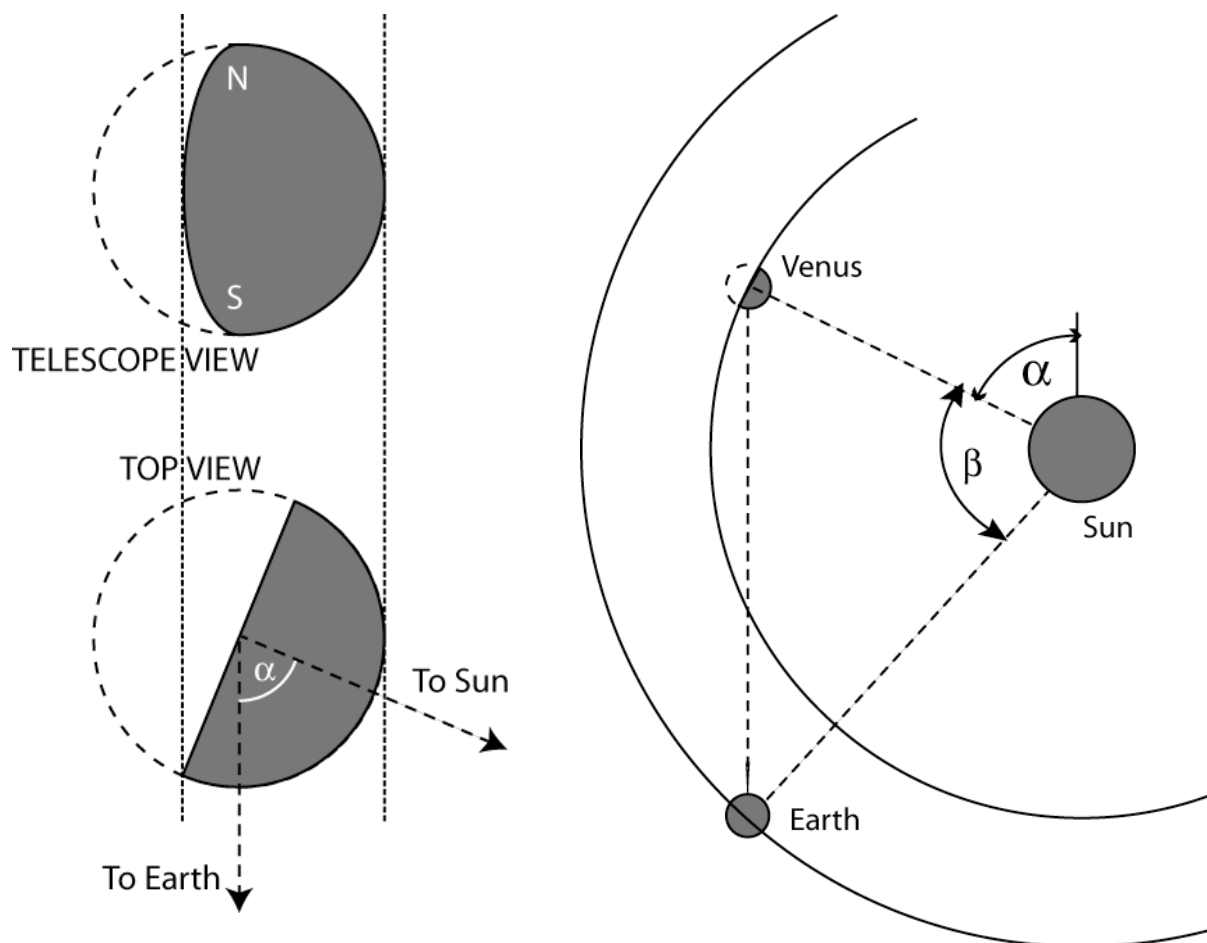


Lab #17b: The Phases of Venus - Gibbous

By now you have already made a decent proportional drawing of Venus as it looks in the telescope. You will use this drawing (choose one of your drawings if you have many) to find out where Venus was on its orbit at the time of your observation. You will gain insight into why the planet shows phases the same way as the Moon does.



In the following we show how the geometry is worked out. You'll need to repeat this procedure using your own drawing of Venus and come up with your own numbers.

The phases of Venus are caused by the changing illumination from the Sun. The starting point is the TELESCOPE VIEW in the picture (the *grey* area is the visible part). Under this picture is a TOP VIEW of Venus as it would look like viewed from above its North Pole. The vertical dashed lines were drawn to determine which part is illuminated (in *grey* again). The next step in the drawing is to find the direction of the Sun, based on the direction of the sunlight. You'll need to draw it and use a protractor to measure the angle α as indicated. You'll notice that this angle α will be how far from the Sun in the sky an observer located on Venus would see Earth. For the next step you will need to produce the equivalent of the second picture that shows the orbits of Venus and Earth. The two angles both denoted α are equal, so you will be able to draw the line from the Sun towards Venus in your drawing and determine where the planet is. Next, draw the vertical dashed line to find Earth on your drawing.

When you complete this procedure, you will see where Venus, Earth and the Sun are located relative to each other. The angle β , which you can measure now, is going to tell you how far ahead Venus is on its orbit. Venus shines 292 days as evening star - that is, it takes 292 days to make a half a circle, which means that this angle β decreases from 180° to 0° in 292 days. Now you can calculate how many days it will take before Venus comes closest to Earth and disappears for the observer in its light.

Why does this matter? Galileo Galilei discovered the phases of Venus, because he was the first one who looked at Venus through a telescope. He used a geometrical procedure to prove that Venus orbits around the Sun and not Earth. You will now follow this procedure and yourself prove that this is true; so that in effect you prove that Copernicus' heliocentric view of the Solar System is the correct one. You'll make a prediction and verify its correctness. This is how science is supposed to work in reality.

In case you do not have a drawing of Venus, use this old drawing:

Venus, 8/12/2009



Note that the drawing must be turned the way to match the telescope view. An observer will not have an 'up' and 'down' direction in the sky.

PROCEDURE AND LAB REPORT

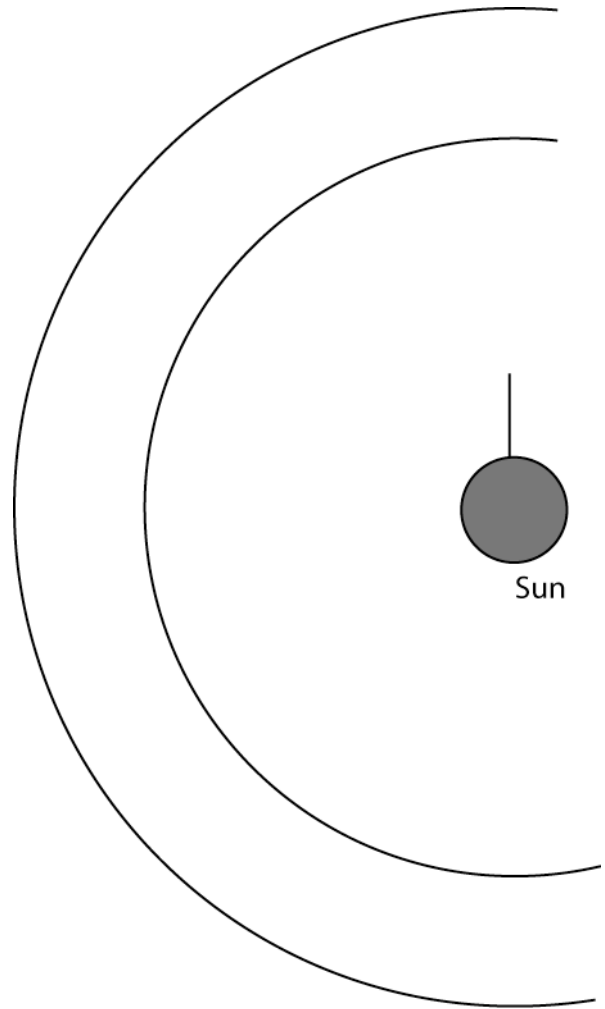
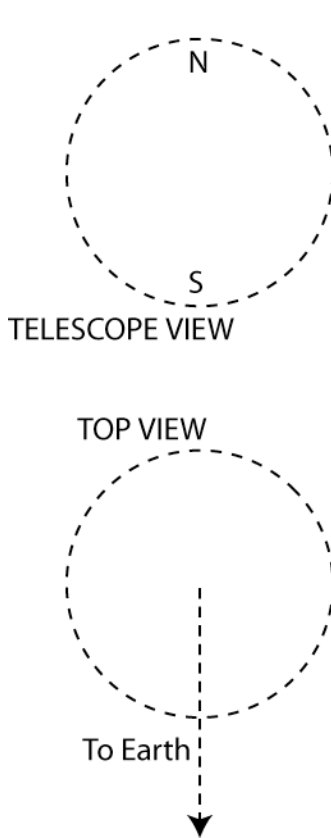
Date: _____ Your name: _____ Partner's name: _____ Section: ____/____

Maximum two students may work together as partners!

This laboratory requires that students draw on the picture below. For this reason, this page of the report must be printed out and the paper copy must be used.

The date and time of the original drawing of Venus: _____

Follow the above sample procedure to find where Venus is on its orbit. Use these blanks to draw.



Your values for the angles are: $\alpha = ___\circ$ $\beta = ___\circ$

You expect Venus to take _____ more days to arrive between the Sun and the Earth after the date of your observation, which happens on _____, according to your prediction.

Now, open up SkyGazer on your computer, set it to "Now", time step 1 day, and read off the date of the inferior conjunction by taking 1-day steps (forward or backwards, as needed). The date is _____ in actual fact.