AST101IN Fall, 2011 Follette Name:_____

Homework #3

5 questions, 5 points each
Due IN CLASS on Thursday, September 8

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 in week 2: 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 effecting 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	

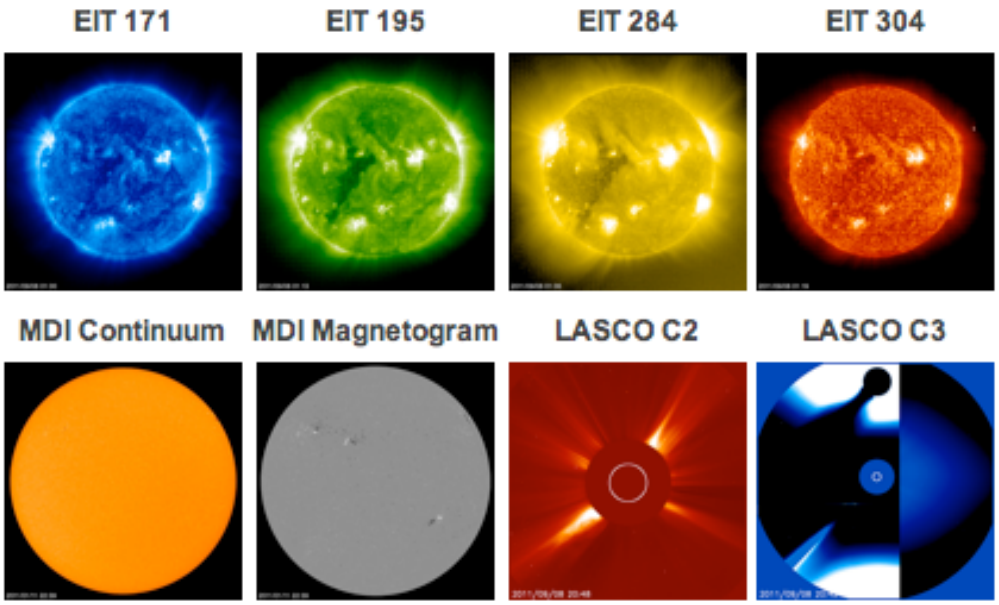
2. While you are waiting for your eyes to adjust, you should also make note of your sensitivity to color. Can you differentiate between the colors of stars? If so, does this ability get better as your eyes adjust? Record what you see.

3. The planet Jupiter is near the constellations Pisces and Aries this month. Go outside and use your planisphere to locate these constellations, which will be near the Eastern horizon, then sketch them on a separate blank sheet of paper (note: this should be done around 9pm or later). Now, identify Jupiter and sketch its location within your drawing (remember it may not be in exactly the same position as shown on the Monthly Sky Map, but it will be close). You should also record the time of your observation and which direction you were facing when you made the sketch. Include features on the ground near your horizon on the sketch and any other nearby constellations that you identify. Label Jupiter, the constellations and anything else you notice and can identify.

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 human eye relative to a camera?

4. Go to www.thesuntoday.org and click on "The Sun Now" in the menu. You should see a block of images from the SOHO telescope that looks like this.



These are eight different images of the sun taken at eight different wavelengths (colors) of light.

(a) Click on "MDI continuum" on the bottom left to enlarge the image. Sketch what you see on a sheet of white paper (use ~1/2 a page for each sketch– you'll make 4 of these sketches total, which should easily fill the front and back of one white sheet of paper). Label your drawing "continuum" which is essentially another name for "white light"

(b) Click on "EIT304" on the upper right and sketch this as well. Label this one "H-alpha". This is the sun as seen in a very narrow range of colors centered around a wavelength of 656 nanometers (nano is billionths!), which is where the element Hydrogen emits much of its light. Next to your drawing, describe how this image is different from the last.

(c) Scroll down to the next block of images (images from the SDO telescope) and click on the "HMI Magnetogram" image. This shows a magnetic image of the sun in black and white, with each color representing a specific magnetic polarity (like the north and south poles of a bar magnet)[1]. Sketch what you see and label it "Magnetogram". Label each visible feature or group of features with A, B, C, D, etc. If features also appear in the same location on either of your other images, label those with the same letters.

(d) Now, go outside with the eclipse glasses that you were given in class (note: this needs to be done soon (within ~1hr) after you visit the website or the features on the face of the sun will have changed) and sketch the sun as you see it. DO NOT LOOK AT THE SUN WITHOUT YOUR ECLIPSE GLASSES ON!!!

5.

(a) Which of your images (a)-(c) is most similar to the sun as you saw it through the eclipse glasses? Why?

(b) Did you see any sunspots? If so, did they appear in all of the images? Why or why not, do you think?

(c) Are any of the other images similar to the magnetogram image? What is revealed about the sun's magnetic field from these?

[1] You may note that the SOHO telescope also includes a magnetogram, but this is not updated as frequently as the SDO version, so it's difficult to match up features with the other images.