CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)

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Project Number

22059

Project Title

Jupiter and Its Moons

Abstract

Objectives/Goals

My objective is to determine why Jupiter's moons have different orbits. I predict that the moon farthest from Jupiter will have the longest orbital period and the closest moon will have the shortest orbital period.

Methods/Materials

Using a Meade LX200 12-inch reflector telescope located in my driveway between the hours of 6:00PM to 11:00PM from January 5th through January 8th, 2002, I observed Jupiter and the continously changing positions of it's four Galilean moons. With a pencil and paper, I drew Jupiter and it's moons exactly as I saw them. After the drawing was completed, I used the January 2002 edition of "Sky and Telescope" magazine to identify the name of each moon. I repeated this same procedure for four consecutive nights. I then measured the distance between Jupiter and it's moons in my drawings and plotted the changing positions of the moons. With this data, I calculated the relative distances of Europa, Ganymede and Callisto to Jupiter compared to the distance from Io to Jupiter. This was done by taking the average drawn distance of each moon to Jupiter. I then created a graph that showed the positions of the moons with time. I connected the points on the graph similar to the orbital pattern seen on the Jupiter Satellite Position chart on page 114 of "Sky and Telescope", January 2002 edition. Then, I estimated the orbital period of each moon. I compared the relative distance of each moon from Jupiter to the orbital period of each moon.

Results

The observed relative distances of each moon to Jupiter compared to Io's distance to Jupiter was determined. The observed relative distance of Europa was 1.49X, Ganymede was 1.94X, and Callisto was 2.56X. Actual relative distances are 1.59X, 2.52X, and 4.58X respectively. The observed orbital period of Io was 2.0 days, Europa was 3.8 days, Ganymede was 7.4 days and Callisto was 12 days. Actual orbital periods are 1.8 days, 3.6 days, 7.2 days, and 16.7 days respectively.

Conclusions/Discussion

After analyzing the data, I conclude that Jupiter's four Galilean moons have different orbits because thay are different distances from Jupiter. My hypothesis is correct in stating that the farther the moon is from Jupiter, the longer it takes to orbit Jupiter. These results support the findings of Johannes Kepler's third law of planetary motion.

Summary Statement

This is an observational study of Jupiter's moons distances from the planet and their orbital period

Help Received

I would like to thank my father for teaching me how to use the telescope. He spent many late nights in the cold extending my knowledge of the solar system.

Preliminary