Positions of the Planets
Lab 2
Astronomy 101

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1 Objective

This labs purpose is to educate the student with the planets, how they move relative to each other, how their position plays a role in what planets can be seen, and what the configurations of planets are. Finally the student will be able to make predictions about where planets will be in the sky.

2 Introduction

In this lab, there will be plotting of planets on coordinate and constellation maps, based on heliocentric values. These plottings will then be used to give orbits and semi-accurately predict where the planets will be at times in the year.

3 Equipment

* Large sheet of Polar coordinate graph paper
* Protractor
* SC001 Constellation chart
* Coloured pencils
* Planisphere

4 Procedure

4.1 Plotting Planets

The planets data was given in heliocentric coordinates, for given times of the year. From those coordinates, the planets were plotted on the Polar coordinate graph paper, using coloured pencils to differentiate between the dates. The data was given in the form of two tables, one which had the heliocentric longitudes of the planets, and another with the Astronomical Unit distance of the planets. In order to do this plotting, the orbits were assumed to be circular.

4.2 Conjunctions, Elongations, and Oppositions

In this section, the planets that have been plotted will have their configuration determined, and whether or not they are visible at sunrise, sunset, noon, and midnight. This can all be determined based on their position relative to the earth and sun.

4.3 Geocentric Ecliptic Longitude of the Planets

5 Observations

5.1 Constellations

See attached constellation diagrams.

5.1.1 Andromeda

Andromeda is located north of the celestial equator, and is only visible north of 40 degrees south latitude. [**?**] It is a very large constellation an area of 722 square degrees.

Mythology: Andromeda was the beautiful daughter of Cassiopeia, who was chained to a rock in the sea by Poseidon, to be eaten by the sea monster Cetus. This happened because Andromeda's father, Cepheus was the king of Aethiopia, and the only way to save his kingdom would be to sacrifice his daughter. The daughter was saved by Perseus, who wielded the head of the medusa and turned the monster Cetus to stone.

Stars Andromeda is interesting because it's brightest star *Alpheratz* with a magnitude of 2.1 and a distance of 97 light-years from Earth, is also the beginning of another constellation, *Pegasus*. There are also two more notable stars (there are more but I was only able to easily discern three when drawing it during the lab), *Mirach*, and *Almach*.

5.1.2 Cepheus

Located near Cassiopeia, and Polaris, Cepheus is shaped somewhat like a sideways child's drawing of a house.

Mythology Cepheus was the king of Aethiopia, father of Andromeda, and husband of Cassiopeia. Cepheus offered his daughter as a sacrifice to save his kingdom, but was always praying for her to live. After Perseus came to save Andromeda from the sea monster Cetus, he allowed Perseus to marry Andromeda instead of his brother Phineus. [**?**]

5.1.3 Perseus

Mythology Perseus is the hero who slain the gorgon Medusa and carries her head. He used the Medusa head to turn the monster Cetus to stone. [**?**]

Stars Perseus is home to *Mirfak* (α Per), the brightest star, which is a supergiant, with luminosity 5,000 times and it's diameter 42 times that of our sun. [**?**] Perseus also contains the star *Algol* (β Per), which is also known as "Demon Head", because it is the eye of the gorgon Medusa. It is approximately 92.8 light-years from Earth. One of the interesting parts of Algol is that is a variable magnitude star from a minimum of 3.5 to a maximum of 2.3, with a period of 2.867 days. [**?**]

5.1.4 Aquila

Located in the northern sky, it lies a few degrees north of the celestial equator. Altair, the constellation's brightest star is a vertex of the Summer Triangle asterism.

Mythology Aquila is believed to have been the bird that carried Zues' thunderbolts. It is also said that Aquila is the eagle who kidnapped Ganymede.

Stars The three main stars of Aquila are *Altair*, *Alshain*, and *Tarazed*

5.2 The Stars

5.2.1 Albireo

Albireo is interesting because it is a double star, Albireo A, which is red and a magnitude of 3.1, and Albireo B, blue and magnitude 5.1. Albireo A, burns cooler (approximately 4000K at its hottest whereas B burns at approximately 13000K)

5.3 Deep Sky Objects

Sketches can be found attached in pen.

5.3.1 Globular Cluster

Messier 15 (M15) A globular cluster with approximately 100,000 stars, approximately 33,000 light-years away and 12 billion years old. M15 has a supermassive black hole in the center, which holds the stars in, in a tight gravitational pull.

5.3.2 Open Cluster

Messier 11 (M11) Open cluster with approximately 3000 stars, which are all similar in age, since they were formed from one very large clump of gas approximately 1000 light years from Earth. Open clusters are loosely bound by mutual gravitational pull, which is different from *Globular Clusters*.

5.3.3 Planetary Nebula

A planetary nebula consists of expanding gas. They are essential to the chemical evolution of the galaxy, meaning they are good for returning materials that have been enriched back to the galaxy.

M57 – Ring Nebula M57 is a great example of a planetary nebula because it contains a now white dwarf , that had gone supernova and exploded, sending gas expanding back into the galaxy. It is approximately 2300 light years away.[**?**]

5.3.4 Galaxy

A galaxy is a large grouping of stars, gas, dust, and other objects that are bound together by gravity. There are estimated to be more than 170 billion galaxies in the observable universe, one of which is our Milky Way galaxy.

Andromeda – M31 Andromeda is another spiral galaxy nearest to our own, at an approximate distance of 2.5 million light years away. The interesting thing about the Andromeda galaxy is that it is one of the brightest spiral galaxies, making it slightly visible to the naked eye on some nights.

6 Conclusion

This lab was a success in that I know a lot more about many new constellations including the four included in the report as well as more such as Signus, and Saggitarius. I also have knowledge about two types of telescope, reflective and refractive, and the uses of both, in addition to being able to operate one.