Planets, Stars, and Galaxies, AST 1002.   **Prof. Daniel Sega**
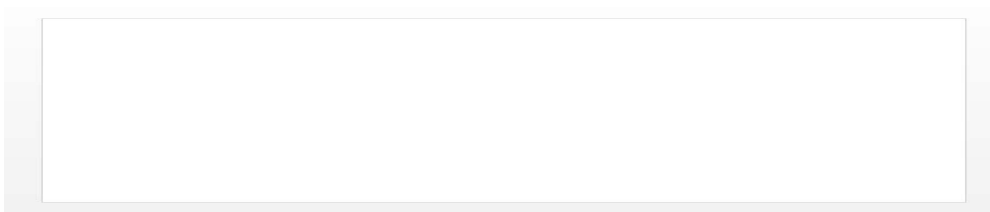
WWT Worksheet 2

Instructions: navigate to worldwidetelescope.org and click on WWT webclient. Now follow the following steps and answer the questions. The submission of this assignment is visa Canvas and you will submit a file with the question answers (in pdf format) and 4 screenshots which I will specify in the activity. The screenshots are a proof that you have navigated successfully using WWT. Have a good trip to space!
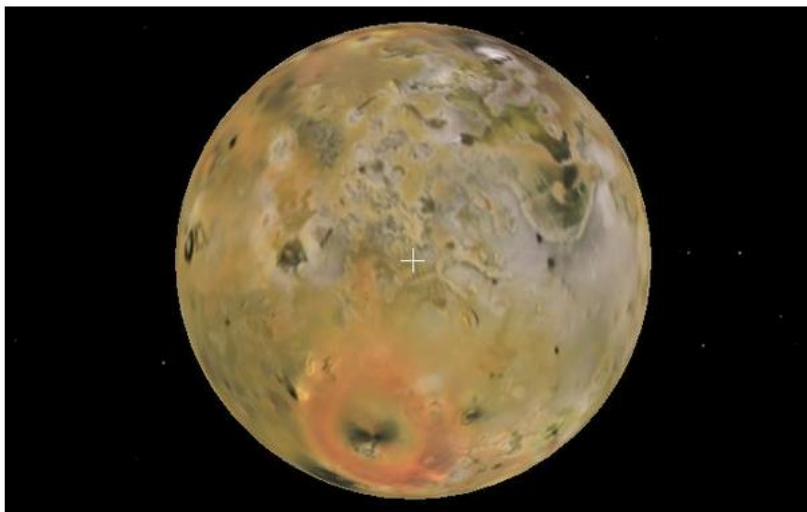
Planet

Use Planet view to explore the other planets and some of the moons of the Solar System. To enter Planet view, select Planet from the Look At menu (bottom left).

To Control the View

- Use the mouse wheel to zoom in and out.
- Click and drag to rotate the planet or moon you are viewing.
- To tilt the field of view **CTRL + click** and drag vertically.
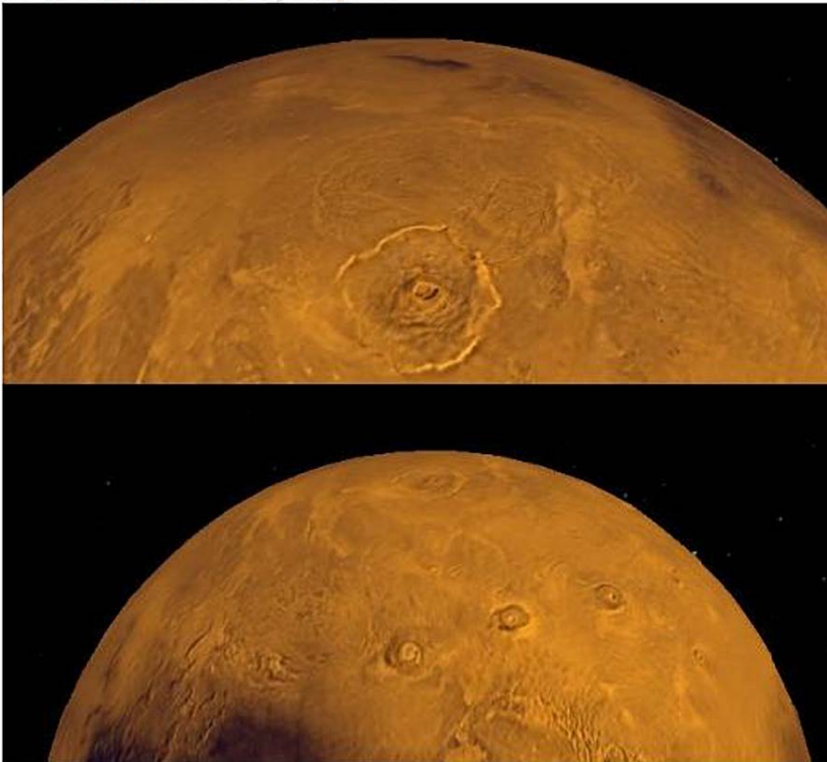- To rotate the field of view **CTRL + click** and drag horizontally.

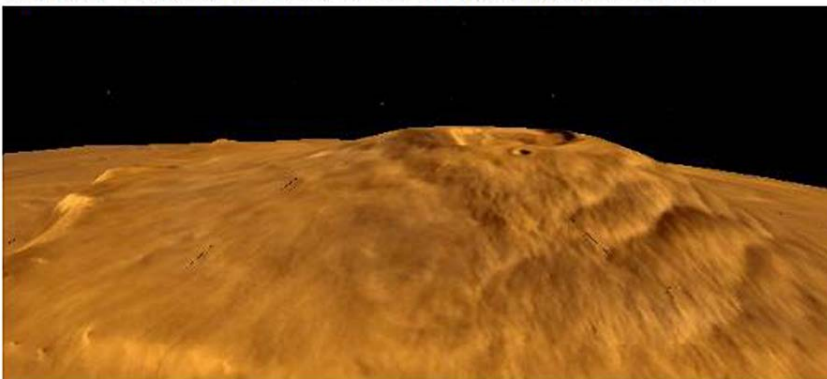Some moons are available under the Planet imagery, including Io, one of the best known of Jupiter's many moons:

Tutorial: Locating Olympus Mons

Olympus Mons is the tallest mountain on Mars (and indeed the Solar System). At a colossal 17 miles high it is three times higher than Everest. The following tutorial locates the mountain:

1. In the Look At list ensure that Planet has been selected.
2. In the Imagery list click on Mars .
3. Pan and rotate the view in order to locate the mountain, noting that it is close to the Martian equator. The mountain can be located visually either from its top-down view, which is distinctive, or from its proximity to three smaller mountains than are in a near perfect line. These two views are shown in the following images:

4. Zoom in and use the **CTRL** key as you click and drag vertically. This will tilt the view to show just how tall Olympus Mons actually is:

5. Olympus Mons is a *shield* volcano, approximately 340 miles wide. The most recent volcanic activity is estimated at 2 million years ago, so it is difficult to classify the volcano as extinct. One theory for the huge size of the mountain is that Mars does not have tectonic plates, so there is no gradual crust movement to recycle the surface. However this theory is countered by the three mountains in a line, which suggests a plate edge. The three smaller mountains are also volcanoes and are named Arsia Mons, Pavonis Mons and Ascraeus Mons, though they are smaller only in relation to Olympus Mons (Arsia Mons — the southernmost — is the tallest at about 12 miles high, Pavonis Mons — the middle of the three — the shortest at 8.6 miles, and Ascraeus Mons — the northernmost — is about 11 miles high).

6. Other surface features of Mars to look for include the great canyon, Valles Marineris, which runs along the equator and is over 2500 miles long. It is the deepest known crevice in the Solar System. Mars is also known for its plains, polar caps, and clear signs of water and wind erosion. Mars' surface temperature is quite cold, ranging from -140 to 20 Celsius. Its atmosphere is mostly carbon dioxide, but there is enough water vapor to form the occasional clouds.

Activity 1: Other surface features of Mars to look for is Valles Marineris. Find it and take a screenshot of it using the screen capture or snip function of your computer. Upload the screenshot to Canvas as a png together with the answered questions as a pdf.

Question 1: At what latitude is Valles Marineris located?

Question 2: What is the main geological processes that formed it?

Question 3: How deep is it compared to the Gran Cayon? Why isn't anything as big on Earth?

Question 4: The tallest building in Pana City is the **J.W Marriot** standing at 293 m and 70 floors. If you were to stack many J.S Marriotts on top of each other, how many would it take to reach the surface starting from the bottom of the deepest part of Valles Marineris?

Panorama

Explore the images sent back by manned and unmanned space vehicles.

To Control the View

- Use the mouse wheel to zoom in and out.
- Click and drag to rotate the view.
- To rotate the field of view **CTRL + click** and drag horizontally.

Use View > Reset Camera to restore the default view and settings.

The Apollo 12 landing site panorama provides some close up detail of the moon surface:

Question 5: You can't see the Earth in the Apollo 12 picture, but you should be able to tell if it's roughly in front or behind the Astronaut. Which is it?

Question 6: What evidence do you have for that?

Activity 2: Take a screenshot of the hill in the Apollo 17 picture.

Question 7: What is the name of this hill? Using the astronauts to scale, estimate the size of this Hill.

Solar System

Use Solar System view to explore the Solar System in three dimensions. Zoom in to view the surface details of many planets and moons. Three of the most visited objects in the virtual Universe, the Earth, the Moon and Saturn.

To Control the View

- Click and drag to rotate the planet.
- Use the Planet Size slider to increase or decrease the size of the Sun and

planets.

- Use the mouse wheel to zoom in and out.
- To tilt the field of view **CTRL + click** and drag vertically.
- To rotate the field of view **CTRL + click** and drag horizontally.

Use View > Reset Camera to restore the default view and settings.

Basic navigation is much easier using the lower panel thumbnails as the starting point, as there are only one star, nine planets, and five moons to choose from!
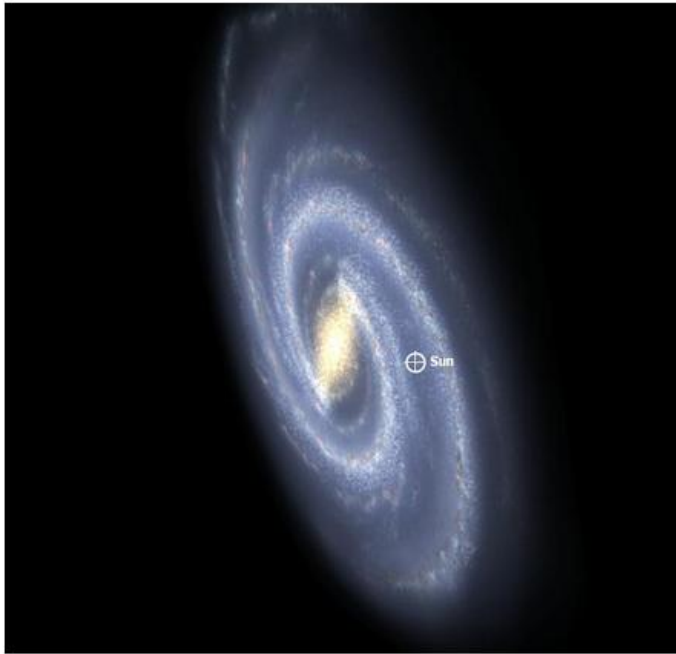

Three of the most visited objects in the virtual Universe, the Earth, the Moon ar Saturn. For this particular image planet size is magnified to the maximum:

Use the mouse wheel to zoom out from the Solar System to view the Cosmos, pausing on the way to look at the Milky Way, noted for its two large spiral arms. The crosshairs show the position of the Solar System.

Activity 3: Take a screenshot of the Milky Way and our position within it.

Question 1: Now go back to the Solar System. What object has the very inclined orbit that in misaligned with the inner planets of the Solar System?

Tutorial: Tracking a Solar Eclipse

A solar eclipse occurs when the Moon passes in front of the Sun, as seen from some locations on Earth. The result is a spectacular mid-day darkness along a path across the Earth. To view the effect in WorldWide Telescope, go through the following procedure:

1. Research a time and location of a total solar eclipse in great Colombia*. NASA has a website dedicated to this task, as do many other astronomy websites. For example, in the year 2041 April 30th, starting around 12.00 UTC (Universal time, or Greenwich Mean Time) there will be a total eclipse tracking across Africa and passing close to Lake Victoria.

2. Select SolarSystem for the Look At list.

3. Ensure that the Planet Size slider is set to Actual . The geometry will be incorrect if this is not set correctly.

4. Click on the Earth thumbnail that appears in the lower panel.

5. In Layer Manager, check Sky > 3d Solar System > Multi-res Solar System Bodies .

* I tried doing this activity with Panama only, but given our size, it was difficult to find a total eclipse

6. In the View panel ensure that the Lighting item is checked.

7. Also in the View panel change the Observing Time date information to the correct date: Year 2041 Month 4 Day 30, as one example.

8. Also in the Observing Time panel, select "UTC", then set the time to Hrs 12 Min 0 Sec 0. Click Apply . Close or unpin the Date Time Selection panel.

9. Now rotate the Earth with the mouse until central Africa is in view. Zoom in a little to see the shadow of the Moon more clearly.

10. Carefully use the fast forward button (setting it to **x100**) in the Observing Time panel to view the shadow as it moves across the continent. It should look similar to the following image as it passes Lake Victoria (at a time of 12.52.05 UTC):

To see the same eclipse but in the Sky view use the following procedure:

1. Select Sky in the Look At list.

2. In the View panel, select Observing Location > Setup and select the city **Kampala, Uganda**.

3. In Layer Manager, under Sky > Overlays > Grids , check the Ecliptic Grid setting.

4. In the View panel select Observing Time , and set the date to 2041, April 30th. Set the time to 11.30 UTC.

5. Select Explore > Constellations and click on Aries . It is in this constellation that the eclipse occurs.

6. Zoom in a little to view the Sun and Moon a bit more closely.

Activity 4: *This was an example*. Take a screenshot of a Greater Colombian Eclipse, both in the Solar system view and in the Sky view. Upload all screenshots together with the answered questions pdf to Canvas.