Astronomy 150:

Killer Skies

MWF 1300-1350
141 Wohlers Hall

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Office Hours:
R: 10:00-11:00 a.m.
or by appointment or email

This Class (Lecture 1):

Astro-disasters

Next Class:

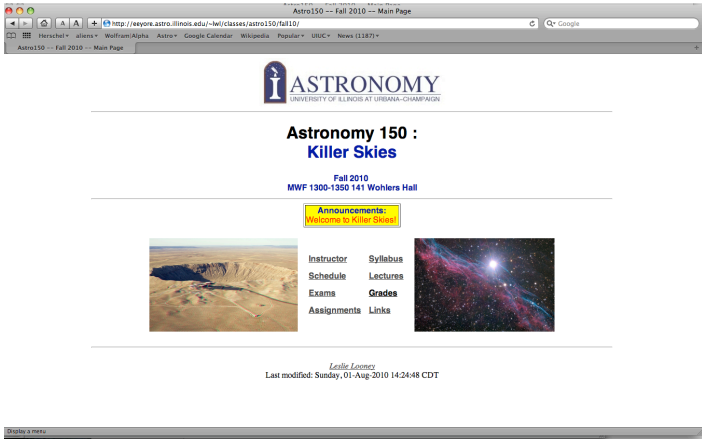
Poor Pluto…

http://eeyore.astro.illinois.edu/~lwl/classes/astro150/fall10/

(simpler to google-me, then click on 150 link)

Music: *Astronomy* – Metallica

Web Page



http://eeyore.astro.illinois.edu/~lwl/classes/astro150/fall10/

Outline

- Class Introductions
- Introduction of Killer Skies
- Class Goals
- Syllabus

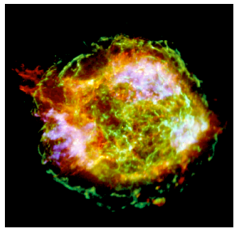
Welcome to Astro 150

- It's a great time to take this course!
- We know of so many ways that astronomy can kill you or your descendents.
- The good news is that astronomy is very, very unlikely to kill you.
- On the other hand, astronomy (or consequences of it) can eventually kill all intelligent civilizations.
- But, you are much more likely to be hit by a bus walking across campus.
  - Which concerns you more?
  - Which is more fun to talk about?

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?



Class Facts

- We will examine the top 10 ways that astronomy can kill you or your descendants.
- I don't want to keep you wondering.. so…

Top 10 Ways Astronomy Can Kill you or your Descendents

1. Impacts!
   Splat.. Boom… Watch out for space rocks!
2. Solar Evolution.
   Sun to Red Giant to White Dwarf.
3. Coronal Mass Ejections
   Cold winter days..
4. Supernova in your face!
   Super sunburn.
5. Gamma Ray Burst.
   From anywhere…

Top 10 Ways Astronomy Can Kill you or your Descendents

6. Rogue objects–Stars, White Dwarfs/Black Holes.
   Black Holes don't suck, but if they hit you it sucks.
7. Galaxy Collisions.
   Milky Way vs. Andromeda.
8. Cosmology!
   This is the way the Universe ends..
9. Quasars. The Monster in the Milky Way?
   It burnssss…
10. Aliens.
    You're kidding right…

Class Facts

- All you need to know?
- How to classify danger?
- Some of these are going to happen no matter what.
- But, what me worry?

- **We will investigate these big questions scientifically.**

Course Goals

After this course one should be able to:

- Understand our current scientific view of the Universe.
- Conceptualize the factors involved with Killer Skies.
- Propose what the future may hold for astro-disasters.
- Make informed decisions about science policies.
- Hold any astronomical finding to a personal scientific standard of proof.

Grades

Requirement		Percentage of Grade
Class Participation (will drop some)		10%
Homework Assignments	10 out of 11	15%
Micro-Meteorite Experiment		2%
Night Observations (For fun!)		5%
Computer Assignments		10%
Hourly Exams (3 in total)		58%
Total		**100%**

Grades

239 students last semester.

12 A+
172 A to A-
37 B+ to B-
18 lower

This does not mean the course is easy, but that the students worked on the class and succeeded. Important to do the HW, labs, and participation assignments!! They are meant to help your grade, but if you don't them, then they severely hurt you.

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 often be asked to use an iClicker to register your response **(worth 10% 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 5-10% will be dropped.
- ***You must bring your iClicker to lecture every day!***

Class Participation: iClicker = 10% 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 80% credit just for trying.
- Not really quizzes.

You need to Register You Clicker

- Go to **link on syllabus** to register your clicker by September 13th.
- Grade points lost if not registered by that date.
- **Bring iclicker to class every day.**

Question

One can easily say that

a) astronomy will kill us all.

b) the most dangerous thing you can ever do is to look at a meteor.

c) impacts from space rocks is the most likely near-term astronomical threat (i.e. ranked #1 in our list).

d) cosmology will kill us all within the next 100 years.

e) the Moon can turn you into a werewolf if you are in London.

Homework Assignments: 15%

- 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.

Homework Assignments: 15%

- Homeworks are due on Compass on Monday nights at 11:59pm.
- For MCs, will have multiple attempts, without penalty
- HW1 is due Aug 30th, but accepted up to Sept 6th (last minute adds)!
- **Late homework may not be accepted.**

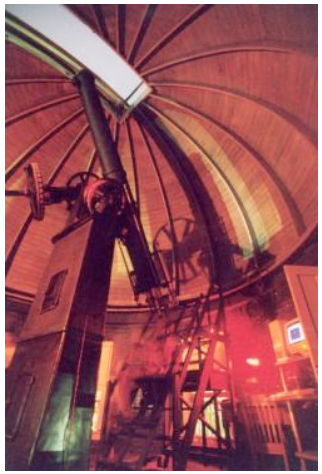
Night Observing: 5%

- Sessions will be held at the Campus Observatory for about 2 weeks, starting in about a month.
- **Night:** Check web for posted dates
  8:00-10:00 pm, requires about 40 mins to 1 hour to complete.

Report: A PDF form will be available on the class website

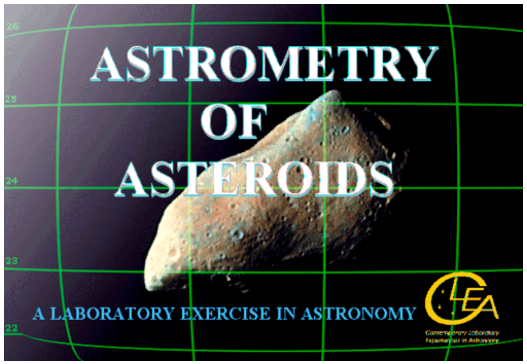
  - Print it out and **bring it with you**

- **Weather:** Some sessions may be cancelled if cloudy
  - Check the website for updates



Computer Labs: 10%

- A "fun" computer lab that walks us through how killer asteroids are detected.
- There will be a few days when lectures will not be be given, and you will be expected to work on the computer labs.
- It has some math, so expect it to take some time.
- Remember it is worth 10%.



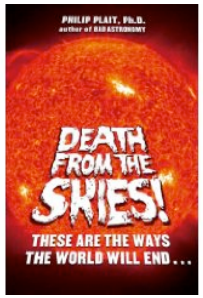
Yuck-- Exams

- There will be three hour-exams but no comprehensive final exam. The exams will consist of multiple choice questions– 1 page of notes is allowed. Dates are as follows:

- **In class Fridays, Sept 24th,Oct 29th, Dec 8th**

Book 'em Danno

TEXTBOOK: *None is required*



Suggested READING (if you want):
Death from the Skies! By Phil Plait

Basic Astronomy Highlights

The following are some astronomy facts for those who have not had any astronomy before.

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.

Astronomy is not Astrology!

- Scientific tests of astrology show predictions are no more accurate than random chance
- Nevertheless, more people earn income casting horoscopes than doing astronomical research
- Pseudo-science, not science

- And the zodiac signs were picked 2000 years ago.
- Since then the Earth has precessed, and someone born "in" Virgo is actually a Libra.

Basic Astronomy

- Earth rotates on its axis, takes about 1 day.
- Sky rises in the East, sets in the West, due to our rotation motion.
- Earth orbits the Sun, takes 1 year.
- Reason for the seasons is the 23 degree tilt of the Earth. It's the end of winter in Australia now!
- Moon orbits the Earth, takes about 1 month.
- No such thing as the "Dark Side" of the Moon, but there is a "Far Side" of the Moon.
- Moon phases are from relative position of Earth, Moon, and Sun.

Question

What is the reason for the seasons?

a) The change in the Sun-Earth distance. The Sun is closer in Summer.

b) The length of the day, longer in summer.

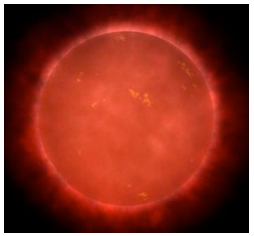
c) The Earth's tilt, gives direct and less direct sunlight.

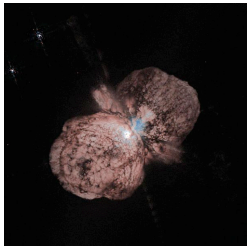
d) Space Monkeys.

e) The orbit of the Sun.

What is a Star?

- A huge ball of mostly hydrogen gas (really a plasma)
- Mostly turning hydrogen into helium, which makes energy.
- Some stars can burn (thermonuclear speaking) for 10's of billions of years (<0.5 solar masses), and some only burn for a few million years (>25 solar masses)
- Our Sun is the closest star.



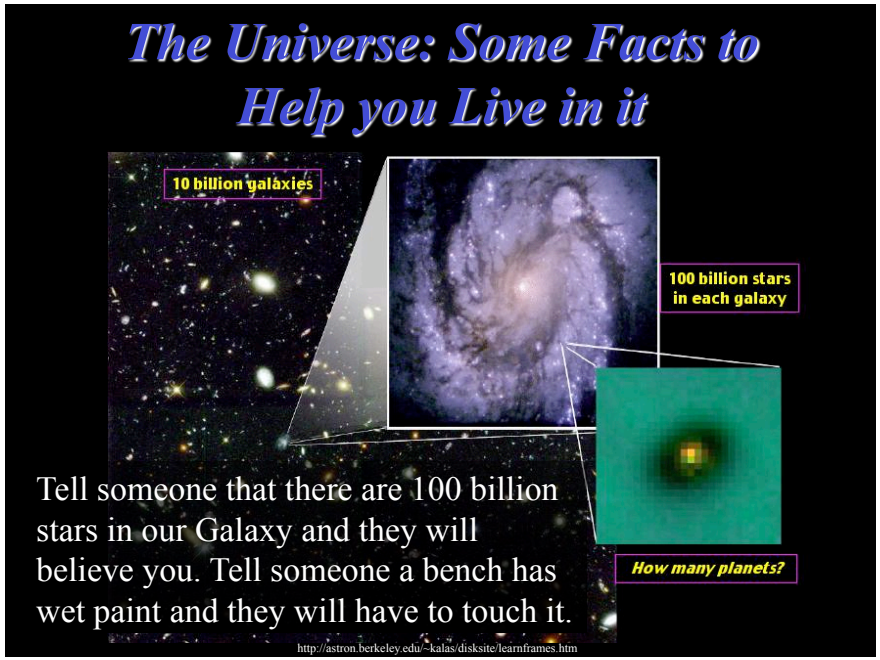


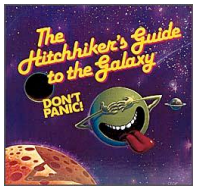
http://www.daviddarling.info/images/red_dwarf_art.jpg

HST of Eta Carinae

Basic Astronomy

- Stars are “freaky far” far away from us!
- All the stars you can see with your naked eye (about 6000), are “nearby”.
- A bunch of stars + gas + dust + stuff together make up a galaxy.
- Galaxies are usually separated by “freaky far” distances.





Space is Big!

“Space is big. Really big. You just won't believe how vastly hugely mind-bogglingly big it is. I mean, you may think it's a long way down the road to the chemist, but that's just peanuts to space…

To be fair though, when confronted by the sheer enormity of the distances between the stars, better minds than the one responsible for the Guide's introduction have faltered.

The simple truth is that interstellar distances will not fit into the human imagination.”

--Douglas Adams

The Hitchhiker's Guide to the Galaxy