

Announcements

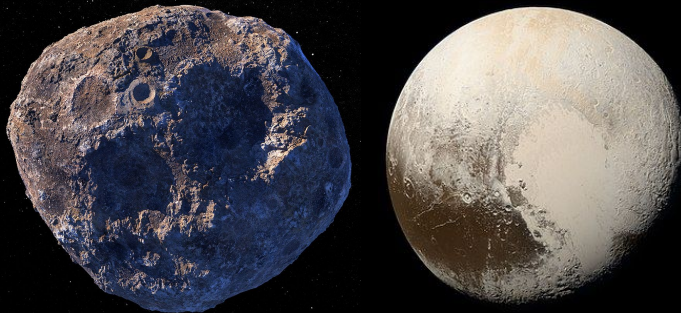
- Today is the last night lab!*
 - Next week we are back to 3:30 for the rest of the semester
- Midnight tonight is the **final deadline** for any missing assignments from the first half of the semester (Unless you have spoken to me for an extension)
 - Anything originally due before spring break
 - Even late, even unfinished, some points are better than none

General Observing

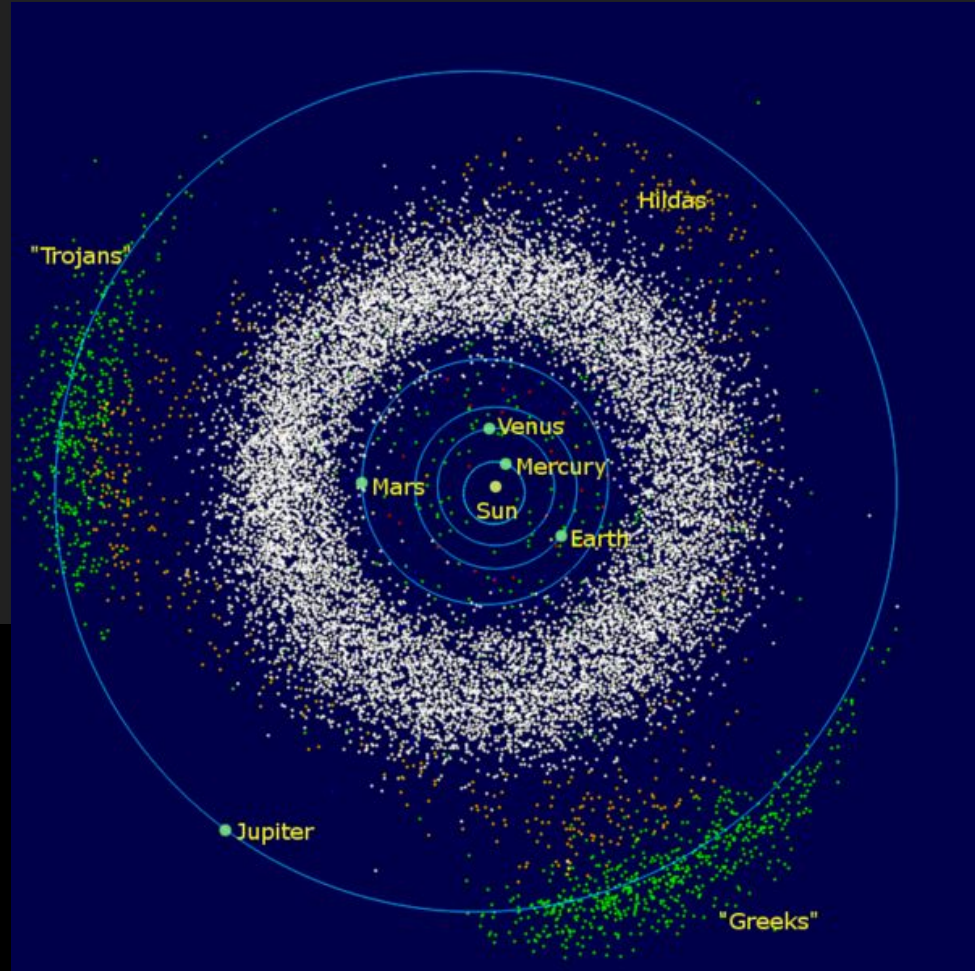
Celestial Objects

Minor Planets (Asteroids and Dwarf Planets)

- Neither a planet or a comet
- Rocky, remnant of early solar system
- Two groups:
 - Asteroids
 - Most are found in between Mars and Jupiter
 - Dwarf Planets
 - Most are found beyond Neptune
- Too small/far away for us to see any today :(
 - Except Ceres and Vesta - but they're behind a building/the ground...



Illustration



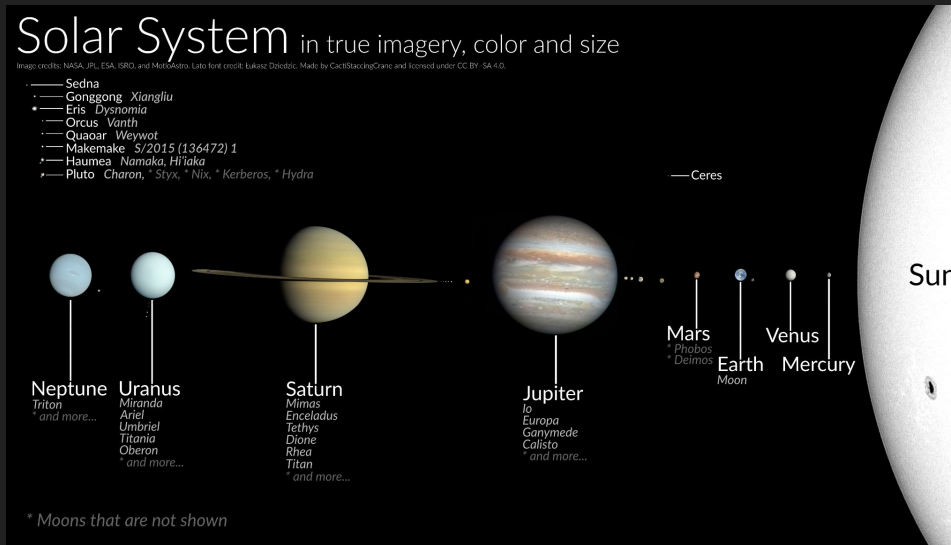
Brief Tangent: Asteroid v Comet v Meteor

- Asteroid: A rocky object that orbits the sun, fairly large
- Comet: An icy (and rocky) object usually orbiting the sun (usually) with a long trail
- Meteor: A meteoroid that has entered the atmosphere and is burning up
 - Meteoroid: Like an asteroid but very small (1 meter or less in diameter)
 - Meteorite: Meteoroid that has hit Earth's surface



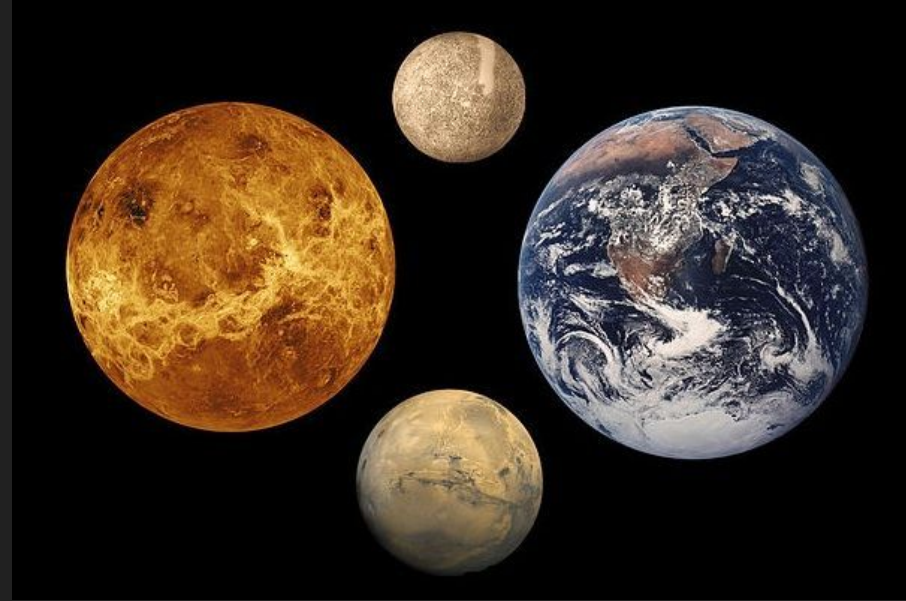
Planets

- Split into two types
 - Terrestrial (Mostly Rock)
 - Jovian (Mostly Gas)
 - For today's observations we have Jupiter and (maybe) Uranus



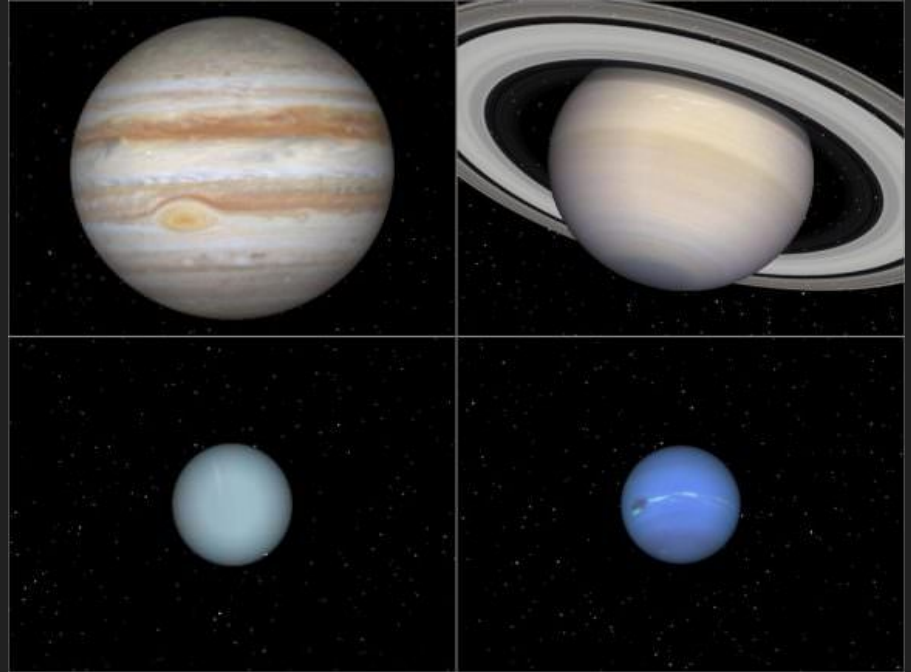
Planets

- Terrestrial:
 - Small, rocky, solid surface, normally near to the star
 - Terra = “Earth”-like



Planets

- Jovian:
 - Large, gaseous, no solid surface, normally further from the star
 - “Jove” = “Jupiter”-like





Moon

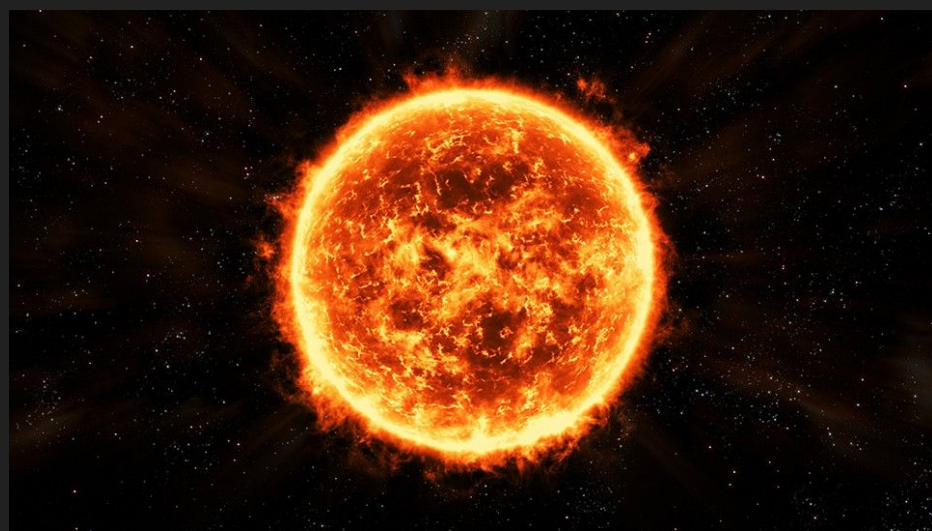
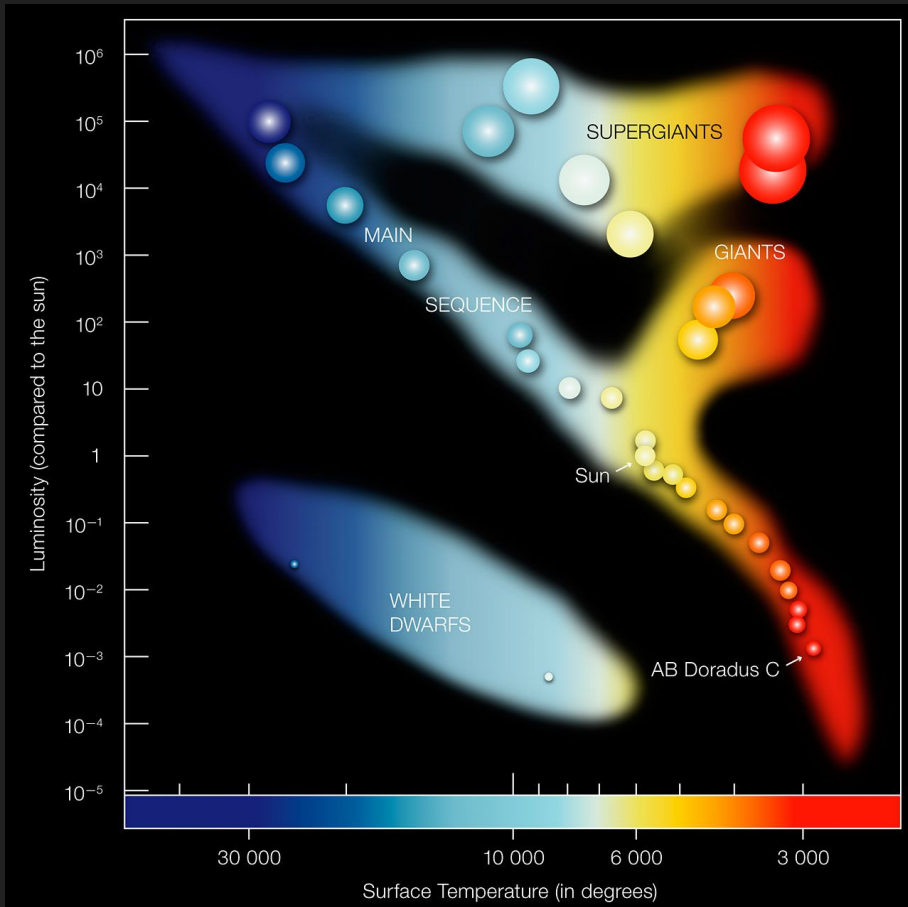
- Small(er) object in orbit around a planet
- May be able to see some of Jupiter's when you look at it through a telescope today





Star

- A luminous ball of gas
- We've gone over spectral types, vary by temperature, size, color
- Many are in gravitationally bound pairs: **binary stars**
 - Often even more than just 2
 - Trinary stars, sometimes quaternary or more
- Some change luminosity over time: **variable stars** (next week's lab!)
- Today you'll be looking at the *sextuple star* Castor
 - Probably won't be able to see all six...
 - You will probably see 2, maybe 3 "stars", each of which is actually a pair too close to each other for our telescopes to resolve



Nebula

- A cloud of dust and gas
- Can be stellar nurseries, and/or remnants of a dead/dying star
- Today: Horsehead Nebula

Eagle Nebula:



Ring Nebula:



Star Cluster

A group of stars that formed in the same general area at the same general time

Open Cluster:

- 10s to 100s of stars, loosely bound, younger stars
- Generally observed in the disk of the Milky Way



We can
(hopefully) see
the Pleiades (left)
today

Globular Cluster:

- 1000s of stars, tightly bound and dense, older stars
- Generally observed in the halo of the Milky Way



Galaxies

A gravitationally bound group of stars (of many different ages), dust, gas, and dark matter

We plan on viewing the Cigar Galaxy today (or maybe something else?)



The Milky Way

Front View



Side View



Extra Credit Questions

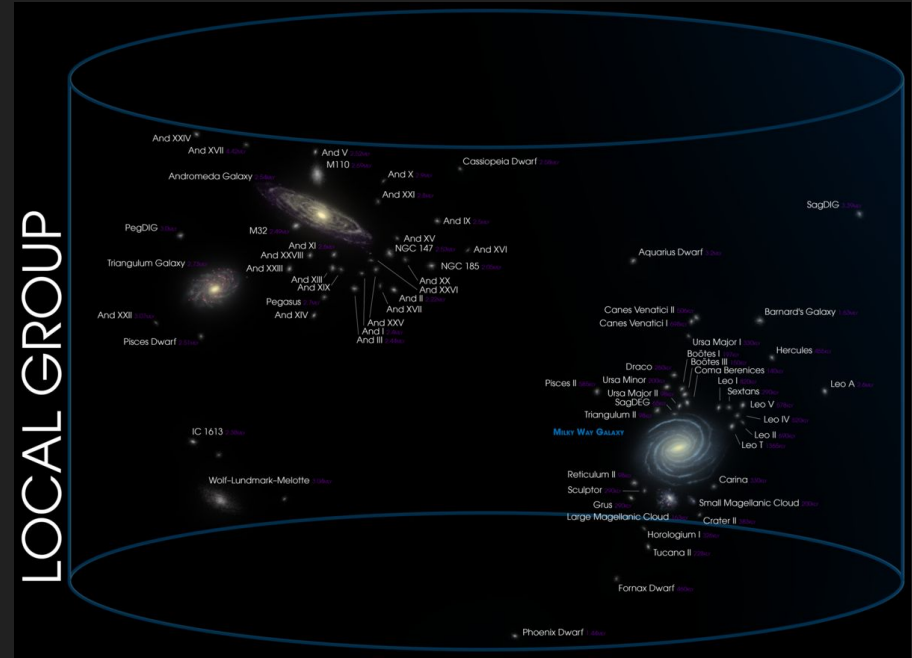
- **Write the answers somewhere I can see on your Lab Script**
- According to historical records, the supernova that created the Crab Nebula was visible from earth in July of 1054. At its peak, the apparent magnitude of this supernova was -6. Roughly how many times brighter is this than the brightest star in the night sky (-1.46)? How much brighter is it than Venus (-4.14)?
- Which spacecraft took the image of “the pale blue dot”? Approximately where in outer space is this spacecraft located now?
- What are the yellow and white objects in the Hubble Ultra Deep Field? Roughly how many of these are contained in the image (please don't try to count, just look them up)?



Galaxy Group

A collection of galaxies bound together by gravity

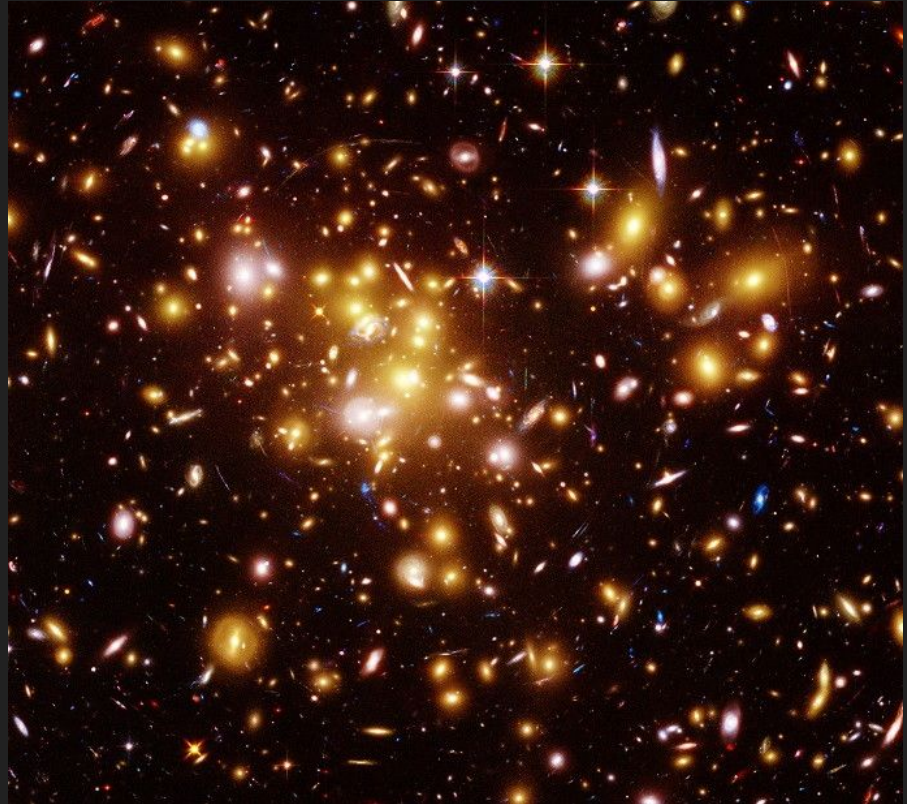
- Contains up to 100 members
- Galaxies vary in size, usually large spirals with a few dwarf/irregular companions
- Local group is about 3 Mpc across



Galaxy Cluster

Hundreds to thousands of galaxies bound together

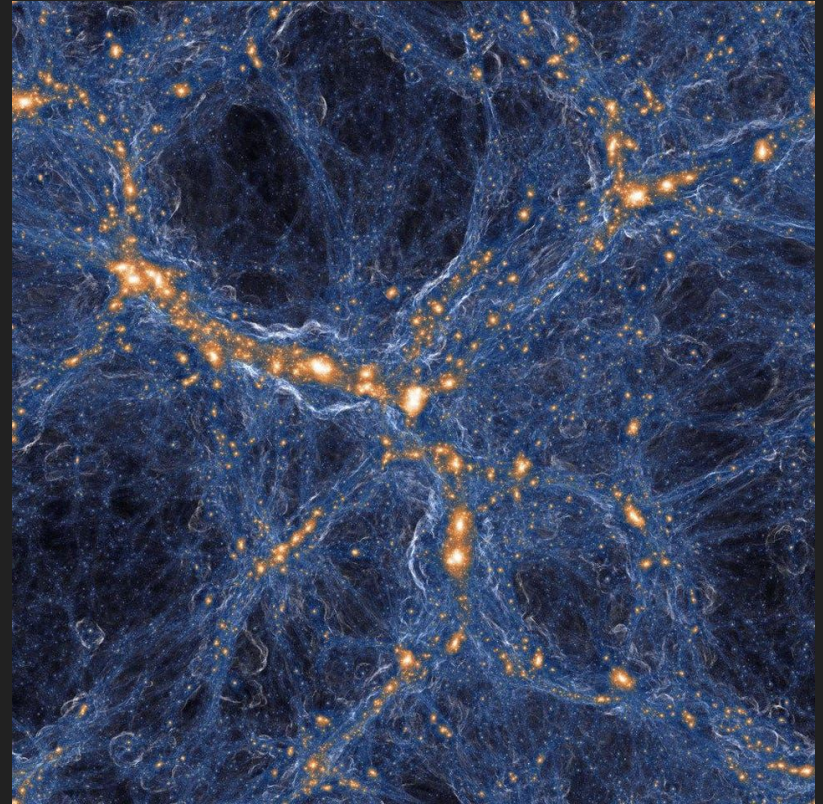
- About 10 Mpc across
- Tends to contain most of the elliptical galaxies, some spirals near the edge
- Most of the mass isn't in the galaxies



Galaxy Supercluster

A collection of Galaxy
Clusters/Groups.

- More than 100 - 300 Mpc
across
- Laniakea Supercluster contains
our galaxy and some 100,000
more



Tips for this lab

- In your observations, write down what you actually see through the eyepiece
 - If it's dim to you, write dim
 - If you see multiple objects, write multiple objects
- Draw what you see
 - If there are details (like stripes on Jupiter), make sure to include them
- Your star wheel and star charts will be helpful!
 - Use stellarium-web.org for questions about the meridian
- Use averted vision
 - If the object you're looking at through the eyepiece is dim, focus your eyesight to the side of it!

Today (Planned)

- Planet:
 - Jupiter
 - Maybe Uranus?
- Star(s):
 - Castor
- Star Cluster:
 - Pleiades
- Nebulae:
 - Horse Head
- Galaxy:
 - Cigar Galaxy?
 - Maybe Andromeda?
 - Maybe Pinwheel?

It's cloudy tonight, so we'll use

<https://www.stelvision.com/astro/telescope-simulator/>

Telescope Diameter: 203mm

Focal Length of Telescope: 2000mm

Focal Lengths of Eyepieces to Try (pick the best): 12mm, 25mm, 40mm

Objects to Draw:

- Jupiter
- Algieba (double star)
- Orion Nebula (reflection nebula)
- Betelgeuse (red giant star)