BOX 2.6

A GAP IN YOUR VISUAL FIELD

Optic disk is the name given to the place where the optic nerve originates, on the back of the eyeball. Because this region contains no photoreceptors, it cannot support vision—it is literally a blind spot. Note that we're distinguishing between a region defined anatomically, the optic disk, and a region defined perceptually, the blind spot. Before we go on about the blind spot, you may want some proof that it actually exists.

Of course you cannot *see* a blind spot (though you can see an optic disk, using an opthalmoscope). What you can see are the consequences of your blind spot—an object imaged within this blind region of your retina will be invisible. The figure below will help you see the consequences of having a hole in your retina. Making sure that the book is propped up at right angles to the tabletop, view the figure from a distance of about 60 centimeters. Close the left eye and, using your right eye only, stare at the fixation cross in the figure. At this viewing distance, the black disk to the right of the cross should fall on your optic disk and therefore disappear. Since the location of the optic disk varies from one person to the next, you may have to stare at a point slightly different from the fixation cross.

The demonstration of the existence of a blind spot represented a milestone in understanding the eye. Edmé Mariotte, the French scientist who discovered the blind spot in 1668, did not simply stumble upon it by accident (Mariotte, 1668/1948). Instead, his dissection of human eyes suggested to him that vision might be impaired in the region of the optic disk. This was the first time that anyone had predicted a previously unknown perceptual phenomenon simply from an anatomical observation. From the geometry of the eyeball, including the location of the optic disk, Mariotte correctly predicted where stimuli would have to be placed relative to a fixation point in order for the image to fall on the optic disk. Mariotte also confirmed that there were individual variations in the precise location of the blind spot, corresponding to individual variations in the optic disk itself.

While you were looking for your own blind spot, you may have noticed something strange. When the black disk disappeared, you didn't see even a shadow or other residue of the disk; the background appeared uniformly white. This is a common phenomenon called *completion* or "filling in." It's been claimed that England's "merry monarch," Charles II, exploited the retina's blind spot to "behead" symbolically members of his court who were in disfavor (Rushton, 1979). After placing them at the right distance from his throne, Charles would adjust his gaze so that the head of his "victim" was imaged on the king's optic disk. Although this is an intriguing story, the more so because Charles II's father had in fact been beheaded, Adam Reeves (1982) describes the story as "a baseless canard" against Charles II. Frankly, we're not sure who's correct.

Fixation cross

lated by a bright bar responds more strongly than does a receptor stimulated by a dark bar.

In panel A, the pattern's bars match the spacing of the receptors, and therefore, the distribution in response magnitude from receptor to receptor accurately mirrors the variation of light in the retinal image (and, hence, in the pattern actually being looked at). In other words, each dark stripe and light stripe in the stimulus has a counterpart in the response of a receptor; all the stimulus information is captured by the receptor array. Panel B demonstrates that the same array would also give a faithful representation of a pattern that is coarser than the spacing of the photoreceptors.

But there is an upper limit to the information that any receptor array can capture. When a pattern gets too fine for that array, the receptors can no longer produce a faithful representation. For the array shown, the pattern in panel C