





# CONSTELLATIONS

Note that you have homework you must do BEFORE coming to class. (See next page.) The questions also refer heavily to vocabulary on the “Astronomy Vocabulary” on page **Error! Bookmark not defined.** You will see many of these words throughout the rest of the semester.

*Purpose:* In this lab, you will acquaint yourself with the night sky and the motions within it; you will also learn to use the star atlas. (You may also want to read the “Using the Planisphere” and “Using the Star Atlas” on pages **Error! Bookmark not defined.** and **Error! Bookmark not defined.**) Therefore, you will observe specific stars and constellations throughout the 3-hr class. You will hopefully have a better idea of how and why stars move during the night. In addition, you will compare what you can see with your naked eye to what is published in your star atlas, which will help you gain an appreciation how the magnitudes of stars compare with what you actually see (in a bright city sky).

## **Some background information about constellations:**

A “Constellation” is a grouping of stars that represents some figure or idea. Forty-eight of the 88 constellations now recognized by the official astronomy naming organization, the International Astronomical Union, date back to ancient Greece. The Greeks inherited them from even earlier civilizations in the Eastern Mediterranean. Some date back 5000 years ago to Egypt. Some, such as the famous Orion, predate the invention of writing by the Sumerians almost 7000 years ago. The remaining 40 were added by European mapmakers and astronomers in the 17<sup>th</sup> and 18<sup>th</sup> centuries, and carry with them their cultural signatures. These constellations include such objects as a microscope (Microscopium), telescope (Telescopium), and a sailing ship (Argus, which has since been broken into several constellations). Since we live in Los Angeles, we will focus on stars in the northern hemisphere.

Many people have a hard time “seeing” the object or person in the star pattern that represents the constellation. Part of the problem is that there are stories behind the constellation, which may have preceded it. Many of the stars in the constellation represent certain aspects of the story rather than parts of the object. Some constellations were simply chosen as groups of stars that are next to another important constellation (such as Orion and his hunting dogs, or Draco and Hercules, or Andromeda and Perseus, etc). Increasingly, people are losing the mythological stories that accompany most of the constellations, and are thus left staring at an odd pattern of stars, baffled at how anyone could “see” such an object in the star pattern that represents the constellation. Another problem is that many people expect too much from a pattern of pinpoints of light. They expect ALL of the parts of the object or person to somehow be there in just the right place and proportions, which is nearly impossible.

Astrology purports that the constellations provide us with the ability to see into the future and predict people’s lives. After you have seen that these constellations are nothing more than patterns of dots (stars) on the sky, and these patterns were simply made up, I am certain that you will agree that the premise that astrology is based upon is utter nonsense. Remember, horoscopes are based on your birthday. Worldwide, almost 20 million people have the same annual birthday; each day about 360,000 people are born, corresponding to 4 births every second. How much do you think you have in common with the 3 other people born during the same second as you, or the other 239 people born during the same minute?

Boundaries have been drawn around the constellations for ease of star naming. Any object that falls within the boundary of a constellation is considered part of that constellation, even if it is not part of the actual pattern of stars that represent the constellation.

## Constellations

### **Requirements BEFORE CLASS**

1. Pick 4 bright stars from your star atlas that are visible during class time (7:30pm-11pm) from different parts of the sky. There are a few restrictions:
  - a. The first star should be between 60 and 90 degrees declination (but not Polaris).
  - b. The second star should be between 35° and 60° declination [medium star]
  - c. The third between 0° and 35° [equator star]
  - d. The fourth below 0° (i.e. negative declination) [southern star]
  - e. You may not pick 2 stars from the same constellation
  - f. Feel free to use the Greek letter as the star name. Example  $\alpha$  Lyra is another name for Vega. In your atlas, map 7, page 27, above “Vega”, you should see the  $\alpha$  symbol. Test your knowledge by looking on map 7. What’s another name for  $\alpha$  Aquila (around +10° declination)? Another name for Deneb? (Look in the left margin!)
  - g. **You may not use any star in common with the other members of your 3-person group. So coordinate your efforts before you begin the lab!**
2. [1 pt] After filling in the information above on the provided chart, get the instructor’s initials on your chart/list at the beginning of class, as soon as possible.

### **What to submit**

1. [5 pts] Six complete rows in the table for each of the **four stars**.
2. [2.5 pts] Simple drawings showing how **five constellations** shift, if at all, over class, including both location and relative orientation. See below for more information. These simple drawings should be done once an hour.
3. [7.5 pts] **Five** detailed sketches of **constellations** with notes (see below). Only one detailed drawing per constellation. [Each of your 5 constellations should have 4 drawings: 3 simple and 1 detailed.]
4. [9 pts] Answers to the questions provided below – some of which are quite challenging, so don’t put it off until the last minute.

### **Directions**

1. Estimate your **4 stars**’ altitudes and azimuths every ½ hour for 3 hours. For each separate star, measure the altitude/azimuth 3 times during the half hour – in other words, repeat your measurement so you can get an accurate average! Later, compute the average value and record everything in the chart.
2. To measure the Polaris angle, determine how many degrees away the star is from Polaris. Use the same method to measure this angle as you are to measure altitudes and azimuths.
3. To compute the “measured declination,” you need to subtract the Polaris angle from Polaris’ declination (which we’ll round to 90°). Example, if a Polaris angle is 30°, the measured declination would be 90° - 30° = 60°. Declination tells you how far a star is from the celestial (sky) equator, which is in the middle of the sky.
4. Find and sketch **five constellations**. You may use the observation sheets provided or your own, if it is easy to compare the “simple” drawings over time. For each constellation, you will submit at least 3 brief drawings (all with instructor’s initials), and 1 detailed drawing.
  - a. For the detailed drawing, include star names or designations (e.g. “ $\epsilon$  Lyra” or “Sirius”) for the 5 brightest stars in each constellation. Record any star colors you see either in the sketch area. Denote which objects you see and a few (relatively) bright objects that are only seen in your atlas. (Many people find it easiest to color code objects. One color will be things you saw with your naked eye, and another color will be things in the atlas that you could not see.) Many of the details can be done as homework, so focus on sketching what you see as accurately as possible.
  - b. For the brief drawings, do 1 per hour per constellation, and include the constellation name. Indicate relative brightness of stars by the size of the dots. Try to draw to scale, including altitude changes of the constellation. As always, anything you clearly observe but cannot accurately draw should be mentioned in the space provided.

## Constellations

### Questions

1. [2 pts] Explain the movement of the stars by answering:
  - A. What is the overall trend?
  - B. Do some stars move through a larger angle than others? Which of the 4 kinds of stars move the fastest? Slowest? If one moves faster in altitude, while another moves faster in azimuth, state that. When answering this question, include your partners' stars in your analysis.
2. [1.5 pt] A) What was the typical (average) difference between your measured declination and the actual declination? B) What could cause this difference? C) What could you do to reduce this difference to get more accurate results?
3. [1.5 pt] Why do some stars move faster than others? (Hint: how far did Polaris move?)
4. [1 pt] What does the color of a star measure? (Hint: this may require some research – don't guess!)
5. [1.5 pt] Astrology questions:
  - a. Why can't you see the constellation Gemini in July? (Hint: Use your planisphere.) When could you see Gemini in the evening sky?
  - b. What defines what sign you are? In other words, why are people born in mid-December assigned "Sagittarius" instead of, for example, Leo? Why is mid-December associated with Sagittarius instead of Leo?
  - c. Does your birth date/sign have a profound affect on your life? Why or why not?
6. [1.5 pt] Referring to your brief sketches: Did constellations appear to
  - a. Change shape? (i.e. did the stars in the constellation move around relative to each other?)
  - b. Rotate/change their orientation relative to the horizon?
  - c. Get bigger, smaller, or stay the same?

Don't forget to turn in your original observation sheets with the answers to these questions.

Constellations

	Star name	Const	Declination	Polaris angle	Measured declin	Time	Alt 1	Alt 2	Alt 3	Az 1	Az 2	Az 3	My Alt avg	Ptnr 1 Alt avg	Ptnr 2 Alt avg	My Az avg	Ptnr 1 Az avg	Ptnr 2 Az avg
example	My star	Sagittarius	-24	160	90-160= <b>-70</b>	9:30	45	42	46	190	200	193	44.3			194.3		
Ex 2				155	90-155= <b>-65</b>	10:00	40	39	43	205	195	198	40.7	These will be from a different star!		199.3	These will be from a diff star!	
northern star																		
medium star																		
equator star																		
southern star																		











*Constellations*

Constellation 1 - detailed sketch	Constellation 2 - detailed sketch	
Constellation 3 - detailed sketch	Constellation 4 - detailed sketch	Constellation 5 - detailed sketch