



# Act VI, Scene II

## Earth and the Solar System Review

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# How It Works/Fun Facts

- Everything is held together by **gravity!**

## Fun Facts!

- The sun makes up about **98%** of the solar system's total mass!
- **SOL**ar. **Sol** means Sun in latin

Ratio of the Planets  
to the Sun (kilometers)

Mercury  
(277:1)

Venus  
(113:1)

Earth  
(108:1)

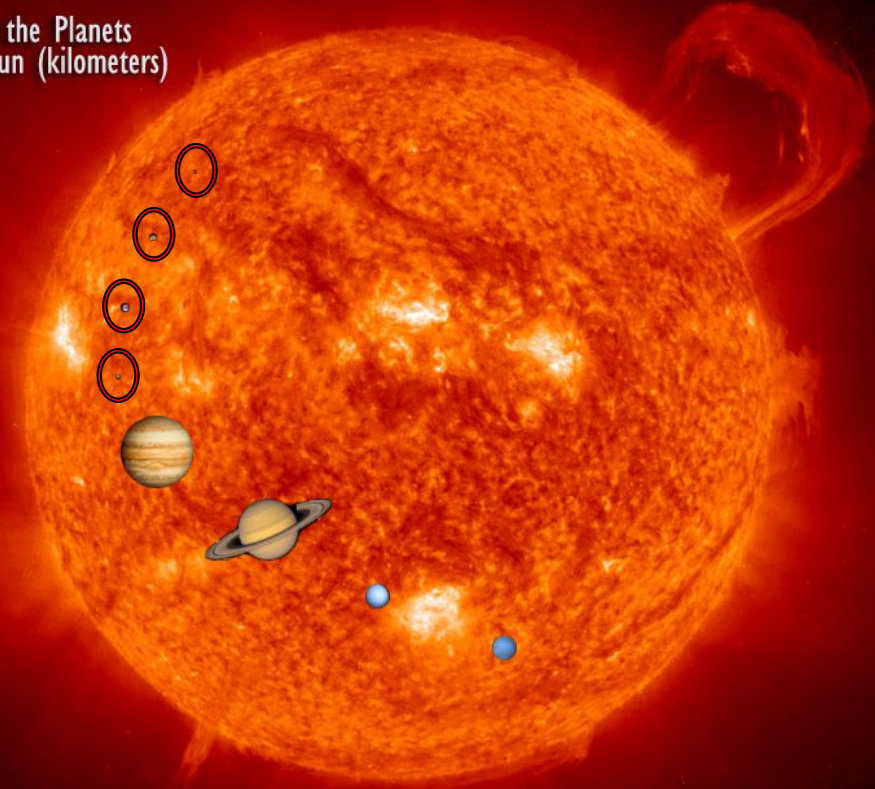
Mars  
(208:1)

Jupiter  
(9.7:1)

Saturn  
(11.4:1)

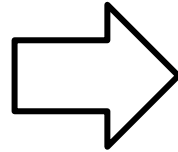
Uranus  
(26.8:1)

Neptune  
(27.7:1)



# The Solar System (a.k.a. The Sun System)

- Aristarchus of Samos, and 2000 years later, Copernicus, first proposed the **heliocentric theory**.
- Kepler realized that the planets have **elliptical** orbits around the sun.



- This allows Sir Isaac Newton to figure out how gravity works through **physics!**
- The Sun, having the largest mass in the solar system, has the largest gravitational influence.

# What Makes A Planet... A "Planet?"



## Requirements...

- Big enough to be **round!**
- Has its **own moon!**
- **Bigger than...** Well, there's actually no specific size!

## Some Exceptions...

- A lot of moons/asteroids are round?
  - Mercury and Venus don't have moons while some asteroids do.
  - And some moons are larger than planets, Ganymede is larger than Mercury!
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# Common Characteristics Of Planets



## Inner Planets:

- Mercury, Venus, Earth, Mars.
- Also called “**terrestrial planets**” because of their small size and **solid, rocky terrain**.
- $\frac{3}{4}$  of the planets have substantial enough atmospheres to generate **weather**.
- Believed to have an **iron core**.

## Outer Planets:

- Jupiter, Saturn, Uranus, Neptune.
  - Also called “**Jovian Planets**” or “**Gas Giants**” because of their **large** size and their small, **rocky cores**.
  - They are composed of mostly gases, specifically **hydrogen** and **helium**.
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# Why are they different?



## Inner Planets

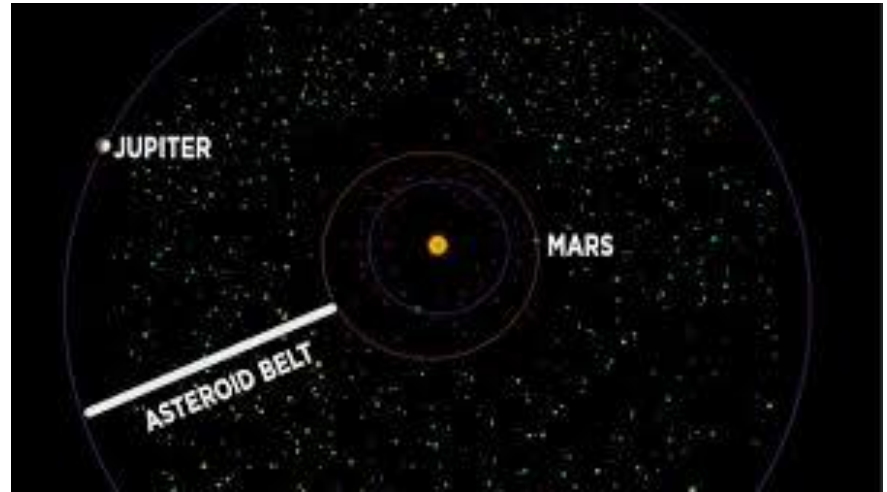
- During formation, they were **closer to the sun.**
- The **warmer temperature/heavier wind** blew away the lighter gases/elements (hydrogen and helium), which caused a thin atmosphere.
- They could only hold on to heavier elements like **nickel or iron.**

## Outer Planets

- Farther away, there was **more material** which allowed for larger planets.
  - Hung on to **lighter gasses** because of their **colder temperatures.**
  - Lighter gasses caused a tremendously thick atmosphere, which eventually **out-massed the solid core** of the planets.
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# The Asteroid Belt

- Between Mars and Jupiter lies the **Asteroid Belt.**
- Although there are asteroids all around our solar system, most are gathered here!
- Essentially just a collection of billions of rocks.
- Like planets, they also revolve around the sun at different rates depending on their distance from the sun.



# Dust Components in our Solar System

Oort Cloud

Kuiper Belt

10,000 AU

100 AU

Asteroid Belt

**Scattered Disk!**

5 AU





# Formation Of The Solar System

## 4.6 Billion Years Ago, it started with a cloud...

Gravity tried to pull the cloud together, but heat tried to pull it apart.

Somehow, the cloud got compressed! Either by shockwave or nebula collision, we are still having vicious debates.

Gravity Won the battle! Angular momentum (when an object gains momentum through spinning) became very important! It made the universe flatten out a bit.

As the cloud collapsed, material fell into the center and started colliding with each other, which formed a couple planets and... you guessed it... a **very hot PROTOSTAR!** A baby sun is born!

As they grew, so did their gravity. Objects that hadn't formed planets already were blown away by the sun's light and heat, forming the mess of rocks into an early solar system!

# Our Earth



- It has a protective **gaseous atmosphere** and a **magnetic field** which allowed life as we know it
  - Earth has multiple layers, like an onion.
    - The crust
    - The mantle
    - The outer core
    - The inner core
  - The **outer core** is liquid nickel and iron which conducts electricity
  - The liquid metal convects, creating a **magnetic field** with a north and south pole
  - This magnetic field **deflects charged particles** and protects the atmosphere
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# Earth's Atmosphere



- The atmosphere is a layer of gas: **nitrogen, oxygen**, and a small amount of **argon** + other **trace gases**.
  - A layer of **ozone**, a molecule of oxygen, absorbs solar UV light.
  - The atmosphere exerts a pressure on surface of about **1 kg/cm<sup>2</sup>**
  - Some **solar wind particles** deflected by magnetic field are channeled into the atmosphere
  - The **auroras** that take place near Earth's poles are caused by **solar wind particles** slamming into **air molecules**
  - These energize the molecules and emit light → **aurora borealis** and **australis**
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# Water Cycle



- **Hydrologic cycle** - how water moves on, above, and below the surface of the Earth, driven by energy supplied by the sun and wind.
  - **Clouds form** from condensed water vapor → **become droplets** → **keeps condensing** and becomes heavier → gravity eventually pulls droplets to the ground as **RAIN!!**
  - Gravity causes **water to run downwards and into the ocean**
  - On the way to the ocean, water picks up **minerals**
  - This salt and minerals runs into the oceans and **doesn't evaporate**, that's why it's salty!
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# The Carbon Cycle

## Plants

- When plants photosynthesize, they **store excess carbon** in the body of the plant.
- This carbon is either given back to the atmosphere, eaten by an animal, or stays there until the plant dies.
- When it dies in the right environment they become **fossil fuels** over time.
- They have to be in an environment where they can be compressed by other dead plants.

## Ocean

- Phytoplankton absorb the dissolved carbon in the ocean.
- When they die, their calcium-carbonate shells fall to the bottom of the ocean.
- It gets compressed over time and forms limestone, which creates carbon dioxide and carbonic acid when it's eroded.

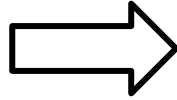
**Carbon is a part of everything on Earth, living or nonliving! We need it for structure and/or fuel.**

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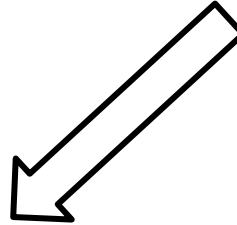
# Effects Of The Carbon Cycle

We release **carbon dioxide** into the atmosphere.

The **permafrost melts**, animals trapped in the ice start decomposing and carbon is released from their reserves..



The higher carbon dioxide levels make the **temperature increase**.



Releases **more carbon dioxide** into the atmosphere, which further increases the Earth's temperature.

