

Planetary Astronomy 8<sup>th</sup> Hour

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*Celestia Project Planet Paper*

The solar system I designed features many common characteristics of planets within our solar system as well as some unique objects which are relatively unknown to our solar system. My solar system consists of: four Terrestrial planets (including one 'earth-like' planet), an Asteroid belt (which houses five asteroids), three Jovian planets, three Ice planets and two comets.

**Terrestrial planets:** are those closest to the sun. They are composed of mostly rock and metal and are usually relatively small in size. All terrestrial planets have solid surfaces which "record their geological history" in that you can often see impact craters on the surface of the planet and the formation of mountains, valleys and volcanoes.

**Jovian Planets:** (also known as giant planets) are very large in size (more than 1400 earths could fit into Jupiter!). Jovian planets are made mostly of gas and do not have solid surfaces (which limits the amount of exploration we can complete as we cannot land on the planet). Jovians could be considered "vast spherical oceans with much smaller, denser cores." Most Jovian planets also have rings composed of various sized bodies of rock and ice or dust. These planets also have many moons varying in shape, size and color. Rings are held in place by what are called shepherd moons. Jovians can also have captured moons which look a lot like asteroids.

**Ice Planets:** Lay on the outer edge of any solar system. As their name highlights, these planets are mostly made of ice with some rock. Like Jovian's, Ice planets can have many moons orbiting them. In our solar system, thousands of ice planets lie within the Kuiper belt.

**Asteroids:** Are rocky bodies varying in shape and size which orbit the sun much like planets do. They are usually found within the asteroid belt of a solar system (usually between the last terrestrial planet and the first Jovian planet). Most asteroids are said to have existed before the respective solar system is formed. Some of the smallest moons of planets (for example a moon of mars) is likely to be a captured asteroid.

**Comets:** Are composed of mostly ice containing frozen gases such as water, carbon dioxide, carbon monoxide or alcohol. Comets are also believed to have existed before the planets were formed and continue to orbit the sun in cooler, distant regions.

### **The ssc. File:**

The ssc. File is a written version of a solar system. Through the combination of texture maps, meshes, orbits, eccentricities and albedo's the solar system is born. The first step I took in creating my solar system was of course designing it. I used the "Celestia Orbit calculator" to determine the size and orbits of my planets and where they would be situated within my solar system. I randomized the sizes of the planets within excel until my 3<sup>rd</sup> terrestrial planet had a radius of approximately 6000 as I wanted my third planet to be my earth like planet. Once I was happy with the organization of the solar system I then opened *System maker*. System maker is a program which allows for the convenient creation of an ssc. File. The ssc. File is a complex document that must be in a specific format in order for it to be read and understood by Celestia. The ssc. File can be edited manually, but for the inexperienced solar system-maker such as myself, System maker is a necessity. The first field requiring an entry within system maker is the star in which your object will orbit. This name of the star must be entered correctly each time in order for a successful solar system to be created. You then must classify the object you are creating as either a planet, moon, asteroid or comet. A texture map (or what the planet is

going to look like) must be selected. Then values from the ‘Celestia Orbit Calculator’ excel spreadsheet must be entered into system maker. Most values have to be entered manually however some properties such as the eccentricity or inclination of a planet can be randomized within System Maker. You continue this process in the same fashion until your solar system is complete. Once you are finished you will have a written representation of your solar system including the: Radius, Appearance, Eccentricity, Inclination, Semi-major axis, Orbital period and Atmosphere of your planets. Written descriptions of asteroids, moons and comets are also present within an ssc. File.

### My Solar system: A brief tour

Below are the 15 most interesting objects found in my solar system which orbits the star HIP 89474.

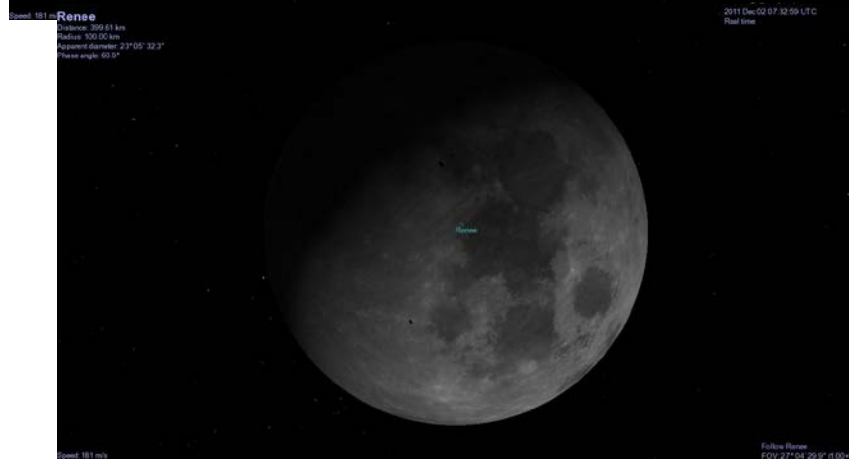
#### 1. **Jessica (Planet): 2213 km in radius**

Jessica is the first terrestrial planet and closest planet to the sun. It is similar to the planet Mercury in our solar system as it has a heavily cratered surface. There is no atmosphere present on Jessica as it is too close to the sun. There is no activity on this planet.



#### 2. **Charlie (Planet): 6607km in radius.**

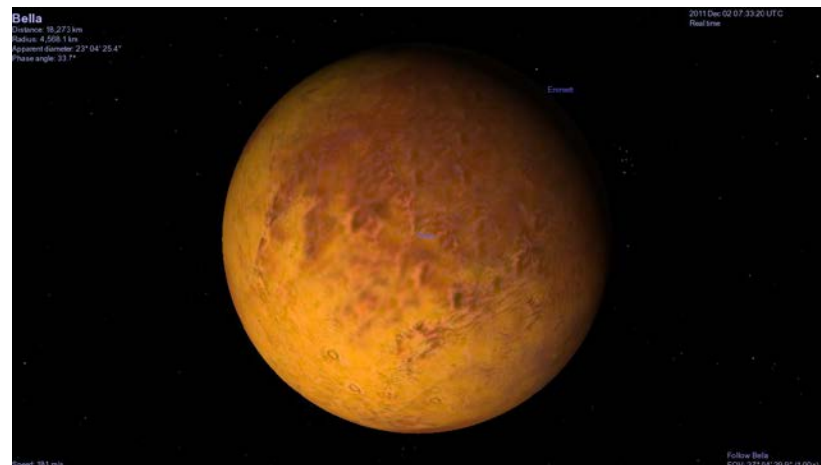
Charlie is the third planet from the sun



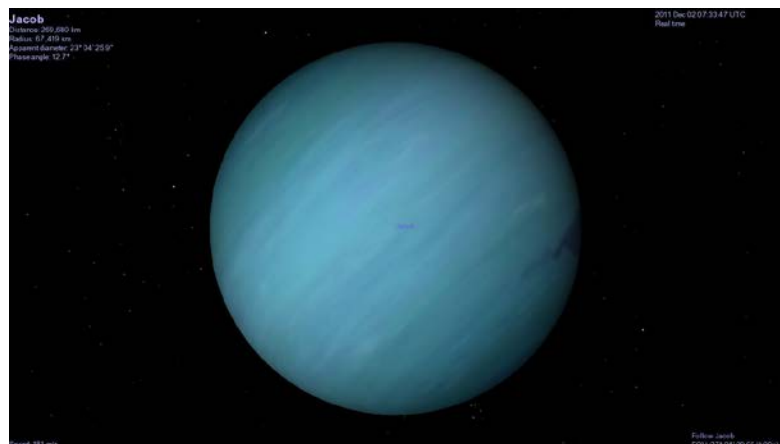
and my third terrestrial planet. It is very similar to the planet Earth within our solar system as it has landmasses, oceans, tectonic plates, continents and clouds. The atmosphere of Charlie also contains oxygen and so it is believed that Charlie can support life.

3. **Renee (Moon):** Renee is the moon of Charlie and is *very* similar to the moon of Earth. It's surface is heavily cratered and also contains rays and marea. There is no activity of this planet as there are several large craters.

4. **Bella (Planet):** Bella is the last terrestrial planet within my Solar System. Its surface is not cratered however the planet is not active. It is believed that possible weather has occurred on the surface of Bella in the past yet it is impossible to know for sure how much actually took place.

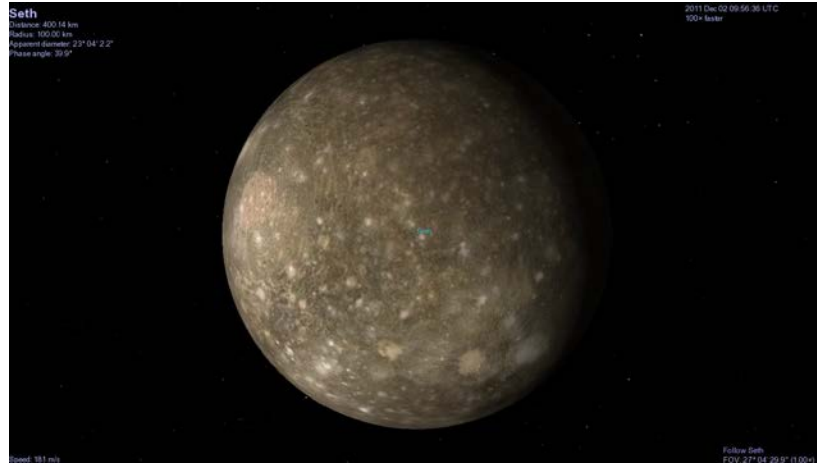


5. **Jacob (Planet): 67,419km in radius** Jacob is the 5<sup>th</sup> Planet within my solar system and the first Jovian planet. It is the largest planet within the solar system and is clearly a gas giant. It has an active chemical atmosphere and also features storms which are likely to be caused by impacts from



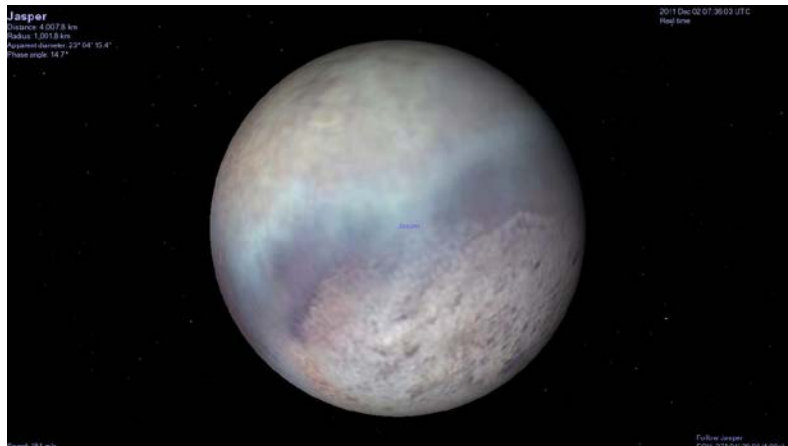
asteroids or other large bodies. The impact likely altered the composition of chemicals within that area and lead to a storm being produced.

6. **Seth (Moon):** Seth is the moon of Jacob and is heavily cratered. The craters appear to be white in color as a result of clean ice being lifted from beneath the surface of the planet during the impact. This moon is again, inactive.



7. **Edward (Planet): 62,629km in radius.** Edward is the second biggest planet within my solar system and is the sixth planet from the sun. It is surrounded by rings which are likely made of varying sized particles of ice, rock and dust. The rings are held in place by a shepherding moon and are the most easily visible rings in the solar system.
8. **Embry (Moon):** Embry is a moon of Sam (another Jovian planet within my Solar System). It is unique in that the surface is believed to have recently melted. This is likely to have occurred within the last few thousand years.
9. **Carlisle (Planet):** Carlisle is the first ice planet within my solar system. It is 1240 km in radius which is a big change from the previous planet's huge radius of 57, 489km. Carlisle is believed to have been stained with chemical ice (i.e. frozen gases).
10. **Esme (Moon):** Esme is the moon of Carlisle. It is unique in that signs of plate tectonics can be seen on the surface of this moon. The presence of Plate Tectonics suggests that there is a molten core within this object.

11. **Jasper (Planet):** Jasper is another ice planet featured within my Solar System. The surface features consist of area tinted with feint pink and blue which could suggest checmical snow. The blue areas are most likely methane snow and the pink areas are most likely Nitrogen snow.

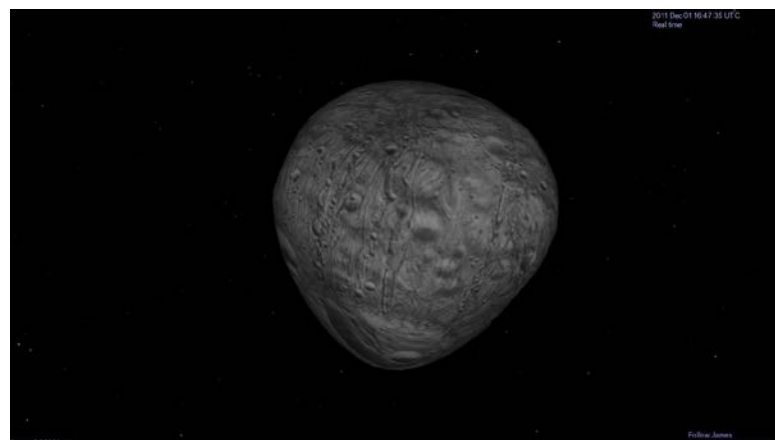


12. **Aro (Asteroid):** Aro is a very large crater with a radius of 424.3 km. It is located within the asteroid belt between the planets Bella and Jacob. It is composed almost entirely of rock and is one of the oldest objects in the solar system (as it probably existed before the solar system was created).



13. **Marcus (Asteroid):** Marcus is also located within the Asteroid belt. Its surface features show signs of colored ice. Which suggests the presence of frozen gases such as methane.
14. **James (Comet):** James is one of two comets featured within my solar system. It is

unique in that it's surface features and shape suggest that it was impacted very largely on one side, causing some of the form to shift over to the other



side of the comet and a smooth surface created around the impact.

**15. Victoria (Comet):** Victoria Is composed of mostly ice and has a very eccentric orbit. It

again, is probably one of the oldest objects found within this solar system as it likely already existed when the solar system was forming. It probably aided in the formation of the shapes and sizes of other objects within the solar system.

