

Homework #2: Part 1

In class you learned how to use a planisphere and a monthly star chart to locate objects in the night sky. Now its time to put all of that into practice and actually make some nighttime observations!

NOTE: You have a full week to complete this assignment so as with all observing assignments, bad weather will not be an acceptable excuse for failing to complete it. Do it early!

Your eye is made up of two types of cells, rods and cones. The rods in your eye are very light sensitive and help you detect changes in brightness, while the cones in your eye are sensitive detectors of color. You will find that your eye is very good at detecting differences in brightness after adjusting to darkness, but is not a great detector of color, and this is because rods are still very sensitive in low-light conditions, while cones are not. You need to be able to read your planisphere once your eyes have adjusted however, so you need some form of light to illuminate your planisphere. This is why you cut pieces of red cellophane out to fit your flashlights during class: the rods in your eyes are much less sensitive to red light than white light, so you will be able to read your planisphere without drastically affecting your night vision.

1. To test how your eyes adjust to darkness with time, find a fairly dark place near your house to complete the following chart. The first column tells you when you should record how many stars you see (in minutes after stepping outside from a brightly lit room). In the second column, you should record the number of stars you see in a “box” created by your thumbs and forefingers held at arms length.

Time Since Stepping Outside	Number of Stars in Finger Box
0min	
1min	
5 min	
10min	

2. While you are waiting for your eyes to adjust, you should also make note of your sensitivity to color. Can you differentiate between the colors of stars? If so, which colors do you see and does this ability get better as your eyes adjust?

3. The planet Jupiter is visible nearly all night this month. Use your sky chart and planisphere to identify Jupiter and sketch its location relative to nearby constellations on a separate sheet of paper (remember it may not be in exactly the same position as shown on the Monthly Sky Map, but it will be close). You should record:

- (a) the time of your observation
- (b) which direction you were facing when you made the sketch
- (c) features on the ground near your horizon
- (d) labels of Jupiter, the nearby constellations and anything else you notice and can identify.
- (e) the elevation of Jupiter relative to the horizon (measured with the astrolabe you made in class)

Extra Credit Option 1: If you have a pair of wide-angle binoculars or a small telescope, look at Jupiter through it and record what you see. Does it look different than an ordinary star? Do you see any differences in color on its surface? Do you see any smaller objects near it? On a separate piece of paper, include a sketch of what you see and an explanation of its appearance relative to other stars and to what you saw with the naked eye.

Extra Credit Option 2: If you have a camera with an adjustable exposure time and a tripod (or a place where you can brace your camera), take a picture of Mars (an exposure time of ~30sec-2min should suffice). Attach your picture to this assignment together with an explanation of how the photograph differs from what you see with your naked eye (make a particular note of the colors). What does this tell you about the sensitivity of the

4. Locate the constellation of Orion in the sky using your planisphere.

(a) On another piece of paper (or the back of your Jupiter sketch), sketch the constellation as you see it relative to the horizon (how is it “tilted?”). For each star in the constellation, make the size of your dot proportional to the brightness of that star (bigger dot = brighter star).

(b) Do you notice color differences between the stars in Orion? If so, label the stars with their colors.

(c) Using the “fist and finger” method that was covered in class, measure the distance in degrees between the stars Betelgeuse and Rigel in Orion, where Betelgeuse is Orion’s left shoulder and Rigel is his right foot. Give your answer in both fists and fingers and degrees.