CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Skye Aaron

Project Number
J1501

Project Title
To Jupiter and Beyond: Build a Telescope to Estimate Jupiter's Diameter and Io's Orbital Speed

Abstract

Objectives/Goals
My objective was to build a Dobsonian telescope and use it to measure the diameter of Jupiter and the orbital speed of Io.

Methods/Materials
I downloaded plans from the Internet for building an 8-inch diameter telescope. I built the telescope from scratch using a SONO tube, plywood, screws and glue. The optical elements were purchased.

After learning how to use the telescope, I used it to determine two things: the diameter of Jupiter, and the speed of Jupiter's moon, Io. I timed a transit of Io across the face of Jupiter. The number of kilometers across Jupiter was then divided by this time to determine Io's speed. I also measured how long it took Jupiter to pass one of its diameters (due to the earth's rotation). This number was used to determine the diameter of Jupiter.

As part of checking the focal length of the primary mirror, I measured the relation between image distance and object distance.

Results
My estimate of Jupiter's diameter was within 1% of the value according to JPL's website. This agreement is mostly luck. The standard deviation of my measurements was 14%.

My estimate of the orbital speed of Io was within 5% of the accepted value.

My measurements of image distance and object distance agreed very well with an equation relating these two distances and the focal length.

Conclusions/Discussion
I successfully measured Jupiter's diameter and Io's orbital speed. I was surprised that I could measure them so accurately with fairly crude methods.

Other things learned from the project are: how to draw celestial objects, how a telescope works, how to collimate the mirrors in a Newtonian telescope, and the relation between object distance and image distance.

Summary Statement
I built an 8-inch diameter Dobsonian reflector telescope and used it to measure Jupiter's diameter and Io's orbital speed.

Help Received
My mother suggested the project. My dad helped with the cutting of the wood and with the measurements. They both helped with the display board. I used Global Aerospace Corp. shop tools (with my dad's supervision).