

ScienceCraft

Astronomy

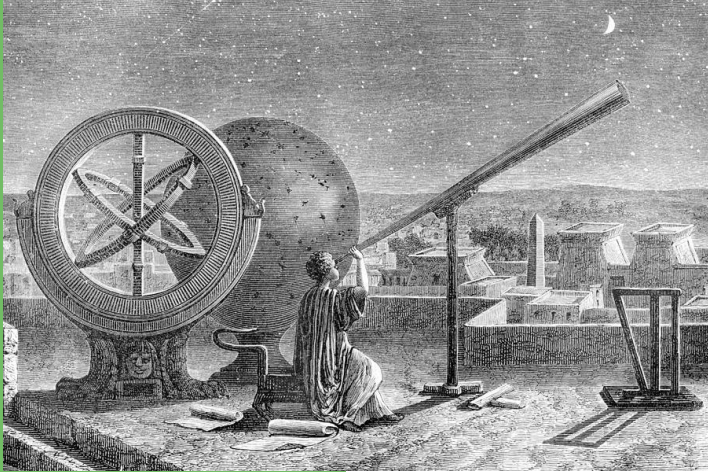
What is Astronomy?



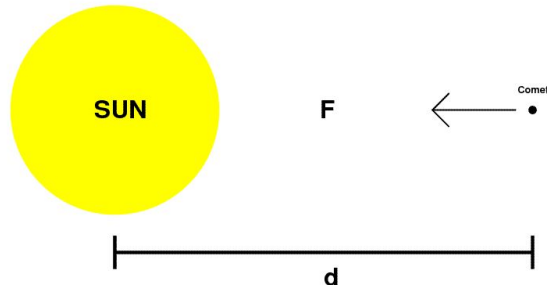
- ✗ Astronomy is **the study of celestial bodies** and phenomena outside of Earth's atmosphere using mathematics, physics, and chemistry
 - ✗ Telescopes, radio waves, and satellites
- ✗ A common unit of measurement: **Light year** – 6 trillion miles!!!



A Brief History



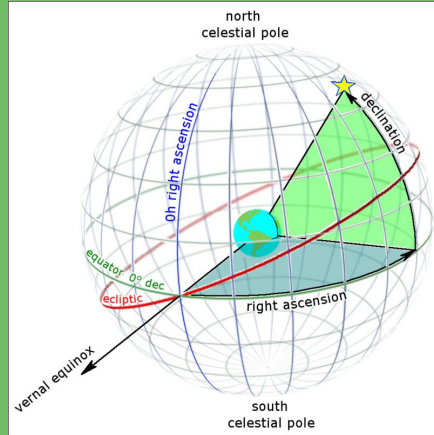
Mass of SUN >> Mass of Comet



- ✗ People have been looking up at the stars **forever**
 - ✗ India, Egypt, The Mayans
- ✗ The Ancient Greeks
 - ✗ Geocentric theory
- ✗ First **observatories** developed by Arab astronomers (9th century)
- ✗ Copernicus proposed **heliocentric theory** (15th century)
 - ✗ Defended by Galileo's work with his **telescope**
- ✗ Kepler describes **motion of planets around the sun**
 - ✗ Newton proves this with math and the **law of gravitation**

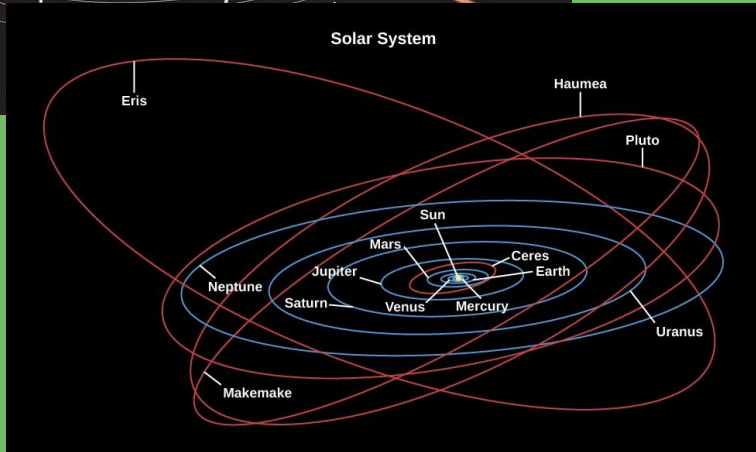
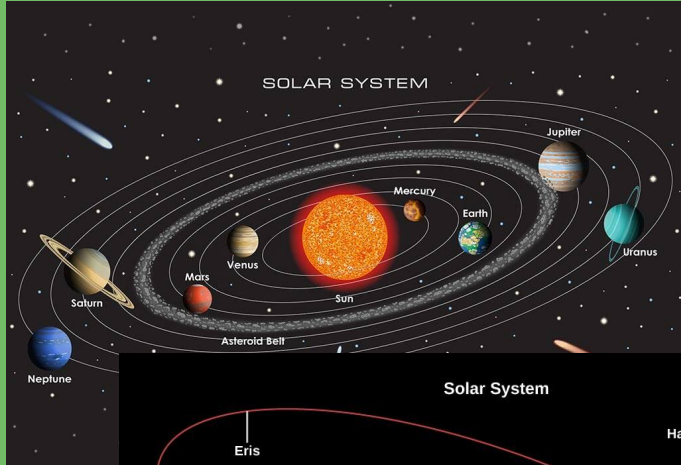


Constellations



- ✗ Since the beginning of time, stargazers have been fascinated by **arrangement of stars** in the sky
 - ✗ Ancient Greeks referred to patterns as constellations
- ✗ Many common constellations in the sky
 - ✗ Orion the Great Hunter
 - ✗ Leo the Lion
- ✗ Constellations help to **identify certain planets/stars** in the sky
 - ✗ North circumpolar constellations
 - ✗ Seasonal constellations: only visible in the winter
- ✗ Astronomers measure constellations using celestial coordinates
 - ✗ **Declination** and **Right Ascension**

Solar System



- ✗ Our Solar System is comprised of **the Sun and the objects that orbit it.**
- ✗ All objects are bound by gravity
- ✗ **26,000 Light years away** from the center of the Milky Way
- ✗ It formed **4.6 billion years ago**
- ✗ How did it form?
- ✗ 1 star, 8 planets
- ✗ Asteroid belt, dwarf planets, moons
- ✗ The **Kuiper Belt**, and the **Oort Cloud**

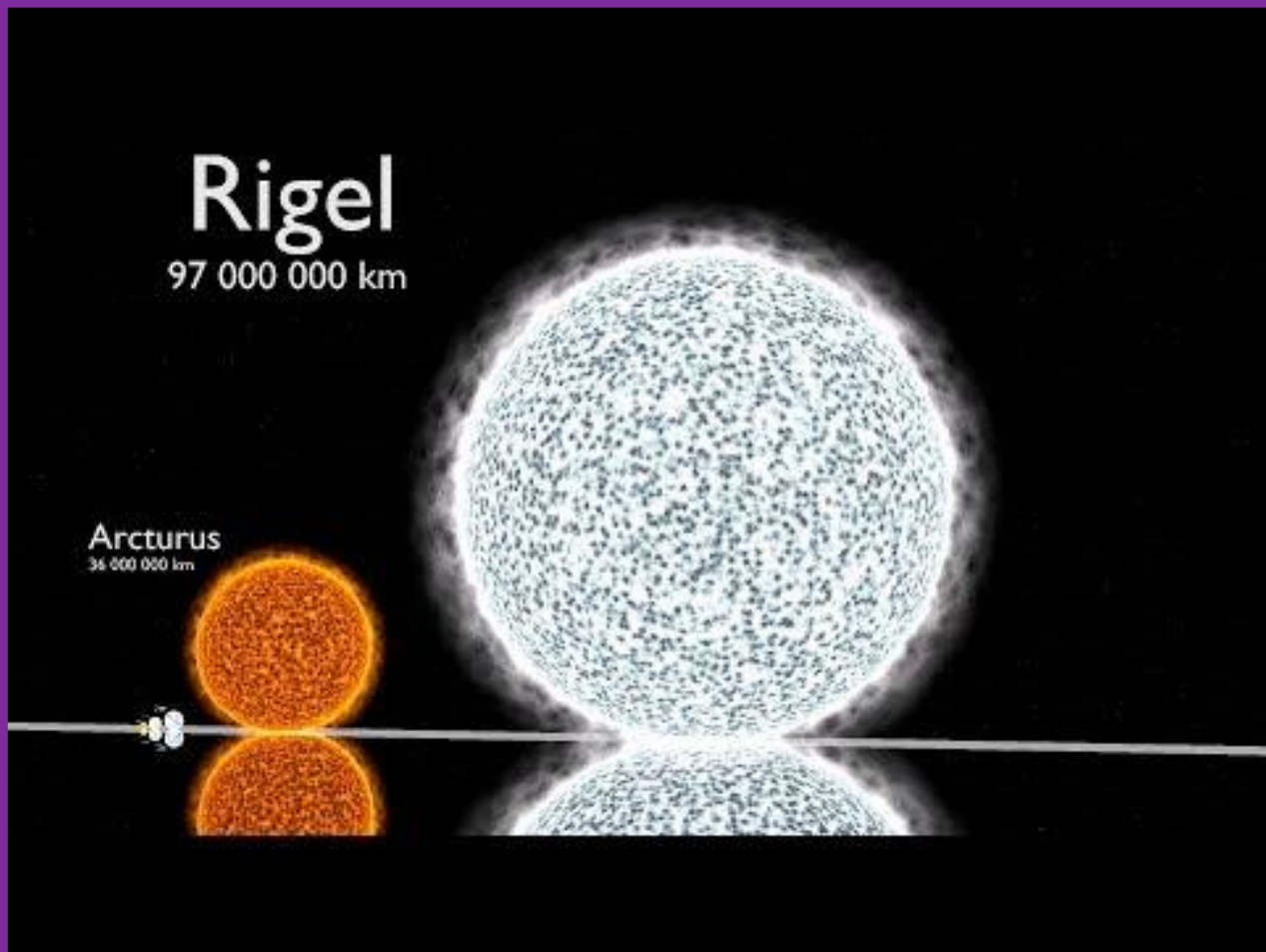


Rigel

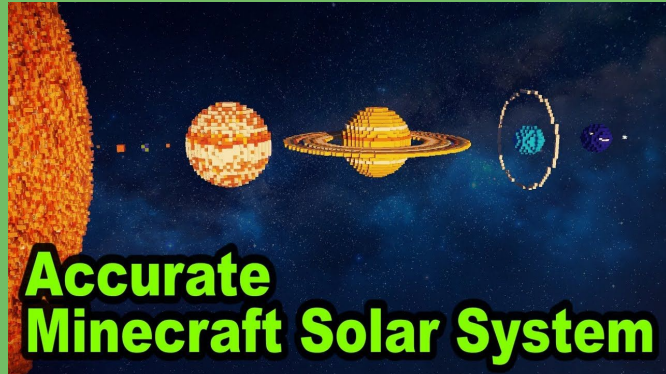
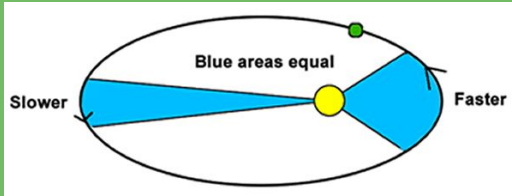
97 000 000 km

Arcturus

36 000 000 km



Planets



- ✗ Celestial bodies that rotate around stars (like the Earth rotates around the sun)
 - ✗ **Rocky planets**
 - ✗ **Gaseous planets**
- ✗ Planets have an elliptical orbit, meaning that the orbit is shaped like an oval
 - ✗ Gravity is responsible for pulling planets towards the sun
 - ✗ Sometimes planets move faster/slower around sun
- ✗ Earth is an example of a “Goldilocks” planet
 - ✗ Right amount of **distance from sun**
 - ✗ Right **atmospheric** setting
 - ✗ Presence of **liquid water**



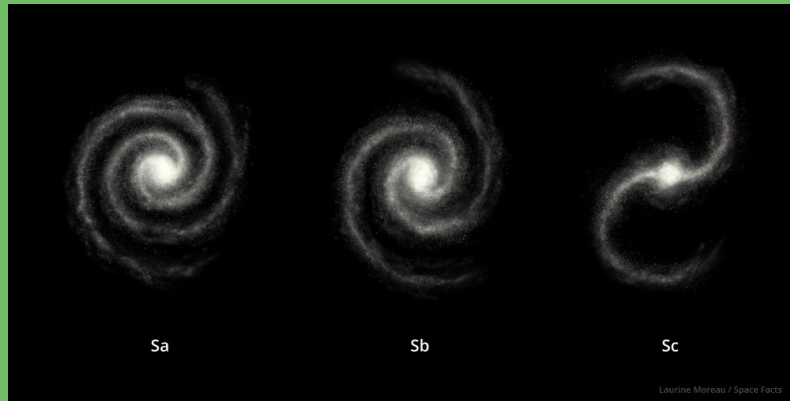
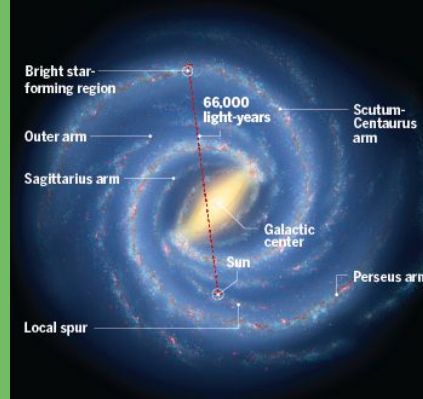
Stars



- ✗ Stars are large, luminous objects in the sky that **light up the night sky**
- ✗ They are the life source for planets/planetary systems
- ✗ Stars go through life cycle, which is dependent on the mass
 - ✗ Small mass means longer life cycle
 - ✗ Large mass means smaller life cycle
- ✗ Stars typically contain a **core** that is made out of **hydrogen**
 - ✗ Through nuclear fusion, the atoms fuse together
 - ✗ Stars unable to survive once nuclear fusion runs out and it contracts/glows red
- ✗ Can result in **red giants** or **supernova explosions, some even black holes**



Galaxies and the Universe



- ✗ Galaxies are huge **collections of gas, dust, stars, meteorites, etc.** that make up solar system
- ✗ The Earth is part of a huge cluster of objects that make up Milky way galaxy
 - ✗ Sun, planets, Trans-Neptunian, Kuiper Belt, Oort Cloud,...
- ✗ The Earth is midway and close to center of Milky Way Galaxy
- ✗ Milky Way is an example of a **spiral galaxy**
 - ✗ Barred spiral
 - ✗ Elliptical Galaxies
 - ✗ Irregular Galaxies



Space Exploration



- ✗ **Robotic exploration** is about 55 years old
- ✗ SpaceX experiments with **reusable spaceships**.
- ✗ NASA satellites and unmanned crafts like **OSIRIS-REx or the JUNO mission**
- ✗ What is the chance of life on other planets?
 - ✗ **Drake Equation** – an estimate of the odds of finding alien civilization
- ✗ The universe is very very very big and there is still much to explore!

Video time Pt 2: NASA OSIRIS-REx Mission information (from yesterday!)



