Orbits Explorer

Brief Summary

Turn visitors into amateur astronomers and help them explore the known universe in depth using the powerful interactive computer program Uniview.

Equipment Required

- Orbits Table Key and Flashlight
- Orbits Explorer computer and table

Educational Strategies

- Inquiry based learning: let the visitor guide your journey.
- Scaffold learning: let the guest make predictions and test them against observations in the program.

Main Teaching Points

- Astronomers understand the universe by making observations
- Astronomers use observations to make predictions about our universe
- Basic Facts About the Solar System and Universe
- Uniview uses real images and data collected from astronomers around the world to create the visualizations you see in the program.

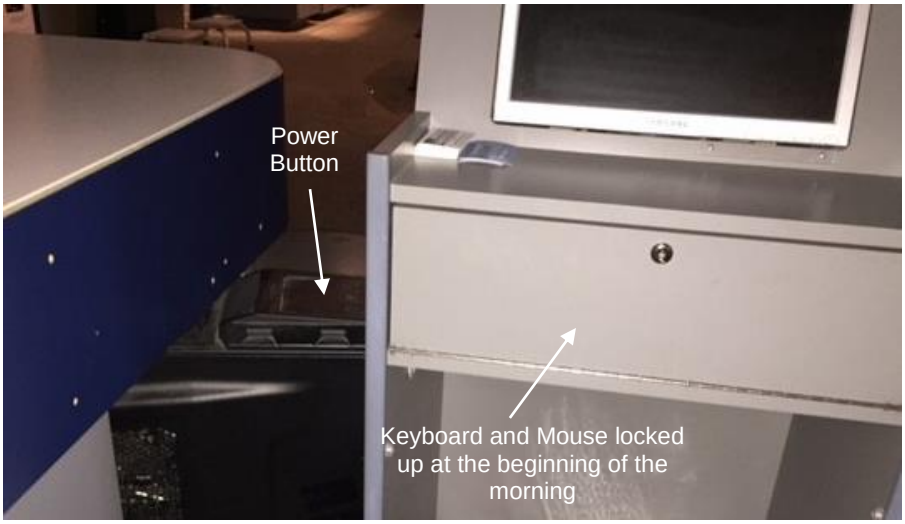
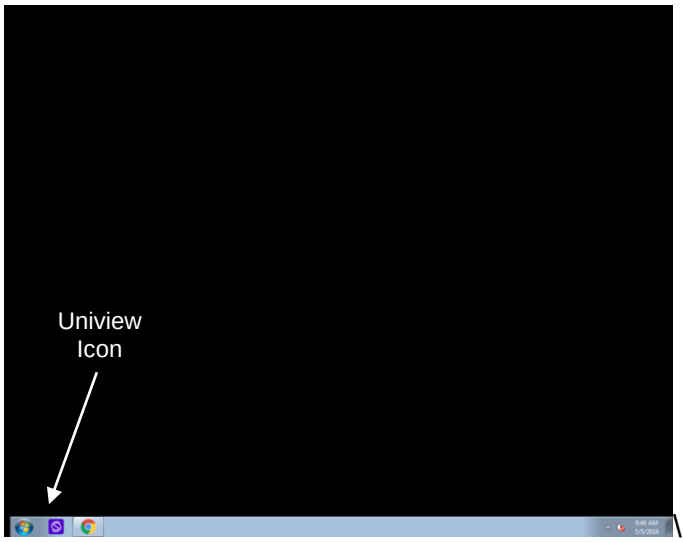
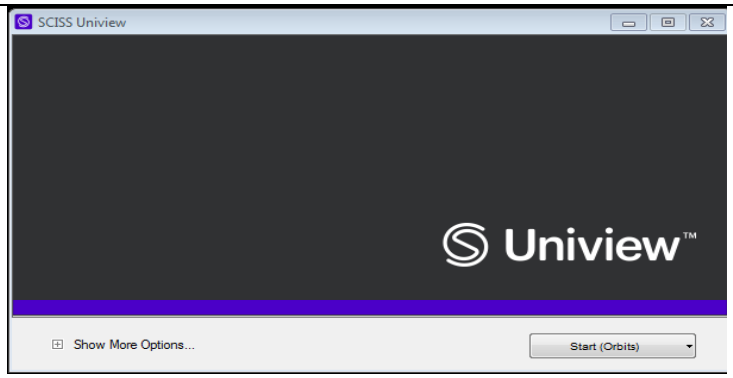
Enriching Teaching Points

- Most of our observations are based on light in some form, such as visible light, infrared light, or radio waves.
- Mathematics is key to our predictions, it allows use to depict things in our universe we have never seen.

Set Up

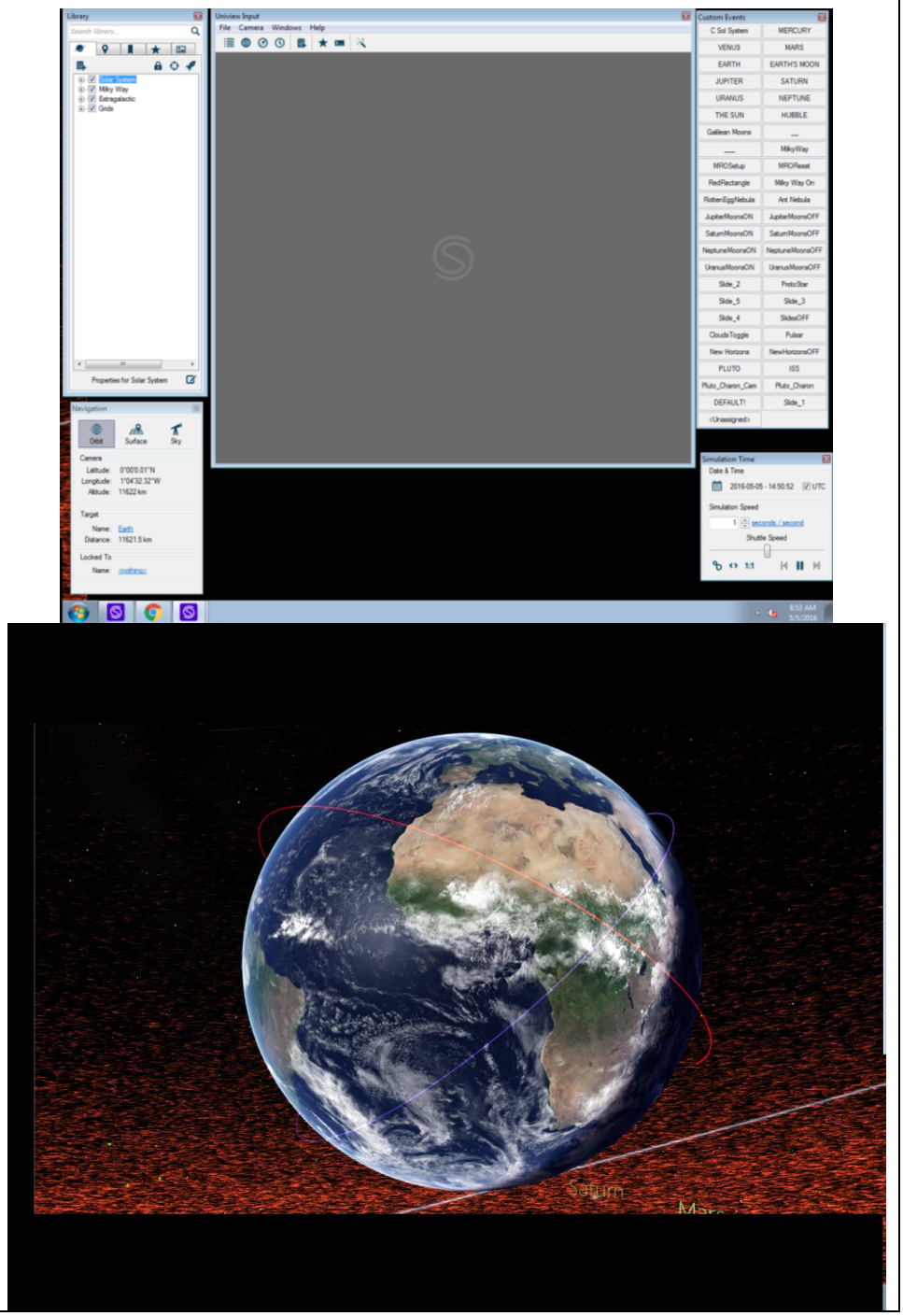
1. Retrieve Orbits Table Key and Flashlight from the Demo Storage Room

If the Computer is turned off:

Turn on the Computer used to run Uniview at the Orbits Table. The power button is located on the top of the desktop, in between the monitor station and the Orbits Explorer Table. Unlock the keyboard and mouse using the key from the Demo Storage Room	
Once the computer turns on, it will automatically log you on and bring you to the Desktop (right). Click on the purple Uniview icon on the Windows Bar to load Uniview.	
Clicking on the Uniview icon will open up the Launcher Window (right). “Click Start (Orbits).”	

Uniview will then begin loading the Orbits Table profile. Once it is fully loaded, Uniview will look like the image on the right.

On the Orbits Table itself, you will see the Earth with two satellites around it and asteroids in the background.



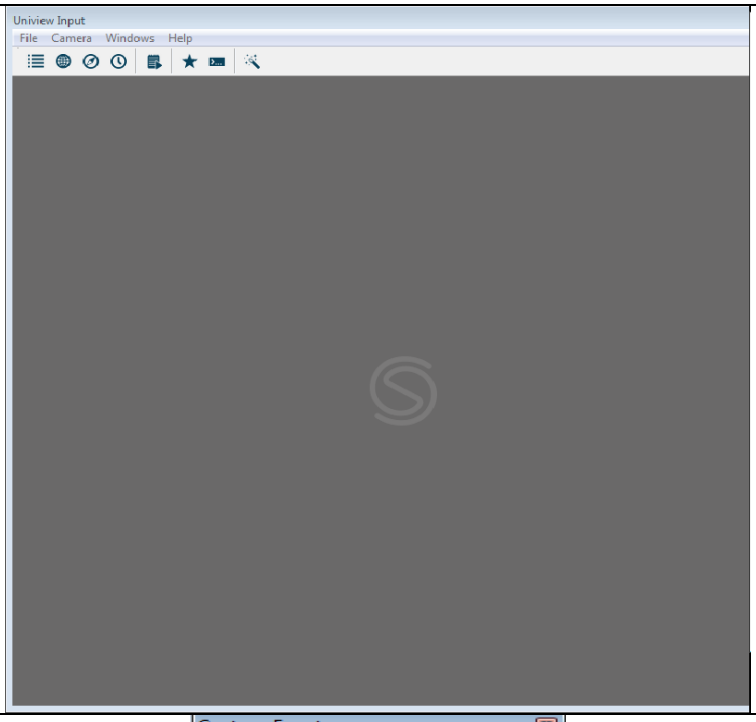
Uniview 101

Uniview Input Window
This window allows you to navigate the universe and move the “camera” in Uniview.

With the cursor over the grey area use the mouse controls to navigate.

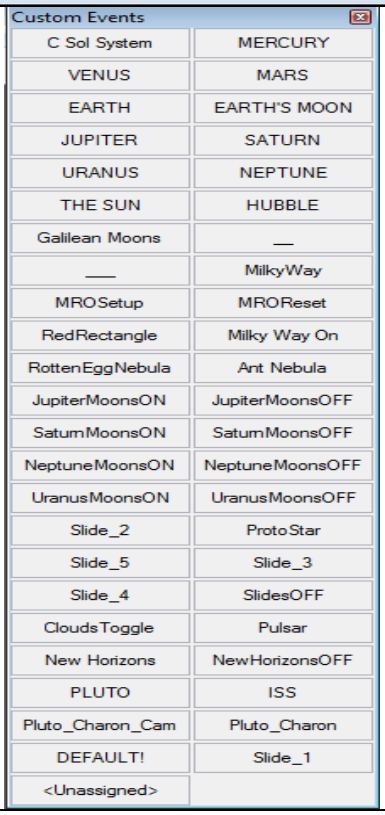
Hold down the left click to rotate the camera.

Hold down the Right Click to zoom. Push the mouse away from you to zoom in and pull it towards you to zoom out.



Custom Events Window
Custom Events are quick and easy ways to get to objects, views of the solar system, slides, or actions that are used frequently.

Left clicking on one of the buttons will perform that preprogramed action.

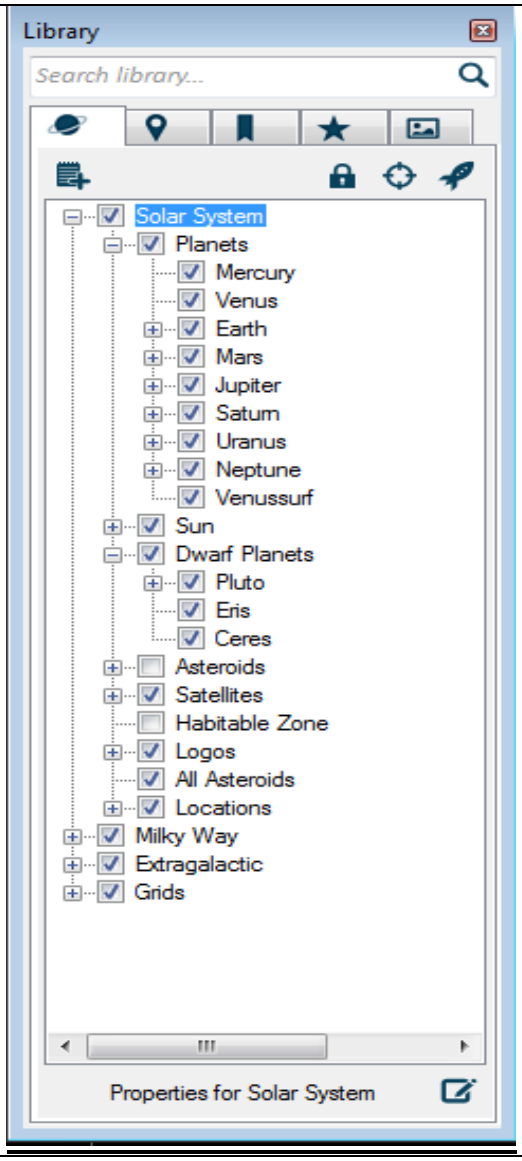


Library Window
The Object Tree is the main window you will see in the Unview Library, located under the tab that looks like Saturn. This is a list of all the objects you can visit or toggle. Left

Click on the plus boxes to open the list to more options (note: this image shows the tree relatively expanded). Left Click the minus boxes to collapse the lists.

From here, you can also turn objects on and off by left clicking the check box. To turn off the entire menu, press "Shift" on the keyboard and then left click.

While the Object Tree is what you will most frequently use, you may also use the next tab over () which will allow you to fly to locations on the surface of Earth, the Moon, and Mars.

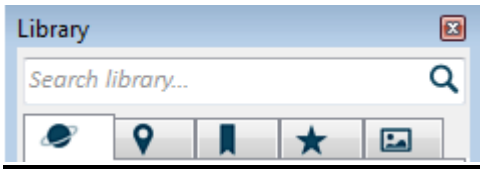
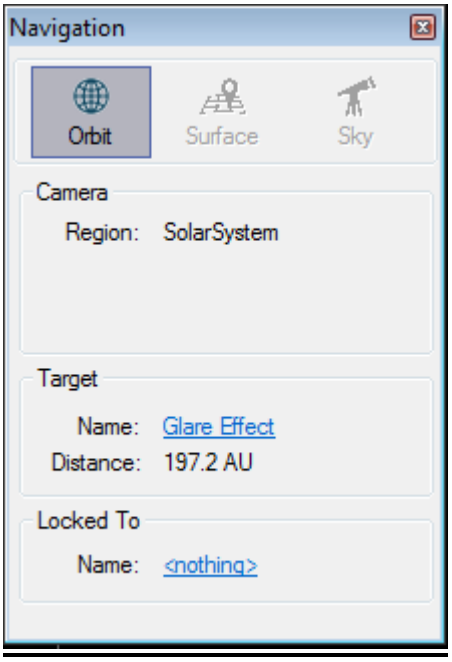


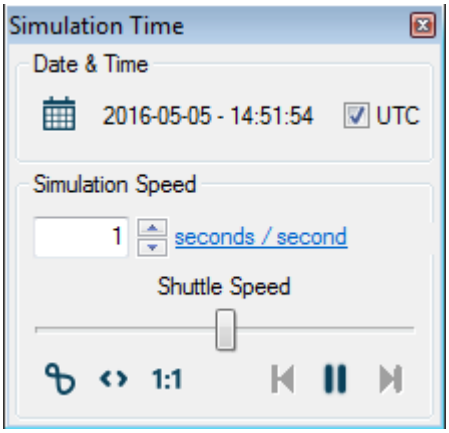
Target/ Fly to/ Jump
Right clicking on an object in the object tree will open the context menu. From that menu you can Target, Fly To or Jump To the object.

Clicking **Target** will center that object in your field of view.

Clicking **Fly To** will fly you to that object.

Clicking **Jump To** will teleport you to the object without the flying animation in between. This is the recommended method for getting to objects

with the Orbits Table since it takes less time.	
Search Bar Clicking on the magnifying glass symbol at the top of the library window will allow you to search for objects in the Library. Type the name of what you are looking for in the search bar. All results will appear underneath the search bar. Right click on the result you are looking for and use the context menu to Target/ Fly to/ or Jump to the object.	
Navigation Window This contains information about what you are looking at. Examples: the objects name, your latitude and longitude. What the camera is focused on. You can also select where you want the camera to focus on the planet. ORBIT: this allows you to pivot around an object as if you were orbiting it. This is the default setting. SURFACE: This brings you down close to the object surface and allows you to examine surface details. This is best done with surface locations, like Olympus Mons on Mars, which are located in the Library in the second tab from the left. SKY MODE: This lands you on the surface of an object and looks up towards the sky. Great for constellation viewing.	

Note: on the flat viewing screen of the Orbits Explorer Sky Mode is extremely hard to navigate and so would be rarely used.	
Simulation Time Window Use this window to travel backward and forward in time. Use the play and pause button to start and stop the flow of time. You can use this to look for a certain event, or to change the speed at which planets are rotating or orbiting to create a pleasing view. The "Shuttle Speed" slider allows you to quickly move forward or backward in time whereas changing the Simulation Speed is better for setting rotation speeds of planets	

Suggested Ways of Presenting this Demo

Politely invite visitors to have a seat with you at the table. Ask them if they have a favorite planet, moon or object in space. Choose a place that the visitor wants to see.

Fly to the object and share a few fun facts about what the visitors are looking at. Ask the visitors if they know any facts about the object.

Ask them if they know how we can understand objects so well that we have never been too. This is a great way to introduce the idea that astronomers base their knowledge on observations.

You may be very knowable about a particular object but remember that one of the goals of the table is to be audience driven. Remember that a visitor may be overwhelmed by a deluge of information or may have trouble following if you get technical. Try not to spend too much time in any one place.

Once you have explored one object for a while, ask for another suggestion and fly off to a new object and repeat the facilitation.

Operating tips

- If the computer won't turn on, crashes, or the projector won't come or is misaligned – tell your Guide Captain, a staff member in a red vest, or call helpdesk using the radio in the 2003 room.
- Something missing from custom events? Please write on the white board in the 2003 room.
- Settings been changed? Please write on the white board in the 2003 room.

Questions and Answers

Common Destinations Requested and Fast Fun Facts:

- The Moon (Luna)
  - Has no atmosphere
  - The time it takes the moon to orbit the Earth is the same time as it takes it to complete one full rotation on its axis. This is called Tidal Locking and is the reason we only ever see one face of the Moon.
  - The moon formed when a Mars-sized planetoid called “Theia” crashed into Earth early in the formation of the Solar System. This sent debris into orbit around the Earth, which eventually merged and formed the Moon
- Mars
  - Red due to the large amount of Iron-Oxide content of the Regolith or rock.
  - Dark spots are large deposits of Basalt, left over from a more volcanic time on Mars
  - Home of the Largest Volcano (Olympus Mons) and Canyon (Valles Marineris)in the Solar System.
- Jupiter
  - Red Spot roughly 1.5-3 Earth’s wide
  - Largest Planet
  - 67 moons
- Saturn
  - Rings made of Ice and Dust
  - Shepard moons cause gaps in rings
  - Very low density so it could float in a bathtub, if you got one big enough \

How was the solar system formed?
Planetary systems, like our own solar system, are a byproduct of star formation. In the denser parts of molecular clouds, such as the giant molecular cloud behind the Orion Nebula or those which preceded the famous *Pillars of Creation* in the Eagle Nebula, gravity causes gas and dust to collapse into objects called cloud cores.

Star Birth
Molecular cloud cores tend to collapse "inside-out." The center collapses under the force of its own gravity, and then the outer layers "rain-in" on top. The collapse stops only when the object forming at the center starts to heat up, becoming a protostar. Leftover dust and gas form a disk around the spinning protostar.

Magnetic fields erupt from the forming protostar and interact with the disk. Some of the disk's spin energy converts into a pair of oppositely-directed jets of gas and plasma. The luminous shockwaves of these jets, and the surrounding gases, act as signposts of starbirth.

Planet Building
Clumps of dust in the disk around the protostar grow by colliding with other particles. Some accumulate mantles of ice. As they settle into the plane of the disk, the clumps can double in

size every few hundred to few thousand years. Eventually their own gravity starts to attract other particles and gas, forming protoplanets with diameters from tens to thousands of kilometers. Collisions of ever-increasing violence mark the last stages of planet formation, which does not end until only about a dozen Moon-to-Jupiter-sized objects remain, in well-separated orbits.

Protoplanets formed in the outer disk contain ices; those formed close to the parent stars do not. Smaller rocky planets tend to form closer to the star, while giant gaseous planets such as Jupiter form in the outer reaches of a forming planetary system. It takes about 100 million years to grow a planetary system by this process, though there are other models that indicate slightly different processes and shorter timescales.

Moons, Asteroids, and Comets
Most of the gas and dust that remains in the star's disk will either be expelled by violent stellar winds and strong magnetic fields, or dragged into the star. However, ongoing collisions break up some of the larger protoplanets. A collision between Earth and a Mars-sized object is thought to have formed the Earth-Moon system.

The large "maria" and giant craters on the Moon date from the end of this era of bombardment. Some of the debris from this era survives as asteroids and meteorites.

Smaller bodies in the outer disk are ejected into the far reaches of a young planetary system by the "gravitational slingshot" effect of the largest forming planets. The ejected objects become comets that loop into the inner planetary system occasionally.

Take Down Procedure

- Go into file in the Uniview Input Window and close the Uniview program.
- Shut Down the computer
- Push the keyboard and mouse in under the monitor, close and lock the drawer.
- Return the key and flashlight to the demo storage room.

Background materials (websites, videos, articles, digital collections links)

- **Uniview Storytelling – See Oribits Explorer Page on Galaxy Guide Portal**
- http://nineplanets.org/ - The Nine Planets
- http://solarsystem.nasa.gov/planets/index.cfm -- NASA Solar System Exploration site
- http://apod.nasa.gov/apod/lib/aptree.html - Astronomy Picture of the Day
- http://hubblesite.org/ - Hubble Space Telescope Public Information
- http://www.nasa.gov/missions/index.html
- http://solarsystem.nasa.gov/missions/index.cfm – NASA spacecraft missions sites