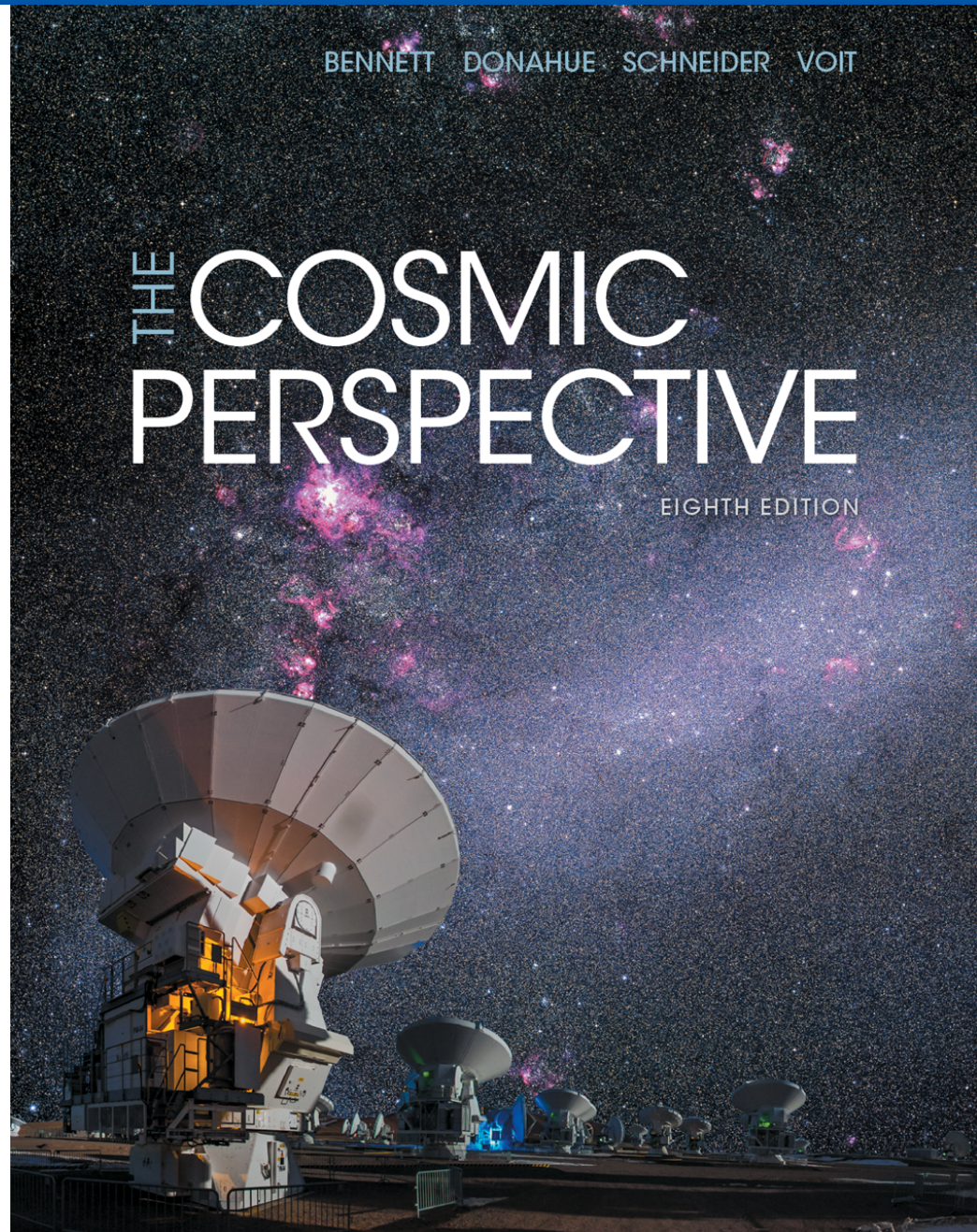


Chapter 6: Telescopes: Portals of Discovery



6.1 Eyes and Cameras: Everyday Light Sensors

- How do eyes and cameras work?

How do the cornea and lens affect light entering the eye?

- a) They reflect light of certain wavelengths, allowing only those that form an image to enter.
- b) They change size to allow an appropriate amount of light to enter.
- c) Light travels slightly slower moving through them, causing the direction of the incoming light to change (refract) and focus on the retina.
- d) They have no affect on the light except to transmit it through to the retina.
- e) The cornea transmits the light to the lens which detects the incoming light.

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Why can cameras see objects too faint to be seen by the eye?

- a) They have larger detectors.
- b) They can record light for a longer period of time.
- c) Their detectors are more sensitive to light than the eye.
- d) They have more pixels than the eye.
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The electronic detector of a digital camera performs the same role as what part of the eye?

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- b) the lens
- c) the pupil
- d) the retina
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6.2 Telescopes: Giant Eyes

- What are the two most important properties of a telescope?
- What are the two basic designs of telescopes?
- What do astronomers do with telescopes?

What is the diffraction limit?

- a) It is the theoretical limit on the angular resolution of a telescope that depends on the wavelength of light and the size of the aperture.
- b) It is the theoretical limit on the faintness of an object that a telescope can detect that depends on the size of the aperture and the type of detector.
- c) It is the theoretical limit to the angular resolution of a telescope that depends on the size of the aperture and the type of detector.
- d) It is the theoretical limit on the faintness of an object that a telescope can detect that depends on the size of the aperture and the wavelength of light.
- e) It is the shortest wavelength of light that can be observed by a telescope and depends on the size of the aperture.

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Which of the following is not a problem for refracting telescopes?

- a) Different wavelengths of light are focused at slightly different locations.
- b) The primary lens can only be supported at the edges making deformation of large lenses difficult to avoid.
- c) The quality of the glass lens in transparency and in the shape of both surfaces must be high.
- d) The secondary mirror blocks some of the light passing through the primary lens.

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Improving the spectral resolution of a spectrograph comes at the expense of

- a) increased exposure time.
- b) decreased angular resolution.
- c) larger telescope aperture.
- d) A and B
- e) none of the above

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What is a light curve?

- a) a plot showing the amount of light at different wavelengths
- b) the shape of a telescope's primary lens or mirror
- c) a plot showing how the intensity of light from an object varies with time
- d) the path that light takes as it goes through a telescope lens and reflects off the mirrors.
- e) a curve that is very shallow

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6.3 Telescopes and the Atmosphere

- How does Earth's atmosphere affect ground-based observations?
- Why do we put telescopes into space?

What is light pollution?

- a) It is the contamination of a spectrum by unwanted wavelengths.
- b) It is city light scattering off the atmosphere and into a telescope.
- c) It is light from a second object in the telescope's field of view that washes out or interferes with the image of the object being studied.
- d) It is degradation of a telescopic image by the presence of smog and other pollutants in the atmosphere.
- e) It is pollution that rises to the top of the atmosphere because it is not as heavy as the other forms of pollution.

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How does atmospheric turbulence affect telescopic observations?

- a) It increases the amount of time needed to obtain a clear image.
- b) It reduces the angular resolution of the image.
- c) It reduces the spectral resolution that can be obtained.
- d) It increases the chromatic aberration of an image.

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Which of the following is not an advantage of space telescopes?

- a) They are closer to the astronomical objects they are observing.
- b) They are unaffected by atmospheric turbulence, which affects angular resolution.
- c) They are able to detect light that is blocked by the atmosphere.
- d) None of the above (all are advantages)

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6.4 Telescopes Across the Spectrum

- How do we observe invisible light?
- How can multiple telescopes work together?

What part(s) of the spectrum can only be observed from space?

- a) Radio
- b) infrared
- c) X-ray
- d) gamma-ray
- e) C and D

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- b) ultraviolet
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How does adaptive optics improve the performance of a telescope?

- a) It rapidly adjusts the shape of the telescopes mirror to compensate for the effects of turbulence.
- b) It adjusts the position of a diffraction grating to match the wavelength of observation to atmospheric conditions.
- c) It adjusts the position of the secondary mirror to automatically change the focus in response to turbulence.
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What is interferometry?

- a) It is the measurement of the different amounts of light at different wavelengths.
- b) It is the analysis of interference patterns of light from different telescopes to enable combining the light into one image.
- c) It is the measurement of atmospheric interference with light entering a telescope to reduce the effects of turbulence.
- d) It is the measurement of x-rays with grazing incidence angle mirrors.
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How does interferometry improve the capabilities of a telescope?

- a) It improves the spectral resolution.
- b) It improves the angular resolution, at the expense of sensitivity.
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