**SPU 26 Assignment 5 due during session on roof of Science Center**

Purpose: To familiarize yourself with stars in the sky and take measurements of their altitude and azimuth.

Materials required:

1.) A protractor with a string attached to the center point, weighted down (e.g. by coins in tape at the end).

2.) A magnetic compass

3.) An additional weighted string (optional)

3.) A watch or time telling device

4.) This assignment with the grid and star chart

5.) Dress warmly

6.) Bring a flashlight if you have one handy

7.) Pen or pencil

Preparation:

Before you come to the observing night, should plan your observations (like an navigator would). Using the approximate time and date that you are planning to come observe, use your knowledge of the stars and/or the Neave planetarium (http://www.neave.com/planetarium/) to estimate which stars will be visible in the sky and their rough locations.

1) Find at least 3 stars (not including Polaris) that are among the lists of stars we are using in the course that should be visible when you will come to observe.

2) Jupiter will be quite bright in the sky. You may want to use the Neave Planetarium to find the position of Jupiter before the exercise. (note that Neave doesn’t do a very good job distinguishing magnitudes – e.g. it lists Pluto, but you will never be able to see Neptune, Pluto, or Uranus without the aid of a telescope).

3) Clear nights usually get rather cold and you’ll be spending about an hour on the roof, so please dress warmly.

Date/time

We will have staffing on the roof of the Science Center on Tuesday, Oct. 23rd and Wednesday, Oct. 24th, assuming these days are clear. The staffing will go from 7:30 PM until 10:30 PM. Please consult your e-mails for updates before you head over to the Science Center. If the weather is bad, we’ll cancel and try for another evening. We’ll keep at it until everyone can complete the assignment. If those dates don’t work for you, please contact your TF with some available evenings when you can make it. The assignment requires two observations separated by at least 45 minutes between the 7:30 and 10:30 PM.

Where to go

 You will be taking observations from the roof of the Science Center in the evening, with the help of a TF. To get to the roof of the Science Center, take the elevator to the 8th floor. Go down the hallway following the “To The Telescopes” signs and go up two more flights of stairs. The TF will have opened the door to the roof, which requires another few stairs. Watch your step on the last bit of getting on the roof and be cautious generally. Also, we may be sharing the roof with other classes who will be using the Clay Telescope. We need to be courteous as we are guests on the roof.

The exercise

1. Find a minimum of three stars and check with the TF whether you have correctly identified them.
2. Find Polaris and check that you have correctly identified it.
3. Using your compass and your protractor, measure that altitude and azimuth of your three stars. If you can’t find the three stars you’ve chosen, pick three that you can track for the next hour.
4. To find altitude, sight along the edge of the protractor until it lines up with the star. Let the string hang down freely. When you have the sighting, you can hold the string onto the protractor by pinching it carefully with your thumb and forefinger. Then inspect the angle. Be careful to make sure you read the protractor properly. It’s easy to make a mistake of 90o – angle. Remember that altitudes are in the range of 0 to 90o.
5. To find azimuth, hold up the string so one end is one the star and the other end hangs down freely. Sight an object on the horizon where the string is hanging. Then, use your compass to find the azimuth of that object. Note that high altitude objects will have a larger uncertainty in azimuth, you may want to try lower altitude objects for the choices of your stars.
6. Wait a minimum of 45 minutes. If you wish to leave and return 45 minutes later, that is acceptable, or you may want to tune up your star intuition with the TF’s.
7. After a minimum of 45 minutes, again measure the altitudes and azimuths of your three stars.
8. Measure the altitude of Polaris. In principle, this should be equal to your latitude.
9. Record these and turn in the paper to the TF. Graph the altitude and azimuths of the stars on the sheets provided for both times.
10. A comment on the graphing sheets – the first is just a standard graph that shows azimuth and altitude in a conventional radial format. The second is a mapping of altitude and azimuth for Boston when plotted on an ‘equirectangular’ projection of celestial coordinates onto Boston. The passage of stars **should** look like horizontal lines on this. Note that east and west get switched around, as this is how you view the stars.
11. You may want to make a copy of your answers to check when you get back.

**Stars that should be visible**

The sun sets at 5:49 PM, astronomical twilight ends roughly at 7 PM.

At 7:30, the following stars should be visible:

Alpheratz

Altair

Arcturus – setting to W

Capella – rising in NNE

Deneb

Dubhe

Fomalhaut

Pleiades – rising in E

Polaris

Schedar

Vega

Moon

Mars – setting in the SW

Around 8:30, Aldebaran and Jupiter rise in the east.

At 10:30, the following stars should be visible:

Aldebaran

Alpheratz

Betelgeuse - rising in E

Capella – rising in NNE

Deneb

Dubhe

Fomalhaut

Pleiades

Rigel – rising in E

Polaris

Schedar

Vega

Jupiter

Moon

**SPU 26 Class exercise, week of Oct 22 2012**

**Make sure you turn this into the TF on the roof of the SC the night of the observation.**

Your name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ TF’s Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Section time \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date and time\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(report angles in degrees)

1st star name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, Time of meas1.\_\_\_\_\_\_\_\_\_\_\_2\_\_\_\_\_\_\_\_\_\_\_\_

Declination:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, Stellar Longitude\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Measurement 1: Alt.\_\_\_\_\_\_\_\_\_\_\_\_\_ Azi\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Measurement 2: Alt.\_\_\_\_\_\_\_\_\_\_\_\_\_ Azi\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2st star name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, Time of meas1.\_\_\_\_\_\_\_\_\_\_\_\_2\_\_\_\_\_\_\_\_\_\_\_

Declination:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, Stellar Longitude\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Measurement 1: Alt.\_\_\_\_\_\_\_\_\_\_\_\_\_ Azi\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Measurement 2: Alt.\_\_\_\_\_\_\_\_\_\_\_\_\_ Azi\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3rd star name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, Time of meas1.\_\_\_\_\_\_\_\_\_\_2\_\_\_\_\_\_\_\_\_\_\_\_

Declination:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, Stellar Longitude\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Measurement 1: Alt.\_\_\_\_\_\_\_\_\_\_\_\_\_ Azi\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Measurement 2: Alt.\_\_\_\_\_\_\_\_\_\_\_\_\_ Azi\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Altitude of Polaris:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Latitude (= altitude of Polaris)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*(On the attached sheets plot the stars at their altitudes and azimuths from both observations and connect them with an arc (radial plot) or line (equirectangular projection).*

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