OUTSIDE LAB 1: Observing the Heavens

OBJECTIVE: To become familiar with some of the more conspicuous constellations and to observe the motions of stars in the night sky.

DISCUSSION:

Most people are unfamiliar with the night sky, glancing up at it only occasionally. The purpose of this laboratory is to familiarize you with the night sky and the motions of the objects in it.

EXERCISES:

EXERCISE 1:

a) Your instructor will point out several prominent constellations (groupings of stars) in various parts of the sky. Make a careful sketch of each constellation and any ground objects (trees, buildings, etc.) around them. Use \( \times \)'s to mark the positions of the stars. Record the time of your first sketch. After at least 45 minutes sketch the new positions of the stars. Use \( \circ \)'s to mark them.

Direction: ________ First Sketch Time: _______ Second Sketch Time: _______
b) Repeat the process for the stars and any other celestial objects in the western sky, noting the times at which the observations are made. Again, make sure the sketches are at least 45 minutes apart.

Direction: _________ First Sketch Time: _______ Second Sketch Time: _______
EXERCISE 2:

After you finish your first set of sketches, re-create the stick figure sketch the constellation designated by your TA. Use the magnitude diagrams on the last page of this lab as a reference and label the magnitudes of the stars given in that constellation. Now pick 3 additional stars in the sky near the constellation and draw them in the correct locations relative to the constellation and estimate their magnitudes.

EXERCISE 3:

Your instructor will point out other constellations and show you various astronomical objects through the binoculars and telescopes.

EXERCISE 4:

After at least 45 minutes have elapsed finish Exercise 1. Make sure you are sitting in the same place where you made your first sketches and that you sketch the same parts of the sky.
EXERCISE 5:

a) Examine the sketches from Exercises 1. What type of motion has occurred in each case?

b) What can you conclude about the apparent motions of the stars from these two sets of sketches?

EXERCISE 6:

Now open up your computer and start the Stellarium program. Hover over the box in the lower left and click the first image on the left called ‘constellation lines’ (or press ‘c’) and the second image labeled ‘constellation labels’ (or press ‘v’). Find the constellation you drew for Exercise 2 (you can search by pressing ‘ctrl’+'f' on a PC or ‘⌘ +’f’ on a Mac). Next find the bright stars whose magnitudes you estimated. Click on them and find their correct magnitudes. Compare the actual value with your value in each case. **Note that your TA does not expect that you will have a perfectly accurate answer.** The idea here is to make a serious attempt at estimating the magnitude and then to see how well you did.
EXERCISE 7:

Finally, take five stars, with no more than two stars in any one constellation, and find the names of them using the Stellarium program. Note that in some cases the stars will have regular names like Deneb and in other cases they may simply have names like Phi Persi which simply means the star labeled by the Greek letter φ in the constellation Perseus. Put those names next to the stars in your plots. Also list their right ascensions and declinations. In what part of the sky are the stars with the largest declinations?
<table>
<thead>
<tr>
<th>Star</th>
<th>Magnitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sirius</td>
<td>-1.5</td>
</tr>
<tr>
<td>Capella</td>
<td>0</td>
</tr>
<tr>
<td>Vega</td>
<td>0</td>
</tr>
<tr>
<td>Altair</td>
<td>0.8</td>
</tr>
<tr>
<td>Aldebaran</td>
<td>0.9</td>
</tr>
<tr>
<td>Polaris</td>
<td>1.95</td>
</tr>
</tbody>
</table>

**Apparent Magnitude Scale**

- **Canis Minor**
  - Procyon: 0.4
  - 2.9

- **Orion**
  - Betelgeuse: 0.5
  - Bellatrix: 1.6
  - Rigel: 0.1
  - Saiph: 2.1

- **Cassiopeia**
  - Schedar: 2.2
  - Caph: 2.3

- **Cygnus**
  - Deneb: 1.3
  - 3.8
  - 2.9
  - Alberio: 3.4
  - 3.9