

# Formation of the Solar System

Ms. Larsh

# Primeval Nebulas & The Formation of the Solar System



A previously undisturbed **nebula**, a cloud of gas and dust, slowly expands outward in a beautiful display of colors

All solar systems and thus, stars originate from these nebulas

# How Stars are Formed

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1. Clouds of gas and dust are disturbed by the gravity of a nearby phenomena.



2. The disturbance causes clumps to form and draw gas inwards



3. The collapsing clump begins to rotate and flatten into a disc of gas and dust.



4. The disc rotates faster and faster pulling more material inwards creating a hot, dense core called a protostar.



5. When the protostar becomes hot enough hydrogen atoms begin to fuse, producing helium and energy.

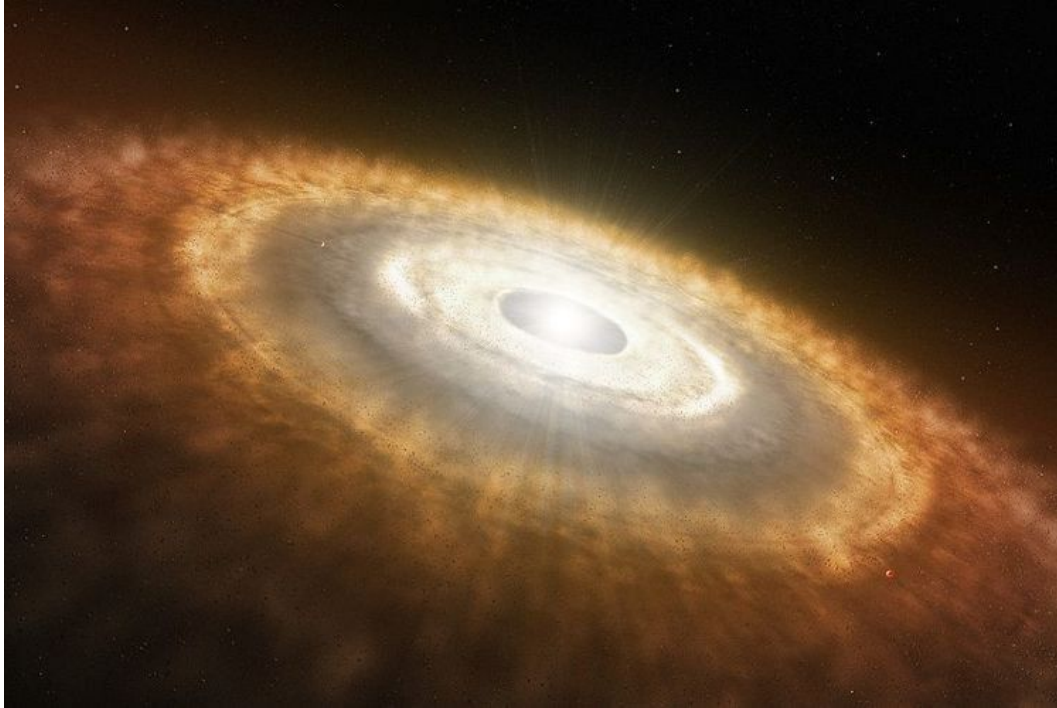


6. After millions of years a bipolar flow erupts from the protostar and blasts away remaining gas and dust.

## Formation of a Star

1. A nebula **collapses** due to **gravity**
2. As material collapses inward the nebula begins to **spin**
3. As the material spins faster the nebula flattens out into a **disk**
4. The disk continues to spin faster, with more material clumping in the center to create a **protostar**
5. When the pressure & temperature become intense enough, **nuclear fusion** occurs and a **main sequence star** is formed

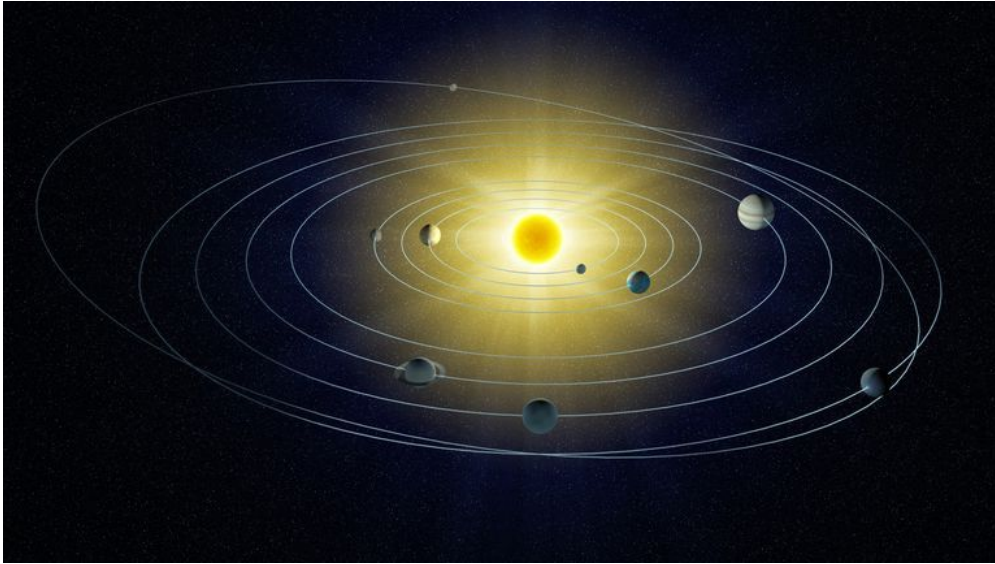
# Main Sequence Stars



A star is formed because the pressure and temperature became intense enough for Hydrogen (H) atoms to fuse into Helium (He) atoms

All main sequence stars involve nuclear fusion of **H** → **He**

# Gravitational Sorting of Materials



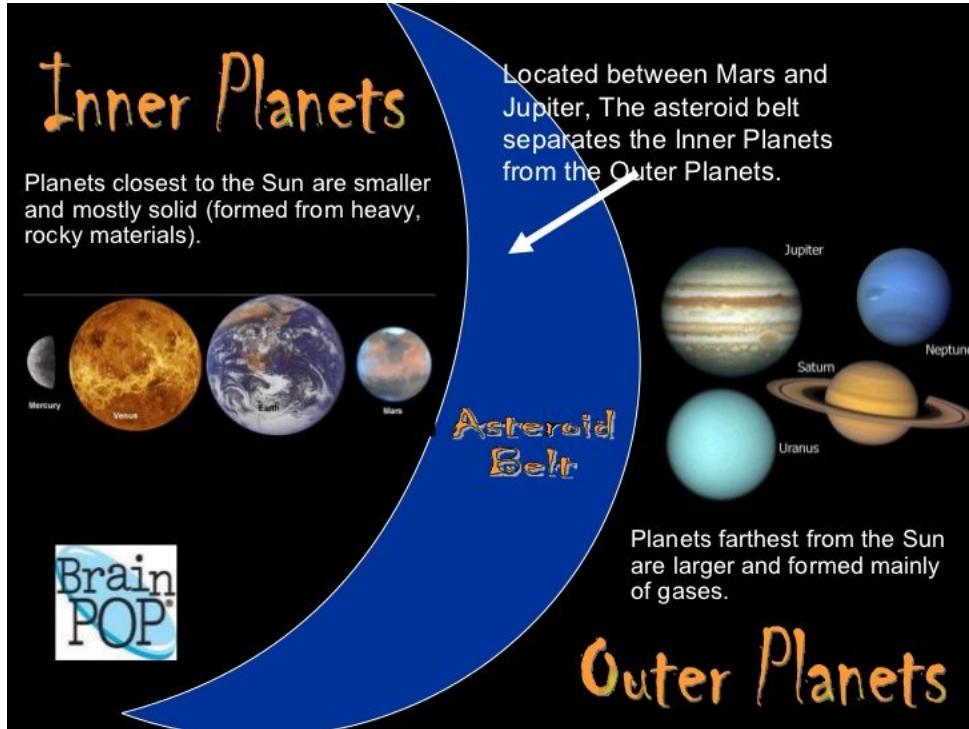
Once nuclear fusion occurs, the **inward collapse** due to gravity is **slowed** by the **outward force** of nuclear fusion

\*For every action there is an equal and opposite reaction

Over time, the disk continues to cool and the **gravitational sorting of materials** causes the denser materials to stay closer to the Sun, while the lighter materials are pushed further from the Sun by solar winds



# Planet Formation / Location

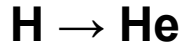


**Denser material** near the Sun formed the Terrestrial or Inner Planets: Mercury, Venus, Earth, & Mars

**Lighter material** away from the Sun formed the Gas Giants or Outer Planets: Jupiter, Saturn, Uranus, & Neptune

# Sun : Low-Medium Mass Main Sequence Star

All main sequence stars involve nuclear fusion of hydrogen into helium



The sun is the ultimate source of energy for life on Earth

