

Planetary Motion

Description: Record the change in the position of two naked eye planets over the course of the semester.

Materials needed: Two sheets of sketch paper, planisphere

Resources:

Monthly Sky Chart

Instructions:

- (1) These observations are similar to the ones that you are doing for the Observing Journal, however you will need to observe the planet Jupiter more frequently than is required for your observing journals (about once per week instead of once per month) and will also need to record the location of another planet at similar intervals.
- (2) Jupiter is visible in the constellation Gemini in the early evening throughout the Spring, 2014 semester. Before you even go outside to observe, use the Monthly Sky Chart and your planisphere to determine where to look. You may use the star chart that you were given in class to record its location.
- (3) Use the Monthly Sky Chart website (<http://www.skymaps.com/downloads.html>) to find another naked eye planet. Saturn and Mars are good candidates, visible later in the evening. Do the same observation, but this time you will need to make your own sketch. Take some time to sketch the stars of the constellation that the planet is in accurately. Use larger dots for brighter stars and smaller dots for fainter.
- (4) In addition to the stars of the constellation the planet is in, sketch the location of at least four more nearby bright stars as accurately as possible. You will be measuring the distance from the planet to each of these bright stars every time you do an observation.
- (5) The planets move slowly relative to background stars, so you do not need to make your observations at the same time or from the same location each time. The planet simply needs to be up in order for you to observe it. You should make your observations approximately once per week over the course of the entire semester, for at least 10 total observations spread over 2 months for each planet. Each time you make an observation, mark the position of each planet carefully on the sketches you made the first night (one for Jupiter, one for the other planet).
- (6) You should also measure the distance from each planet to at least four nearby bright stars using fist and finger measurements. Record these values in a table.
- (7) Mark the date next to each observation, and also note which of the other stars in the field is closest in brightness to the planet on that night.

Data:

- (1) Sketch showing the changing location of Jupiter in Gemini relative to background stars over the course of the semester.
- (2) Table showing the distance from Jupiter to a number of nearby bright stars, measured using fist and finger measurements
- (3) Sketch showing the changing location of another planet (recommendation: Mars or Saturn) relative to background stars over the course of the semester.
- (4) Table showing the distance from this planet to a number of nearby bright stars chosen by you and measured using fist and finger measurements

Questions to Address in Your Poster's Data Analysis Section:

- (1) How far (in degrees, which you can estimate using your sketch and the fist and finger method) did each planet move over the course of the semester. If your planet didn't follow a straight line, give the total straight line distance it moved and the approximate distance along the path it actually took.
- (2) Which planet moved more and why?
- (3) Did the brightness of either planet change over the course of the semester? Why or why not (what would cause it to change)?
- (4) Calculate the rate of movement for each planet from one observation to the next (number of degrees moved divided by the number of days between each observation gives the rate of motion in degrees per day) and list it in a separate table on your poster. Did the planets always move in the same direction? Did they always move at the same speed?
- (5) Were the patterns of motion (speed, total distance traveled, shape, etc.) different between the two planets? Why or why not?
- (6) If you were to have observed Venus or Mercury instead of an outer planet, how would their motions have been different over the course of the semester?
- (7) Whether or not either of your planets showed a retrograde loop during the semester, explain the actual cause of retrograde motion in a heliocentric (sun-centered) solar system.