29:50 Astronomy Lab – Evening Sections
Stars, Galaxies, and the Universe
Fall 2010

Name _____

Date _____

Grade _____ /10

OBSERVING THE NIGHT SKY I

INTRODUCTION

In this session we will observe the night sky. The idea is to fix some of the concepts discussed in class, such as the celestial coordinate system. However, the main point is to see the night sky and notice some of the properties of stars and some other astronomical objects such as star clusters and galaxies. This will make them seem more real as we discuss them throughout the semester.

Part of the activity will consist of finding stars, constellations, or other astronomical objects. **To show that you have found an object, you point it out to a teaching assistant or other observer, who will then "sign-off" on it for you.**

In going through these exercises, you will have a chance to use the Sky and Telescope star wheel, the SC1 constellation chart, and the Sky and Telescope Pocket Star Atlas. You may also want to use the interactive sky chart on the Sky and Telescope website: www.skyandtelescope.com. In using the pocket star atlas, you will need a pair of binoculars to see objects fainter than the naked eye limit. Also, be sure and notice where the various constellations are in the sky (i.e. constellation X is low in the northwest, constellation Y is about halfway up the eastern sky).

OBSERVING EXERCISES

1. Get yourself oriented so you know where N, S, E and W are. Find the bright star **Arcturus**, in the constellation of **Bootes**, and point it out to your TA. **Q1**

2. Using the *Sky and Telescope* Star Wheel, find the stars **Deneb**, **Vega**, and **Altair (parts of the Summer Triangle)**. Now find a couple of other stars in the constellations of **Cygnus**, **Lyra**, and **Aquila**, which contain these three bright stars. Point them out to your TA. **Q2**

3. Find the constellation of **Pegasus** (the "Great Square" of Pegasus), as well as the constellation of **Andromeda** which is attached to it. Point these constellations out to your TA. **Q3**

4. Three planets (Mars, Venus and Jupiter) may be visible as it gets dark. Jupiter should be located in the East and Venus and Mars to the West. See if you can identify these planets and point them out to your TA. **Q4**

5. Notice where the Moon is relative to one of the planets and describe this in the box to the right. **Q5**

6. By the end of the session, there will be a bright star rising in the northeast. Find it and identify it. Which star is it, and in what constellation? **Q6**

Q7: Estimating Stellar Magnitudes

We will now try estimating (a rough measurement) apparent magnitudes of some stars. In this part of the exercise, you are using your eyes as a scientific instrument, as was done in the science of astronomy up until the 1920s. The table below gives the apparent magnitudes of some stars, and their apparent magnitudes. Find the stars and look at them, and notice the differences in their brightness.

Star/Object	Constellation	Apparent Magnitude
Jupiter	Rising in the East	**-2.9**
Vega	Lyra	**0.0**
Deneb	Cygnus	**1.3**
Zeta UMa (handle of Big Dipper)	Ursa Major (Big Dipper)	**2.3**
Eta Pegasi	Pegasus (next to Great Square)	**3.0**
Delta Lyrae	Lyra (in the little parallelogram below Vega)	**4.3**

After looking at these stars and their magnitudes in the above table, you should be able to "calibrate" your eye so that it can measure apparent magnitudes. Find the following stars in the sky, and estimate their apparent magnitudes. Try and estimate to 0.5 magnitudes. Go back to the above table to refresh your memory. Write down your estimate of the apparent magnitude in the column provided.

Star	Constellation	Apparent Magnitude
Altair	Aquila	
Albireo (Beta Cygni)	Cygnus (end of the "Northern Cross")	
Alpha Capricorni	Capricornus	
Mu Andromedae	Andromeda	

USING BINOCULARS FOR OBSERVING

Now let's try to find several Deep Sky object using the Pocket Sky Atlas and/or the finding charts below.

8. We will look at the globular cluster M13 in the constellation of **Hercules**. Using the Star Wheel and SC1 chart or the finding chart below, find Hercules. Use a pair of binoculars to look at the region of M13, and locate the object. You will see it as a faint smudge of light instead of a star image. **At the end of the night, look in your textbook (p 533) at a picture of a globular star cluster.** A typical globular star cluster is a swarm of about 100,000 stars. They contain some of the oldest stars in the universe, which formed billions of years before the Sun. The distance to M13 is 21,000 light years. The light you are seeing tonight was emitted by those stars many thousands of years before any civilizations existed on Earth.

Draw a little picture of what you see in the box to the right. Point out to the TA where you are looking, and what you see. M13 is a type of object called a *globular star cluster.* **Q8**

M13 Globular Cluster in Hercules RA: 16h41.7m Dec.: +36° 28′

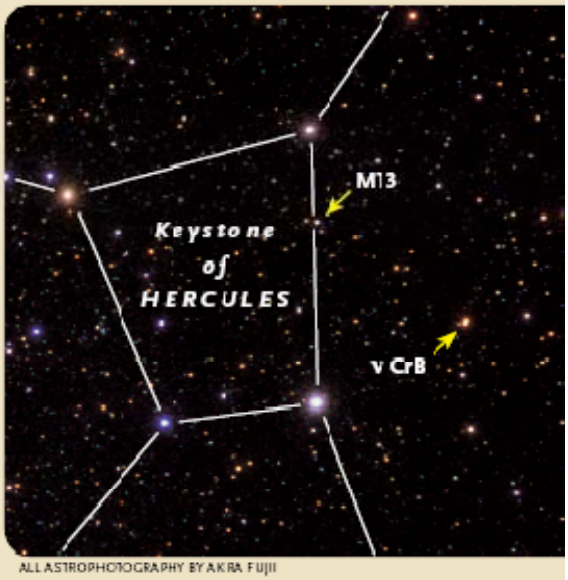
The Great Hercules Cluster, magnitude 5.8, lies in the western side of the Keystone of Hercules. It's a fuzzy "star" distinctively set between two 7th-magnitude pinpoints. Take a minute to savor the combined glow of half a million suns 25,000 light-years away. Then look for M13's near-twin M92 (magnitude 6.4) in a sparser field 10° northeast (it's outside this photo; use a chart). M13 may be the most familiar globular because of its easy location, but it's not the biggest or brightest!

PSA Chart 52.

ν¹, ν² (Nu) Coronae Borealis
Double star
RA: 16h22.4m Dec.: +33° 48′

Magnitudes 5.4, 5.6, separation 361″ (0.1°). From M13 move about one binocular field southwest toward Corona Borealis to pick this nicely matched, orange eye-catcher.

PSA Chart 52.



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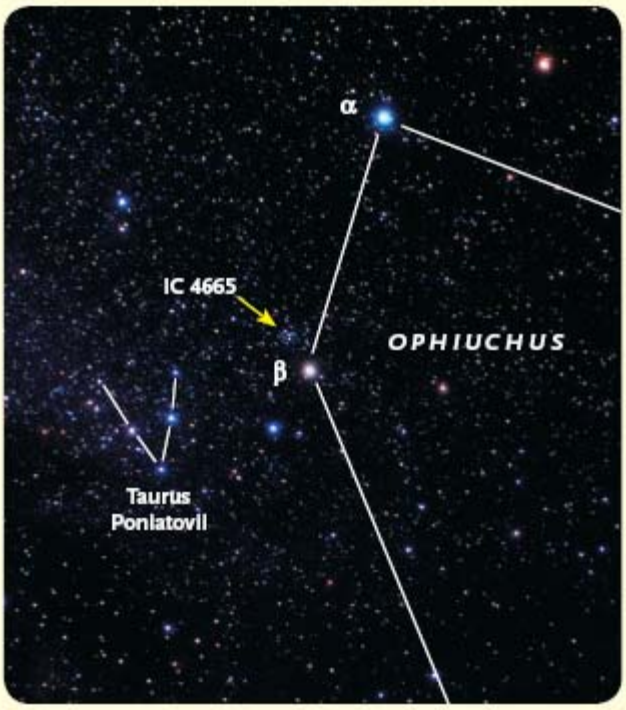
9. We will next look at an asterism and an open cluster near the constellation Ophiuchus. An asterism is a pattern of stars seen in Earth's sky which is not an official constellation. In this asterism, the stars make a shape like the bull's face traditionally associated with the winter constellation Taurus. IC 4665 is an open cluster located at a distance of 1,400 light years.

Draw a little picture of what you see in the box to the right. Point out to the TA where you are looking, and what you see. **Q9**



Taurus Poniatovii **Asterism** **RA: 18h 03.0m** **Dec.: +02° 40′**

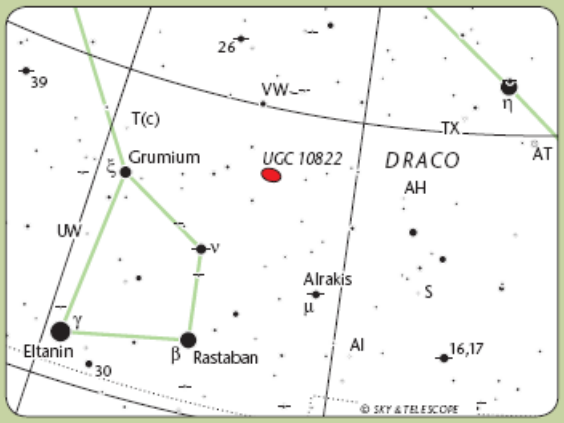
Off the eastern shoulder of Ophiuchus is a Hyades-shaped V pattern 4° tall. In 1777 the Polish astronomer Martin Poczobutt named it "Poniatowski's Bull," for Poland's king Stanislaus Poniatowski. The name has stuck. *PSA Chart 65.*

10. Finally, a challenge observation: observing the double star in nu (ν) Draconis. For more details see the description and finding chart below.

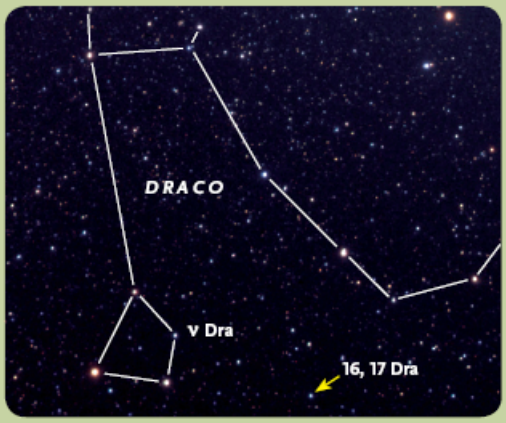
Draw a little picture of what you see in the box to the right. Point out to the TA where you are looking, and what you see. M13 is a type of object called a *globular star cluster.* **Q10**

Hugh Bartlett, an avid binocular observer, enjoys sharing the sky with the public at the Chabot Space and Science Center in Oakland, California. Send comments to him at hughandmaret@earthlink.net.

ν Draconis Double star RA: 17h 32.2m Dec.: +55° 11′
One of my favorite binocular doubles! Magnitudes 4.9 and 4.9, separation 63″, Nu Draconis is a tiny, distant pair of headlights marking the back corner of Draco's head. This double is pretty tight for binoculars, so brace them firmly on something and look closely. *PSA Chart 52.*



The *Pocket Sky Atlas* (PSA) is an ideal companion for small instruments; it shows stars to magnitude 7.6 and deep-sky objects to magnitude 10, 11, or 12 depending on type, plus some special others. Compare this section to the photo at right. Double stars have a horizontal line through them. Nu Draconis is part of Draco's head; the fine pair of 16 and 17 Draconis lies farther west.



16, 17 Draconis Double star RA: 16h 36.2m Dec.: +52° 55′
Magnitudes 5.4 and 5.5, separation 90″. In a haunting, low-power parallel to the Double-Double in Lyra, this near-copy of Nu Draconis is oriented perpendicularly to it less than two binocular fields away (assuming a 5° binocular field), in the direction of Boötes. *PSA Chart 52.*