ASTR 1040: Accel Intro Astron 2

Stars & Galaxies

Two merging galaxies
HST: NGC2207 / IC2163

Prof. Juri Toomre TAs: Ryan Horton, Loren Matilsky

Tues/Thur 11:00am, Duane G-130

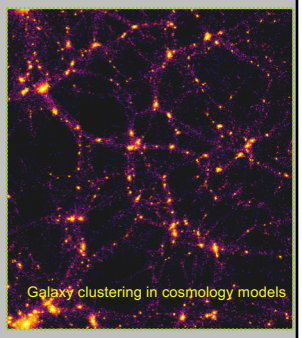
Lecture 1 28 Aug 2018

Detailed course syllabus passed out

zeus.colorado.edu/astr1040-toomre

Who SHOULD take this course?

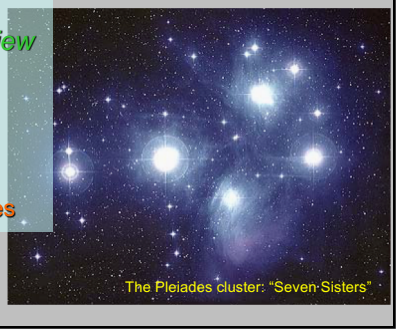
- *Astronomy/Astrophysics, Physics & Engineering majors*
- *with prereq ASTR 1030*
- *Moderate amounts of quantitative work (algebra)*
- *with prereq/coreq MATH 1300 or APPM 1350*



Galaxy clustering in cosmology models

Beginning of Today's Class

- Course goals
- Course overview
- Course information
- Introduction: Sizes and Scales



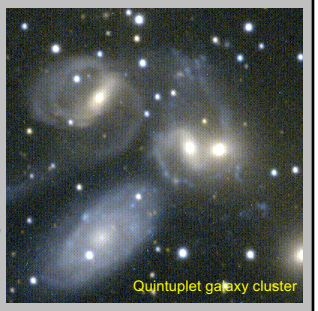
The Pleiades cluster: "Seven Sisters"

Course Goals

Develop a broad view of what we think we know about the universe

Understand the forces that shape the universe and its history

Appreciate the beauty and richness of what goes on



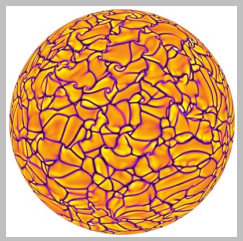
Quintuplet galaxy cluster

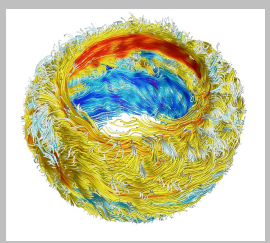
Course Goals (more general)

- *Learn critical thinking skills*
  - how to think, reason, and argue scientifically, using logic, observation, and evidence
- *Understand how we know what we know about the universe*
  - and what we don't yet know!
- *Gain knowledge and appreciation of the scope, scale, and phenomena of the physical universe*

Galaxy cluster

Who am I …





Theoretical astrophysics: *Stellar convection and magnetism*

Who are you…

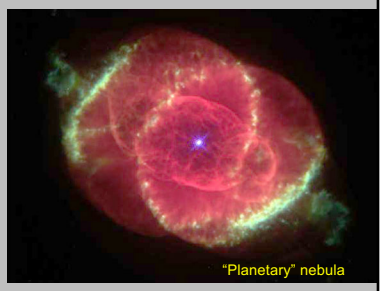
- Introduce yourself to 2 neighbors:
  - –Trade names, hometowns, interests, etc.
  - –Why are you taking this course?
  - –What topics do you most want to learn about in this class?
- We'll try to get to know you throughout the semester but you can help by…
  - –Asking questions
  - –Answering questions
  - –Coming to see us in office hours
  - –Volunteering for demos

Course Information

COURSE PRIMARY WEB PAGE:
zeus.colorado.edu/astr1040-toomre

Can find info on all assigments (passed out in class), course calendar, lecture notes, reading schedule

Grading is shown on course D2L site – many active links

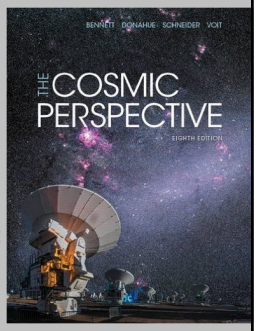

"Planetary" nebula

Required Text or eText

The Cosmic Perspective
by Bennett et al. 2017 8th ed

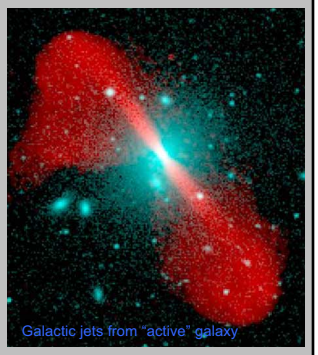
Includes:
Access code for website
www.masteringastronomy.com
Go there to set up your own MA account! Most homeworks need it

You will *need to link* to our course there: ASTR1040TOOMRE2018B
(see syllabus, complete by Thursday)



How to succeed in this course

- *GOT TO PUT IN THE TIME:*
  4 credits at CU →
  6 to 10 hours outside of classroom (no kidding)
- Read sections *BEFORE* discussion in class (secrets of memory)
- Come see us during office hours!


Galactic jets from "active" galaxy

Important classroom policies

- Working together on homework is encouraged, *BUT:*
- Your answers must be in your own words -- copies will be awarded split credit
- Cite sources on all write-ups
- Web submissions must be done independently
- Using another person's clicker is cheating
- *Students are expected to follow the CU Honor Code*

Read all course information in your syllabus handout (after class)!

Three in-class mid-term exams (m/c, short essay, qualitative analysis): 45%
Homeworks (weekly): 20%
Final exam: 25%
Clickers + discussion contributions + observing: 10%

There are no make-up exams or late turn-ins

i-clickers (radio frequency)

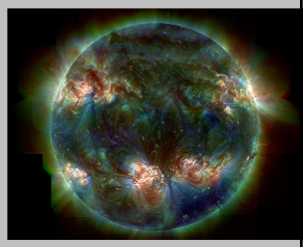
- Required -- bring to each class and recitation!
- Register clicker to your CU login name by Thurs class (by logging into MyCUInfo site, go to student tab, or our D2L course site)
- Used for reading quizzes, in-class discussion questions, feedback

Observatory Nights

- Starting Tues 4 Sept at 8:30pm, then about every ten days (11 in all) – *go to at least one session by signup*
- *Sommers-Bausch Observatory* (next to Fiske): two new 20" + 24" telescopes

Got Questions?

- Textbook?
- Clickers?
- Office Hours?
- Exam Policy?
- MasteringAstronomy?
- Observing Nights?



Syllabus or course main website
zeus.colorado.edu/astr1040-toomre

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Recitations

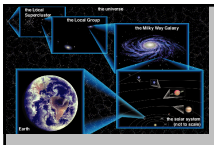
Two merging galaxies
HST: NGC2207 / IC2163

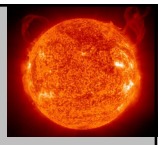
- We have three *weekly 50 min recitations (assigned)*:
- *Loren Matilsky:* Tues 1pm and 2pm (D-142); Wed 1pm (D-142)
- These are a *crucial part* of the course

Electronic Device Policy

- Turn off your phones.

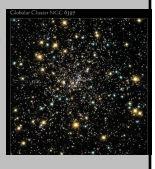
- If you wish to takes notes on a laptop or tablet, please sit on the left-hand side of the room (facing forward).

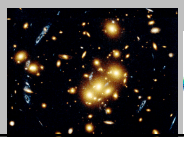


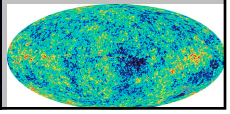


Course Overview

What we will study







For Thurs class meeting, read/review:

How to Succeed in this course, p. xxiv+
- Chapter 1, all *(Our Place in Universe)*
- Review *Basic Astronomical* terms, p. 6
- Chap 3, sec 3.3, 3.4 *(Kepler, Nature of Science)*
- Chap 4, read all *(Making Sense of Universe)*

- Begin reading Chap 5, carefully *(Light and Matter)*

- You can get a copy of these slides after class from course website (can be helpful)

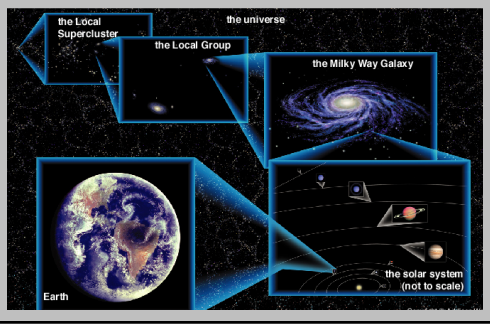
Mastering Astronomy (MA) + homeworks

- Online MA Assignment (HW # 0) available NOW
  Walks you through how to submit all the assignments and MA resources available, and some review of concepts (good practice, extra credit)
  Complete by Tues Sept 4, 6pm
- Homework # 1 on "Light & Spectroscopy" now available for pickup, *involves both MA portion and written portion, to be turned in by Thur Sept 6 class*

- Get your MA account set up asap, linking to "ASTR1040TOOMRE2018B" -- your MA account from 1030 should carry over -- see our syllabus or go to our D2L site if need further instructions or help

Sizes and Scales

- Vast range of *SIZES and SCALES*, finding our way through the universe



Light (Electromagnetic Radiation)

- *What is light?*
- *How do we use it to find out what and where things are?*
- *Waves vs particles*
- *A small calculation is in order*

Telescopes (Tools of the Trade)

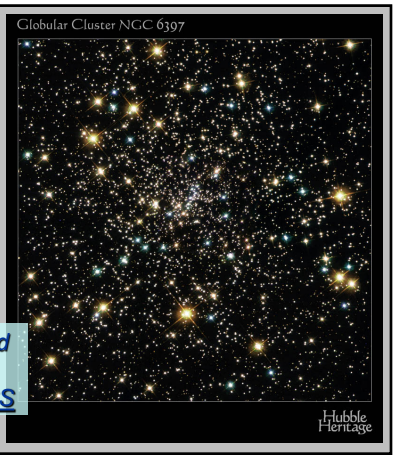



Our Nearest Star : The Sun

Star in middle of its life on MS

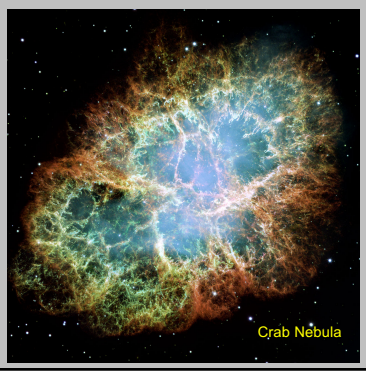
STELLAR Birth and Life

STARS of very many sizes and colors



Evolution path and color / brightness Depends on MASS

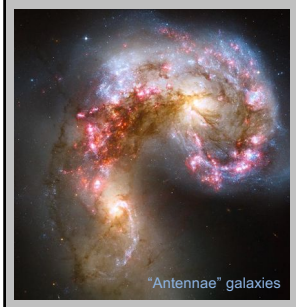
STAR DEATH: white dwarfs, supernovae, neutron stars, black holes



OUR GALAXY : The Milky Way

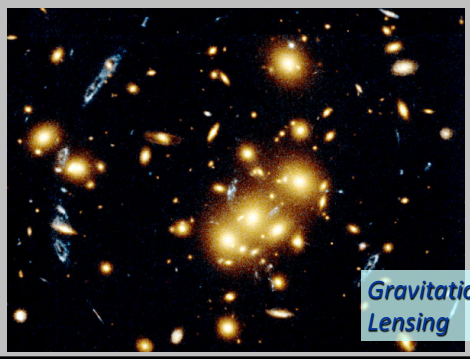
Exploring a Universe of GALAXIES

GALACTIC evolution

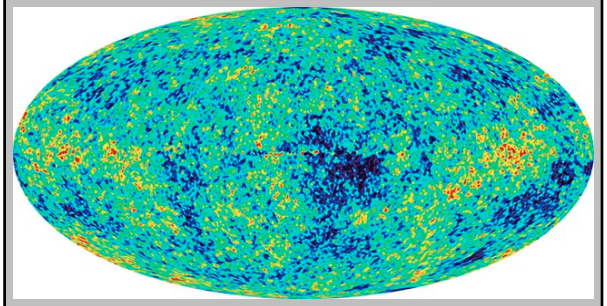


Galaxy collisions, quasars

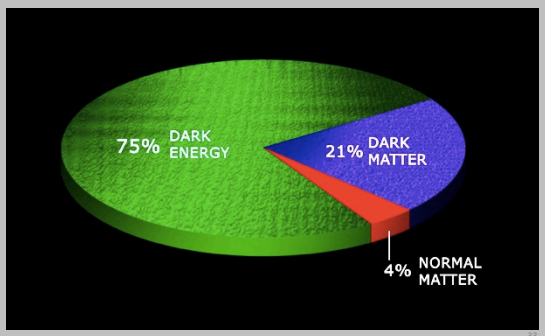
Dark matter and lensing of background galaxies



BIG BANG beginning



Dark Matter, Dark Energy and the Fate of Universe



What this course is NOT?

Astronomy is not Astrology!!!

What this course is NOT?

Memorizing Constellations

Topics for Thursday

- Nature of astronomy as a science
- Scientific method: we observe, hypothesize, test its predictions, maybe fix it and try again
- Mystery of planetary orbits: gravity makes you move on ellipses (..Kepler, Newton)
- Light as waves (and as particles)
- Special colors of light associated with each element