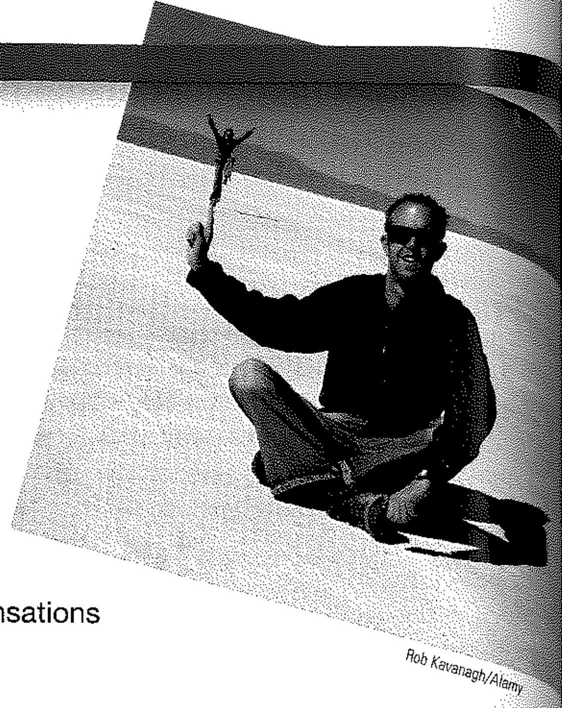
Module 19

Visual Organization and Interpretation



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Module Learning Objectives

- 19-1 Describe Gestalt psychologists' understanding of perceptual organization, and explain how figure-ground and grouping principles contribute to our perceptions.
- 19-2 Explain how we use binocular and monocular cues to perceive the world in three dimensions and perceive motion.
- 19-3 Explain how perceptual constancies help us organize our sensations into meaningful perceptions.
- 19-4 Describe what research on restored vision, sensory restriction, and perceptual adaptation reveals about the effects of experience on perception.

Visual Organization

19-1 How did the Gestalt psychologists understand perceptual organization, and how do figure-ground and grouping principles contribute to our perceptions?

It's one thing to understand how we see shapes and colors. But how do we organize and interpret those sights (or sounds or tastes or smells) so that they become meaningful perceptions—a rose in bloom, a familiar face, a sunset?

Early in the twentieth century, a group of German psychologists noticed that when given a cluster of sensations, people tend to organize them into a **gestalt,** a German word meaning a "form" or a "whole." For example, look at **FIGURE 19.1**. Note that the individual elements of this figure, called a *Necker cube,* are really nothing but eight blue circles, each containing three converging white lines. When we view these elements all together, however, we see a cube that sometimes reverses direction. This phenomenon nicely illustrates a favorite saying of Gestalt psychologists: In perception, the whole may exceed the sum of its parts. If we combine sodium (a corrosive metal) with chlorine (a poisonous gas), something very different emerges—table salt. Likewise, a unique perceived form emerges from a stimulus' components (Rock & Palmer, 1990).

gestalt an organized whole. Gestalt psychologists emphasized our tendency to integrate pieces of information into meaningful wholes.

Over the years, the Gestalt psychologists demonstrated many principles we use to organize our sensations into perceptions. Underlying all of them is a fundamental truth: *Our brain does more than register information about the world.* Perception is not just opening a shutter and letting a picture print itself on the brain. We filter incoming information and construct perceptions. Mind matters.

AP® Exam Tip

The Necker cube is an excellent vehicle for understanding the distinction between sensation and perception. The only visual stimuli are the blue wedges. The circles, lines, and cube are all the products of perception—they are in your mind and not on the page.

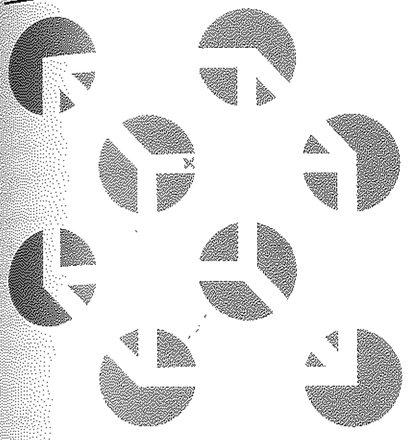


Figure 19.1

A Necker cube What do you see: circles with white lines, or a cube? If you stare at the cube, you may notice that it reverses location, moving the tiny X in the center from the front edge to the back. At times, the cube may seem to float in front of the page, with circles behind it. At other times, the circles may become holes in the page through which the cube appears, as though it were floating behind the page. There is far more to perception than meets the eye. (From Bradley et al., 1976.)

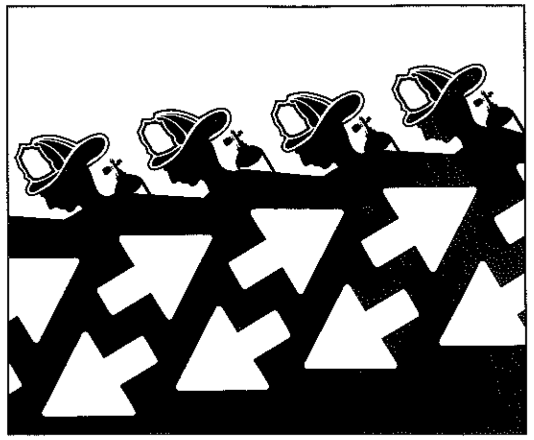


Figure 19.2

Reversible figure and ground

Form Perception

Imagine designing a video-computer system that, like your eye-brain system, can recognize faces at a glance. What abilities would it need?

FIGURE AND GROUND

To start with, the video-computer system would need to separate faces from their backgrounds. Likewise, in our eye-brain system, our first perceptual task is to perceive any object (the *figure*) as distinct from its surroundings (the *ground*). Among the voices you hear at a party, the one you attend to becomes the figure; all others are part of the ground. As you read, the words are the figure; the white paper is the ground. Sometimes the same stimulus can trigger more than one perception. In **FIGURE 19.2,** the **figure-ground** relationship continually reverses—but always we organize the stimulus into a figure seen against a ground.

figure-ground the organization of the visual field into objects (the *figures*) that stand out from their surroundings (the *ground*).

grouping the perceptual tendency to organize stimuli into coherent groups.

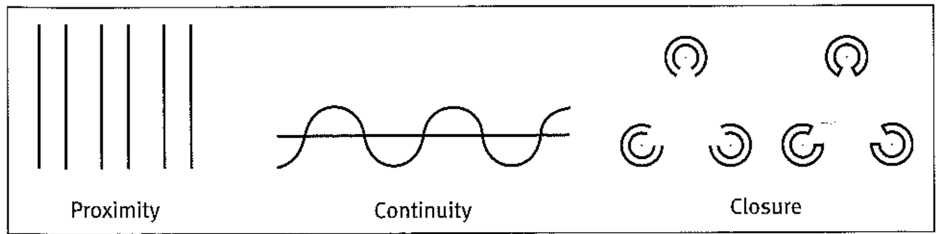
GROUPING

Having discriminated figure from ground, we (and our video-computer system) must also organize the figure into a *meaningful* form. Some basic features of a scene—such as color, movement, and light-dark contrast—we process instantly and automatically (Treisman, 1987). Our minds bring order and form to stimuli by following certain rules for **grouping.** These rules, identified by the Gestalt psychologists and applied even by infants, illustrate how the perceived whole differs from the sum of its parts (Quinn et al., 2002; Rock & Palmer, 1990). Three examples:

PROXIMITY We group nearby figures together. We see not six separate lines, but three sets of two lines.

CONTINUITY We perceive smooth, continuous patterns rather than discontinuous ones. This pattern could be a series of alternating semicircles, but we perceive it as two continuous lines—one wavy, one straight.

CLOSURE We fill in gaps to create a complete, whole object. Thus we assume that the circles on the right are complete but partially blocked by the (illusory) triangle. Add nothing more than little line segments to close off the circles and your brain stops constructing a triangle. Such principles usually help us construct reality.



Depth Perception

19-2 How do we use binocular and monocular cues to perceive the world in three dimensions and perceive motion?

From the two-dimensional images falling on our retinas, we somehow organize three-dimensional perceptions. **Depth perception** enables us to estimate an object's distance from us. At a glance, we can estimate the distance of an oncoming car or the height of a house. Depth perception is partly innate, as Eleanor Gibson and Richard Walk (1960) discovered using a model of a cliff with a drop-off area (which was covered by sturdy glass). Gibson's inspiration for these **visual cliff** experiments occurred while she was picnicking on the rim of the Grand Canyon. She wondered: Would a toddler peering over the rim perceive the dangerous drop-off and draw back?

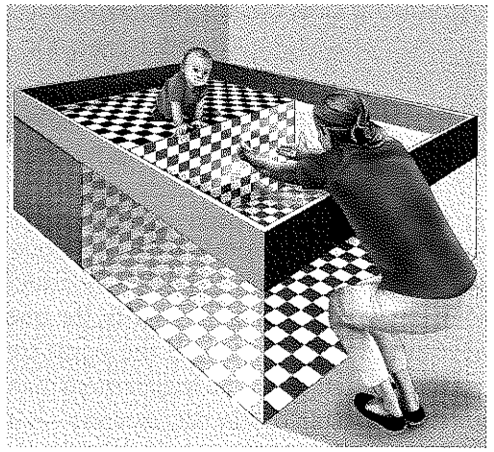


Figure 19.3
Visual cliff Eleanor Gibson and Richard Walk devised a miniature cliff with a glass-covered drop-off to determine whether crawling infants can perceive depth. Even when coaxed, infants are reluctant to venture onto the glass over the cliff (Gibson & Walk, 1960).

Back in their Cornell University laboratory, Gibson and Walk placed 6- to 14-month-old infants on the edge of a safe canyon and had the infants' mothers coax them to crawl out onto the glass (**FIGURE 19.3**). Most infants refused to do so, indicating that they could perceive depth.

Had they *learned* to perceive depth? Learning seems to be part of the answer because crawling, no matter when it begins, seems to increase infants' wariness of heights (Campos et al., 1992). Yet, the researchers observed, mobile newborn animals come prepared to perceive depth. Even those with virtually no visual experience—including young kittens, a day-old goat, and newly hatched chicks—will not venture across the visual cliff. Thus, it seems that biology predisposes us to be wary of heights and experience amplifies that fear.

How do we perceive depth? *How* do we transform two differing two-dimensional (2-D) retinal images into a single three-dimensional (3-D) perception? Our brain constructs these perceptions using information supplied by one or both eyes.

BINOCULAR CUES

Try this: With both eyes open, hold two pens or pencils in front of you and touch their tips together. Now do so with one eye closed. With one eye, the task becomes noticeably more difficult, demonstrating the importance of **binocular cues** in judging the distance of nearby objects. Two eyes are better than one.

Because your eyes are about 2½ inches apart, your retinas receive slightly different images of the world. By comparing these two images, your brain can judge how close an object is to you. The greater the **retinal disparity,** or difference between the two images, the closer the object. Try it. Hold your two index fingers, with the tips about half an inch apart, directly in front of your nose, and your retinas will receive quite different views. If you close one eye and then the other, you can see the difference. (You may also create a finger sausage, as in **FIGURE 19.4.**) At a greater distance—say, when you hold your fingers at arm's length—the disparity is smaller.

We could easily build this feature into our video-computer system. Moviemakers can simulate or exaggerate retinal disparity by filming a scene with two cameras placed a few inches apart. Viewers then wear glasses that allow the left eye to see only the image from the left camera, and the right eye to see only the image from the right camera. The resulting 3-D effect, as 3-D movie fans know, mimics or exaggerates normal retinal disparity. Similarly, twin cameras in airplanes can take photos of terrain for integration into 3-D maps.

depth perception the ability to see objects in three dimensions although the images that strike the retina are two-dimensional; allows us to judge distance.

visual cliff a laboratory device for testing depth perception in infants and young animals.

binocular cues depth cues, such as retinal disparity, that depend on the use of two eyes.

retinal disparity a binocular cue for perceiving depth: By comparing images from the retinas in the two eyes, the brain computes distance—the greater the disparity (difference) between the two images, the closer the object.

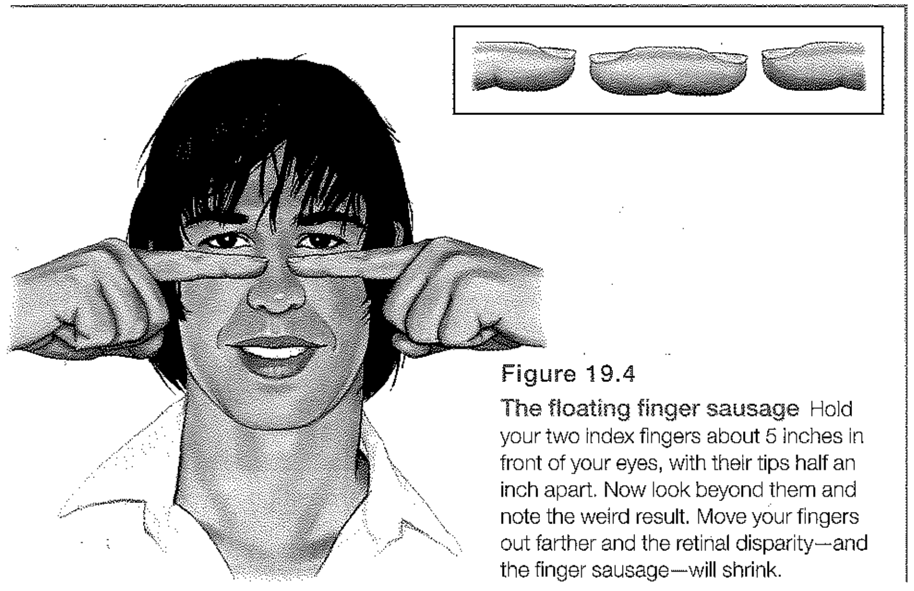


Figure 19.4
The floating finger sausage Hold your two index fingers about 5 inches in front of your eyes, with their tips half an inch apart. Now look beyond them and note the weird result. Move your fingers out farther and the retinal disparity—and the finger sausage—will shrink.

FYI

Carnivorous animals, including humans, have eyes that enable forward focus on a prey and offer binocular vision-enhanced depth perception. Grazing herbivores, such as horses and sheep, typically have eyes on the sides of their skull. Although lacking binocular depth perception, they have sweeping peripheral vision.

MONOCULAR CUES

How do we judge whether a person is 10 or 100 meters away? Retinal disparity won't help us here, because there won't be much difference between the images cast on our right and left retinas. At such distances, we depend on **monocular cues** (depth cues available to each eye separately). See **FIGURE 19.5** on the next page for some examples.

Motion Perception

Imagine that you could perceive the world as having color, form, and depth but that you could not see motion. Not only would you be unable to bike or drive, you would have trouble writing, eating, and walking.

Normally your brain computes motion based partly on its assumption that shrinking objects are retreating (not getting smaller) and enlarging objects are approaching. But you are imperfect at motion perception. Large objects, such as trains, appear to move more slowly than smaller objects, such as cars, moving at the same speed. (Perhaps at an airport you've noticed that jumbo jets seem to land more slowly than little jets.)

To catch a fly ball, softball or cricket players (unlike drivers) want to achieve a collision—with the ball that's flying their way. To accomplish that, they follow an unconscious rule—one they can't explain but know intuitively: Run to keep the ball at a constantly increasing angle of gaze (McBeath et al., 1995). A dog catching a Frisbee does the same (Shaffer et al., 2004).

The brain also perceives continuous movement in a rapid series of slightly varying images (a phenomenon called *stroboscopic movement*). As film animation artists know well, you can create this illusion by flashing 24 still pictures a second. The motion we then see in popular action adventures is not in the film, which merely presents a superfast slide show. We construct that motion in our heads, just as we construct movement in blinking marquees and holiday lights. When two adjacent stationary lights blink on and off in quick succession, we perceive a single light moving back and forth between them. Lighted signs exploit this **phi phenomenon** with a succession of lights that creates the impression of, say, a moving arrow.

monocular cues depth cues, such as interposition and linear perspective, available to either eye alone.

phi phenomenon an illusion of movement created when two or more adjacent lights blink on and off in quick succession.

"Sometimes I wonder: Why is that Frisbee getting bigger? And then it hits me." -Anonymous

"From there to here, from here to there, funny things are everywhere." -Dr. Seuss, *One Fish, Two Fish, Red Fish, Blue Fish*, 1960

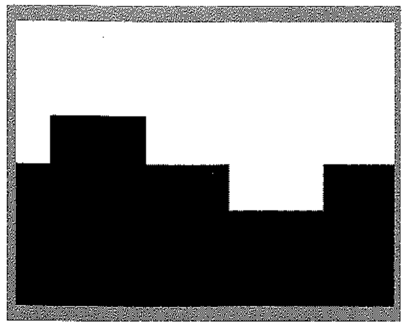
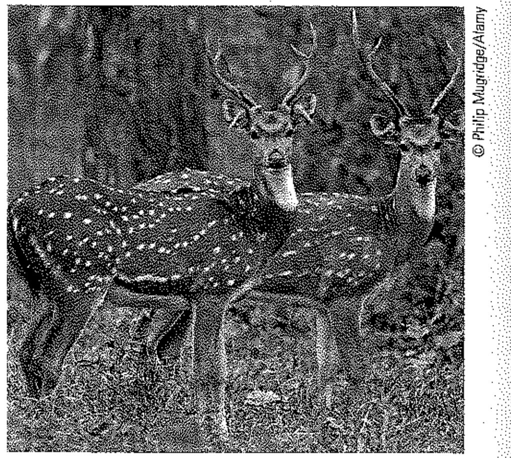


Image courtesy Shaun P. Vecera, Ph.D., adapted from stimuli that appeared in Vecrera et al., 2002

Relative height We perceive objects higher in our field of vision as farther away. Because we assume the lower part of a figure-ground illustration is closer, we perceive it as figure (Vecera et al., 2002). Invert this illustration and the black will become ground, like a night sky.

Relative size If we assume two objects are similar in size, *most* people perceive the one that casts the smaller retinal image as farther away.



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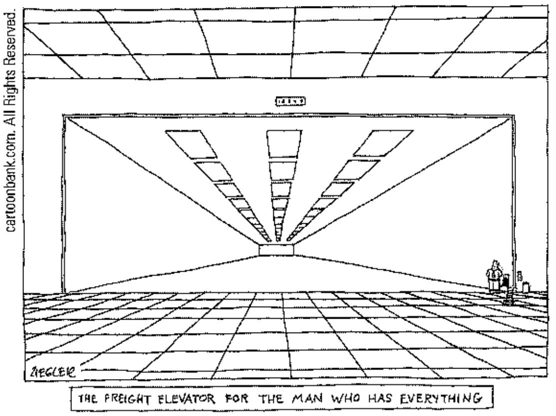
Interposition *Interpose* means "to come between." If one object partially blocks our view of another, we perceive it as closer.

Relative motion As we move, objects that are actually stable may appear to move. If while riding on a bus you fix your gaze on some point—say, a house—the objects beyond the fixation point will appear to move with you. Objects in front of the point will appear to move backward. The farther an object is from the fixation point, the faster it will seem to move.

Direction of passenger's motion ⟶

Linear perspective Parallel lines appear to meet in the distance. The sharper the angle of convergence, the greater the perceived distance.



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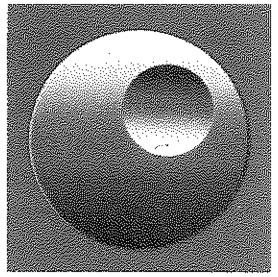
Light and shadow Shading produces a sense of depth consistent with our assumption that light comes from above. If you invert this illustration, the hollow will become a hill.



From "Perceiving Shape From Shading" by Vilayanur S. Ramachandran. Copyright © 1988 by Scientific American, Inc. All Rights Reserved.

Figure 19.5
Monocular depth cues

AP® Exam Tip

The illustrations in Figure 19.5 provide you with excellent opportunities to practice identifying monocular depth cues. To really demonstrate your understanding, look for these cues in other drawings and photographs. There are almost always cues to identify.

Perceptual Constancy

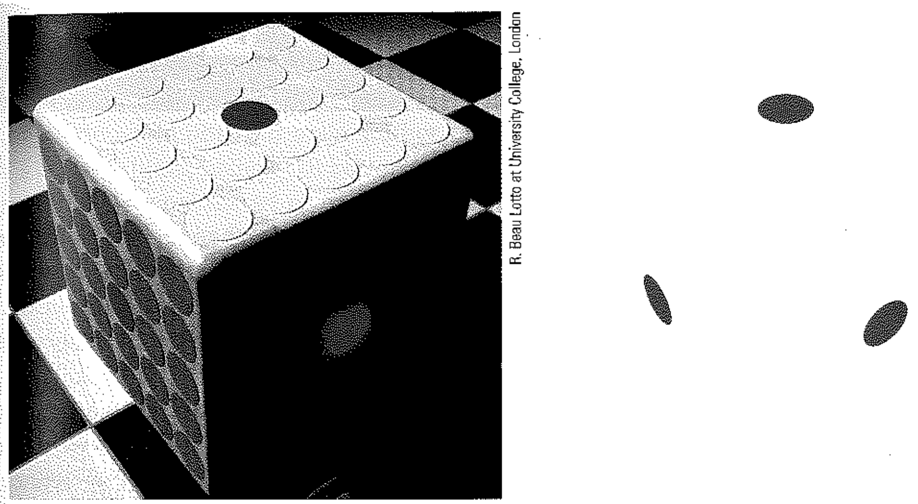
19-3 How do perceptual constancies help us organize our sensations into meaningful perceptions?

So far, we have noted that our video-computer system must perceive objects as we do—as having a distinct form, location, and perhaps motion. Its next task is to recognize objects without being deceived by changes in their color, brightness, shape, or size—a top-down process called **perceptual constancy.** Regardless of the viewing angle, distance, and illumination, we can identify people and things in less time than it takes to draw a breath, a feat that would be a monumental challenge for even advanced computers and that has intrigued researchers for decades.

COLOR AND BRIGHTNESS CONSTANCIES

Color does not reside in an object. Our experience of color depends on the object's *context.* If you view an isolated tomato through a paper tube, its color would seem to change as the light—and thus the wavelengths reflected from its surface—changed. But if you viewed that tomato as one item in a bowl of fresh fruit and vegetables, its color would remain roughly constant as the lighting shifts. This perception of consistent color is known as **color constancy.**

Though we take color constancy for granted, this ability is truly remarkable. A blue poker chip under indoor lighting reflects wavelengths that match those reflected by a sunlit gold chip (Jameson, 1985). Yet bring a bluebird indoors and it won't look like a goldfinch. The color is not in the bird's feathers. You and I see color thanks to our brain's computations of the light reflected by an object *relative to the objects surrounding it.* (But only if we grew up with normal light, it seems. Monkeys raised under a restricted range of wavelengths later have great difficulty recognizing the same color when illumination varies [Sugita, 2004].) **FIGURE 19.6** dramatically illustrates the ability of a blue object to appear very different in three different contexts. Yet we have no trouble seeing these disks as blue.



(a) (b)

R. Beau Lotto at University College, London

Figure 19.6
Color depends on context
(a) Believe it or not, these three blue disks are identical in color.
(b) Remove the surrounding context and see what results.

Similarly, *brightness constancy* (also called *lightness constancy*) depends on context. We perceive an object as having a constant brightness even while its illumination varies. This perception of constancy depends on *relative luminance*—the amount of light an object reflects *relative to its surroundings* (**FIGURE 19.7** on the next page). White paper reflects 90 percent of the light falling on it; black paper, only 10 percent. Although a black paper viewed in sunlight may reflect 100 times more light than does a white paper viewed indoors, it will still look black (McBurney & Collings, 1984). But if you view sunlit black paper through a narrow tube so nothing else is visible, it may look gray, because in bright sunshine it reflects a fair amount of light. View it without the tube and it is again black, because it reflects much less light than the objects around it.

This principle—that we perceive objects not in isolation but in their environmental context—matters to artists, interior decorators, and clothing designers. Our perception of the color and brightness of a wall or of a streak of paint on a canvas is determined not just by the paint in the can but by the surrounding colors. The take-home lesson: *Comparisons govern our perceptions.*

perceptual constancy perceiving objects as unchanging (having consistent shapes, size, brightness, and color) even as illumination and retinal images change.

color constancy perceiving familiar objects as having consistent color, even if changing illumination alters the wavelengths reflected by the object.

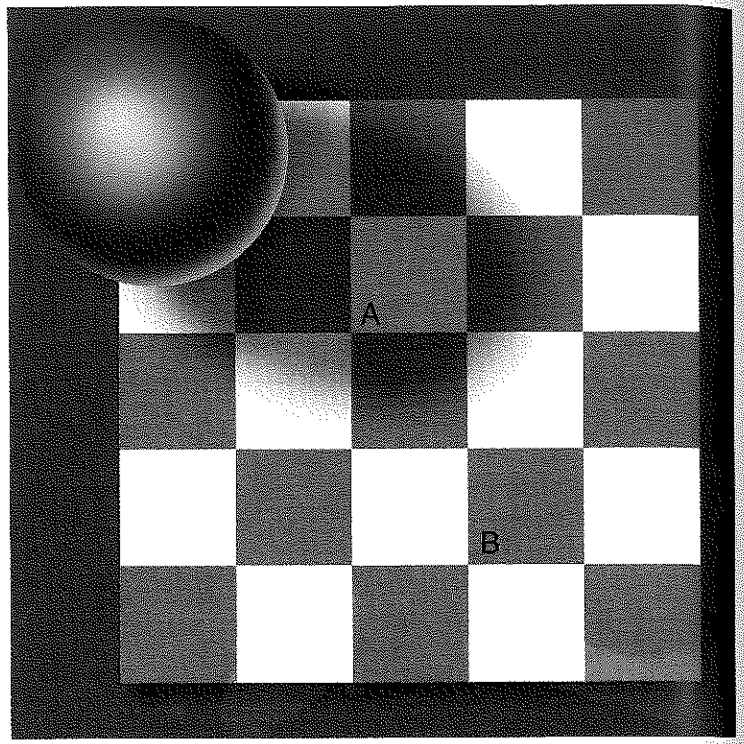


Figure 19.7
Relative luminance Squares A and B are identical in color, believe it or not. (If you don't believe me, photocopy the illustration, cut out the squares, and compare.) But we perceive A as lighter, thanks to its surrounding context.

SHAPE AND SIZE CONSTANCIES

Sometimes an object whose actual shape cannot change *seems* to change shape with the angle of our view (**FIGURE 19.8**). More often, thanks to *shape constancy,* we perceive the form of familiar objects, such as the door in **FIGURE 19.9**, as constant even while our retinas receive changing images of them. Our brain manages this feat thanks to visual cortex neurons that rapidly learn to associate different views of an object (Li & DiCarlo, 2008).

Thanks to *size constancy,* we perceive objects as having a constant size, even while our distance from them varies. We assume a car is large enough to carry people, even when we see its tiny image from two blocks away. This assumption also illustrates the close connection between perceived *distance* and perceived *size.* Perceiving an object's distance gives us cues to its size. Likewise, knowing its general size—that the object is a car—provides us with cues to its distance.

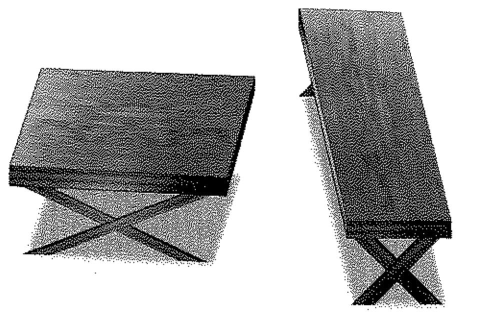


Figure 19.8
Perceiving shape Do the tops of these tables have different dimensions? They appear to. But—believe it or not—they are identical. (Measure and see.) With both tables, we adjust our perceptions relative to our viewing angle.

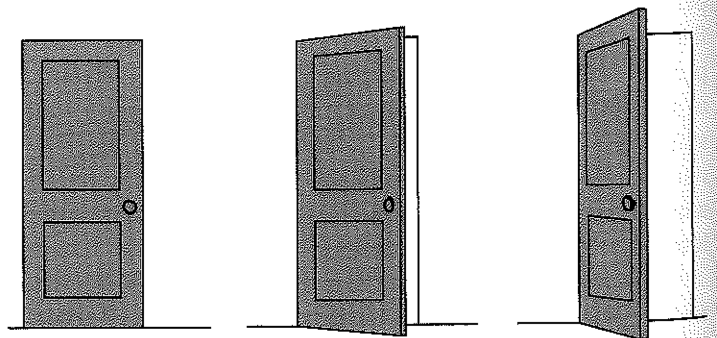


Figure 19.9
Shape constancy A door casts an increasingly trapezoidal image on our retinas as it opens, yet we still perceive it as rectangular.

Even in size-distance judgments, however, we consider an object's context. The dogs in Module 17's Figure 17.3 cast identical images on our retinas. Using linear perspective as a cue (see Figure 19.5), our brain assumes that the pursuing dog is farther away. We therefore perceive it as larger. It isn't.

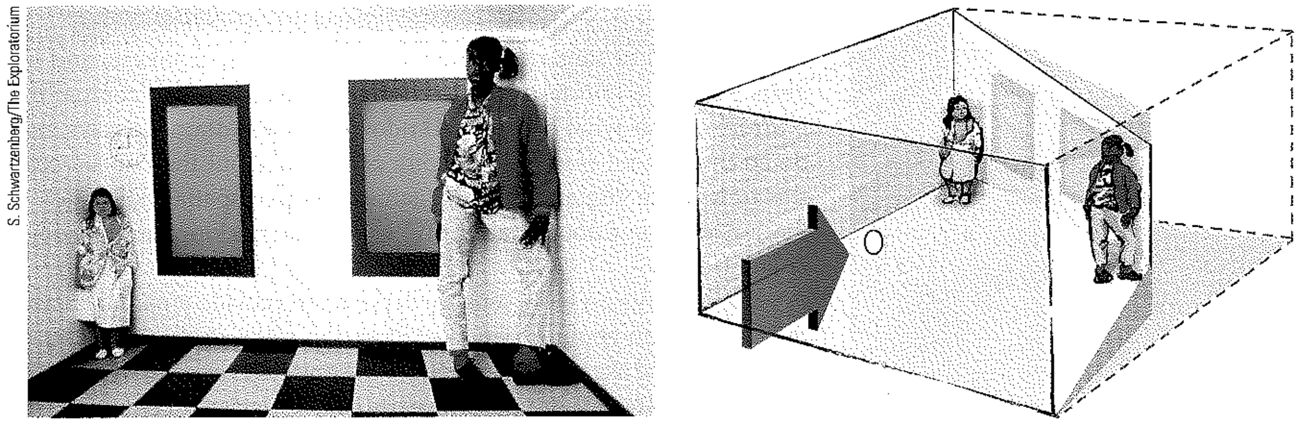
This interplay between perceived size and perceived distance helps explain several well-known illusions, including the *Moon illusion:* The Moon looks up to 50 percent larger when near the horizon than when high in the sky. Can you imagine why? For at least 22 centuries, scholars have debated this question (Hershenson, 1989). One reason is that cues to objects' distances make the horizon Moon—like the distant dog in Figure 17.3—appear farther away. If it's farther away, our brain assumes, it must be larger than the Moon high in the night sky (Kaufman & Kaufman, 2000). Take away the distance cue, by looking at the horizon Moon (or each dog) through a paper tube, and the object will immediately shrink.

Size-distance relationships also explain why in **FIGURE 19.10** the two same-age girls seem so different in size. As the diagram reveals, the girls are actually about the same size, but the room is distorted. Viewed with one eye through a peephole, the room's trapezoidal walls produce the same images you would see in a normal rectangular room viewed with both eyes. Presented with the camera's one-eyed view, your brain makes the reasonable assumption that the room *is* normal and each girl is therefore the same distance from you. Given the different sizes of the girls' images on your retinas, your brain ends up calculating that the girls must be very different in size.

Perceptual illusions reinforce a fundamental lesson: Perception is not merely a projection of the world onto our brain. Rather, our sensations are disassembled into information bits that our brain, using both bottom-up and top-down processing, then reassembles into its own functional model of the external world. During this reassembly process, our assumptions—such as the usual relationship between distance and size—can lead us astray. *Our brain constructs our perceptions.*

* * *

Form perception, depth perception, motion perception, and perceptual constancies illuminate how we organize our visual experiences. Perceptual organization applies to our other senses, too. It explains why we perceive a clock's steady tick not as a *tick-tick-tick-tick* but as grouped sounds, say, *TICK-tick, TICK-tick.* Listening to an unfamiliar language, we have trouble hearing where one word stops and the next one begins. Listening to our own language, we automatically hear distinct words. This, too, reflects perceptual organization. But it is more, for we even organize a string of letters—THEDOGATEMEAT—into words that make an intelligible phrase, more likely "The dog ate meat" than "The do gate me at" (McBurney & Collings, 1984). This process involves not only the organization we've been discussing, but also interpretation—discerning meaning in what we perceive.



S. Schwartzenberg/The Exploratorium

Figure 19.10
The illusion of the shrinking and growing girls This distorted room, designed by Adelbert Ames, appears to have a normal rectangular shape when viewed through a peephole with one eye. The girl in the right corner appears disproportionately large because we judge her size based on the false assumption that she is the same distance away as the girl in the left corner.

Visual Interpretation

> "Let us then suppose the mind to be, as we say, white paper void of all characters, without any ideas: How comes it to be furnished? . . . To this I answer, in one word, from EXPERIENCE." -JOHN LOCKE, *AN ESSAY CONCERNING HUMAN UNDERSTANDING*, 1690

Philosophers have debated whether our perceptual abilities should be credited to our nature or our nurture. To what extent do we *learn* to perceive? German philosopher Immanuel Kant (1724–1804) maintained that knowledge comes from our *inborn* ways of organizing sensory experiences. Indeed, we come equipped to process sensory information. But British philosopher John Locke (1632–1704) argued that through our experiences we also *learn* to perceive the world. Indeed, we learn to link an object's distance with its size. So, just how important is experience? How radically does it shape our perceptual interpretations?

Experience and Visual Perception

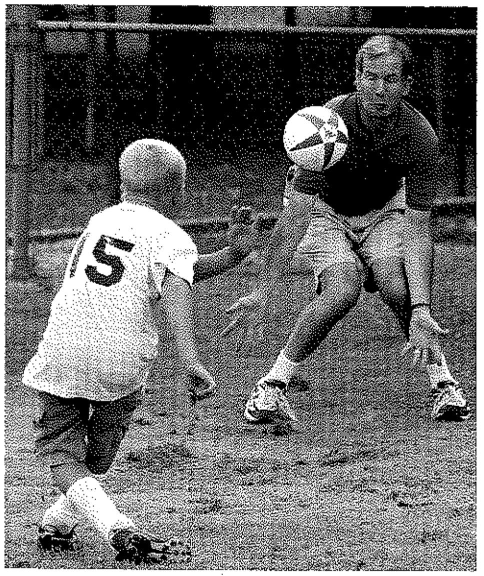
19-4 What does research on restored vision, sensory restriction, and perceptual adaptation reveal about the effects of experience on perception?

RESTORED VISION AND SENSORY RESTRICTION

Writing to John Locke, William Molyneux wondered whether "a man *born* blind, and now adult, taught by his *touch* to distinguish between a cube and a sphere" could, if made to see, visually distinguish the two. Locke's answer was *No,* because the man would never have *learned* to see the difference.

Molyneux's hypothetical case has since been put to the test with a few dozen adults who, though blind from birth, have gained sight (Gregory, 1978; von Senden, 1932). Most had been born with cataracts—clouded lenses that allowed them to see only diffused light, rather as someone might see a foggy image through a Ping-Pong ball sliced in half. After cataract surgery, the patients could distinguish figure from ground and could sense colors—suggesting that these aspects of perception are innate. But much as Locke supposed, they often could not visually recognize objects that were familiar by touch.

Seeking to gain more control than is provided by clinical cases, researchers have outfitted infant kittens and monkeys with goggles through which they could see only diffuse, unpatterned light (Wiesel, 1982). After infancy, when the goggles were removed, these animals exhibited perceptual limitations much like those of humans born with cataracts. They could distinguish color and brightness, but not the form of a circle from that of a square. Their eyes had not degenerated; their retinas still relayed signals to their visual cortex. But lacking stimulation, the cortical cells had not developed normal connections. Thus, the animals remained functionally blind to shape. Experience guides, sustains, and maintains the brain's neural organization as it forms the pathways that affect our perceptions.



Learning to see: At age 3, Mike May lost his vision in an explosion. Decades later, after a new cornea restored vision to his right eye, he got his first look at his wife and children. Alas, although signals were now reaching his visual cortex, it lacked the experience to interpret them. May could not recognize expressions, or faces, apart from features such as hair. Yet he can see an object in motion and has learned to navigate his world and to marvel at such things as dust floating in sunlight (Abrams, 2002).

AP Photo/Marcio Jose Sanchez

In both humans and animals, similar sensory restrictions later in life do no permanent harm. When researchers cover the eye of an adult animal for several months, its vision will be unaffected after the eye patch is removed. When surgeons remove cataracts that develop during late adulthood, most people are thrilled at the return to normal vision.

The effect of sensory restriction on infant cats, monkeys, and humans suggests there is a *critical period* for normal sensory and perceptual development. Nurture sculpts what nature has endowed. In less dramatic ways, it continues to do so throughout our lives. Despite concerns about their social costs (more on this in Module 78), action video games sharpen spatial skills such as visual attention, eye-hand coordination and speed, and tracking multiple objects (Spence & Feng, 2010).

Experiments on early sensory deprivation provide a partial answer to the enduring question about experience: Does the effect of early experience last a lifetime? For some aspects of perception, the answer is clearly *Yes:* "Use it *soon* or lose it." We retain the imprint of some early sensory experiences far into the future.

PERCEPTUAL ADAPTATION

Given a new pair of glasses, we may feel slightly disoriented, even dizzy. Within a day or two, we adjust. Our **perceptual adaptation** to changed visual input makes the world seem normal again. But imagine a far more dramatic new pair of glasses—one that shifts the apparent location of objects 40 degrees to the left. When you first put them on and toss a ball to a friend, it sails off to the left. Walking forward to shake hands with the person, you veer to the left.

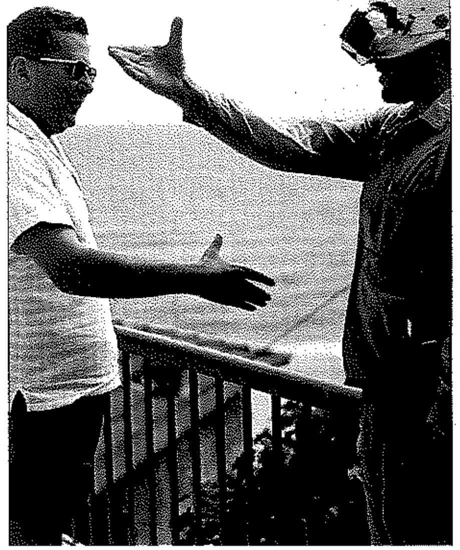
perceptual adaptation in vision, the ability to adjust to an artificially displaced or even inverted visual field.

Could you adapt to this distorted world? Baby chicks cannot. When fitted with such lenses, they continue to peck where food grains *seem* to be (Hess, 1956; Rossi, 1968). But we humans adapt to distorting lenses quickly. Within a few minutes your throws would again be accurate, your stride on target. Remove the lenses and you would experience an aftereffect: At first your throws would err in the *opposite* direction, sailing off to the right; but again, within minutes you would readapt.

Indeed, given an even more radical pair of glasses—one that literally turns the world upside down—you could still adapt. Psychologist George Stratton (1896) experienced this when he invented, and for eight days wore, optical headgear that flipped left to right *and* up to down, making him the first person to experience a right-side-up retinal image while standing upright. The ground was up, the sky was down.

At first, when Stratton wanted to walk, he found himself searching for his feet, which were now "up." Eating was nearly impossible. He became nauseated and depressed. But he persisted, and by the eighth day he could comfortably reach for an object in the right direction and walk without bumping into things. When Stratton finally removed the headgear, he readapted quickly.

In later experiments, people wearing the optical gear have even been able to ride a motorcycle, ski the Alps, and fly an airplane (Dolezal, 1982; Kohler, 1962). The world around them still seemed above their heads or on the wrong side. But by actively moving about in these topsy-turvy worlds, they adapted to the context and learned to coordinate their movements.



Courtesy of Hubert Dolezal

Perceptual adaptation "Oops, missed," thought researcher Hubert Dolezal as he viewed the world through inverting goggles. Yet, believe it or not, kittens, monkeys, and humans can adapt to an inverted world.

Before You Move On

▶ ASK YOURSELF

Try drawing a realistic depiction of the scene from your window. Which monocular cues will you use in your drawing?

▶ TEST YOURSELF

What do we mean when we say that, in perception, "the whole is greater than the sum of its parts"?

Answers to the Test Yourself questions can be found in Appendix E at the end of the book.