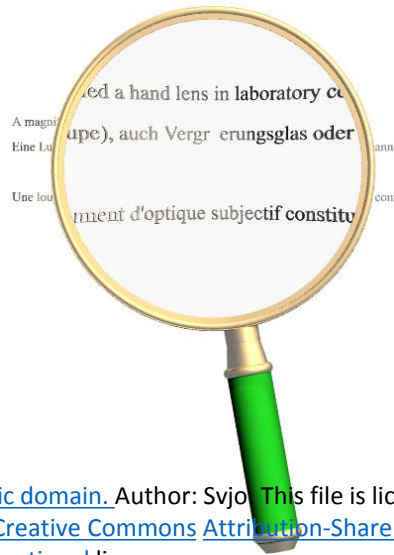


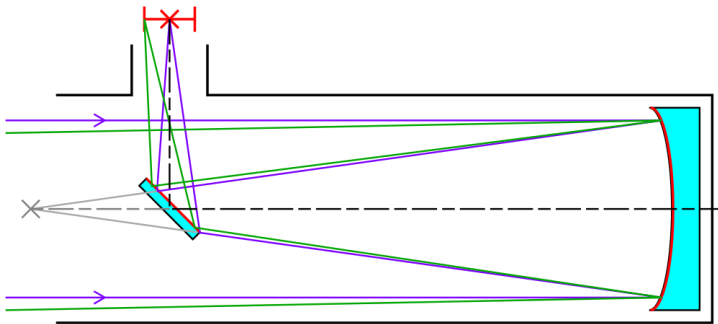
Optical Devices



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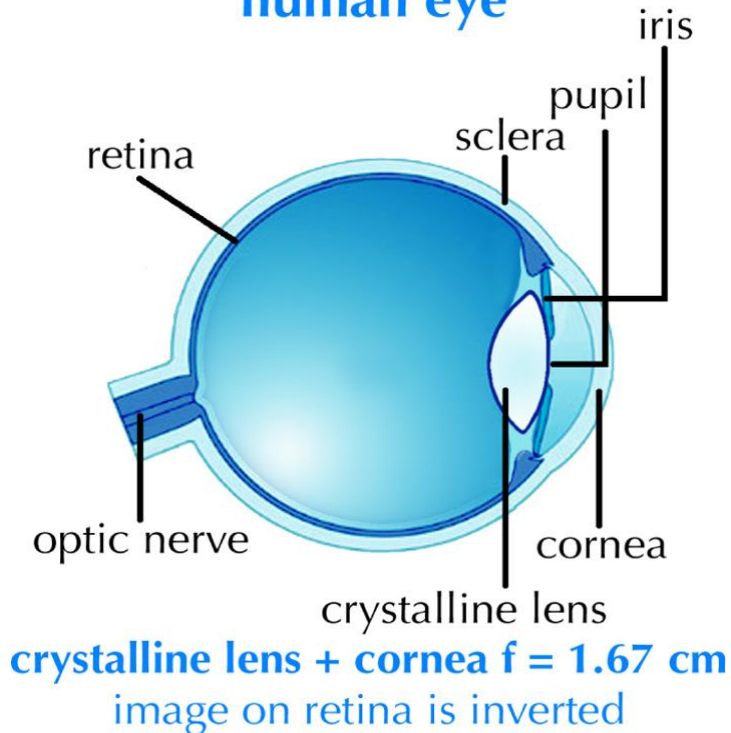
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1. The Eye

human eye



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Fig.4-1

Play the [interactive](#)

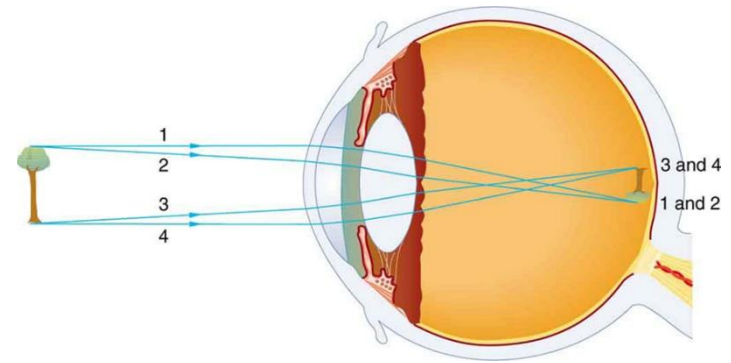


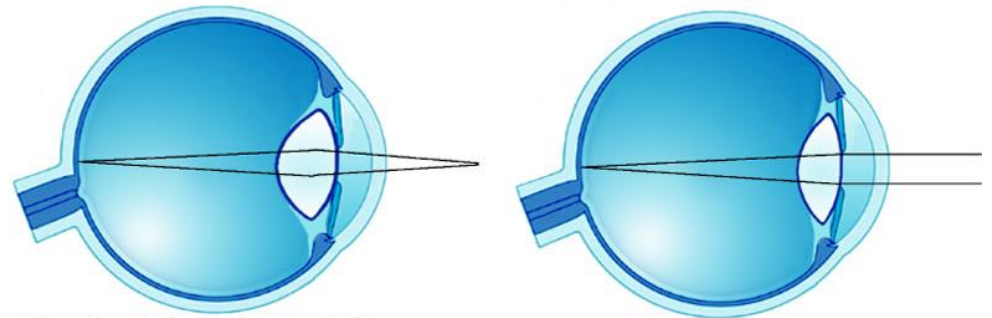
Fig.2 in Ch.26.1 of OpenStax College Physics.
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Accommodation is the change of the focal length of the eye lens to view objects at a range of distances:

accommodation of the eye

near object: the crystalline lens thickens

far away object: the crystalline lens is relaxed

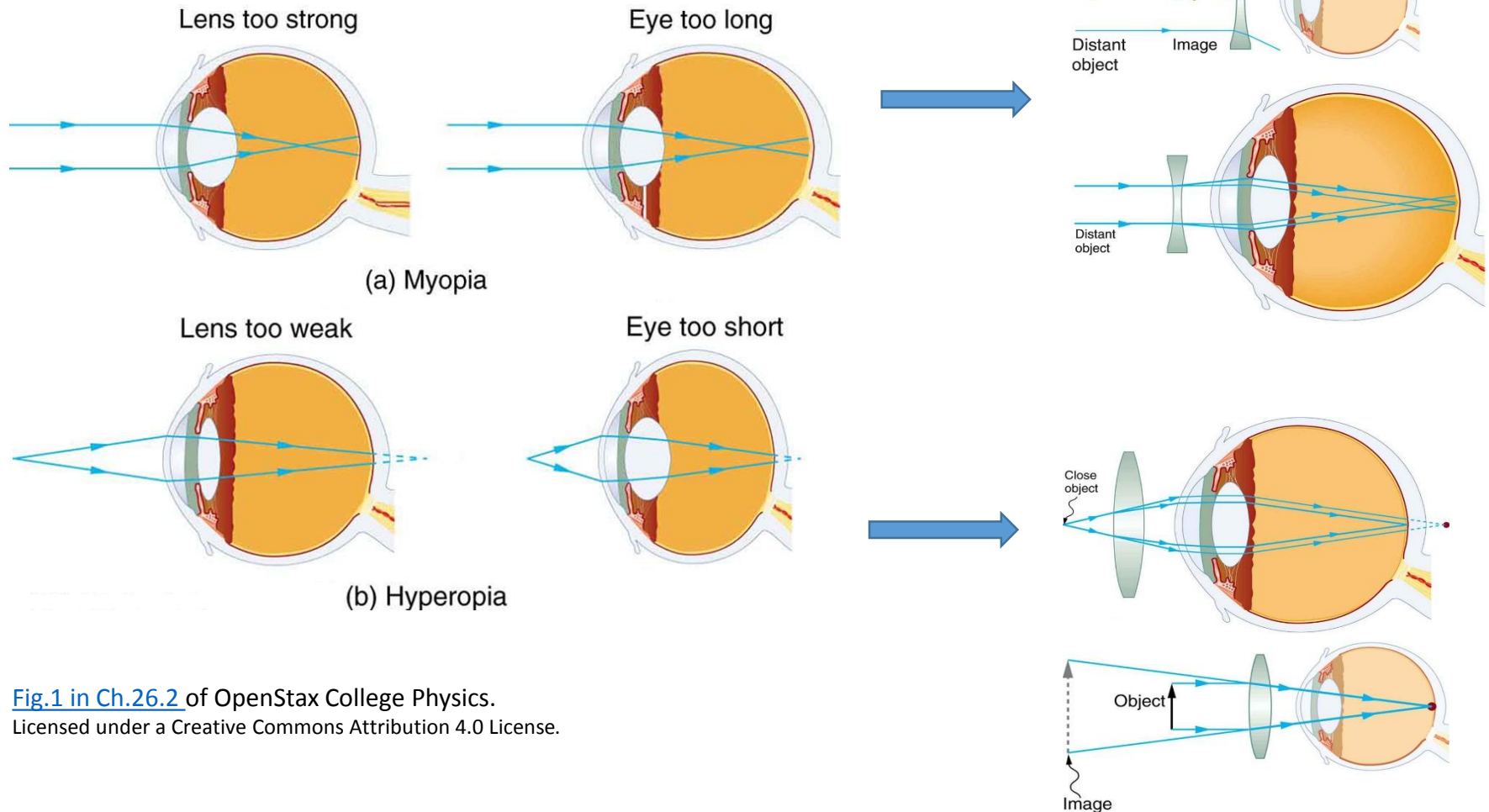


but there is a limit: the "near point"
this is the shortest distance of distinct vision

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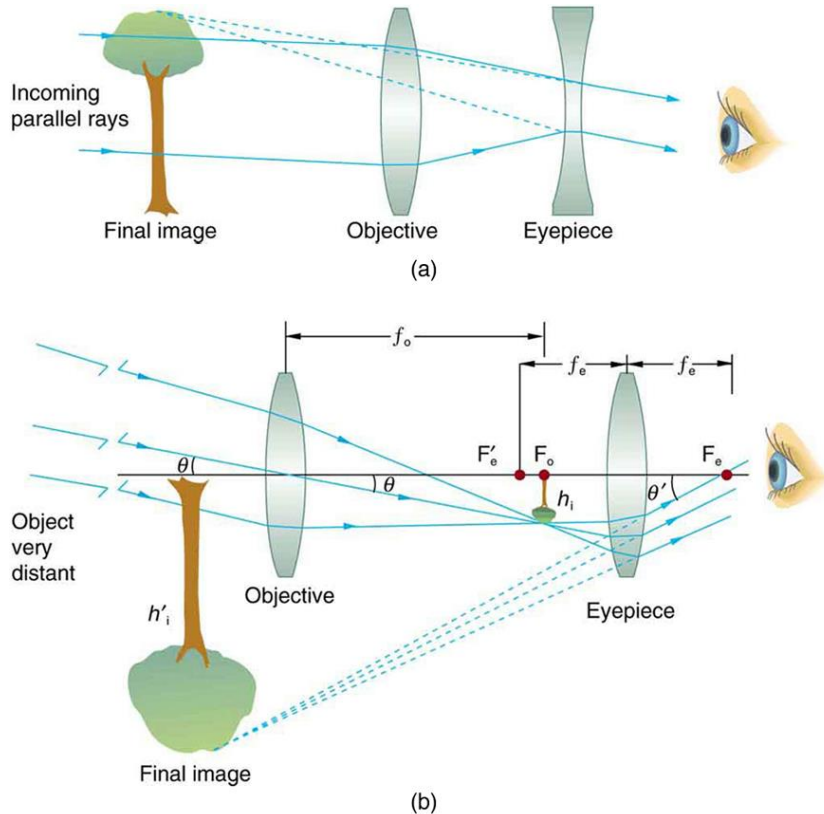
Fig.4-3

Nearsighted and farsighted eyes need corrections



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2. Telescopes



The magnification of a telescope is the ratio of the focal lengths of the objective lens and the eyepiece:

$$M = \frac{f_o}{f_e}$$

The telescope designs of Galileo (a) and Kepler (b).

[Fig.1 in Ch.26.5](#) of OpenStax College Physics.

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Optical telescopes are two basic types:

- reflectors (*use a primary mirror*)
- refractors (*use a primary lens*)

See a demo here:

http://college.cengage.com/coursemate/astronomy/shared/active_figures/thirteen/index.html



The 12" refractor from 1922 at Cornell University's Fuertes Observatory in Ithaca, NY. This file is licensed under the [Creative Commons Attribution-Share Alike 3.0 Unported](#) license. Attribution: [AlphaOrionis42](#) at [English Wikipedia](#)

Examples of various types of telescopes:

<https://www.telescope.com/home.jsp>

More details for telescope enthusiasts:

http://www.rocketmime.com/astronomy/Telescope/telescope_eqn.html

Q: What property of a telescope is most important?

The most important properties of a telescope are:

- Light-gathering ability



*Which bucket
collects more rain?*



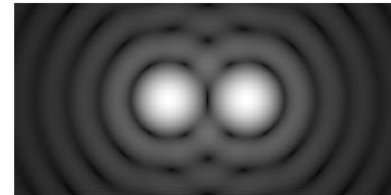
*Think of telescopes
as light buckets.*

A larger diameter of the primary mirror
(lens) telescope collects more light
and has a better resolution.

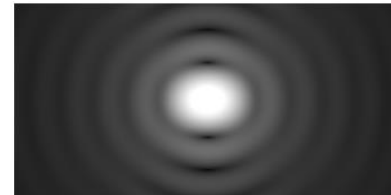
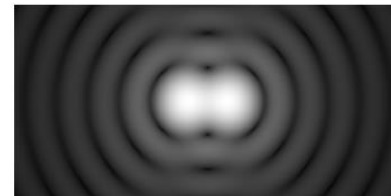
The atmosphere limits the resolution
to 1" (arcsec). Adaptive optics is used
to overcome this limitation.

- Angular resolution

(to separate close objects)



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author: Spencer Bliven



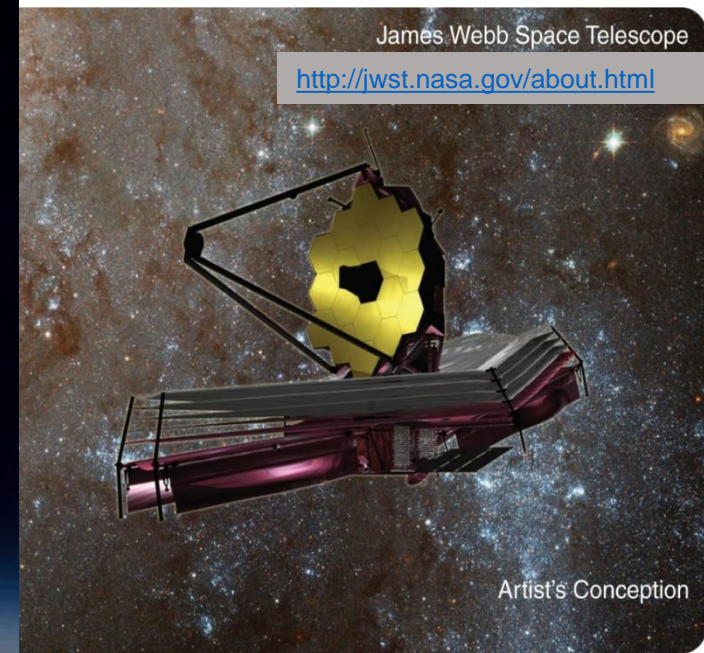
Where are the largest telescopes?

<http://www.space.com/14075-10-biggest-telescopes-earth-comparison.html>

Examples of [space telescopes](#)

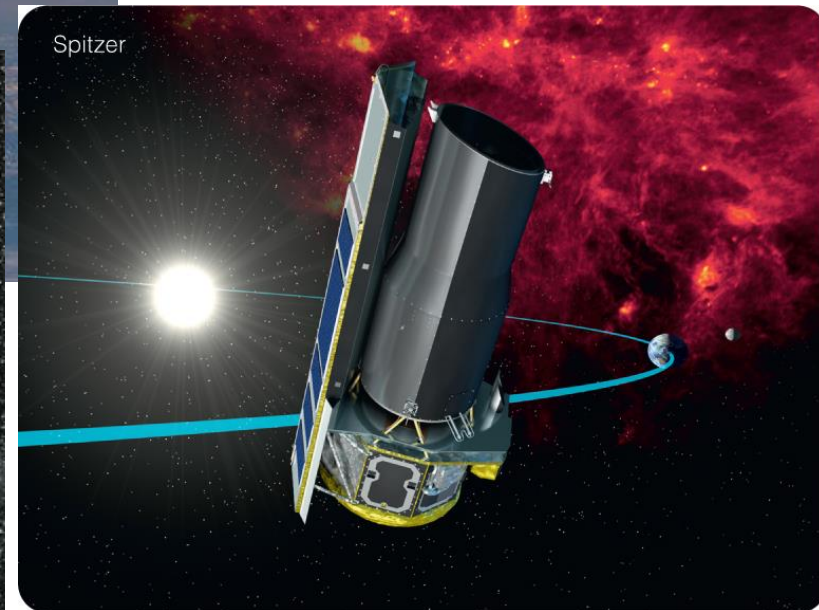


Hubble space telescope
[Public domain](#)



Kepler Space Telescope

Credit: [NASA/Kepler mission/Wendy Stenzel](#)



3. Binoculars

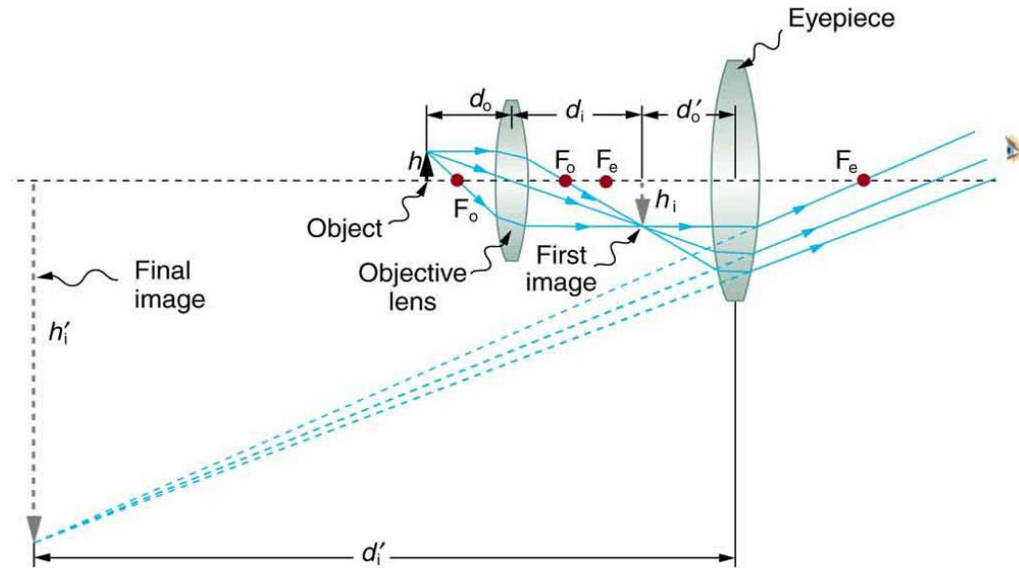
Example: 7x is the magnification;
50mm diameter of the objective lens



[The binocular specifications](#)

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4. Microscopes



[Fig.2 in Ch.26.4](#) of OpenStax College Physics.

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The magnification of a microscope is the product of the magnifications of the objective lens and the eyepiece:

$$M = m_o m_e$$