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Lab report 1 – exploring the night sky

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September 2023
ASTR 101 B12

Lab 1: The Night Sky

Objective: To understand the functions of a telescope and to have knowledge about how they work. In addition, the constellation section of the lab introduces different types of mythology from different religions and cultures.

Procedure: The lab was divided into four stations. Each station relates to a certain topic about the solar system: parts of a telescope, constellations, 8 inch celestron telescopes, 32 inch DFM telescope. For the drawing related sections, refer to the paper copy.

Station 1: The instructor presented us a slideshow explaining how the functions of a telescope and explained how light passes through telescopes. They also went into detail about the different types of telescopes.

Station 2: The instructor took us through Stellarium, a website showing the constellations and explained where to find certain constellations and the details regarding them.

Station 3: The weather did not allow for the use of the telescopes due to the rainy conditions. Therefore, information and sketches were used to answer certain questions.

Station 4: Station 4: der to satisfy questions sketches and the internet were used.

Objective: Understand the function and parts of a telescope

Station 1:

1-2) See paper copy

3) Function of telescope parts:

Primary mirror - Light travels down the length of the telescope, it hits the primary mirror where the light will reflect off and travel back towards the front of the telescope.

Secondary mirror - Helps by concentrating light into a beam which travels toward and then through a hole in the primary mirror.

Finder - Smaller telescope, sits on the side of the main telescope. Used to locate object the observer desires to see through a more powerful telescope

Eyepiece - Takes the light captured from the telescope and helps magnify the image making it visible to the human eye.

Focuser - Link between the telescope and eyepiece, helps with focusing blurry images

Mount - Keeps the telescope stable.

4) If the human pupil can dilate to a radius of 0.5cm in the dark.

The total area of the pupil = $\pi(0.5\text{cm})^2 = 0.8\text{cm}^2$.

The celestron telescope has a primary mirror radius of 10cm.

The area of the mirror = $\pi(10\text{cm})^2 = 100\text{cm}^2$.

The intensity of the light =

area of Celestron

area of pupil = $100/0.8 = 125$. The Celestron will show a star to be 125X brighter.

5) A refractor telescope is a telescope that magnifies and focuses light by reflecting it using a mirror. It makes use of the primary and secondary lenses to collect and focus light.

6) A refractor telescope uses lenses to collect and focus light, while reflector telescopes use mirrors. A major issue with refractor telescopes is the lenses were made out of glass and since telescopes need to be large for light collection over time the glass lens would warp from their own weight. So mirrors that are made of stronger materials such as the reflector telescope have become more frequently used in modern times.

Objective: Research and find at least three constellations. To gain insight on constellation mythology through different religions

Station 2:

7-8) See paper copy

9) Ursa Minor - For the Cree, there is a story associated with this star. It is called, In The Dog Star story, Polaris is called Mahkan Atchakos, the wolf star. A long time ago, the Cree did not

have any dogs to protect them. So the wolves, coyote, and fox held a meeting and came to the conclusion that each group would pick two members to go live with the humans. Each pup from each species got sent to all four directions of humankind where they became adapted and domesticated. They became tools for guarding homes and camps. The creator was so grateful that to honor them, they placed a reminder in the heavens. The star polaris anchors the leash as the dogs run around their sky camp. The three stars represent the wolf, coyote, and fox while the four stars represent the pups sent to the four directions of humankind.

Cassiopeia - In Hindu Mythology, Cassiopeia was associated with the mythological figure Sharmishtha, the daughter of the great Devil King Vrishparva and a friend to Devayani.

Camelopardalis - No known mythology with this constellation.

Cygnus - In Chinese mythology, Cygnus is a bridge across a heavenly river. It is known as the magpie bridge. The story associated with the Cygnus star starts with a fairy named Zhi Nu who sneaks into the human world and marries a man who's a human named Niu Lang despite it being forbidden for fairies and humans to be together. The queen of heaven found out and she took Zhi Nu back to heaven and created a river in order to separate the two. Once a year all the

magpies which are birds combine together to create a bridge for the two of the lovers to be reunited.

Objective: Find certain planets and go in depth about what they look like and their moons

Station 3:

- 10-11) See paper copy
- 12) The terminator of the Moon is where the edge of the shadow meets the visible light part of the Moon.
- 13) Saturn - The colors of Saturn are a sandy yellow with tints of brown throughout the planet. There were no visible markings seen on the planet. Seven moons were seen around Saturn being Titan, Rhea, Tethys, Enceladus, Dione and Iapetus. The planet is gibbous. Date and time: 2023/09/24 10:00 pm
- Jupiter - Jupiter has brown, yellow and whitish stripes throughout the planet with hints of gray spots too. There were some craters seen on Jupiter too. Four moons were visible. They were Europa, Callisto, Io, and Ganymede. The planet was gibbous. Date and time: 2023/09/24 9:50 pm
- 14-18) see paper copy
- 19) Albireo is a very big bright yellow star paired with a smaller blue star.
- 20) The blue star is hotter, because hotter radiation is needed to produce which carries more energy compared to a red star.

Objective: Understand and differentiate between globular clusters, open clusters, planetary nebula and galaxies.

Station 4:

- 21) See paper copy
- 22) Globular cluster - Globular clusters are a large population ranging from tens of thousands to millions of stars. They are very tightly gravitationally bound and are densely populated. Due to being so intensively gravitationally attracted to one another it gives the globular cluster their regular, spherical shape. They are typically populated by older, redder stars.
- Open cluster - Open clusters are smaller populations of stars that are not as gravitationally attracted to each other than globular clusters. They can have as little as a few tens to a few hundred stars. Since they are loosely bound to each other they are often found in spiral and irregular galaxies.
- Planetary Nebula - Planetary nebula are not related to planets contrary to popular belief. They are ionized gas and clouds that emit light from dying stars.
- Galaxy - Galaxies are a collection of stars, dust, gas and dark matter that are held together by gravitational attraction. Galaxies can be as many as a few hundred million to a few trillion stars.

Discussion: The telescope has provided us a lot of information on space. Not only has it shown astronomers what galaxies, stars, planets and many more look like. It has also taught us a lot about the night sky.

The night sky holds immense significance on humanity. It was once used as a natural calendar and told stories and legends by our ancestors. Nowadays, the night sky is primarily used by astronomers to learn more about our universe.

Conclusion: Telescopes even in ancient times and now in modern days have been an essential tool in gaining knowledge about our night sky. Even as new technology has been invented telescopes have remained in their important role in learning about the universe and constellations.

Constellations have stayed relatively the same through the eons. This has become fundamental in learning about the stories and myths from ancient civilizations.

Citations

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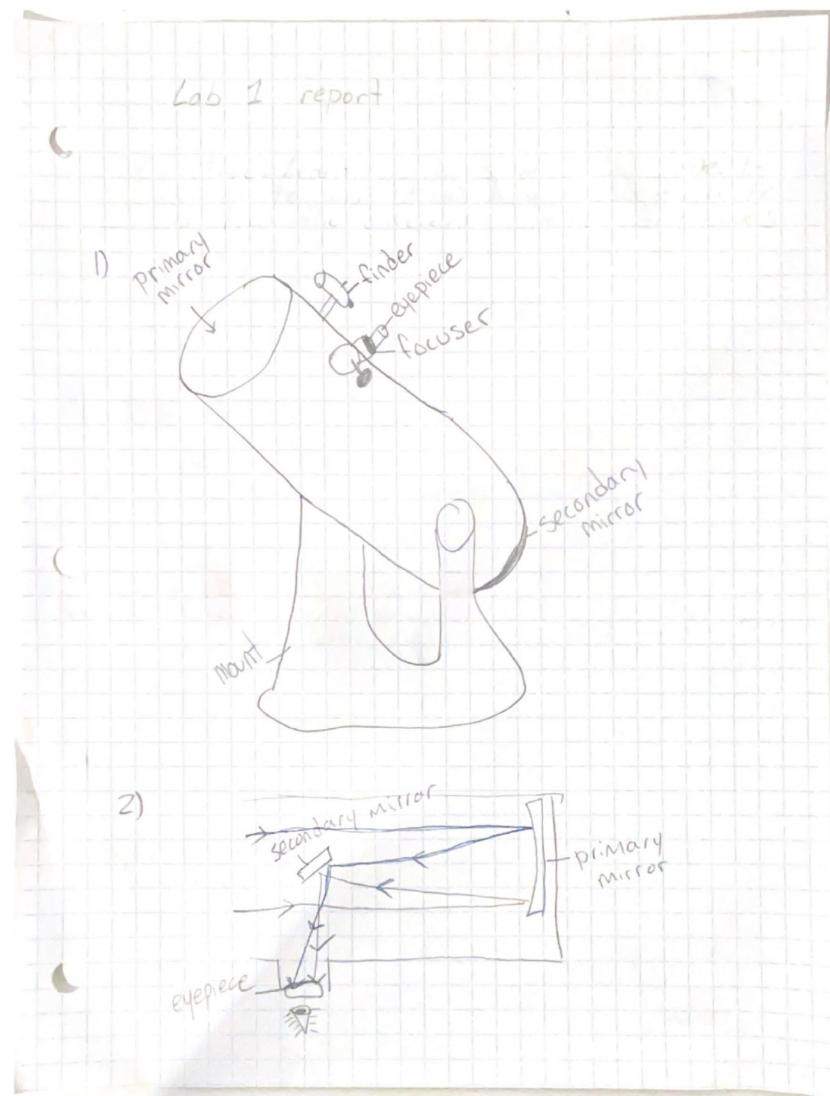
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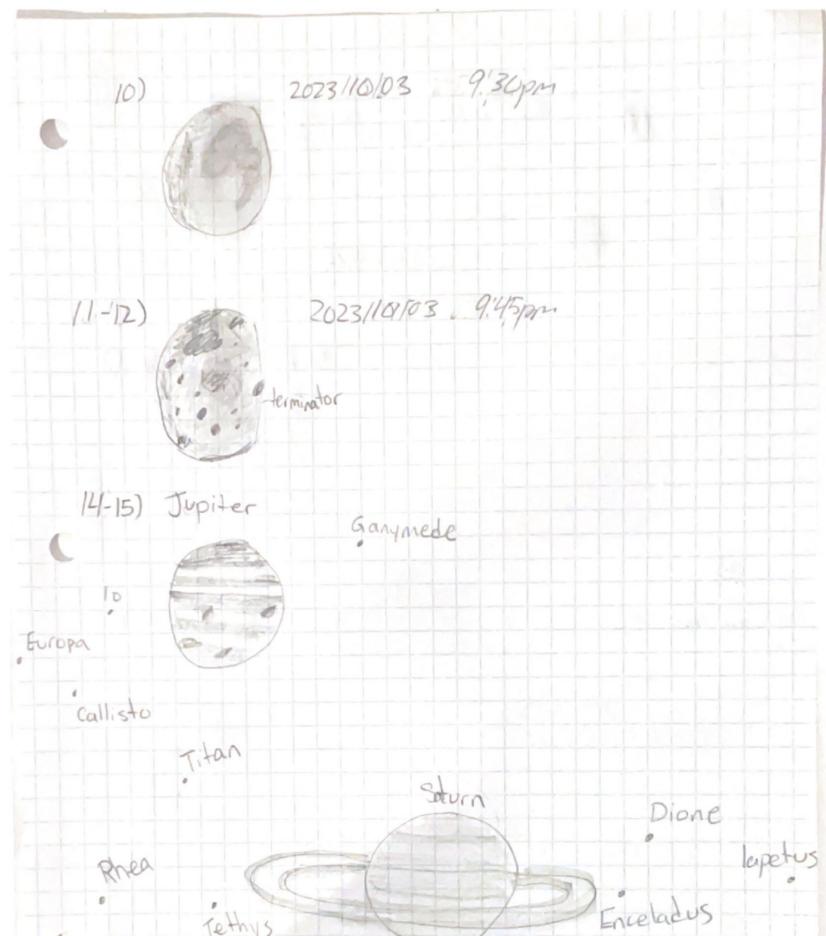
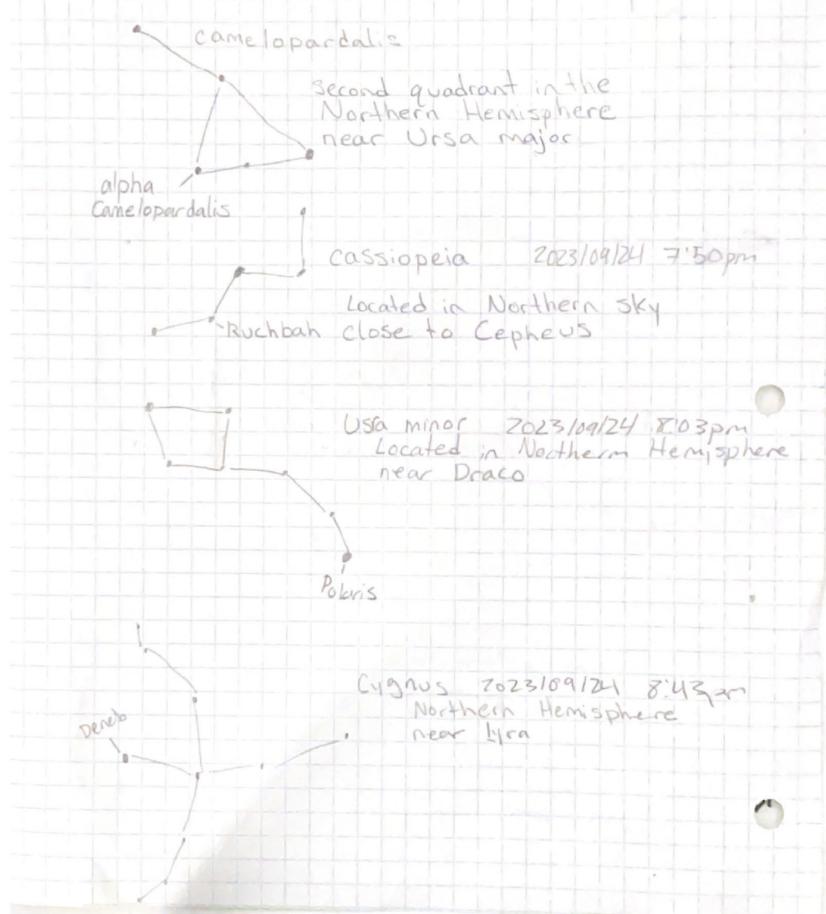
Planets
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7) 2023/09/24 7:46pm



16)

Blue and very bright
2023/09/24 9:50pm

17+8)

Albireo
Beta Cygni B

2023/09/24 10:00pm

211) Globular star Cluster M13 Wild Duck Cluster M11



Andromeda Galaxy M31



Omega Nebula M17



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