

Understanding the Sky

- **(Introduction)** Begin with Stellarium at current time and current location. The only option that should be turned on is the atmosphere (so you need to turn off drawings of the constellations and equatorial grid). You may wish to turn off the atmosphere at some point as then you can view the stars during the daytime.
 - **Let's advance time, watch the sun set, and get ready for night time observing.** You should rotate the sky to the west, advance time, and watch the sun set.
 - Talk a little bit about Stellarium – **This is a desktop planetarium that allows us to simulate the sky for anywhere on the Earth. It is a free program that anyone can download and use.**
- **(Earth's Rotation)** *Stellarium allows us to speed up time. Let's increase the rate at which time passes and watch that happens.*
 - **Let's start looking east. What are these stars doing?**
 - **Now let's look west. What are these stars doing?**
 - **Now look south. What are these stars doing?** At some point you may wish to run on the equatorial grid as it will help observer's see that these objects are making "lazy" circles in the sky.
 - **So stars (and planets) rise in the east and set in the west? Are these objects really moving (or is it us that is doing the moving)?** You may need to ask leading questions depending on the audience.
 - **Let's look toward the north. How do these objects appear to be moving? In circles – can you identify the center of the circle? This is called the north celestial pole – it is the point in the sky that is directly above the Earth's north pole. So that when the Earth rotates – the stars appear to be moving in the opposite direction around the pole.**
 - **How long does it take an object to appear to circle the north celestial pole.**
 - Point out Polaris (the north star). **Note that there is a star very close to the NCP. What is the name of this star? What is the significance of this star? Why do you think that it is important?** Talk about navigation at sea, a marker in the sky.
- **(Constellations)**
 - **Can you recognize any patterns in the northern sky?** You should hear "big dipper", if not give a hint. Trace out dipper, point out multiple star system in middle of handle.
 - **The "Big Dipper" is what we call an asterism – a modern pattern in the sky.** Point out how the "pointer stars" of the Big Dipper always point to Polaris.
 - **Do you know what the patterns seen by ancient peoples in the sky are called?** Constellations. **What constellation was the Big Dipper part of?** Turn on constellations in Stellarium and point out parts of the Great Bear.
 - Point out other circumpolar constellations: Ursa Minor, Draco, Cepheus Cassiopeia. Ancient peoples also used the skies for storytelling. Examples.
- **(Circumpolar)**
 - Lets advance time forward again. **Do these 5 constellations disappear during the night?**
 - Explain that the equal sign = allows you to step forward in increments of 24 hours. Advance forward 24 hours repeatedly – up to 6 months. **Do these 5 constellations change with the seasons?**
 - Talk about circumpolar. These stars are always up in the sky – even in the daytime – thus, they are good ones to learn.

- (Orientation of the Dipper)
 - Talk about the orientation of the big dipper. Now it is on the other side of Polaris and the little dipper.
 - Not only did ancient peoples use the sky for navigation, storytelling, and astrology – they also used the sky as a calendar. Celestial events were useful for the timing of planting and hunting.

Star Clock Exercise

- (Rise and Set Stars)
 - Go back to Stellarium and focus on the south part of the sky. ***The other stars in the sky – the south, east, and west – change with the seasons.***
 - ***Stars rise and set 4 minutes earlier per day – so a star will rise earlier and earlier and eventually a star will rise until after sunset and you won't see it for a while.***
- (Sky Charts)
 - ***Sky charts (or star charts) are useful for finding the interesting objects in the sky that change with the seasons.***
 - Pass out sky charts and talk the students through the directions for using them.
- (Planets)
 - ***Sky charts are especially useful for finding planets. Planet comes from the Greek word for "wanderer" since they wander among the background stars. Note that our solar system is disk-shaped – like a CDROM. The plane of our solar system in the sky is called the ecliptic.*** Turn on the ecliptic (4) in Stellarium and point it out.
 - ***The sun, moon, and planets must be near the ecliptic.*** Zoom out while looking south and when you can see most of the ecliptic start advancing forward in time through the night. Point out the planets and moon that come up along the ecliptic. Go forward until sunrise which will be right on the ecliptic.
- (Current Sky)
 - Return to the current evening sky. ***Let's look at a few objects of interest in tonight's sky.***
 - ***Saturn is up in the early evening.*** Point out its location in Stellarium and zoom in on it – select it, hit the space bar to center on it, then zoom in repeatedly with the Page Up key. ***** Go to Powerpoint on Saturn *****

Build Model of Saturn Exercise

- Return to Stellarium and zoom in on the Orion Nebula. Easy to pick out with constellation drawings on. *** Go to Powerpoint on Orion Nebula ***
- Wrap-up
 - Provide link to Stellarium
 - Provide Link to Sky Charts (point our URL on Sky Chart)
 - Provide Handouts for objects of interest.