

USING YOUR FIELD GUIDE AND STAR CHARTS

What will you learn in this Lab?

By this point you should be familiar with the layout of the Night Sky and how you find your way around it, or at least you should know how to read a star map. This exercise will allow you to use your new skills, or polish them, to find and locate objects in the sky and answer specific questions about where things are or will be. Treat it as a celestial treasure hunt.

What do I need to bring to the Class with me to do this Lab?

For this lab you will need:

- A copy of this lab script
- A pencil
- Audubon Sky Guide
- SC sky maps (both of them)
- Star wheel
- Red Flashlight
- "Introduction to the Night Sky" and "Coordinate System" reports

Introduction

At this point you have been introduced to the layout of the Night Sky and how it moves. In addition you have been shown how astronomers find things in the sky using a variety of different coordinate systems depending on the job at hand. This exercise combines all those skills to give you a real “test drive” of your abilities in finding things, figuring out relative positions, and how long items may be up in the sky.

Background

You should probably bring your graded lab scripts from the Night Sky and Coordinate Systems labs with you for reference. You will need your star charts, your star wheel and your Audubon guide, since you'll be using them intensively tonight. One definition that you will need is that of **hour angle**. This is simply the time between where the object appears to be right now and when it was on your meridian. The definition is negative if the object is east of the meridian, and positive if west. Another way of looking at it is in terms of sidereal time. Sidereal time is the RA of your meridian right now, and so this value changes (moves forward) at a rate very similar to a regular clock. Hour angle is therefore the difference between an object's RA and your local sidereal time at any given instant.

Procedure

- I. **Starwheel** - Use your starwheel to figure out what the Night Sky should look like for today's date and the current local time.
 - Write down the names of 5 bright stars close to the Meridian, as you see them right now.
 - Star 1 -
 - Star 2 -
 - Star 3 -
 - Star 4 -
 - Star 5 -
 - What are the approximate hour angles of the 5 bright stars you chose? Make sure you get the sign right.
 - Star 1 -
 - Star 2 -
 - Star 3 -
 - Star 4 -
 - Star 5 -
 - How long will it be until each one sets on the western horizon?
 - Star 1 -
 - Star 2 -
 - Star 3 -
 - Star 4 -
 - Star 5 -
 - Would you expect stars at a higher altitude on the Meridian to have a higher or lower declination?

 - Would you expect the higher stars to set sooner or later on the western horizon? Explain why.

 - Advance your starwheel in time to test your assertions. Were you correct or not? If not, why not? Explain your reasoning.

- II. **Star Charts** - Now switch to using your equatorial star chart – the long chart. For today's date locate the position of the Sun on the Ecliptic.
- Using the current time and your knowledge of what stars are on the meridian from Part I, predict what the time of sunset was tonight. Check your answer with your TA. Were you correct?

Find the lowest star you can see directly South of you. Find that star on the chart. Answer the following questions for that southern star:

- What is its Declination?
- From the declination of this star, figure out an estimate of Phoenix's latitude – and don't just look it up!! Show your math. (A sketch may prove useful.)
- How far below the path of the Ecliptic is this star?

Pick a star in the northern sky. Find it on the north polar star chart. Answer the following questions for that northern star:

- What is its declination?

 - At what latitude would this star pass through your zenith?

 - How far is it from the Pole Star (angular distance)?

 - Is it circumpolar? How do you know? Explain your reasoning.

 - Can you find any planets on the Ecliptic tonight (they won't be on the star chart!)? If so, estimate their ecliptic longitudes. How far around the Ecliptic are they from the Sun (in degrees)?

 - If an object is at an ecliptic longitude of 180° , where is it located in the Solar System relative to us and the Sun? Draw a picture to illustrate your answer. At what local time does this object rise and set?
- III. **Field Guide** - Locate the monthly sky charts in your guide – plates 21-68. Find the set of four that correspond to this month. Compare them with the sky you see before you currently.

- Do these star charts look correct compared to the night sky you are seeing? If not, how do they differ? Describe the differences, and do you have any kind of explanation for the differences? Remember that the book was written for people at a variety of geographical latitudes, and are drawn for a specific time of night. Read the notes at the start of that section of the guide.

Pick a constellation in tonight's sky close to the zenith and make as good a sketch of it as possible. Next, find that constellation in the Field Guide and label all the named stars on your sketch.

- Can you see all the named stars against the bright Phoenix lights? Which ones are missing? Does it make sense that they are invisible – are they the faintest stars indicated on the charts?

Choose another constellation and find the photographic plate of that constellation in the Field Guide plates 156-211.

- Does the photo look like what you currently see? If not, how is it different? Is the orientation the same? Do the stars all look similar in brightness to the photograph – why do you think you can see more faint stars in the photograph?

Conclusion: (Please make some estimates about how well you can estimate angles, times, locations, etc. in your observations. Also reflect upon what you were asked to do tonight. Can you see specific strengths or weaknesses with using each of the three main tools you employed? Under what circumstances is it best to use one versus another?)

Foul Weather Alternative

In the eventuality that the weather is uncooperative enough to not allow a somewhat clear view of the sky tonight, please follow these instructions:

I. Star Wheels

This part should still be possible from inside a classroom.

II. Star Charts

Most of this part should also be possible. Your TA will provide a candidate southern horizon star and the ecliptic longitudes of the planets for this date.

III. Field Guide

This part will be very difficult to do from inside. There is some chance it could be done using the Planetarium as a surrogate, but this will depend on the TA and Mr. Matlaga's opinion on the matter, and whether other sections are scheduled to be using the Planetarium tonight.

IV. Lab Report

The main issues raised above for this section should still be addressable. Make sure you follow the guidelines. Ask your TA if in doubt.