

Day: 310 Year: 2850 Report: Solar System

Completed by: Admiral Forrest, Admiral Grady, Admiral Freskos, and Corporal Mansbridge

Introduction

General Barton Clark,

I hope this report finds you well. It's been long since we last spoke. Ahead is the report on the Solar System you asked for. It hosts eight planets and multiple dwarf planets, along with many moons. It looks like a fine place for colonisation, although it has only one inhabited planet called Earth. Sorry about the delay, in order to collect our information, we had to send some brave soldiers back in time to see how this system formed and we lost some brave souls. A worthy sacrifice for our great empire. Ahead you will find an in-depth report on the formation of this system, the movement of it's planets, an overview of the changes that have occurred in the system, predictions for its future, and other information.

Sincerely,
Admiral Forrest

Formation

4.5 billion years ago, this system formed inside a massive cloud of gas and dust called the Oort cloud. This cloud is mostly hydrogen and helium. This cloud was formed from a supernova explosion. When a supernova explodes, it spits its guts out into space, forming massive clouds of gas and dust.

This system formed planets and a sun after a small portion of it collapsed into itself. Collapse could have been triggered by a shockwave from a supernova nearby that affected the cloud, or a passing star affecting gravity inside the Oort cloud. Another thing that most likely triggered collapse is two black holes swirling into each other, as shown in the graphic to the right. This

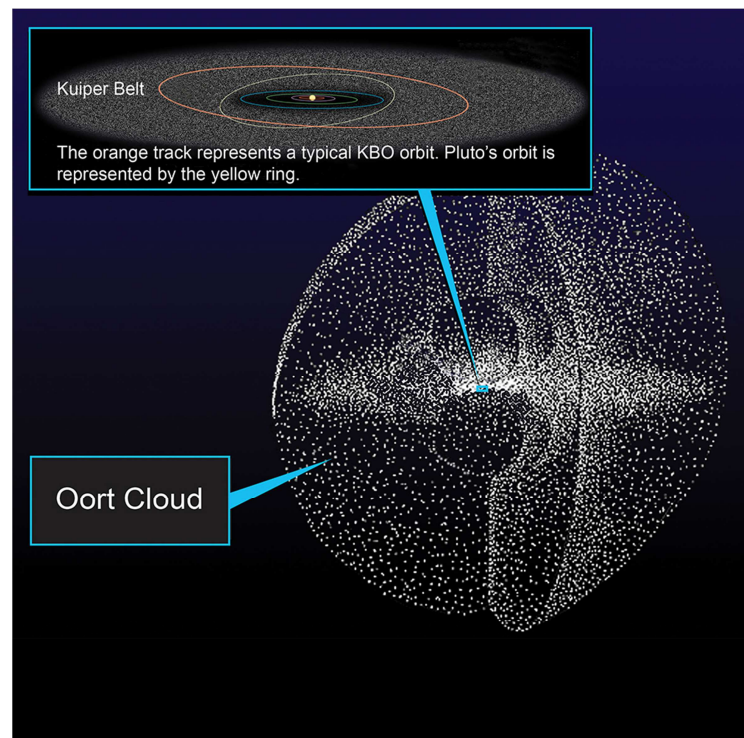


sent out massive waves of gravity into the cloud, causing the gas and dust to collapse in on themselves. To put it simply, this gas and dust began to fall towards a center point, forming a star, and the leftover materials formed the planets. This only happened to a small region inside this cloud. As these particles collapsed, angular momentum played a role. As these materials fell closer and closer to this gravitational center point, they began to spin faster and faster. The initial rotation or tumbling motion was accelerated as the reaction contracted, like a spinning skater who pulls in his arms to spin faster. The contracting, rotating cloud flattened into a disc. Within the disc, the largest concentration of matter was in the center. This became the sun. Matter collected in smaller clumps out in the disc. These became the planets.

This system is completely surrounded by the swirling material in the Oort cloud and makes up only about 5% of the cloud itself. The region that collapsed was very small in relation to the rest of the cloud. Within the cloud, the Solar System is surrounded by the Kuiper belt, a doughnut-shaped ring of icy objects around the Sun, extending just beyond the orbit of Neptune from about 30 to 55 astronomical units. 1 astronomical unit is equal to the distance between Earth and the Sun. Earth is one of the planets in this system, and it is the unit that the life forms there use. Similar to the

rings of saturn, where our solar system is the planet, and the rings around it are the Kuiper belt. This belt is material that never formed into planets. The size and scale of the Oort cloud and the Kuiper Belt are pictured to the right.

In our research, we discovered that the star of this system is not the first star to be there. We believe it is a second or third generation star, because of the nature of the elements inside of it. There are many heavy elements inside the star, which do not form normally during a star's regular lifetime. These elements only form when a star dies or a new one is born, leading us to believe that the star in this system is not the first star to occupy this region of space



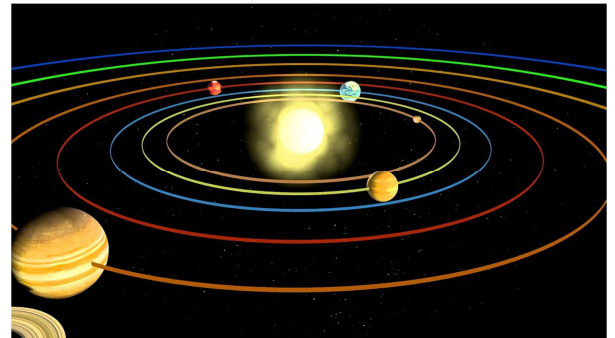
Planetary Rotation and

System changes

Over the first 700 million years of this system's existence, it's planets formed and developed, which geologists called the Hadean Era. The eight planets and five dwarf planets in this system have their own orbital paths around the sun, which have slowly changed over time. There isn't much in space to slow things down, so when something starts rotating, it usually doesn't stop. Because of this, all the planets spun in the same

direction when the solar system was created. However, today, some planets have put their own spin on their motion, slightly differing from one planet to the next, as seen in the graphic to the right.

The only inhabitable planet in this system is Earth, the third planet from their sun. This planet has one Moon, which they call Moon. The life forms of Earth aren't very intellectual if you ask me. Since its formation, the orbital path of Earth has changed a fair amount. It has slowed down due to a process called gravitational braking from its moon. This is caused by the moon's gravity subtly affecting Earth's



orbital pattern. Earth has also had the same effect on the moon, as it's gravity has changed and restructured the moon's orbit over the years. The moon's orbit path has slowed down and become farther away from Earth over time, moving little by little every year. Another major change has been Earth's surface over the years. When it formed, the surface temperature was 400 degrees. As it cooled, meteors hit it, containing water. Due to this, the planet became covered in large oceans and it continued to cool as rocks on the surface absorbed atmospheric carbon dioxide, until it was almost completely covered in ice. Over time, that ice melted, and around 400 million years ago, the planet's first continent formed, called Gondwana. Since then, more land has been created and destroyed, and land has been moved around. The land has formed into seven continents, through tectonic plate movement, erosion, landslides, volcanic activity, and more. Another major change has been Earth's climate. Since it was covered in ice, it has slowly heated up. As intelligent life evolved and they began to industrialize, Earth's atmosphere began to change. Humans, the top life form on this planet, have gradually put more and more carbon dioxide into the atmosphere as their economy and industry has advanced. Their planet steadily heated up until the year 2055, when they figured out how to produce clean energy and reverse the effects of climate change on their planet. This system has undergone many changes since it's formation.

Significance of Comets and Meteorites

Our imperial scientists believe that impacts from comets played a large role in the evolution of this planet billions of years ago. What causes meteors to fall to Earth is the process of accretion, which is the process of objects growing or getting bigger to the point where they may form a large rock or a meteor. These objects travel through space

and when they get close enough to Earth's atmosphere, they get pulled down by gravity and collide with the Earth. When our soldiers went back in time to view what happened, they saw that comets brought water minerals and a variety of organic molecules to the planet. These comets are also responsible for the creation of the Moon, as well as global shifts in climate and extinction of some species. Comets and meteorites struck Earth and killed billions of animals and made many species extinct. As they struck, they created chaos in the ocean, on land, and in the atmosphere. Comets are a very large chunk of ice so when it hits a surface, it displaces water in every direction.

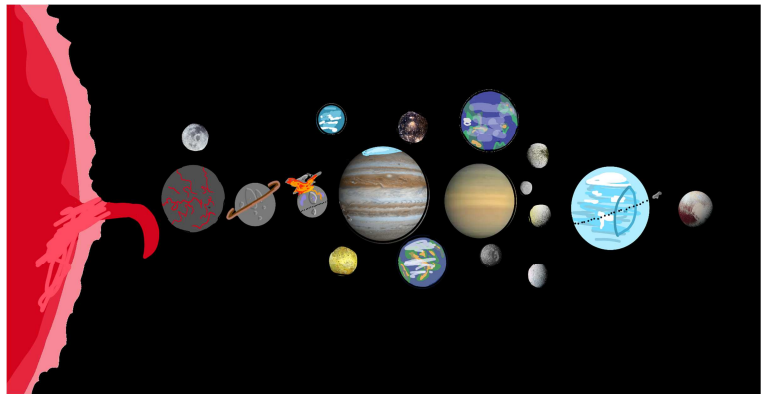
Comets and meteorites have helped our astronomers trace and learn about the evolution of this system. Comets change very little over time, so they still have a record and materials from the early stages of the solar system. This helps scientists and



astronomers study and find out the evolution of the solar system. These traces show how the planets got into their formation. Scientists studying comets can show how Earth formed and how life on that planet may have evolved. Samples of cometary dust revealed the presence of certain minerals. By scientists studying meteorites we can learn the early history of the solar system and the diverse materials that came off meteors

when they struck Earth.

At the moment, the Moon is moving away from Earth by about 1.5 inches a year, and in 50 billion years the Moon will be completely out of Earth's orbit. If by then Earth and Moon have not already been engulfed by the Sun, that will mean they will be locked together and will be facing each other as they orbit the sun. In 65 billion years, if they are still around, the Moon could possibly collide with Earth. In around 7.5 billion years, the sun could expand to engulf and devour Venus, Mercury and possibly Earth because they are the closest planets to the Sun. This could occur from the sun running out of energy and collapsing in on itself, leading to a massive explosion, which could engulf the inner planets.



Conclusion

General Clark,

As you can see we have done thorough research on this system and gathered a lot of information. Our information on how this system formed, how it has changed, planetary rotation, and comets and meteorites helps us to understand it much better. The Solar System is a very interesting system, and although it has only one inhabitable planet right now, we may be able to colonise other planets. There are many resources and minerals here, and it could aid our cause greatly. Thank you for your time, and long live the Empire!

Sincerely,

Admiral Forrest, Admiral Grady, Admiral Freskos, and Corporal Mansbridge