Build a Telescope

by Tim McIntyre and Margaret Wegener

Experiment Overview

The telescope has been an important scientific tool ever since Galileo used it to view the moons of Jupiter in 1610. In its simplest form, a telescope consists of an objective lens and an eyepiece lens. The objective lens forms an image within the telescope which is enlarged by the eyepiece. In this experiment you will be asked to construct and characterise a simple telescope. The experiment takes place over two sessions – in the first session you'll examine the critical parameters that determine the magnification and quality of the image that is formed. In the second session you will build an optimised telescope and devise methods to determine its theoretical and experimental magnification.

Aims and Objectives

- an enhanced conceptual understanding of optics;
- a practical familiarity with real and virtual images;
- basics in experimental methodology – setting up an optical system;
- experience with using and interpreting ray diagrams.

Level of Experiment

First Year

Keyword Descriptions of the Experiment

Specific Descriptors
Simple lenses, optical instruments, telescope

Course Context

This experiment accompanies a lecture series covering electricity and magnetism, optics, special relativity and quantum mechanics. The optics component includes coverage of geometric optics with emphasis on the principles of simple lenses, mirrors and optical instruments.

Prerequisite Knowledge and Skills

Students are expected to have learned the theory of light propagation through simple lenses and to be familiar with the design of a simple telescope.

Time Required to Complete

Prior to Lab: No pre-lab required
In Laboratory: Up to 6 hours
After Laboratory: Up to 2 hours if writing a report

Experiment History

This version of our telescope experiment has been completely revised as part of the new laboratory structure in this course in semester 1, 2010. It is yet to be taken by students. A shorter, more prescriptive version of the experiment has been used in the laboratory for about five years.

Comments

The experiment is designed to be completed by small groups of students. We believe three is the optimal number but four is probably preferable to two.

In our first year course, students are asked to write a formal report near the end of semester about one experiment they have completed during the semester. Hence students may or may not complete a formal report on this experiment.