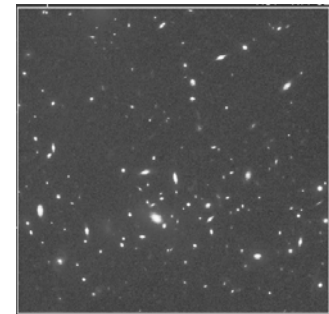


## AST 207 The Science of Astronomy—1 Sep

- Ed Loh, Loh@msu.edu, 884–5612
- Syllabus on [angel.msu.edu](http://angel.msu.edu)
- Outline of cosmology
- Course mechanics
- Course goals
- 51 Pegasi—Example of a scientific discovery

## Cosmology

1. What is a science? How was science born?
  - Ancient—200AD
  - Copernican Revolution—1600
    - Beginning of science
2. The stars —1830-1930. What powers the sun? What is the future sun? Where does oxygen come from? "We are stardust."
  - The sun turns H into He to produce energy.
  - The sun formed & will die.
3. The universe: What is the universe made of? How old is the universe?
  - The Big Bang—1927
    - Galaxies are moving apart because of the Big Bang.
  - Cosmic Radiation—1965
    - The isotropic 1-mm radiation comes from the Big Bang.
  - What is the universe made of?—Present
    - The universe is made mostly of "dark energy," which repels matter.



## angel.msu.edu

- For help on angel, call 355-2345.
- Announcements
- Up-to-date syllabus
  - Class slides by the end of the day. (Click on the date)
  - Homework (Click on link next to the due date)
  - Links to class slides from Fall 2009 are on dates in the future.
  - Links to tests from Fall 2009.
- Pre-class questions, due by 8:00am on the day of the class.
  - Lessons>Pre-class questions>09-03 for Friday's assignment

## Clickers

- Purpose for in-class exercises
  - Assess whether an idea is clear
    - For the student: Did I understand the idea?
    - For the instructor: Do I need to say more about the idea?
- In-class exercises require i-clickers
  - New textbooks have a coupon for a clicker.
  - If you have one already, you don't need to buy a new one.
  - 10% of clicker questions are dropped.
  - You may turn in clicker questions on paper for at most 2 classes.
  - Bring your i-clicker on Friday.

## Registering your i-clicker



Until you register your i-clicker, your responses are tied to your clicker remote ID (located on the back of your clicker), rather than to you.

If you do not register, your answers are recorded, but you will not get credit.

When you do register, your previously recorded answers will be assigned to you.

## Registering your i-clicker online

1. Go to [www.iclicker.com](http://www.iclicker.com).
2. Click "REGISTER."
3. Enter these 4 details and click "submit."

**IMPORTANT!!**  
 You MUST enter your **MSU email** in the STUDENT ID field to ensure proper crediting.  
 My email is [LOH@msu.edu](mailto:LOH@msu.edu)  
 My STUDENT ID is LOH

REGISTER AT [www.iclicker.com](http://www.iclicker.com)

## Other stuff

- Homework
  - Purpose is to help you think about ideas.
  - You have a week to complete it.
  - If you have questions, ask during office hours.
  - Not every question will be graded, but you are responsible for every question.
- Course grades
  - Pre-class questions: 5%
  - In-class questions: 9%
  - Homework: 23%
  - Test 1: 5%
  - Test 2 & 3: 14%
  - Final exam: 30%
- Average course grade in 2009 was 3.07.

## The goals of AST207

- Bruce Alberts, 2009, *Science*, 323, p. 437, "Redefining Science Education."  
 "There is a major mismatch between opportunity and action in most education systems today... Rather than learning how to think scientifically, students are generally being told about science and asked to remember facts. [Goals are] to prepare students  
 to "know, use, and interpret scientific explanations of the natural world"...  
 to generate and evaluate scientific evidence and explanations, to understand the nature and development of scientific knowledge,  
 to participate productively in scientific practices and discourse"
- What goals are missed in learning that planets orbit the sun?

## The method of AST207

- Goals
  - Phenomena and explanations.
  - Examine a few discoveries
    - Examine and interpret the data.
    - What made the discovery possible?
    - How did that change our understanding?
  - Learning is a conversation between you and the subject. You will need to do that in the future, since information doubles every 2-3 years (Robert Gavin).
- NOT goals
  - Memorize facts
  - Constellations
- After each class, test your understanding
  - What are the one or two big ideas? You must understand these.
  - What are less important ideas? How are they related to the big ideas?
  - What are details?

## 51 Pegasi

- Big idea: Scientific discovery
  - You should be able to describe scientific discovery and point to the main features using this example.
- Michael Mayor & Didier Queloz discovered something important by studying the star 51 Pegasi.
- The steps to discovery
  1. Examine the data for the facts. What is the evidence? Collect clues.
  2. Brainstorming. What are models that explain the evidence?
  3. Developing your idea
  4. Testing your idea Does any clue refute any part of the model?
  5. What was discovered?

## Motion of 51 Peg Away & Towards Us

- In 1994, Michel Mayor and Didier Queloz began to observe the motion of the star 51 Pegasi. They found that it moves towards us and then away from us and the towards us, etc. It repeats every 4 days and 5 hours. The fastest it moves is 60m/s or 120mi/hr, which is unusually slow for an astronomical object. (Earth moves 5000 times faster.) — MSU Kids' College, 1998

