

Astronomy 122

Section 1– TR 1300-1350



1320 Digital Computer Laboratory

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Office: Astro Building #218

Office Hours:

**T 10:30-11:30 a.m. or
by appointment**

<http://eeeyore.astro.uiuc.edu/~lwl/classes/astro122/spring06/>

This Class (Lecture 1):

Introductions

Next Class:

The Night Sky

Music: Pets – Porno for Pyros

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Outline



- Class Introductions
- Introduction of Astronomy
- Class Goals
- Syllabus

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Class Webpage



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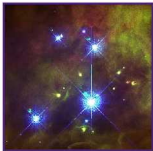

Address: <http://eeeyore.astro.uiuc.edu/~lwl/classes/astro122/spring06/>

ASTRONOMY
UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

Astronomy 122: Stars and Galaxies

Spring 2006, Section 1 TR 1:00-1:50pm 1320 Digital Computer Laboratory

Announcements:
Welcome to Astro 122!

[Instructors](#) [Syllabus](#)
[Schedule](#) [Lectures](#)
[Exams](#) [Grades](#)
[Assignments](#) [Links](#)

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Last modified: Fri Dec 9 09:47:34 CST 2006

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Book Website



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Address: <http://bcs.whfreeman.com/universe7e/default.asp?uid=0&rau=0>

UNIVERSE SEVENTH EDITION
Roger A. Freedman • William J. Kaufmann III

Welcome to Universe Online!
Students: If you would like to access all of the resources, you must be registered. Click the "Sign me up as a Student" link in the left column. (Some content [e.g., quizzes] requires you to register.) Already registered? Enter your e-mail address and password in the left column and click "Go." Anonymous users will be able to access some of the resources here. To begin, click either a chapter or category below.

Instructors: All instructor materials require you to register. **For materials to use on the first day of class**, please visit our [instructor preview page](#). To register, click the "Sign me up as a Instructor" link in the left column. Already registered? Enter your e-mail address and password in the left column and click "Go." We will need to confirm your status as an instructor before approving you for instructor access to this site.

[View the new Universe, 7e e-Book!](#)

View Content by Chapter

Chapter 1: Astronomy and the Universe
Chapter 2: Knowing the Heavens
Chapter 3: Eclipses and the Motion of the Moon
Chapter 4: Gravitation and the Waltz of the Planets
Chapter 5: The Nature of Light
Chapter 6: Optics and Telescopes
Chapter 7: Comparative Planetology I: Introducing Our Solar System

Student Resources

- Chapter Objectives
- Animations and Videos
- Looking Deeper
- Deep Space Explorer Observing Exercises
- Web Links
- Print Links

W.H. Freeman & Co. | Astronomy | About This Book | Order a Book | Contact Us | Tech Support

Welcome to Astro 210



- It's a great time to take this course! Astronomy is in a golden age!
- In 1995, we knew of 9 planets. Now, in 2006, we know of 165 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.
- We will address the Universe with scientific methods, but also perhaps with some philosophy and science fiction thrown in too.
- In this course, you will get an understanding of the big astronomical picture.

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Astronomy is not Astrology!



- In the ancient world, astronomy and astrology went hand-in-hand
- Many ancient astronomers were also astrologers
- Today, they are not connected



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Astronomy is not Astrology!



- Scientific tests of astrology show it's predictions are no more accurate than random chance
- Nevertheless, more people earn income casting horoscopes than doing astronomical research
- And the zodiac signs were picked 2000 years ago.
- Since then the Earth has precessed, and someone born "in" Virgo is actually a Libra.



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Type of Course



I expect some interactivity and responses, not just my voice.

Feel free to interrupt me and ask questions, or pose new points, etc.

So....

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Class Participation



Class Participation

- You should attend lectures.
- 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 occasionally be asked to write down and hand in your response (worth 10% of your grade!).
- Although the number of these are not set, often they come upon me on a whim, usually we will have 8-15 of these a semester, and 1-3 of them are dropped. This *usually* means that you can miss 1-3 surveys without penalty.

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Type of Course



For example: What is Astronomy?

I said what it wasn't, but what is it?

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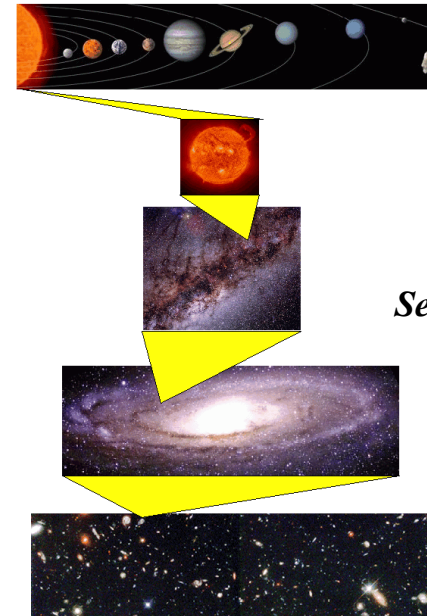
Course Goals



- *The Big Picture*-the basic organization of the cosmos from subatomic scales to the entire Universe.
- *Basic Physical Laws*-the rules that nature follows, and how to apply them to understand astronomical observations and events.
- *Key Discoveries*-the answers to questions such as: How does the Sun shine? How do stars form? What are black holes and what evidence for them exists? Why do we believe in dark matter? What will be the future fate of the universe, and how can we predict this?
- *"critical thinking"*-i.e., careful, logical, rigorous thinking about problems

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Astronomy: The Big Picture

*Seeing how all these pieces fit
together into a coherent
picture of our Universe!*

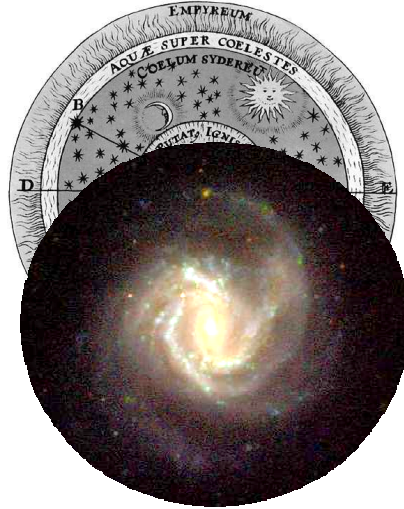
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What is Astronomy?



- Quite simply, astronomy is the scientific study of the Universe beyond our Earth
- It is an ancient discipline, tracing back to the dawn of history
- It is a broad science, crossing the boundaries of physics, geology, chemistry, and biology



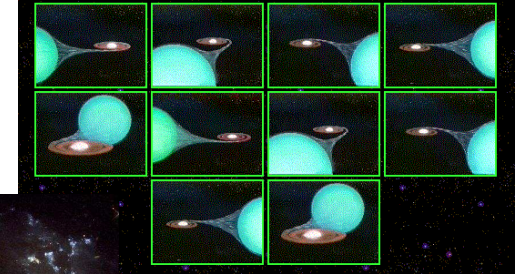
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Some Key Questions



What happens when stars collide?



What happens when *galaxies* collide?

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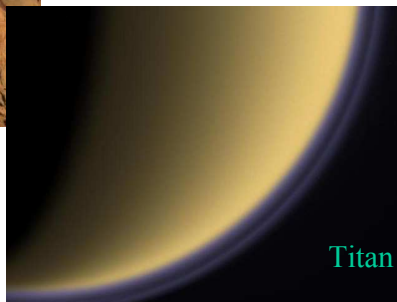
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Is There Anyone Out There?



Mars

Could there be life in a place like this?



Titan

Or perhaps a place like this?

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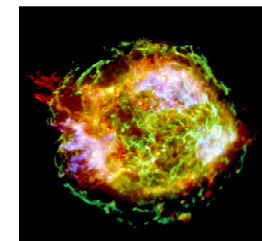
Should we be AFRAID?



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



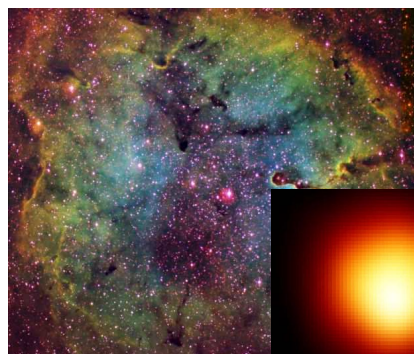
- Will we be swallowed by a black hole?



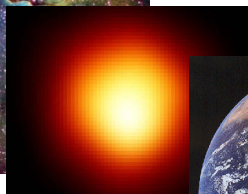
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Where Do We Come From?



- How can clouds of gas and dust form stars, worlds - and us?



- ... and where are we going?

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The Night Sky



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<http://antwrp.gsfc.nasa.gov/apod/ap010627.html>

Our Earth



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<http://antwrp.gsfc.nasa.gov/apod/ap010204.html>

The Moon

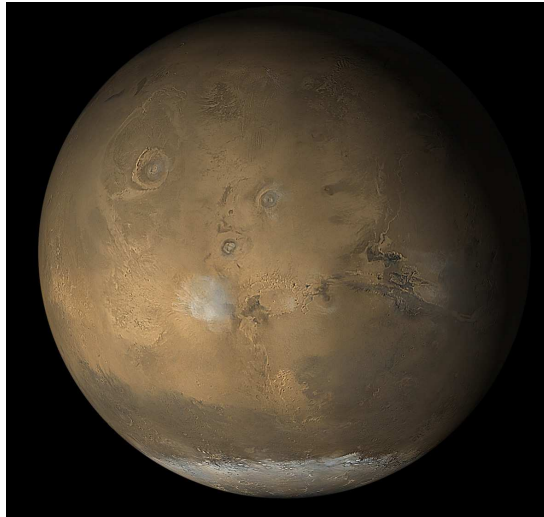


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<http://antwrp.gsfc.nasa.gov/apod/ap000113.html>

Mars



http://www2.jpl.nasa.gov/files/images/hires/6_10_tharsis_high.jpg

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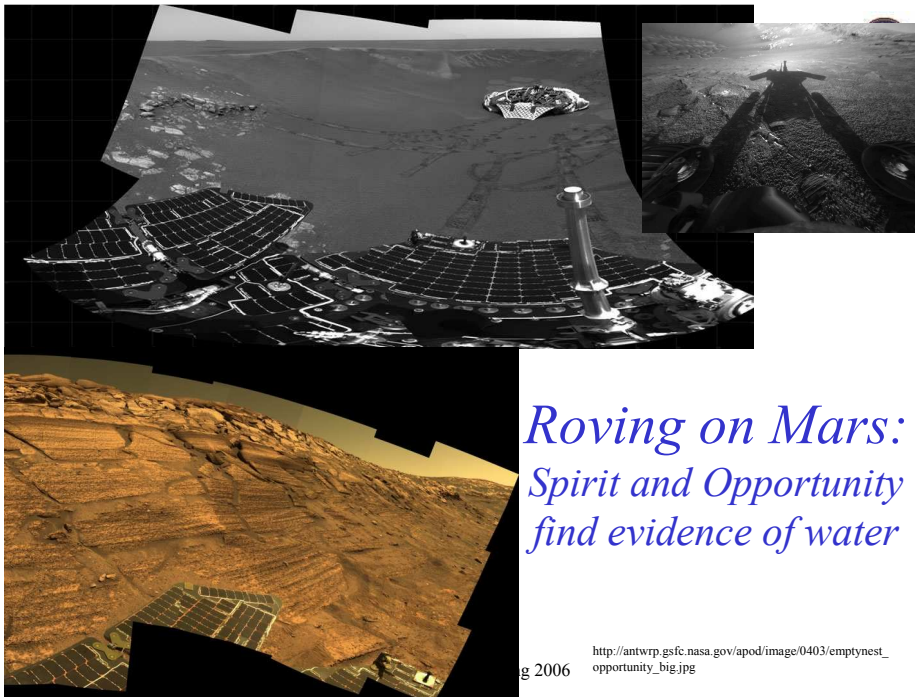
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Roving on Mars



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*Roving on Mars:
Spirit and Opportunity
find evidence of water*

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

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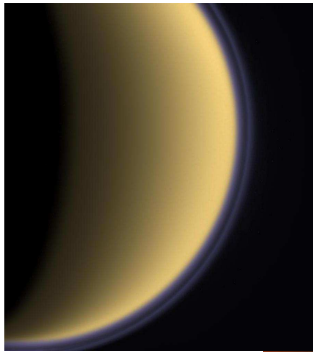
*Cassini
Explores the
Ring World*

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

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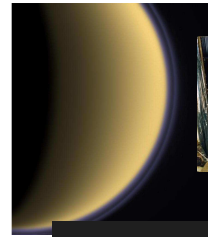
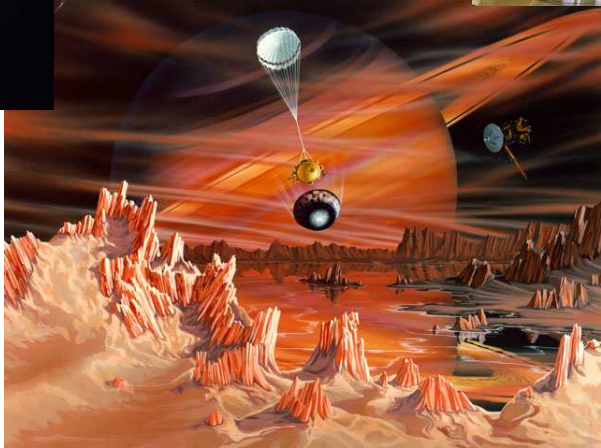
Cassini: Life on Titan?



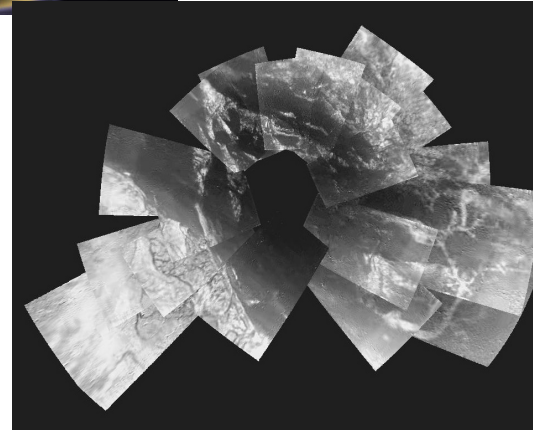
The
Huygens
probe
touched
down on Jan
14th 2005!

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

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Cassini: First Images



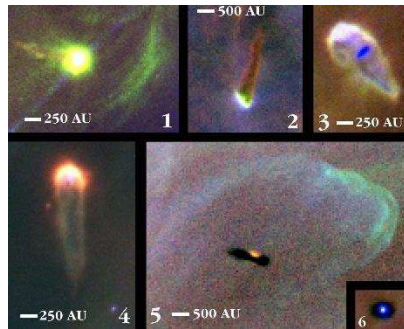
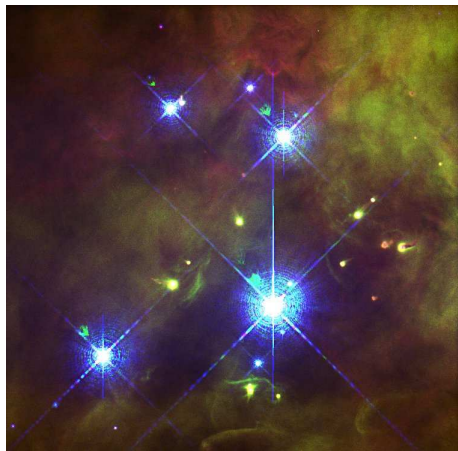
http://www.esa.int/SPECIALS/Cassini-Huygens/SEMCRQ71Y3E_0.html

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Formation of Stars and Planets

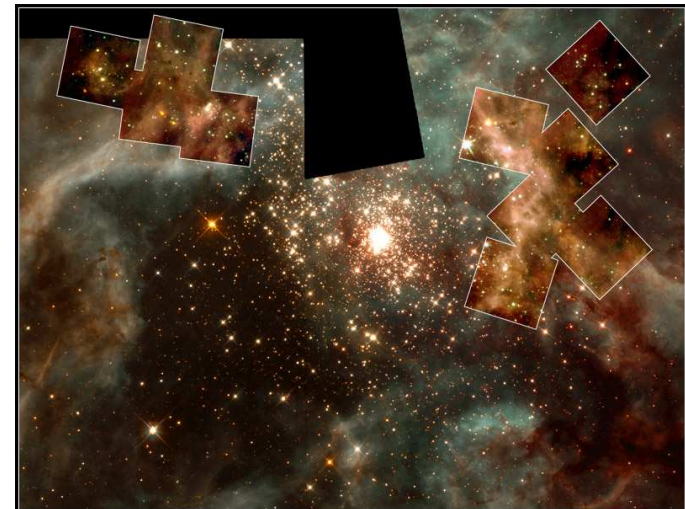


<http://www.merlin.ac.uk/biennial/fig02.jpg>
http://www.aip.de/~gallery/SF/proplyds_big.jpg

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Young Massive Stars



30 Doradus Nebula in the LMC
HST • WFPC2 • NICMOS
PRC99-33a • STScI OPO • N. Walborn (STScI), R. Barbá (La Plata Observatory) and NASA

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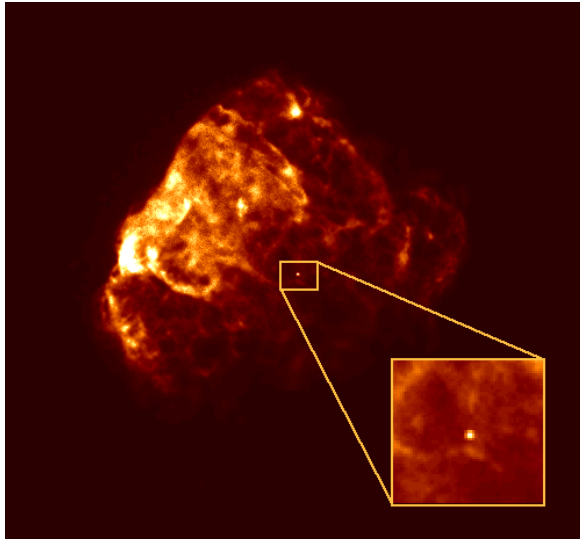
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Death of Stars



X-ray image of the death of a star!

A supernova has blown up, and made a shell of hot gas. At the center is the remnant— a neutron star.



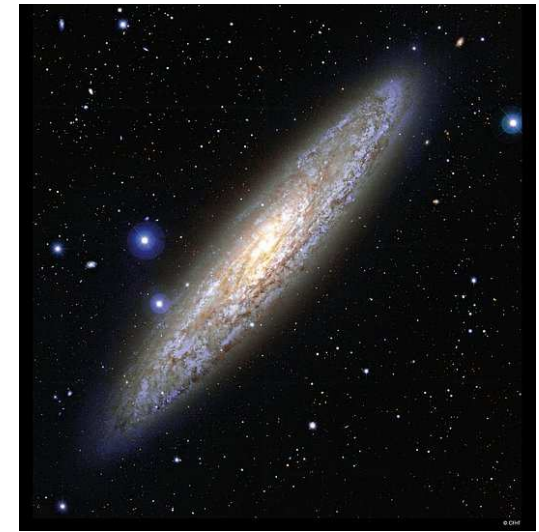
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Galaxies



Spiral Galaxy NGC 253, almost sideways. About 10 million light years away. NGC 253 is considered a starburst galaxy.



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<http://antwrp.gsfc.nasa.gov/apod/ap030525.html>

Galaxies



M74: The Perfect Spiral. More than just another pretty face, this galaxy has about 100 billion stars and is 30 million light years away. Taken by the state of the art telescope, the Gemini North on Mauna Kea in Hawaii.

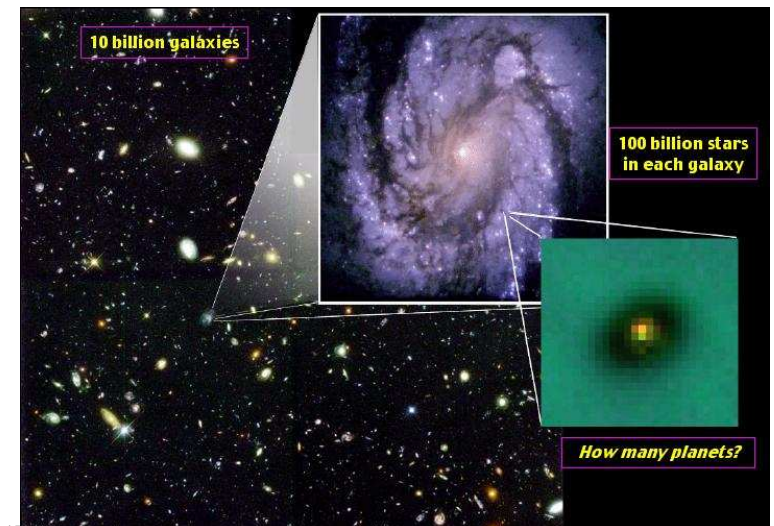


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<http://antwrp.gsfc.nasa.gov/apod/ap030524.html>

The Universe: Some Facts to Help you Live in it



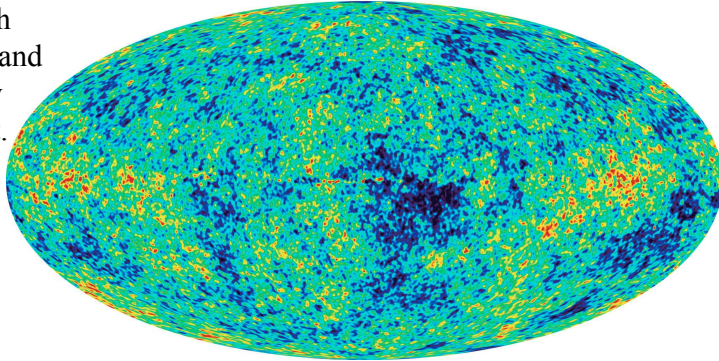
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<http://astron.berkeley.edu/~kalas/disksite/learnframes.htm>

Leftovers of the Big Bang



Microwave map of the sky with point sources and our Milkyway subtracted out.



The small variations allow the dating of the age of the universe—13.7 billion years old! And good to 1%.

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<http://antwrp.gsfc.nasa.gov/apod/ap030212.html>

Grades



Requirement	Percentage of Grade		Points
Class Participation Exercises (will drop 1 or 2 or 3)		10%	100
Homework Assignments (best 10 out of 11)	10 x 3% each	30%	300
Night Observing Report	5% each	5%	50
Midterm Hour Exam		20%	200
Final Exam		35%	350
Total		100%	1000

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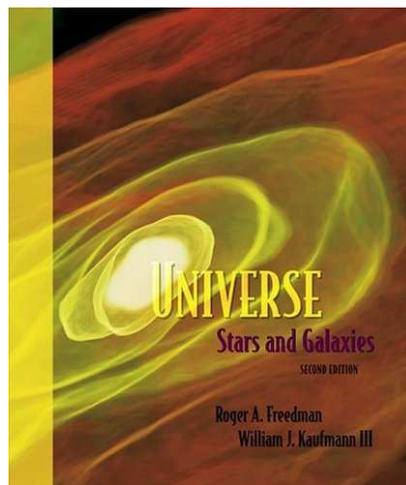
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Text



Text: *Universe: Stars and Galaxies*, by Roger Freedman & William Kaufmann III, W.H. Freeman & Co., 2004.

A solid text and average priced. There is also an electronic version available that is cheaper than a new copy.



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Homework



- There will be 11 homework assignments. The best 10 will be **30%** of your final grade!
- These are meant to sharpen your thinking on the material covered in lecture, to develop physical intuition and quantitative skills, and to help prepare you for the exams.
- Homework is due Friday night (assuming we do Compass). Check assignment for details. (<http://eeyore.astro.uiuc.edu/~lwl/classes/astro122/spring06/hw.html>)

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Night Observing



- Sessions will be held at the Campus Observatory
- **Night:** Check web for posted dates 8-10pm (1 hr)
- **Report:** A PDF form is available on the class website
 - Print it out and **bring it with you**
- **Weather:** Some sessions may be cancelled if cloudy
 - Check the website for updates



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Yuck-- Exams



Exams

- Exams will consist of problem solving and essay questions. There will be a single midterm and a comprehensive final exam. Dates are as follows.
- Midterm: Thursday, March 9th
- Final Exam:
1:30-4:30 pm, Friday May 5th

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Power of Tens



<http://micro.magnet.fsu.edu/primer/java/scienceopticsu/powersof10/index.html>

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