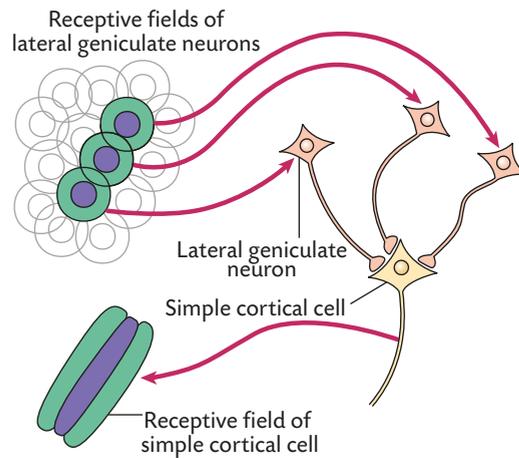


**Figure 5.56** The receptive field of a simple cortical cell in the primary visual cortex. The cell receives synaptic input from many neurons in the lateral geniculate nucleus. The neurons connected to a particular cortical cell have circular receptive fields that are linearly arranged and of the same type. This gives the cortical cell an oblong receptive field, with parallel regions where illumination either stimulates or inhibits the cell.



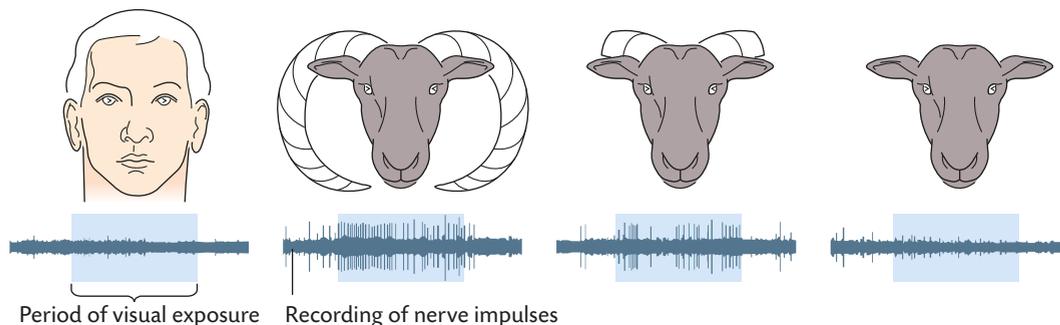
a point-to-point transmission of light intensity, as is the case for shaping a pixelated picture on a television or computer screen. Instead, analytical processing of the visual information, both in the retina and in the brain, occurs in such a way that only information about selected characteristics of the images on the retina are conveyed to the next level. Such characteristics are linked to contrasts, such as contours, lines, corners, and movement. The connections between neurons in the visual pathways are not fully developed at birth, and the formation of synapses is, to a large extent, regulated by visual impressions gained during a limited period after birth. Kittens growing up in cylindrical cages where the wall has a pattern of vertical black and white stripes will, as adults, be completely blind to horizontal stripes. People who grow up in a modern society possess relatively many cortical cells that are sensitive to angles of  $90^\circ$ , as well as to vertical and horizontal lines. The explanation is that the structure of buildings and many of the objects in such societies usually follows vertical and horizontal lines, and the details are rich in right angles. It is there-

fore easy for urban people to identify  $90^\circ$  angles in a complex pattern, whereas this is much more difficult for people in cultures in which the children grow up in tents or straw huts. Angles of  $90^\circ$  are rare in nature, and during maturation of the visual pathways in these children, fewer cells become specialized in detecting such details in the image. However, children who grow up in tents find it easier to detect  $60^\circ$  angles than children growing up in modern cities.

Visual impressions during a limited period after birth influence the brain's processing of visual information throughout life

In other words, when an animal looks at something, the brain receives many different "reports" concerning the characteristics of the image. Based on these reports, the brain performs an independent interpretation, resulting in a visual perception of a coherent picture. However, it is a highly subjective picture, which is partly determined by the visual experiences of the individual during a critical period after birth, and a number of details will not be detected. The

Visual perception is determined by the brain's interpretation of a selection of details in the retinal image



**Figure 5.57** Activity of a cortical neuron specialized in detecting horn size. The neuron was located in the part of the temporal cortex bordering the visual cortex of a Dalesbred (horned) sheep. The animal was exposed to images of three different sheep heads and a human face during the periods indicated by blue shading. Recorded action potentials are shown as vertical deflections from the baseline. The head with the greatest horns evoked the highest impulse frequency in the neuron. Modified from Kendrick and Baldwin, 1987.