

Our Corner of the Universe
AST 101, FALL 2007
LUNAR PHASES I: THE MOTION AND PHASES OF THE MOON
Week of August 28

In this activity you will observe how the Moon changes position in the sky and how its appearance changes as it moves. You will also study the lunar surface.

For this lab you will need:

- a sheet of drawing paper. The larger, the better. You will need at least 11" × 16"
- a blank sheet of paper and a ruler
- a table of times of "moonset" at Syracuse (check the web)
- read Cosmic Perspective, pp. 39-40

During Lab Session:

Your TA will explain the observations you will be making while outside. The procedure is described in detail in the next part of this handout.

Outside:

A complete cycle of lunar phases requires about 29½ days. You will follow the Moon for almost half a cycle, about two weeks. During this time, you will be recording the appearance of the Moon, that is, how much of the lunar disk is illuminated, and also the position of the Moon relative to the landscape. It will be easiest for you to begin your observation shortly after the new moon. The moon will be new on September 11 and will be new again on October 11.

The observations will be easiest to do if you chose the time of the first observation so that the moon is near the western horizon (i.e. just before moonset; see tables or newspaper).

You will need to find a spot with a clear view of the horizon and of the sky; especially its southern portion. Identify some low-profile landmarks near the horizon, such as trees, buildings, or telephone poles. All your observations must be done from the same location and approximately the same time (except for #5). Good locations are Mt. Olympus (best); northern most point on law school plaza; N.E. corner of quad; corner Euclid and Comstock.

In addition to the observations described below, you should also study the Moon through the telescope or binoculars during designated observing evenings. Make a single sketch of the features of the Moon as seen through the telescope. Try to be accurate and include as much detail as you can. Please note that although you are asked to make a number of observations, you need only submit one drawing of the lunar landscape.

You need to make from 4 observations, spread evenly over the ten days to two weeks. Since the weather may hamper your observations, you do not want to let clear nights go by. Make one observation (#5) at a different time of day from all the others. You might even want to do this observation during the day!

Your first observation may require about half an hour, but succeeding observations will require only 5 minutes.

On your first observation, you may want to go out about half an hour before the optimum observing time in order to get enough information.

To make a scale drawing you will need to measure the angular height, width and separation of a few landmarks around your observation site (at least four, spread over as big an angle as possible). The most convenient procedure is to measure the angles using your hand measurements.

To report the landmarks on your drawing use one of the following *scaling rules*:

- $5^\circ \Leftrightarrow 1 \text{ cm.}$
- $5^\circ \Leftrightarrow \frac{1}{2} \text{ in.}$

Label the landmarks on the drawing with letters of the alphabet a, b, c, etc.

Mark down also the cardinal points: East, South, West, and North.

The following are the steps necessary to complete the activity during all the 4-6 night you choose for your observations.

To plot the position of the Moon, select a landmark near the Moon and from it measure *how far up* and *how far right/left* the Moon's center is located using the above scaling rules. Then fill in the table below. In the column where you have to report how far on the right/left of the landmark the Moon was, put (near the distance in degrees) an R/L if the Moon was on the right/left.

Table 1.

	Date	Time	How far up ($^\circ$) W.r.t. landmark	How far R/L ($^\circ$)	Moon's Phase
Observation # 1					
Observation # 2					
Observation # 3					
Observation # 4					
Observation # 5					
Observation # 6					

By recalling that 5° corresponds to 1 cm (or $\frac{1}{2}$ in), plot the position of the Moon on your drawing. You may want to forget about getting the Moon's size to scale and use an object (like a coin) to draw the Moon: shade the portion of the lunar disk that is illuminated.

Number the observations on your drawing.

Lab Report:

Your report should include:

- a) Table of "Moonset" times
- b) Table 1
- c) Plot of the Moon's positions you recorded
- d) Sketch of the Moon's features as seen through the telescope or binoculars
- e) Answers to the following questions

1. Did the Moon move with respect to the landmarks? In which direction?
2. Why did the Moon move? Be explicit.
3. Estimate the average daily rate of motion of the Moon from your observations. How long will the Moon need to make a full circle, according to your observations?
4. Where would the Moon have been if you had observed #6 at your regular observing?
5. Is there any correlation between Moon's phase, Moon's position in the sky and its position with respect to the Sun? Explain.

Due week of October 8

Acceptable until November 8 with -1 point penalty.