

生物物理学 II Handout No. 9

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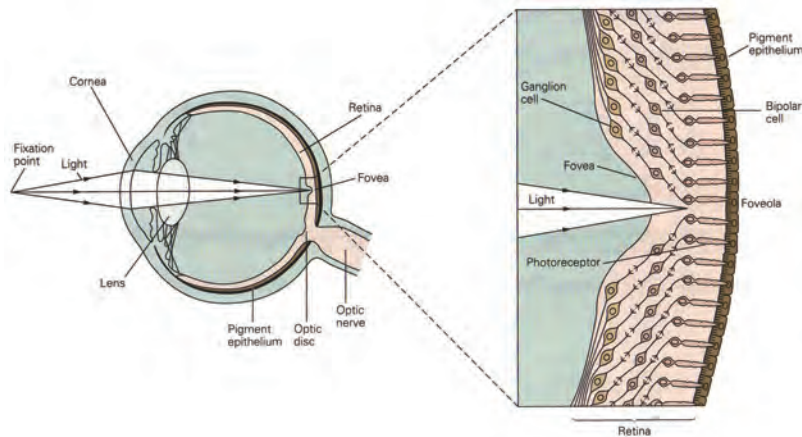


Figure 26-1 Photoreceptors are located in the retina. The location of the retina within the eye is shown at left. Detail of the retina at the fovea is shown on the right (the diagram has been simplified by eliminating lateral connections mediated by interneurons; see Figure 26-61). In most of the retina light must pass through layers of nerve cells and their processes before it reaches the photoreceptors. In the center of the fovea, or foveola, these proximal neurons are shifted to the side so that light has a direct pathway to the photoreceptors. As a result, the visual image received at the foveola is the least distorted.

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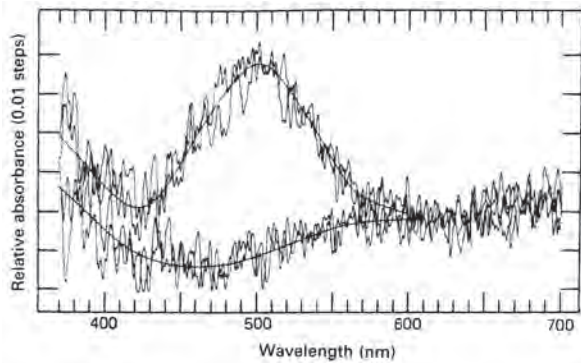


Figure 15.38. Absorbance spectra of a single human rod outer segment, determined by microspectrophotometry. The microspectrophotometer beam was scanned from blue (short wavelengths) to deep red and back again, giving the noisy traces shown. Continuous curves are drawn through the middle of the noise. The upper curve was determined for the dark-adapted rod exposed only to dim deep red light after surgery, and the lower curve shows a similar record after bleaching with white light. (From Bowmaker & Dartnall, 1980.)

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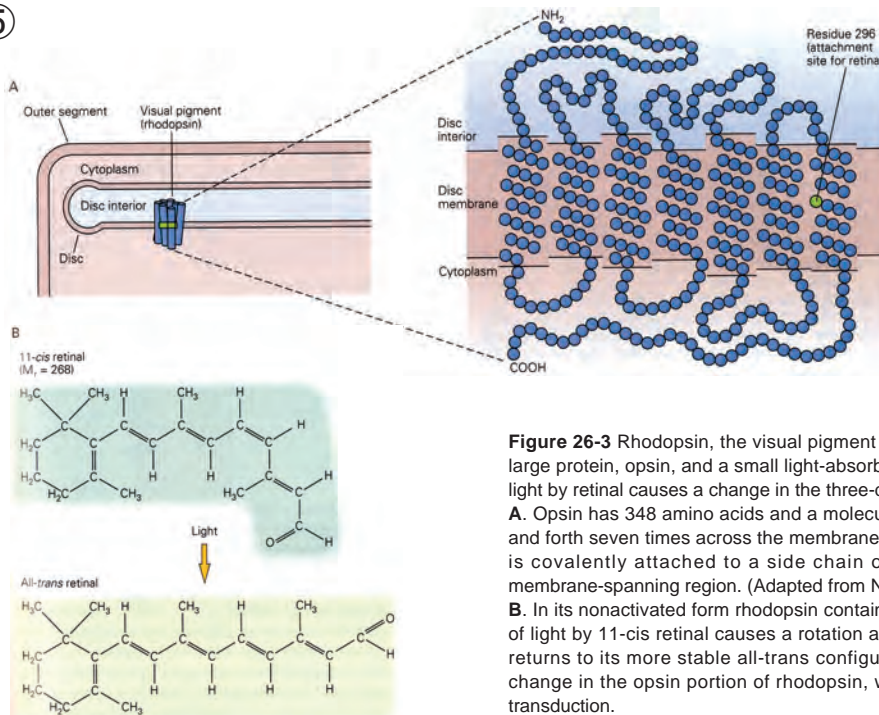


Figure 26-3 Rhodopsin, the visual pigment in rod cells, is the covalent complex of a large protein, opsin, and a small light-absorbing compound, retinal. The absorption of light by retinal causes a change in the three-dimensional structure of rhodopsin. **A.** Opsin has 348 amino acids and a molecular weight of about 40,000. It loops back and forth seven times across the membrane of the rod disc. Retinal (green rectangle) is covalently attached to a side chain of lysine 296 in the protein's seventh membrane-spanning region. (Adapted from Nathans and Hogness 1984.) **B.** In its nonactivated form rhodopsin contains the 11-cis isomer of retinal. Absorption of light by 11-cis retinal causes a rotation around the 11-cis double bond. As retinal returns to its more stable all-trans configuration, it brings about a conformational change in the opsin portion of rhodopsin, which triggers the other events of visual transduction.

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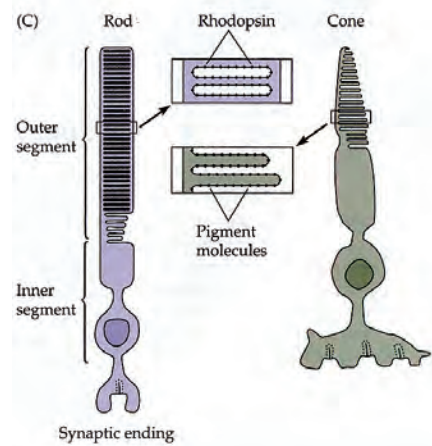


FIGURE 19.4 Diagram of a rod and a cone. In the rod, the pigment rhodopsin (black dots) is embedded in membranes arranged in the form of disks, not continuous with the outer membrane of the cell. In the cone, the pigment molecules are on infolded membranes that are continuous with the surface membrane. The outer segment is connected to the inner segment by a narrow stalk. The synaptic endings continually release transmitter in the dark. (after Baylor 1987.)

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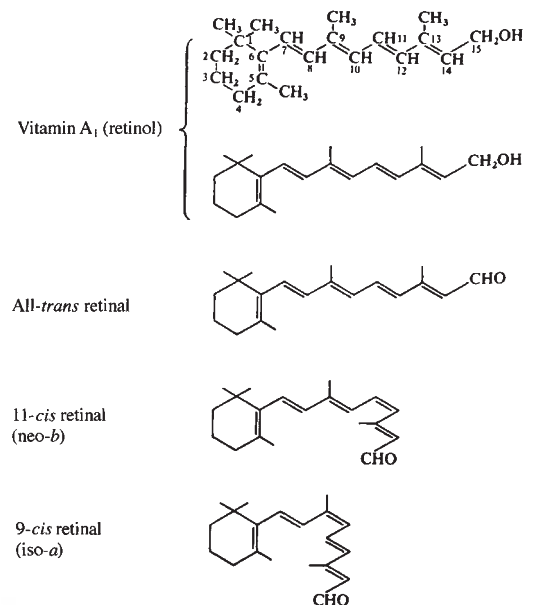


Fig. 18.14. Structural formulae of vitamin A₁, shown in full and in shorthand notation, and of three stereoisomers of retinal, shown in shorthand notation.