Lab 1: The Moon

Goals of Lab
This week we will be focusing on observing the moon.

Resources
East Valley Astronomy Club: Lunar Program

Terms
Some key terms and concepts that are important to know for this lab are:

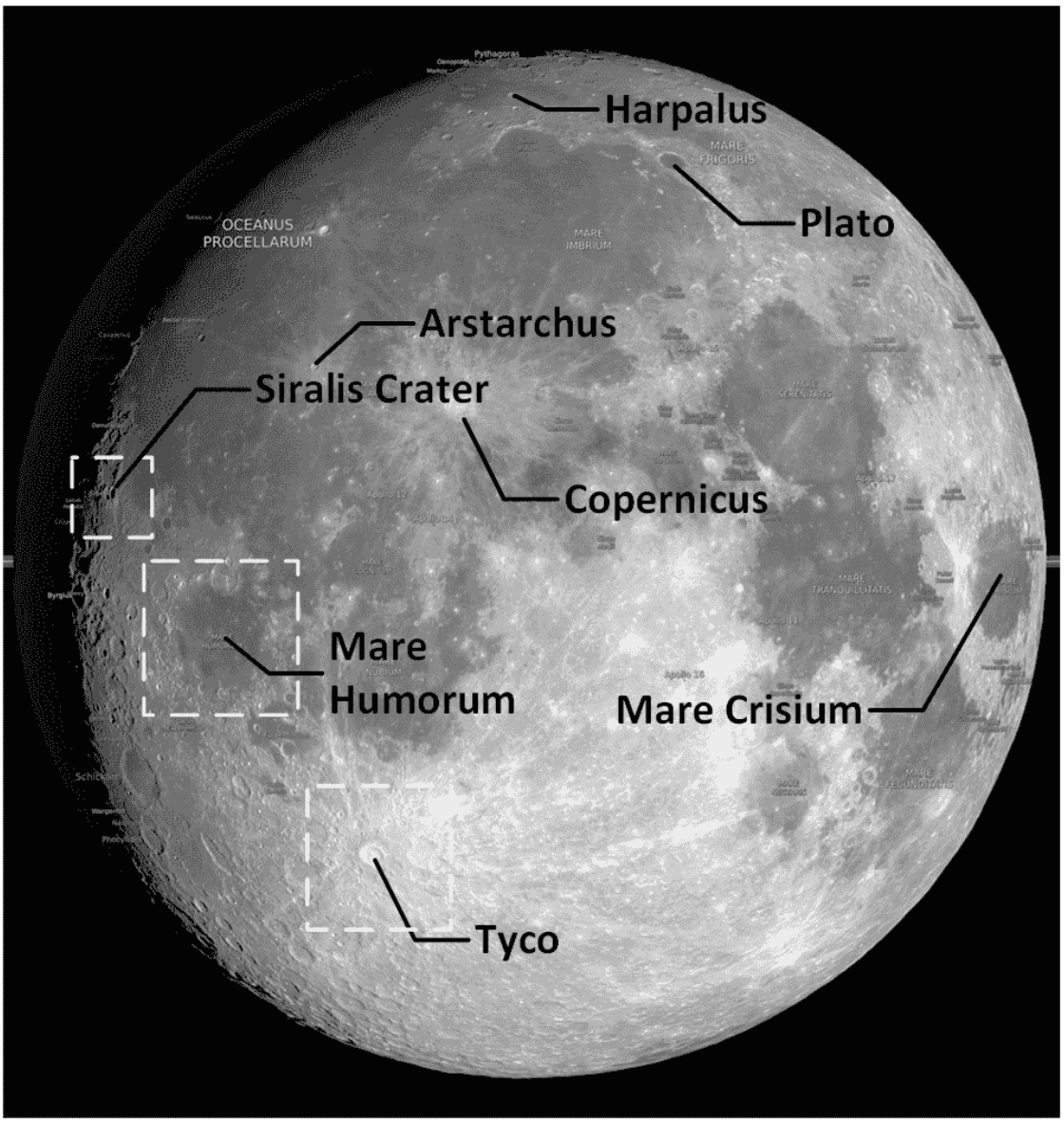
- **Apogee** – The point of the moon's orbit furthest from Earth.
- **Basin** – A large impact crater with a diameter in excess of 100km.
- **Craters** – Indentations that are bowl of saucer shaped in configuration. Formed by impact or geologic activity
- **Escarpment** – A steep slope or long cliff that forms as a result of faulting or erosion and separates two relatively level areas having different elevations.
- **Highlands** – Densely cratered and higher elevated areas of the lunar surface.
- **Lacus** – Small plain.
- **Mare** – Latin for seas. Large dark basaltic planes on the moon formed by ancient asteroid impacts on the far side of the Moon that triggered volcanic activity on the near side.
- **Mon** - Mountain
- **Montes** – Mountains
- **Palus** – A small plain.
- **Perigee** – Point of lunar orbit closest to Earth.
- **Rill** – Any of several long, narrow meanderings valleys or trenches on the moons surface.
- **Rima** - One of 18 different categories of lunar features recognized in the current system of IAU nomenclature. The IAU defines a rima as a "fissure". The term is used as prefix to the feature name.
- **Rupes** – (aka Scarp), a one-sided feature with the terrain on one side being at a substantially different elevation from that on the other.
- **Terminator** – The line on the Moon or a planet that divides the bright, sunlit part from the part in shadow. It's usually the most exciting and detailed region of the Moon to view through a telescope.
- **Terra** – Latin for land. The higher elevations of the moon.
- **Vallis** – Valley

Exercise: The Moon

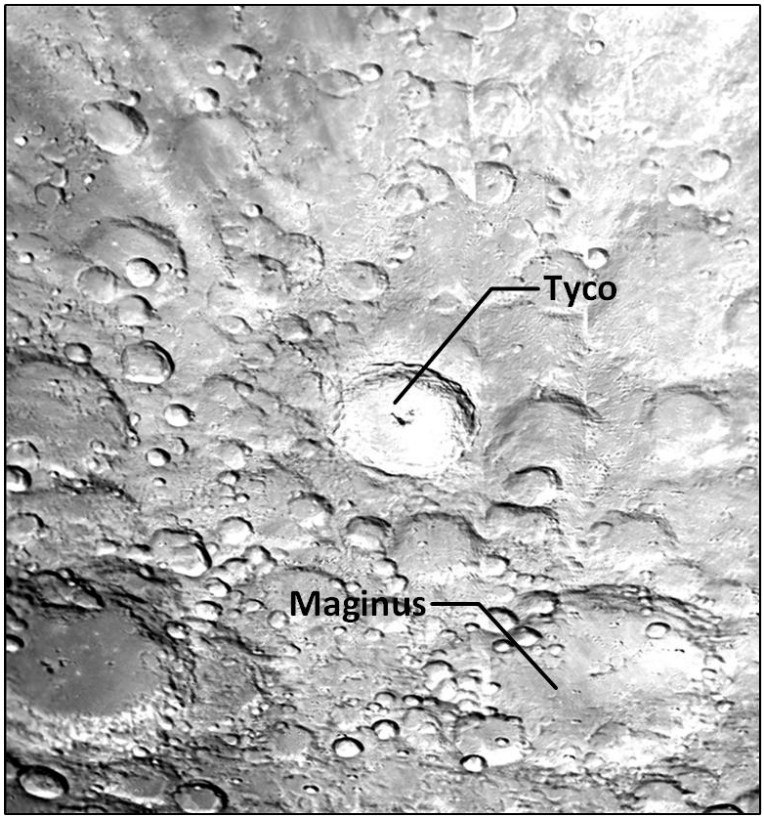
What objects of interest to view on the moon is highly dependent on the phase of the moon when you observe it. This is because features close to the terminator since shadows are more pronounced and highlights features better.

First, we need to determine the phase of the moon for our observation session. A great online resource for this is the NASA website NASA Dial-A-Moon. You can also purchase moon atlases or download an application for exploring the moon. The Moon Globe HD (iOS, $1.00) is a great application for this. A PDF map of the moon showing many features can be downloaded from the USGS website.

Using your references and knowledge of where the terminator will be for the lab, locate a few objects you would like to observed along the terminator line area. Make note of where the targeted item is in reference to one of the easily identified landmarks on the moon.



Tyco Crater



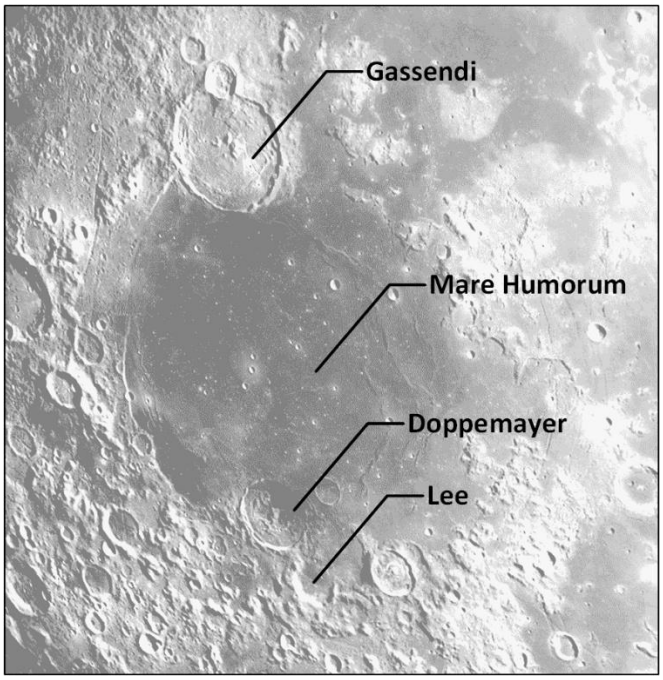
Named after the Danish astronomer Tycho Brahe, and it's probably the most recognizable crater on the Moon. Tycho is one of the youngest large craters on the Moon, at only about 108 million years old.

Central Peak – When impacted by the asteroid estimated to be 5-6 miles across when impacted the immediate area momentarily behaves more like a liquid than a solid and the floor of the crater rebounds up forming the central peak you see. Interestingly the material in these types of central peaks is composed of materials up to several kilometers (up to a mile) below the surface that then freezes into place once the material starts to take on its solid properties.

The rays. Bright streaks of ejecta spread out from Tycho in every direction, some more than 1,500 km long, and one crosses Mare Serenitatis. Fresh ejecta is bright because it hasn't yet been darkened by "space weathering" from the solar wind and micrometeorites. Over hundreds of millions of years, rays fade and disappear, so Tycho's are still in their prime. Viewing the full Moon is the worst time for crater detail but the best time for observing rays.

Questions: Note the crater Maginus just south of Tyco has a number of smaller craters in it and along it's west rim. are these craters older or younger than Maginus?

Mare Humorum



Humorum is Latin for the “Sea of Moisture” or “Sea of Humors”. A compact, almost circular mare on the southwest part of the near side of the moon, roughly the size of Iceland.

Like all the lunar maria, Humorum was formed in two steps, separated by hundreds of millions of years.

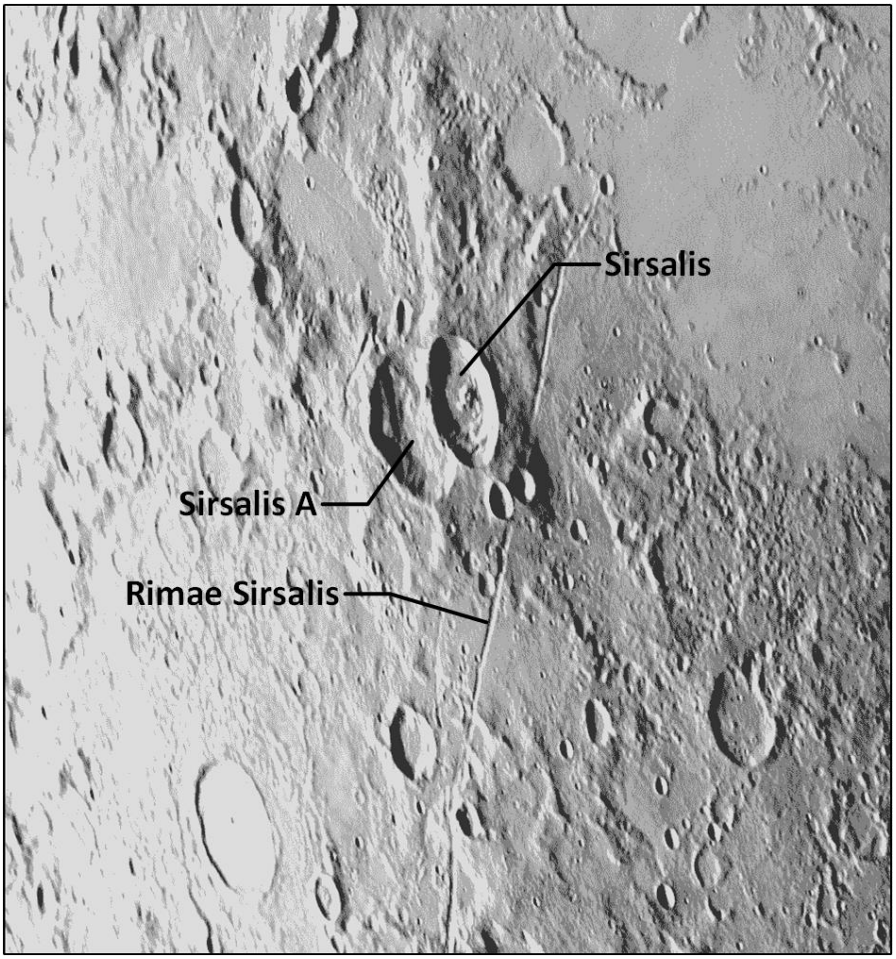
1. The basin-forming impact. First, a very large impact excavated a multi-ring basin estimated to be between 260-512 miles (425 to 825 km).

2. Lava flooding. Much later, basalt rose from the mantle and filled the basin. This basalt fill is believed to exceed 3 kilometers in thickness at the center. That dense lava is why Humorum is one of the major mascon maria, regions where the crust contains a large amount of material denser than average for that area.

After the lava cooled, the lava layers sank under their own enormous weight and deformed the crust beneath, creating wrinkle ridges, fracture zones and escarpments around the edge of the basin.

Doppelmayer and Lee on the southern shore, partly flooded craters whose seaward walls are breached or buried, so they look like bays.

Siralis Crater



Named after Gerolamo Sersale, a 17th century Jesuit who produced one of the early telescopic maps of the moon. and is approximately 26 miles (42 km) wide and was formed by the impact from a large asteroid.

Central Peak – Note the central peak

Rimae Sirsalis – One of the longest rilles on the Moon, running roughly 250 miles (400 km) northeast to southwest just east of the crater. It's a graben, a strip of crust that dropped down between two parallel faults. It's thought to sit above a buried dike, where magma rose and stretched the crust above it. It crosses craters and highlands with no regard for the topography, which is a nice clue that it formed later and from below.

Questions: Note the Rimae Sirslis runs right through a small carter just SE of Sirsalis, did this impact happen before or after the Rimae Sirsalis was formed? What crater is older Sirsalis or Sirsalis A?

The Planets



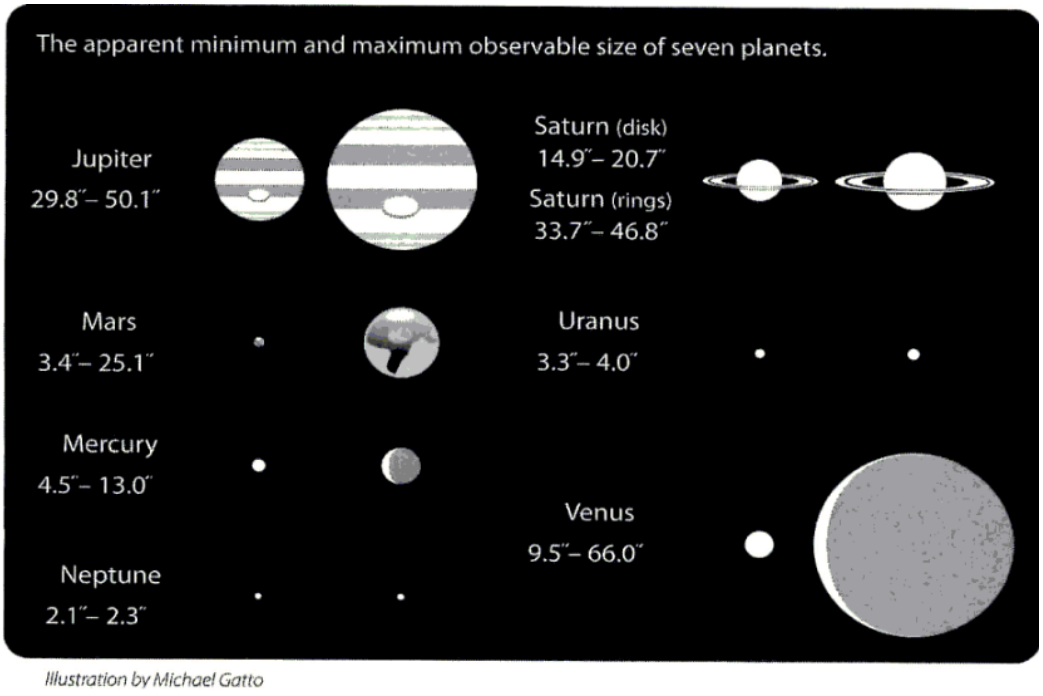
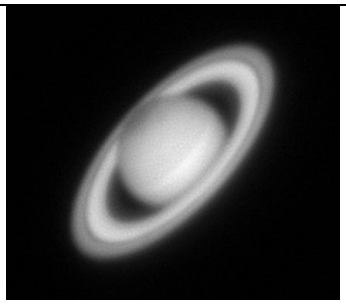
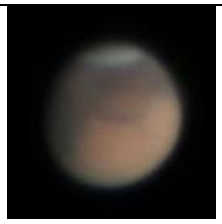


Illustration by Michael Gatto

Planetary viewing is particularly dependent upon the seeing conditions. These are fairly bright objects, so higher magnifications will bring some benefit but again, will be limited by how good the seeing is for the night. It usually is best to observe the planet for at a couple of minutes, since you will notice that there will be moments when the view gets particularly good for a split second before the atmosphere muddies the image. It is at these moments when you may catch a glimpse of some of the more subtle features of the planet.

2026-10-23

Mercury | Set = 06:27pm
Venus | Set = 09:12pm
Saturn | Transit=10:53pm | Set = 05:03am

Image	Description
	**Jupiter** Usually, the two main bands are visible, and sometimes the great red spot is visible. The four major moons of Jupiter: Io, Europa Ganymede and Callisto appear as for bright stars in the same orbital plane circling the planet. Occasionally one of the moons transits the planet and if the seeing is particularly good you can see the moon shadow make its way across the surface of the planet (Cool!). Inspect the image here and you can see the two main bands, upper and lower bands, the great red spot and even the shadow of a moon near the pole of the planet.
	**Saturn** Rings of Saturn should be visible. When seeing is particularly good you may be able to spot the Cassini Division in the rings. A number of the moons of Saturn are typically visible, but unlike Jupiter the main moons of Saturn are not in the same orbital plane, so they are harder to distinguish from the background stars. *The Cassini Division will not be visible for us since the rings are almost edge-on.* The Cassini Division is clearly visible in this image.
	**Mars** Generally, not much in features can be seen except some lighter and darker regions can be glimpsed. Careful observation may reveal a light region in the top or bottom of the planet. This is a polar cap that grows and shrinks as the Mars Winter progresses. Lighter and darker regions of Mars along with the polar cap is visible in this image.
	**Venus** No features of Venus will be visible. What is interesting to observe is that since Venus is an inner planet, it displays phases like the moon. No features to see, but a phase is clearly visible here.