Telescopes - Tools of the Trade

Keck telescope in Mauna Kea, Hawaii

Large lens = more light = brighter image

How a lens focuses light

World’s largest refracting telescope

How a curved mirror focuses light
Some focus arrangements for reflectors.

**World’s Largest Optical Telescope**

One of the twin Keck telescopes

**One of the two Gemini telescopes**

Diffraction limits the ability to observe fine details.

**Astronomical Interferometer**

Telescope Versus Interferometer

Can observe 2 stars!
Photograph of a radio telescope

Radio waves from space
Signals are focused here and carried by cable to the control room.
A dish 10.4 meters (about 34 feet) in diameter collects radio waves and reflects them to focus.
Mounting allows telescope to track sources.

The Hubble and other observatories

Hubble Space Telescope (11 m in length)

Effects of refraction

Star appears to be here
Star is really here.

Images from the Hubble

Light Pollution

Twinkling of Stars

Wind moves pockets of slightly cooler air across your line of sight.

Light ray shifted from side to side by refraction in air pockets.

Images of Jupiter

The Cat's eye nebula

Ring of gas around the supernova 1987 A

Hourglass Nebula

Disk of dust gas in a star of the galaxy M51

A black hole may lie in the disk's center.
The Crab Nebula