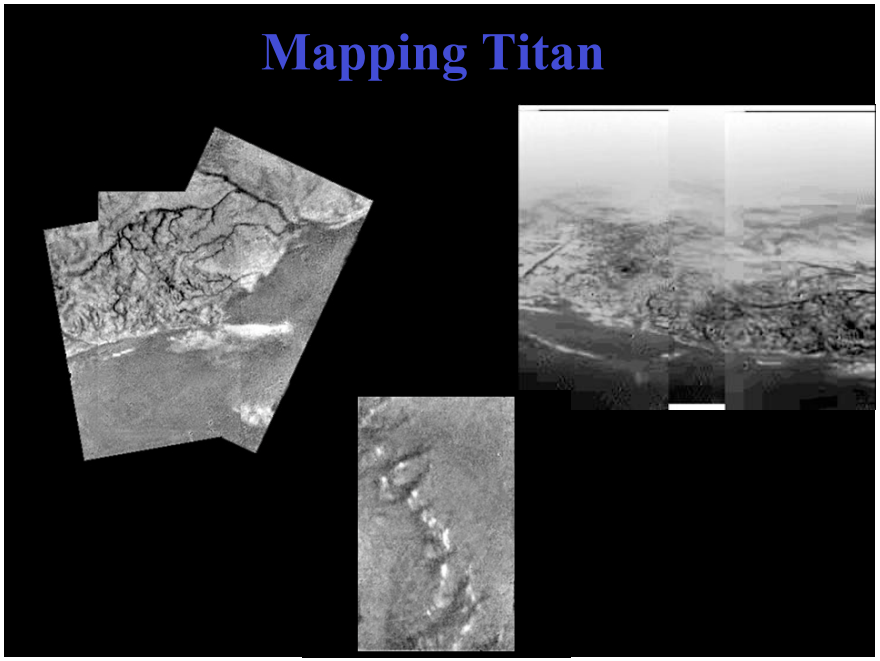
Cassini:
Life on Titan?



The Huygens probe touched down on Jan 14th 2005.

http://antwrp.gsfc.nasa.gov/apod/ap041220.html

Mapping Titan



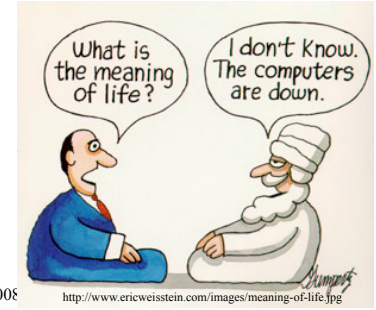
Astro 330

In this class, we shall confront some of the ideas concerning the formation of life on this planet (origination of life), so we can apply it to extraterrestrial life. Remember, we only have a sample of one in the entire Universe!

BUT, we will not condemn anyone's beliefs (God, Gods, UFOs, etc.). So, we will examine life in the scientific sense.

Life

- This examination may bring us to some very depressing conclusions
- What is life?
  - Just sunlight plus geochemistry?
- If we decide that intelligent life is common in the Universe, how will that make us feel?



http://www.ericweisstein.com/images/meaning-of-life.jpg

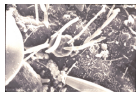
Class Facts

- Today, there is **no** evidence for ET life.
- And we don't even know how life happened on Earth.
- Earth's early geologic record (first 1/2 billion years) is **GONE**
  - Clues to early life formation are gone
  - Earth is about 5 billion years old

- But, we do have evidence for very early microbial life on Earth (about 3.5-4 billion yrs old).
- First multi-celled life only 1 billion years ago.

Class Facts

- Humans are NEW on Earth (about 5 Myrs ago)
- Keep in mind that faith is not science. Faith is fine, but we have to keep in mind that in this class, "I just KNOW it!" is not an acceptable answer.



- **We are investigating big questions scientifically.**

Aliens?

We have been bombarded by aliens in the media– all types.

No surprise that **close to half** of all Americans believe in aliens.

Course Goals

After this course one should be able to:

- Understand our current scientific view of life in the universe.
- Conceptualize the factors involved with the ultimate question.
- Propose what the future may hold for the field.
- Make informed decisions about science policies.
- Hold any "discovery" of extraterrestrial life to a personal scientific standard of proof.

Course Outline

Topics:

- We will review some basic astronomy
- Planetary and solar system astronomy
- Biology and biochemistry
- Geology
- Paleontology
- Evolution
- History and the future of mankind on Earth
- Interstellar communication and travel, including UFO's.
- Take part of the journey, and let's enjoy the ride.

Grades

Requirement		Percentage of Grade
Class Participation (will drop some)		12%
Presentation Synopsis		1%
Homework Assignments	10 out of 11	10%
Presentation		15%
Research Paper Draft		1%
Research Paper		6%
Two One-Hour Exams		30%
Final		25%
Total		**100%**

Class Participation

Class Participation

- You should attend lectures and discussions.
- We will have random opportunities for your feedback, in the form of asking questions, "voting" on the possible outcomes of observations or demonstrations, or brainstorming answers to open-ended questions. To reward your participation in these activities, you will often be asked to use an iClicker to register your response **(worth 12% of your grade!)**.
- Although the number of these are not set, often they come upon me on a whim, we probably have these for every class, so a handful will be dropped.
- ***You must bring your iClicker to lecture every day!***

Class Participation: iClicker + discussion section = 12% of Grade!

- I will be using the iClicker a lot in this course.
- Often will be used in class to gauge understanding.
- Your response will be recorded automatically.
- Get 75% credit for trying.
- Not really quizzes.

- Sometimes you will be asked to hand in short essay instead. Depends on point I am trying to make.

You need to Register You Clicker

- Go to link on syllabus to register your clicker.
- **Bring it to class every day.**

Question

Although there is no proof of ET life, it can be said that

a) everyone feels a deep connection with the night sky, suggesting that we are from space.

b) about ½ of the US population believes in aliens.

c) aliens walk among us.

d) only a very small number of people think that aliens are a possibility.

e) it is a known fact that there are no aliens.

Questions

1. Why did ***you*** take this course?
2. What are ***you*** interested in learning in this course?
3. Do ***you*** think extraterrestrial life exists?

Oral Presentation

- Most students in this class come with a topic that is of interest to them.
- Student will build this interest into a research project. Logically, if one student is interested then other students will likely be interested in the topic too.
- This forum provides the opportunity to investigate issues that may not be explored or not explored in depth during class.

Oral Presentation Questions

1. How relevant is the topic to the search for extraterrestrial life or this class?
2. How interesting is the topic for the general class audience?
3. Rate the extent of the speakers knowledge on the topic?
4. Rate the quality of the overall presentation?
5. Does the research use enough solid scientific basis?

These questions are rated 1-10 out of 10 scale.

Presentation Examples

- Life without a planet
- Faces and pyramids on Mars
- Aliens in South Park: Satire, Silly, or Scientific
- Supernovae: Adding Heavy Elements to the Mix
- Panspermia: Life from the Stars
- Human Colonization of other Planets/Asteroids
- Terraforming Mars
- How to get to Mars
- Self-Replicating Space Probes: Explore the Galaxy on the Cheap.

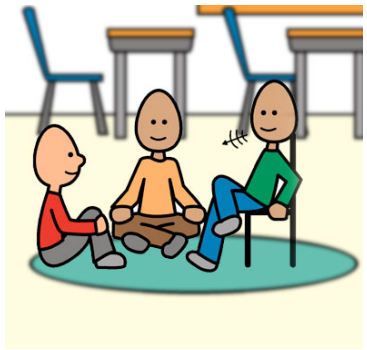
Presentation Synopsis

Due on Feb 5th, the presentation synopsis (after 1st HWs 1&2 are due).

- 1-2 paragraphs: describing the main idea behind the presentation
- 1-2 paragraphs: addressing the 5 questions directly
- A list of 5 or more references for the presentation / research paper. This is necessary to help you avoid some of the more *questionable* sources. URLs are fine refs for this class.

In Discussion Class

- Go to your discussion class on this Wednesday, and every after unless told by your discusser (?) otherwise
- This is where the presentations will be performed (?)
- It's all about the love!
- Should probably bring a calculator to the first discussion class (probably only time they are kinda necessary).



http://sharing.mayer-johnson.com/images/index_discussion.jpg

Research Paper

- You will be writing a research paper on the presentation topic.
- This paper must be 5 to 10 pages double-spaced 12-point font, not including references. A draft of the paper is due as listed on the website.
- The final paper is due as listed on the website. Most points are usually lost for bad referencing (expect a couple refs per page on average) or missing bibliography.

For examples on WWW reference, see the syllabus or contact me. Remember that I have access to google as much as you do. Academic honesty is vital!

Homework Assignments

- There will be 11 homework assignments given throughout the course (1 is dropped).
- These will be MC, simple answer or short essay, and are meant to sharpen your thinking on the material covered in lecture, and to help prepare you for the exams.

http://lrrc3.sas.upenn.edu/popcult/cartoons/anthropo/homework/homework.JPG

Homework Assignments

- Homeworks are due on Compass on Sun nights at 11:59pm.
- For MC, will have multiple attempts, without penalty
- First one is due this weekend!
  - Easy-peasy
- **Late homework may not be accepted.**

http://lrrc3.sas.upenn.edu/popcult/cartoons/anthropo/homework/homework.JPG

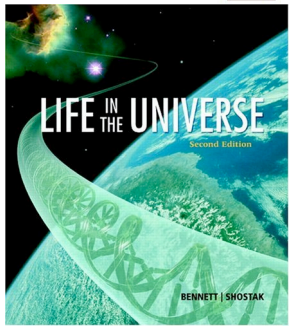
Yuck-- Exams

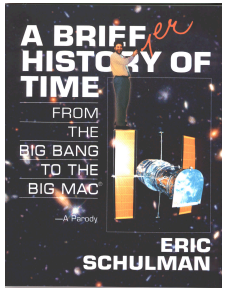
- There will be two hour-exams and a comprehensive final exam for this course. The exams will consist of short answer essay and multiple choice questions. Dates are as follows:

- **Hour Exams: In class Thursdays, Feb 26th and Apr 9th**
- **Final Exam: 1:30-4:30 pm Wednesday, May 13th**
  - Three parts: 1st exam, 2nd exam, and the remainder.
  - Will count the hour exams or the final part, whichever is higher, for the hour exam grade.

Book ‘em Danno

TEXTBOOK: *Life in the Universe*, 2nd edition, by Bennett & Shostak





RECOMMENDED READING:
A Briefer History of Time by Eric Schulman
http://members.bellatlantic.net/~vze3fs8i/bhtes/index.html