動物生理学 III　Handout No. 4

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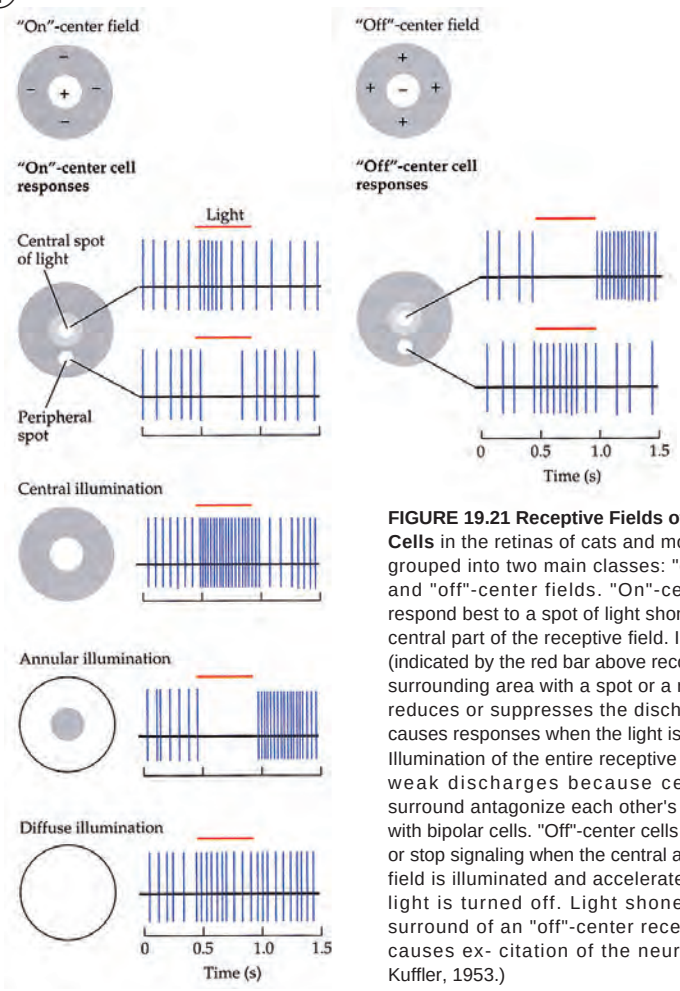

FIGURE 19.21 Receptive Fields of Ganglion Cells in the retinas of cats and monkeys are grouped into two main classes: "on"-center and "off"-center fields. "On"-center cells respond best to a spot of light shone onto the central part of the receptive field. Illumination (indicated by the red bar above records) of the surrounding area with a spot or a ring of light reduces or suppresses the discharges and causes responses when the light is turned off. Illumination of the entire receptive field elicits weak discharges because center and surround antagonize each other's effects, as with bipolar cells. "Off"-center cells slow down or stop signaling when the central area of their field is illuminated and accelerate when the light is turned off. Light shone onto the surround of an "off"-center receptive field causes ex- citation of the neuron. (After Kuffler, 1953.)

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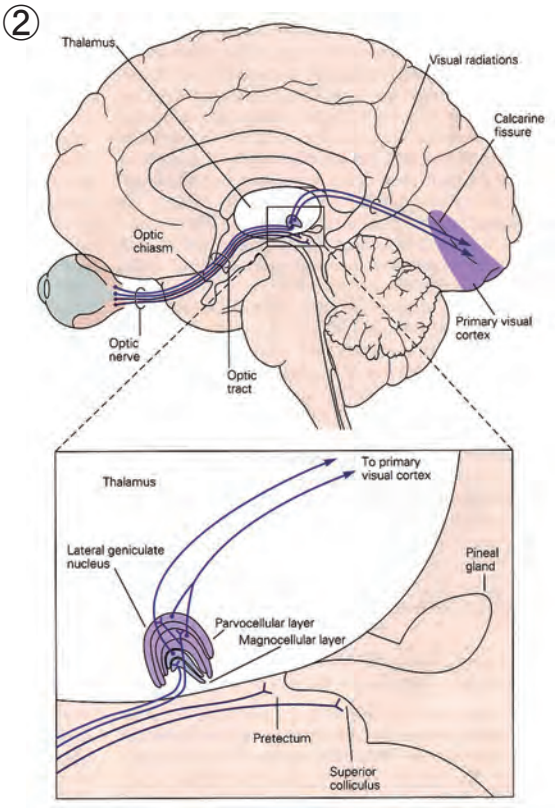

Figure 27-4 A simplified diagram of the projections from the retina to the visual areas of the thalamus (lateral geniculate nucleus) and midbrain (pretectum and superior colliculus). The retinal projection to the pretectal area is important for pupillary reflexes, and the projection to the superior colliculus contributes to visually guided eye movements. The projection to the lateral geniculate nucleus, and from there to the visual cortex, processes visual information for perception.

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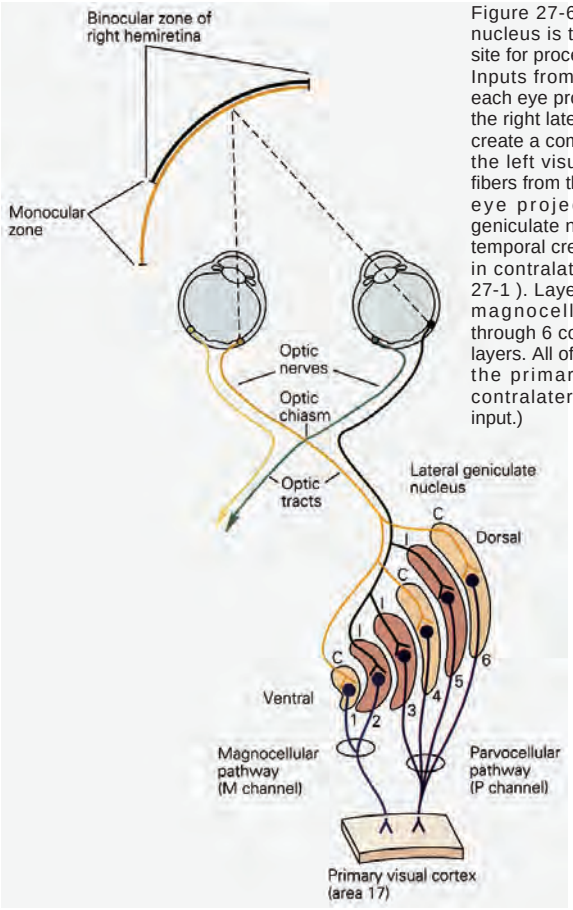

Figure 27-6 The lateral geniculate nucleus is the principal subcortical site for processing visual information. Inputs from the right hemiretina of each eye project to different layers of the right lateral geniculate nucleus to create a complete repre- sentation of the left visual hemitield. Similarly, fibers from the left hemiretina of each eye project to the left lateral geniculate nucleus (not shown). The temporal crescent is not represented in contralateral inputs (see Figure 27-1). Layers 1 and 2 comprise the magnocellular layers; layers 3 through 6 comprise the parvocellular layers. All of these project to area 17, the primary visual cortex. (C = contralateral input; I = ipsilateral input.)

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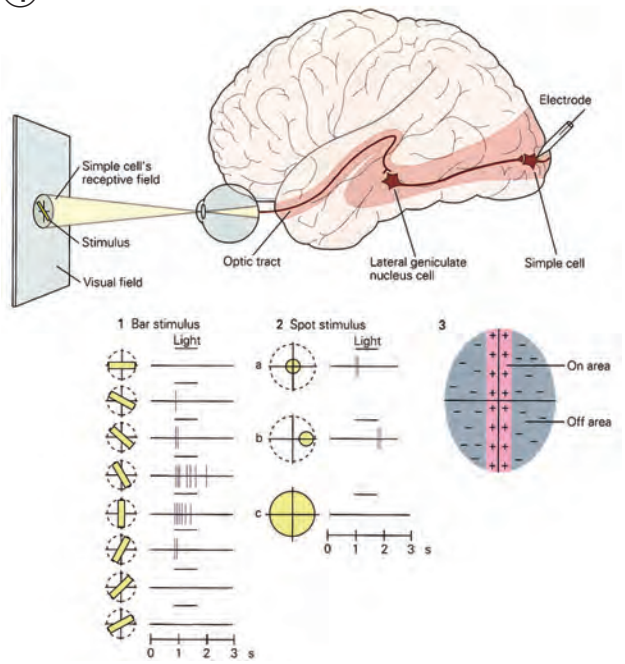

Figure 27-11 Receptive field of a simple cell in the primary visual cortex. The receptive field of a cell in the visual system is determined by re- cording activity in the cell while spots and bars of light are projected onto the visual field at an appropriate distance from the fovea. The records shown here are for a single cell. Duration of illumination is indicated by a line above each record of action potentials. (Adapted from Hubel and Wiesel 1959 and Zeki 1993.)
1. The cell's response to a bar of light is strong- est if the bar of light is vertically oriented in the center of its receptive field.
2. Spots of light consistently elicit weak responses or no response. A small spot in the excitatory center of the field elicits only a weak excitatory response (a). A small spot in the inhibitory area elicits a weak inhibitory response (b). Diffuse light produces no response (c).
3. By using spots of light, the excitatory or "on" areas (+) and inhibitory or "off" areas (-) can be mapped. The map of the responses reveals an elongated "on" area and a surrounding "off" area, consistent with the optimal response of the cell to a vertical bar of light.