
Accretion Theory: Gravity as the Main Source to Form the Solar System

Introduction

The earth is flat, that's what people thought before the Greek geographer Eratosthenes proposed the idea that the earth was round. People have also thought the earth was the center of our solar system but that was debunked by Copernicus. There are also many theories about how the solar system was first formed, but the most believed one is Accretion Theory, which explains how gravity was the main source to form the solar system. Gravity helped form the Sun, planets, and other celestial bodies. The sun is the central pivot point to which our solar system relies on.

The Sun

The sun was the first thing to form in the solar system, and its gravity keeps the planets moving. According to the expert Charles Q. Choi, "the shock wave from the explosion is thought to have compressed parts of the nebula, causing these regions to collapse" (Choi) This evidently shows that 4.6 billion years ago solar system was a cloud of dust and gas known as a solar nebula, gravity collapsed the material in on itself as it began to spin, forming the sun in the center of the nebula. "The sun was born about 4.6 billion years ago. Many scientists think the sun and the rest of the solar system formed from a giant, rotating cloud of gas and dust" (Choi) This demonstrates that formation and evolution of the Solar System began 4.6 billion years ago with the gravitational collapse of a small part of a giant cloud. Most of the collapsing mass collected in the center, forming the Sun. Also the scientists at Euro Fusion states that "the Sun's gravitational force confines the positively-charged hydrogen nuclei and work with the high temperatures that cause the nuclei to move around furiously, collide at high speeds overcoming the natural electrostatic repulsion that exists between the positive charges and fuse to form the heavier helium." (eurofusion.org) This means that the gravitational force confines Hydrogen atoms fuse together to make helium and in the process it makes photons. This makes light for our sun. Nuclear fusion kicked in at 18 million degrees Fahrenheit. The sun also plays a big role on the planets of our solar system, the planets of our solar system rely on the sun.

The Planets

The various planets are thought to have formed from the solar nebula, the disc-shaped cloud of gas and dust left over from the Sun's formation. Based on Cynthia Bown, "planets form from particles in a disk of gas and dust, colliding and sticking together as they orbit the star. The planets nearest to the star tend to be rockier because the star's wind blows away their gases and because they are made of heavier materials attracted by the star's gravity." (Brown) Particles in the nebula clump together because of gravity and the planets closer to the sun are more rockier. The gas planets have a major contrast compared to the rocky ones, because "the gravity becomes stronger as the planet grows large enough to capture and retain some hydrogen and helium gas, continually sweeping up ice-rich pebbles. As these pebbles fall through the planet's atmosphere, a fraction of the ice evaporates, adding water vapor to the

atmosphere" (carnegiescience.edu) The planets grow larger, this makes the gravity grow even stronger. The gravity then pulls in gases and ice pebbles that melt and turn into water vapor. This makes the planets like Jupiter, Saturn, Uranus, and Neptune so gassy. The temperature and size vary because "... The thickness of a planet's atmosphere depends on the planet's gravity and the temperature of the atmosphere. A planet with weaker gravity does not have as strong a hold on the molecules that make up its atmosphere as a planet with stronger gravity. The gas molecules will be more likely to escape the planet's gravity." (astronmynotes.com) Gas planets have strong gravity, so they hold more gas molecules. If a planet had less gravity it is harder for the gravity to hold onto those gas molecules. That is why Jupiter is the planet with the most gravity. The temperature also affects the atmosphere's thickness, so hotter planets have more gravity. The bigger the planet, therefore, the bigger the atmosphere it would have. This is because its gravity is able to overcome the kinetic energy of the gas molecules. The Planet's gravities pull in Moons, Asteroids/Meteoroids, and Comets.

Moons, Asteroids/Meteoroids, and Comets

Moons, Asteroids/Meteoroids, and Comets act like smaller planets in the solar system. "Some of the leftover dust formed the moons of the planets. It is likely that large rings couldn't form on inner planets (Mercury, Venus, Earth, Mars) because the rings are made of frozen ice. When they are in the gravity well of an outer planet, like Saturn, they start to orbit the planet." (scienceline.ucsb.edu) The rockier planets have less moons. The gassier planets have more gravity while the rockier planets do not. The rockier planets gravity can not hold that many moons, or like Mercury and Venus are the closest to the sun and there gravity is not that strong to hold moons. "Made almost entirely of hydrogen and helium, these planets do not have solid surfaces. ... Gravity by itself would make a planet spherical, but their rapid rotation flattens out ... In contrast, many moons and rings orbit each of the jovian planets." (scienceline.ucsb.edu) The gassy planets have more moons. The gassy planets have more gravity which pulls in the matter in space to create moons. It also helps that the gassy planets gravities are able to hold that many moons. "Some asteroids have very elliptical trajectories, crossing the orbits of the inner planets Mars, Earth or Venus. The cause of these elliptical trajectories could be collisions within the asteroid belt" (sun.org) The asteroids of the asteroid belt would be a planet, but it is not because of gravity. The asteroids are moving too fast into each other, so they can not become a planet. The gravitational force is too strong, so they just crash into each other occasionally, which forms debris, and that debris forms meteoroids."elliptical trajectories... the gravitational influence of the massive planet Jupiter changing the orbits of some asteroids gradually over time (see orbital resonance)." (sun.org) The asteroids of the outer planets have mostly been taken by Jupiter because it is the planet with the most gravity. There are still a few floating around, but Jupiter has either taken all them or have thrown them out. "Periodic comets, originate from a disk-shaped band of icy objects known as the Kuiper Belt beyond Neptune's orbit, with gravitational interactions with the outer planets" (nasa.gov) Comet nuclei are loose collections of ice, dust and small rocky, the volatile materials within the comet to vaporize and stream, because of their low mass, comets cannot become spherical under their own gravity. "Comets spend most of their lives far away from the Sun in the distant reaches of the solar system. They primarily originate from two regions: the Kuiper Belt, and the Oort Cloud" (space.com) All of the comets in the Kuiper Belt and Oort Cloud are part of the solar system. They orbit our Sun, and obey the same laws of motion as the planets and their moons. They also obey the same laws of gravity too. Moons, Asteroids/Meteoroids, and Comets are a small part of the solar system, but they still play a big role.

Conclusion

We now know for sure that the that our Earth isn't the center of our solar system. We know this because of the main theory of the Nebular Hypothesis. The main thing that this theory is about is gravity. Gravity formed the Sun, Planets, and other celestial bodies.

eduzaurus.com