Astronomy 350: Laboratory 1

- 0. If the following call for observing, either with the naked eye or with a telescope or with stellarium, give the date and time of the observations (separate observations must be with a different date/time), the "conditions" (eg. how cloudy it is, "the seeing" etc).
- 1. Look at the coordinate spreadsheet on the web site. Answer the following questions.
- 1a) Whats the celestial sphere?
- 1b) Whats the meridan? Whats the celestial equator? Whats the ecliptic?
- 1c) Whats the prime meridian?
- 1d) Whats the latitude and longitude of Oswego?
- 1e) If you are at latitude 90 degrees North where are you?
- 1f) If you are at 0 degrees longitude where are you?
- 1g) How many arcseconds in a degree?
- 1h) Express 40 degrees and 2 arcminutes and 3 arcseconds in decimal degrees.
- 1i) Convert 28.64 degrees to degrees, arcminutes and arcseconds.
- 1j) What are Right Ascension and Declination (RA/Dec)?
- 1h) What is the name given to the point on the sky with 0 degrees RA?
- 1i) What is the name given to the point on the sky with 90 degrees North declination?
- 1j) One hour is one twentyfourth of 360 degrees. How many degrees is it?
- 1k) Convert 3 hours 14 minutes and 24 seconds to decimal degrees.
- 1l) Is the latitude/longitude of Oswego different if you are in New York compared to London?
- 1n) Does the latitude/longitude of Oswego change with time?
- 1m) Does the RA/Dec of a star change with your location on Earth or the time at which you observe it?
- 1n) Use stellarium to find the RA/Dec of tha stars in the Summer Triangle.

- 1o) What are altitude and azimuth (alt/az) and how are they different to RA/DEC?
- 1p) Can a star with 0 degrees altitude have a non-zero declination?
- 1q) Does the altitde/azimuth a star change with time and location of observer?
- 2. Make sure you go through the telescope quick starts on the class web page and know how to setup the 8" telescopes.
- 3. Do exercise 1, p. 1 in Ferguson. Know the different types of telescope, mounting and the telescope quick start on the class web site.
- 4. Install Stellarium on your laptop/college computer and become familiar with its operation.
- 4a) Change the location to Oswego, NY and the time to roughly March 21 2011. Mark the ecliptic and the equator. Look at the intersection of the ecliptic and the equator. Whats its RA? Now go to roughly Sept. 21 2011 and look at the RA of the intersection of the ecliptic and equator. What is the difference (roughly) between the two RAs?
- 5. Either use naked eye observations or stellarium to do exercise 2. p. 7 in Ferguson.
- 6. Find the altitude of Polaris from the following locations: London, New York, Glasgow, Rekyavik, Oslo. What is the relationship between latitude and altitude of Polars?
- 7. When can you observe Jupiter during the week of Aug. 29-Sep2 in Oswego?
- 8. When/what time is it best to observe Saturn from Oswego?
- 9. If its clear can you observe the Andromeda Galaxy (M31)?
- 10. Observe delta Cep. Where would you look to observe it during late August/early Septmeber. This is a type of variable star called a Cepheid. Research this using google and describe what these stars are "used for."
- 11. Find and observe epsilon Lyrae - which star is it close to? Draw a picture of what you see. Epsilon Lyrae is a "double double." Epsilon 1 and epsilon 2. Research these stars and write a short paragraph or two about them.
- 12. Observe the summer triangle (see star chart). How do the brightnesses and color of the 3 stars of the summer triangle compare?

- 12a) Whats the luminosity of a star? What units is it measured in? What is the luminosity of the Sun? How many 100W light bulbs is this equivalent to?

- 12b) The brightness (B) of a star is its luminosity (L) divided by the distance squared:

$$B = \frac{L}{4\pi d^2},$$

where d is the distance.

- 12c) What happens to the luminosity and brightness of a star if it is moved twice, three times and four times as far away?

- 12d) Brightness is measured by magnitudes. If all stars were at a distance of 10 parsecs, then the scale of measuring brightness is called absolute magnitude. Otherwise the scale of measuring brightness is called apparent magnitude. On Stellarium, find the apparent magintude of the Sun and Vega. Why is this the apparent magnitude and not the absolute magnitude?

- 12e) The smaller the magnitude (whether absolute or apparent) the brighter the object. So which is brighter in the sky, Vega or the Sun?

- 12f) Stars A and B have absolute magnitudes -1 and 2 respectively. Which star has the larger luminosity? Which star is intrinsically brighter? Which star appears brighter in the sky?

- 12g) Stars A and B have apparent magnitudes 3 and 0 respectively. Which star has the larger luminosity? Which star is intrinsically brighter? Which star appears brighter in the sky?

- 13. Make sure you know 5 constellations and 5 stars in the fall sky in Oswego and 5 constellations in August/September in the Southern hemisphere. For example, you should know how to find the Polaris, whats the summer triangle.

- 14. Write about 1 page explaining why firstly the positions of stars changes during the night, secondly why the positions of stars seen at 9pm at Oswego changes during the course of a year and thirdly why the positions of stars changes with position on Earth.

- 15. Find out some constellations that can be seen from a latitude of 70° at about this time (9pm, late August).

- 16. Find out where Mars and Venus are in the sky in August/September. Can they be observed during class time?

- 17. Do exercise 3, p. 13 in Ferguson.