Astronomy

The Study of Stars, Galaxies, Planets, and More
Outline

The Solar System
Sizes Activity
Sun, planets, etc

Our Galaxy
Distances Activity
stars, gas, & black holes

Beyond Our Galaxy
Sorting Activity
galaxy shapes, structure,
universe & large structures
Solar System Sizes Activity
Solar System Sizes Activity

Sun, Jupiter, Earth, Mars, Ganymede, Mercury, Moon, Pluto
The Solar System

- Mercury
- Venus
- Earth
- Mars
- Jupiter
- Saturn
- Uranus
- Neptune
- Ceres
- Pluto
- 2003 UB₃₁₃

“Planets”

“Dwarf Planets”
The Solar System
The Sun is the closest star
Asteroids are leftovers from planet formation.

Ida has a moon, Dactyl!
The Outer Planets

Jupiter

Saturn

Uranus

Neptune
Further Out Objects

(Icy) Dwarf Planets
Largest known trans-Neptunian objects (TNOs)

- Dysnomia
- Nix
- Charon
- Hydra
- Namaka
- Hi’iaka
- Eris
- Pluto
- Makemake
- Haumea
- Sedna
- Orcus
- 2007 OR$_{10}$
- Weywot
- Quaoar
Comets orbit the Sun beyond Pluto...

... and can be disturbed to orbit near the Sun.
Distances Activity
Distances Activity

HST $348 \text{ mi} = 51 \times \text{height airplanes}$
Moon $238,857 \text{ mi} = 60 R_{\text{earth}} = 1 \text{ light second}$
Sun $93,000,000 \text{ mi} = 1 \text{ AU} = 8 \text{ light minute}$
Furthest comet $50,000 \text{ AU} = \sim 100 \text{ light hour}$
Nearest star $4 \text{ ly}$
Imaged Exoplanet $25 \text{ ly}$
Naked-eye Star Cluster $440 \text{ ly}$
MW disk $2,300 \text{ ly}$
MW center $27,000 \text{ ly}$
Andromeda $2,540,000 \text{ ly}$
Our galaxy is the Milky Way.

Stars and dust make up galaxies.
This is what the Milky Way Galaxy looks like if you didn’t have the Earth in the way.
A model of the Milky Way.

Milky Way rotates this way.
Stars are like the Sun but very far away.

Blue stars are hot

Red stars are cool
The Pleiades is a young star cluster, not a constellation.
This an old star cluster called M80.
We discovered over 400 planets around other stars!

Fomalhaut
HST ACS/HRC

HR 8799 Planetary System

Beta Pictoris
Clouds of gas and dust in space are called “nebulae” = latin for “cloud”

The gas glows because it is lit up by the nearby stars.
Stars are born in these nebulae.

Eagle Nebula

Orion Nebula
These nebulae are from dying stars.

Cat’s Eye Nebula  
Butterfly Nebula
Sag A*
Galaxy Sorting Activity
Galaxies come in groups called clusters. This is the Virgo Cluster.
Galaxies can interact with each other.
Supermassive black holes lurk in most galaxies.
Groups of galaxies form a 3D web in the Universe.
Powers of Ten