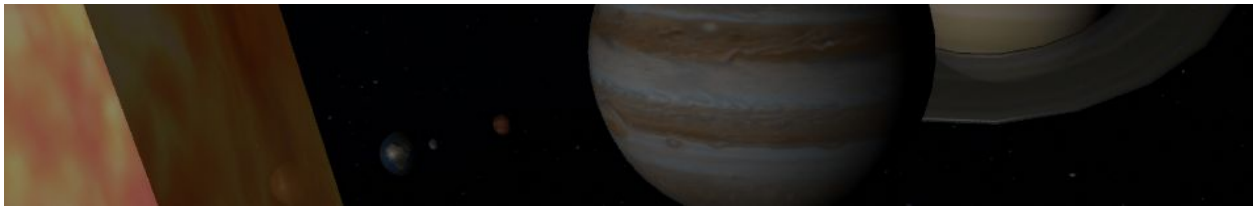
The Solar System (part one)



For this project, we will, as I imagined you assumed, construct the solar system. We will go through animation at a later point to ensure our solar system works and everything. Without further adieu, let's make some planets and some moons.

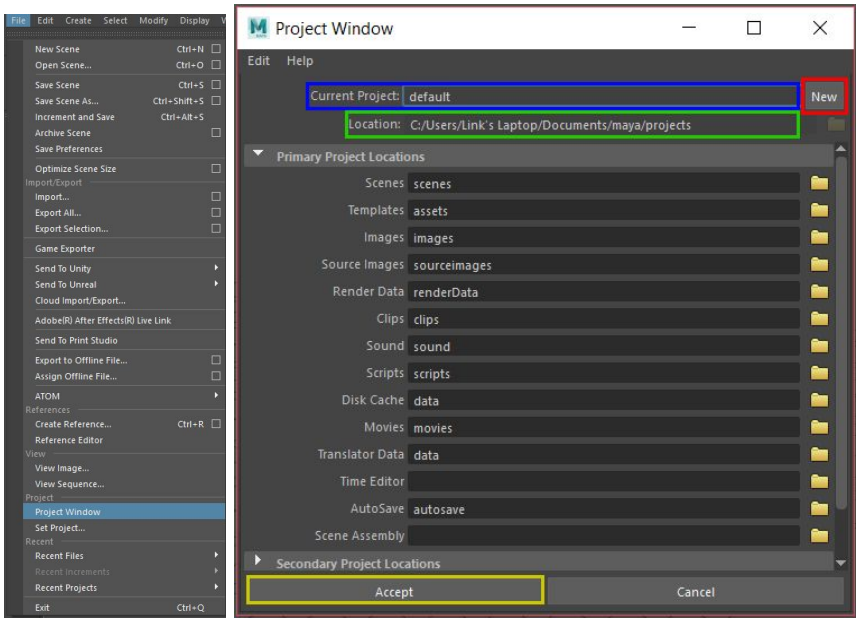
Things we will cover during this short lesson:

- Creating a Project Folder
- Creating/Naming objects
- Moving/Scaling/Rotating objects

The reason we will only focus on these few things with this PDF is that we need to make sure our distance and size make sense and looks good. I did the above using a relative scale to earth for both.

Creating a Project Folder

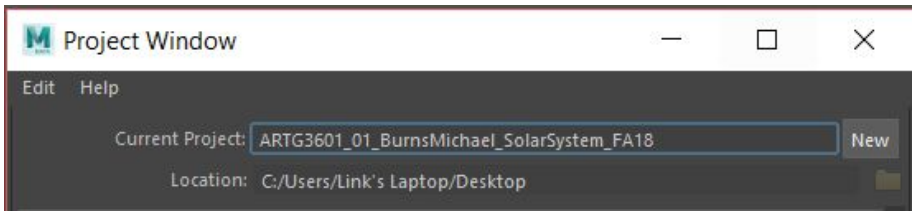
We will start by creating a directory, or project folder, for us to use. To do this, click File>Project Window. This will bring up a “project window” window that looks like the one below.



In said window, you will first select new (Red) and then name it under Current Project (Blue). Make sure you put it somewhere that makes sense and that you can find it again. You can change where it saves by changing the destination in Location (Green).

The name of this directory needs to be:
ARTG3601_YourSection_LastnameFirstname_SolarSystem_FA19

All of the projects will follow a similar pattern when it comes to the naming convention. Once completed hit accept (Yellow). Here is how it should look when completed. I saved mine to the desktop because it's easier to find that way. Yes, my laptop is named "Link", it seemed like the best name.



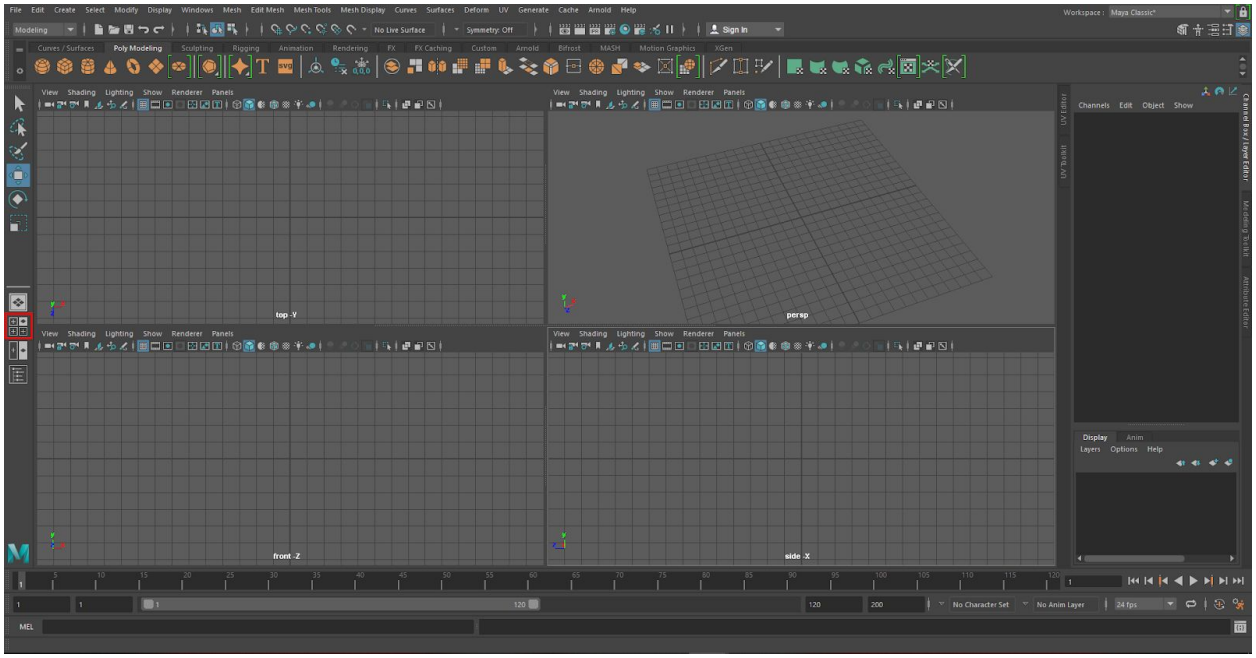
You will have to do this for every new project you make. It allows maya to know where to find your textures, sounds, video clips, anything you add to your scene. It also lets maya know where to save your scene files and where to save any images it uses for textures.

It is a good idea after closing and reopening maya to set your project. This will tell maya where you want it to look for all of your files pertaining to said project. To do this, click File>Set Project, and choose the project. You can select the folder itself and choose "set".

Creating/Naming Objects

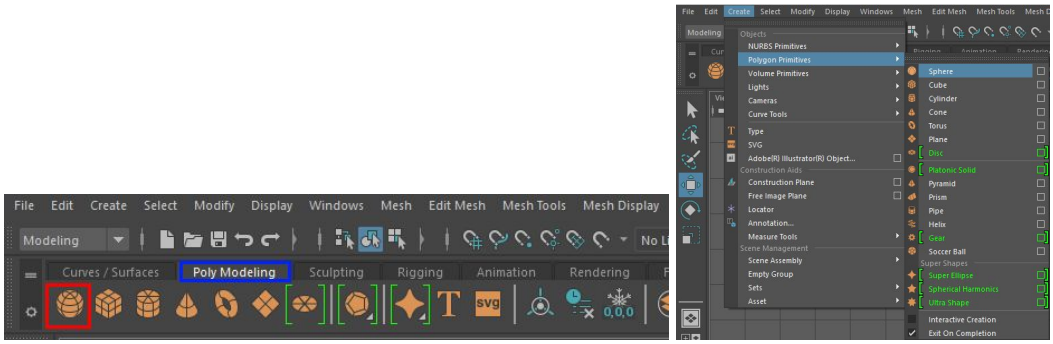
Now we need to actually make the planets and their moons. For now, we will focus on the planets and the sun. Like most things, there are around 6 billion ways to do everything in Maya. I will show you how to do it via the menu options as well as the short cuts as I tend to use them quite a bit.

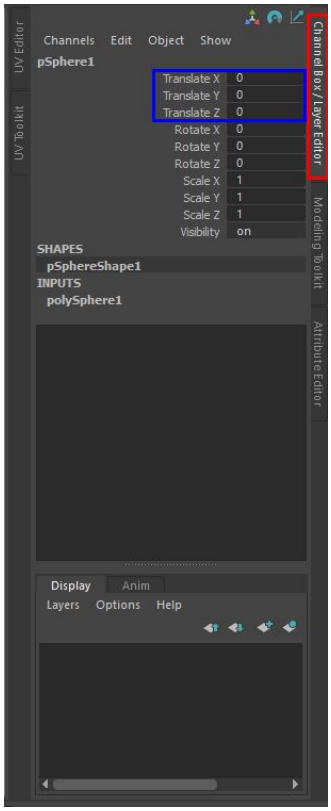
Maya's viewport allows us to see using 4 (many more, but 4 is what we will use) different cameras. Those are the orthographic cameras: Top, Side, and Front and also the Perspective viewport so you can see everything in 3D. When Maya is first opened, it will display the perspective viewport. If you press this button (Red) or hit the spacebar, it will display all 4 viewports and look like this.



If you hover over any one of those 4 viewports and press spacebar again, It will put that one in full screen mode. For the beginning of this project, we will use our top down viewport. If you'll notice at the bottom center of each of the viewports, it says which is which. The one in the upper left is the top down.

Now we will create our first object, a sphere. Which is the only object we will use for each of the planets and the sun because well.. they are (basically) spheres. To create those spheres, you can either press this button (Red), assuming you are under the Poly Modeling tab (Blue), or go to Create>Polygon Primitives>Spheres.



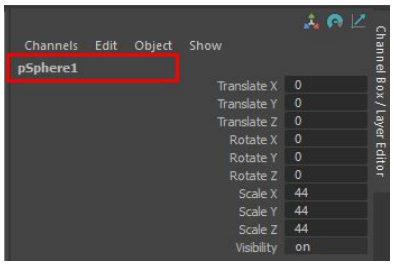


Once you create a sphere, it will appear at 0,0,0. This means that it is located at 0 on the X axis, 0 on the Y axis, and 0 on the Z axis. A quick way to check to see where the object is located is to look in the Channel Box/Layer editor tab (Red) on the far right hand side of the screen. The actual location is under Translate X,Y,Z respectively (Blue). This tab is helpful for a number of reasons, which we will discuss in a little bit. For now, we can change the size of the Sun using it. Doing it this way will allow us to input an exact number.

Now, if we were to set all of these planets, including the sun, at their exact size, relative to earth, meaning that earth's scale would be one, the sun would be 109 times the size of earth. As I likely showed you in class, exact doesn't work very well. So, what we will do instead split the solar system into two parts, using two different sets of rules for both "sides". This will help us make it look decent and keep our distance and size fairly close to accurate without causing problems. Here is the link I used for the size of the planets relative to the earth.

https://nssdc.gsfc.nasa.gov/planetary/factsheet/planet_table_ratio.html

For the Sun, we will scale it to 10 times the size of earth. You can change the Sun's scale using the Channel Box tab by Changing the scale on the X,Y, and Z to 10. (NOTE: The images that I used originally had the sun much larger, please don't set it to 44.) That will give you the Sun. Well, the size of it anyway. Now that a sun has been created, we must name it. You will need to name everything in the scene (every scene you turn in) or risk losing 10 points immediately. The simplest way to name it is by using the channel box editor. If you look at the top left of the editor, you will see the words "pShere1". All you need to do is click that and rename the object to "Sun".



Moving/Scaling/Rotating Objects

So far, we have been using the channel box tab to change our size. However, as you may have imagined, there is another way that works, but it isn't nearly as precise as we need it for this particular project. So, I'm going to pause for just a moment to explain how to move, rotate, or scale objects. The simplest option is to use these buttons to the left of the viewport. Move (Red), Rotate (Blue), Scale (Green). The way I will generally do this is shortcuts, and those are W (Move), E (Rotate), R (Scale).

Now we can create Mercury. You can just make another sphere if you want to for the time being. According to our link, Mercury's diameter is 0.383, relative to Earth. Since Earth will be a sphere at 1x1x1, we can safely say that changing the scale to 0.383 on the X,Y, and Z, we will get the size of Mercury.

Now for the distance. Remember that we are splitting the solar system up. This matters most with the distance as planets will only get further and further.. and further out. In order to make this work, we will first do from Mercury to Mars with one set of rules, and then a different set for Jupiter to Pluto. We will be moving each of the planets along the X axis, so change the Translate X value in the Channel Box editor. Since we have exact numbers, we may as well use them right? Right? Now, while we can say that 93 million miles is the distance the earth is from the sun and then do the math to figure out how many million miles each planet is based on the

link, lets just look it up instead. It is much faster that way. According to Google, Mercury is 35.98 (round to 36) million miles from the sun. The problem is that we can't use the actual distance and expect it to work at all. So, for Merc-Mars, we can use 1:10,000,000 miles the actual distance and it works pretty well. That gives us 3.6. Which is great, but we still aren't finished. If you put 3.5 into the Translate X box, you'll notice that Mercury is inside the Sun and that would likely create a problem for.. I guess just mercury, but we also wouldn't be able to see it. Being the selfish people that we are, we need to see it. So we will use the diameter of the Sun and add it to the distance we found. The diameter of the Sun, being its scale that we set, is 10, so adding 10 to our 3.6 gives us 13.6. We put that into our Translate X and viola, we can see mercury again. Now you can use the link provided, Google, and this "formula" to figure out the size and distance of the rest of the from Mercury to Mars.

Now for Jupiter and beyond. You'll notice on the planetary fact sheet that Jupiter is 11.21x the size of earth. That creates a problem as Jupiter is now bigger than the Sun. I'm not a hundred percent certain, but I'm fairly sure this isn't the case. To solve this, and this will be what we do for the rest of the planet's scale for Jupiter to Pluto, we will simply divide the scale by 3. So you can take the number from the fact sheet and divide it by 3 and it works.

The distance, we will use a formula similar to the one we used for Mercury to Mars. Except we will multiply the distance by .05. This will allow us to keep the planets closer together and still give us a decent looking solar system.

"Formulas"

Distance:
Mercury to Mars -
x(.1) + 10
Ex: Earth is 93,000,000 miles from the sun
93,000,000(.1) = 9.3
9.3 + 10 = 19.3

Jupiter to Pluto -
x(.05) + 10
Ex: Jupiter is 483.8 million miles away from the sun (you can round up if you would like)
483.8 (.05) = 24.18
24.18 + 10 = 34.18

X = Distance from the sun that you googled

Size:
Mercury to Mars -
Use the diameter provided by the planetary fact sheet linked above.

Jupiter to Pluto -

Use the diameter provided divided by 3.