Texas Tech University Department of Physics
Astronomy 2401 Observational Astronomy
OBSERVING EXERCISE 1 - VISUAL OBSERVING

Objectives:

There are three principle objectives for this observing session.

(a) To observe a variety of deep-sky objects.

(b) To become familiar with the appearance in the telescope of different types of objects.

(c) To gain practice with using a telescope under computer control.

Introduction:

In astronomy, as with any science, it is extremely important to keep accurate records of your observations. It is therefore a requirement of the observing sessions, that you keep an observer's logbook into which you record the details of your observations.

In your logbook you should record:

(a) The date on which the observation were made;
(b) Details of the conditions under which the observations were made. Eg sky conditions, amount of light pollution, etc.
(c) The size and type of telescope used for **EACH OBSERVATION**, including the size of eyepiece used and the resulting magnification
(d) Where appropriate, sketches of the various object being observed.
(e) A short description of the appearance of the appearance of the object being observed.
(f) Any other comments you feel will enhance the completeness and accuracy of your records.

Observing Hints:

Much of the detail in astronomical objects viewed through a telescope is very subtle and delicate, and requires patience and careful observation to discern. A quick, casual glance will reveal little. When observing through a telescope it takes time for the eye and brain to interpret what is being seen.

For deep-sky observing, one trick that helps considerably is not to look directly at the object in view, but rather to look just to one side of the object. This is called **averted vision**. By doing this the light from the object will fall on the part of the eye that is most sensitive to faint light. This means that you will see much more this way. It may take a little practice, however it is very easy to get used to and soon becomes natural when at the telescope.

NEVER USE A WHITE TORCH FOR READING STAR CHARTS OR MAKING SKETCHES! White light desensitizes the eye too much. Always use a DIM red light. Red torches are available at the observatory.

One final point, if you have not already noticed, it can get a little cold outside at night during winter in this region, **SO DRESS WARMLY WHEN OBSERVING**! Nothing ruins a good observing night so thoroughly as getting too cold!

Procedure:

Before heading up to the observatory, re-read the instructions for using the telescopes that you were given at the start of the course. On arrival at the observatory, begin the start-up procedures as described in the instructions and ready the telescopes for observations. There will be three eyepieces for each telescope. Which one you will use will depend on the object being observed and the telescope that you are using. It will be up to you to decide which one gives you the best view for your sketch. The information below will give you some guide.

Once you have the telescope ready to use, use "The Sky" to locate each object listed below and move the telescope to that object. Once you have it centred, switch eyepieces to the one that gives you the best view, then make your observation, including a sketch and comments.

Types of Objects

Double Stars

Double stars are where 2 or more stars revolve around a common center of gravity. The distance between the stars can vary enormously, from just a few million kilometers to many thousands of millions of kilometers. The wider the stars are apart, the easier it is to "split" them in the telescope. Many double stars show contrasting colors, which makes for a more interesting view. In general you will need to use **high** magnification when viewing. In your logbook, sketch the appearance of each double star you observe, noting the relative brightness of the stars and the colors.

Open Clusters

Open clusters are "families" of stars. A group of stars that have formed together and are bound together be their mutual gravity. The number of stars in the group can vary from about a dozen to several hundred. In general you will need to use **low** magnification when viewing. In your logbook, sketch the general appearance of each open cluster you observe, noting the richness of the cluster and any stars that show colour.

Globular Clusters

Globular clusters are huge groupings of stars, spherical in shape. They can contain over one million stars or more. In general you will need to use **high** magnification when viewing. In your logbook, sketch the general appearance of each globular cluster you observe, noting the size of the cluster and if you were able to resolve any of it into individual stars.

Planetary Nebulae

Planetary nebulae are the remnants of a dying star. They consist of material blown off from the surface of the star in its final stages of its life cycle. They can have a variety of forms, such as circular, ring-shaped, or irregular. When observing planetary nebulae you may need to use **high** or **low** magnification when viewing, depending on the size and brightness of the object. In your logbook, sketch the general appearance of each planetary nebula you observe, noting general shape and any other features you find interesting.

Galaxies

Galaxies are giant collections of stars, gas and dust. They may be 150,000 light years or more in size and contain 100,000,000 stars. They may be elliptical, spiral or irregular in shape. Unfortunately the beautiful spiral shapes that many galaxies have are not visible in small telescopes. When observing galaxies, you may need to use **high** or **low** magnification when viewing, depending on the size and brightness of the object. In your logbook, sketch the general appearance of each galaxy you observe, noting general shape and any other features you find interesting.

Objects to Observe 12" telescope

beta Cygni. (Alberio) Double star. Distance: 135 light years. Brightness: 80 and 7 suns. A very colourful double star with a good contrast in the colours of the 2 stars. Use **high** magnification for the best view.

eta cassopeiae This is a beautiful double star with a fine colour contrast. Use **high** magnification for the best view. The brighter star is about the same brightness as the sun.

epsilon Lyrae (The double double) At very low magnification just 2 stars are seen. At higher magnification both stars are seen to be double.

iota cassopeiae One of the best triple stars in the sky. Use **high** magnification for the best view. The brighter star is about 35 times brighter than the Sun.

M52 Open cluster. Distance: 5,000 light years. Total Brightness: 23,000 suns. A large and bright open cluster in CAssopeia. Use **moderate** magnification for the best view.

NGC 457 The "ET Cluster" So named because it looks like the figure of a stick man with outstretched arms and bright glowing eyes. Open cluster. Distance: 7900 light years. Total Brightness: 25,000 suns. Use **moderate** magnification for the best view.

M 11 Open cluster. Distance: 6200 light years. Total Brightness: 200,000 suns.
The "Wild Duck Cluster". A very rich open cluster in Scutum.

M17 Emission nebula. Distance: 5000 light years. Total Brightness: 10000 suns.
The Omega Nebula. Typical example of a bright emission nebula.

M13 Distance: 25,000 light years. Total Brightness: 130,000 suns.
Considered the finest globular clusters in the northern sky. **Moderate** or **high** magnification should be used. Look for resolution of the cluster into individual stars. Each of these stars are over 50,000 times brighter than the Sun!

M27 Planetary nebula. Distance: 1350 light years. Total Brightness: 480 suns.
The Dumbbell Nebula. A large and fairly bright planetary nebula with an irregular outline that looks like a weight-lifter's barbell. Use **moderate** magnification for the best view.

M31 The Andromeda Galaxy This is the closest large spiral galaxy to the Milky Way. It is about 150,000 light years in diameter and contains over 400,000,000,000 stars! Look for the 2 small companion galaxies close by. Use **very low** magnification to see all of the galaxy.

Objects to Observe 20" telescope

M15. Distance: 33,600 light years. Total Brightness: 100,000 suns.
A very compact globular cluster. **Moderate** or **high** magnification should be used. Look for resolution of the cluster into individual stars.

M57 Planetary nebula. Distance: 3000 light years. Total Brightness: 260 suns.
The Ring Nebula. This is the classic ring-type planetary nebula. Use **moderate** magnification for the best view.

NGC 7662 Planetary nebula. Distance: 5600 light years. Total Brightness: 400 suns.
The Blue Snowball Nebula. A small, bright planetary nebula with a bluish colour. Use **moderate** magnification for the best view.

NGC 891 A fine example of an edge-on spiral galaxy. See if you can see the dark patch running down the middle of the galaxy. Use **moderate** magnification for the best view.

NGC 7331 This spiral galaxy is believed to be very similar to our own Milky Way. Distance: 43,000,000 light years. Total Brightness: 8.5 billion suns. Use **moderate** magnification for the best view.

Object: ……	Object: ……
Date: ……	Date: ……
Telescope: …….	Telescope: …….
Magnification ……..	Magnification ……..
Comments:	Comments:
Object: ……	Object: ……
Date: ……	Date: ……
Telescope: …….	Telescope: …….
Magnification ……..	Magnification ……..
Comments:	Comments:

Object: ……	Object: ……
Date: ……	Date: ……
Telescope: …….	Telescope: …….
Magnification ……..	Magnification ……..
Comments:	Comments:
Object: ……	Object: ……
Date: ……	Date: ……
Telescope: …….	Telescope: …….
Magnification ……..	Magnification ……..
Comments:	Comments:

Object: ……	Object: ……
Date: ……	Date: ……
Telescope: …….	Telescope: …….
Magnification ……..	Magnification ……..
Comments:	Comments:
Object: ……	Object: ……
Date: ……	Date: ……
Telescope: …….	Telescope: …….
Magnification ……..	Magnification ……..
Comments:	Comments:

Object: ……	Object: ……
Date: ……	Date: ……
Telescope: …….	Telescope: …….
Magnification ……..	Magnification ……..
Comments:	Comments:
Object: ……	Object: ……
Date: ……	Date: ……
Telescope: …….	Telescope: …….
Magnification ……..	Magnification ……..
Comments:	Comments: