DAY LABORATORY
OPTICS AND TELESCOPES

Goals:

- To explore the functions of simple lenses
- To construct and use a refracting telescope
- To understand the concepts of focal length, focal ratio, and magnification.
- To study aberrations in simple telescope systems.
- To explore the concept of angular resolution.

Equipment: Lens kits, optical benches, light sources, rulers, calculators

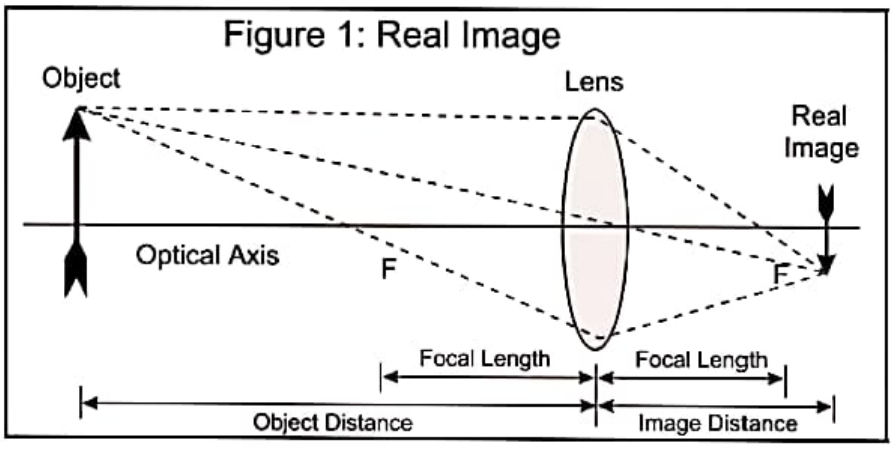
Methods:

- Measure lens focal lengths by forming images of distant objects
- Focus refracting telescope on distant object - measure lens separations
- Compare optical aberrations of refracting and reflecting telescopes
- Explore optical systems using a multiple lens optics kit and light source
- Measure angular resolution of the eye using distant eye chart

Introduction - Telescopes are the primary instruments for the acquisition of data by astronomers. This exercise investigates the basic principles of geometric optics as applied to telescopes. You will primarily use refracting telescopes for the examples, but what you learn can be applied to any telescope (i.e., reflecting or radio).

Lenses and Mirrors - A **positive lens** has at least one convex surface and is capable of focusing light from a distant **object** into a real **image**, that is, an image which can be seen projected onto a screen (see Figure 1).

Figure 1: Real Image



However, the same lens, when placed *close* to an object, produces a magnified *virtual* image which can be seen through the lens with the eye, but cannot be projected onto a screen (see Figure 2). A **negative lens** has at least one concave surface and always produces a virtual image. All of the lenses in this exercise have convex surfaces (the glass surface bulges outward from the lens center).