# *Lab A-1:* **Voyager**

**Purpose:**
1. To make a variety of observations of the sky, specifically looking at the motions of the sun, moon, planets and constellations.
2. To understand the types of motions people have to tried to explain with various models of the solar system/universe.
3. To define several astronomical terms.

**Procedure:**

1. Turn on the program called "Voyager III." In describing the motions of objects, refer to compass directions, not "left" or "right." You can set the time stamp, the time between screen updates by the little menu on the top of the floating window in the top left part of the screen. You can close the other two windows that may first appear. Keep in mind that the program is trying to map a 360° view of the sky onto a flat screen. Depending on the method used to transform a 3-D coordinate, the "sky" can appear to do strange things. It is probably best to use the "Chart/Projection/180° Orthographic" projection, and make sure that it is set for "Chart/Coordinates/Local Horizon."

*Part 1: The motions of the stars.*

2. Describe the motion of the stars over the course of a night. Make sure the time stamp is set for a few minutes, and not days.

3. Find the North Star (Polaris) and watch it over a night. (If you can't find it, use "View/Find and Center..." Describe what you see.

4. Set the time stamp to a few weeks and run the simulation. Do the stars ever move with respect to one another?

5. Give two models that would explain these motions.

*Part 2: The motions of the sun and moon.*

6. Describe the motion of the sun and moon over the course of a night/day. Do they move against the stars?

*Set the time to about 5:30 pm and look to the west (you should see the sun.) Set the time stamp to one day and run. It may be easier to turn of the "Chart/Natural Sky..." so that you always see the stars, even in the day.*

7. Describe the positions and motions of the stars.

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8. Describe the motion of the sun.

9. Describe the motion of the moon.

*Part 3: Planets. Increase the time stamp a few days, and also turn on "Display/Reference Lines..." and choose the ecliptic equator after clicking on "Show reference lines". To see the names of the planets, click on the "ABC" button in the upper right of the window. This may be easier to see by picking to "Charts/Coordinate lines/Solar System."*

10. Describe the motion of the planets from day to day. (There is a lot to this! Describe where the planets can and cannot be in the sky, the directions and speeds they travel, and any thing else that sets them apart from the stars and from each other.)

**Questions:**

1. Define the following terms (you will probably have to look some of these up.):
   ecliptic

   celestial equator

   equinox

   solstice

   retrograde motion

2. What is meant by the phrase "fixed stars"?

3. Describe the motion of the planets with respect to the "fixed stars."

4. What is different about the motions of Venus and Mercury compared to the other planets?