

Topic 2.1

Perception

2.1.01 Top-Down and Bottom-Up Processing

[2.1.A.1]

Sensation arises when sensory information from the environment (eg, a smell) is converted into neural signals. This process, called transduction, is described in Sub-Topic 1.6.01. Following transduction, the process of **perception** involves integrating, organizing, and making meaning out of the data collected by the senses.

Perception guided by preexisting information or beliefs is called **top-down processing**. For example, when someone overhears neighbors talking about finding snakes in their yard and then later perceives a garden hose as a coiled-up snake, that person's perception has been guided by preexisting information.

In contrast, **bottom-up processing** occurs when perception is guided by sensory input. For example, an individual steps on sand barefoot and identifies it as hot.

Top-down and bottom-up processing are compared in Figure 2.1.



Figure 2.1 Top-down versus bottom-up processing.

Top-down processing allows the brain to use mental shortcuts to process information more quickly, which can enable perceptual illusions. For example, an individual misperceives a ball of lint as a spider after seeing a spider earlier in the day (see Figure 2.2).

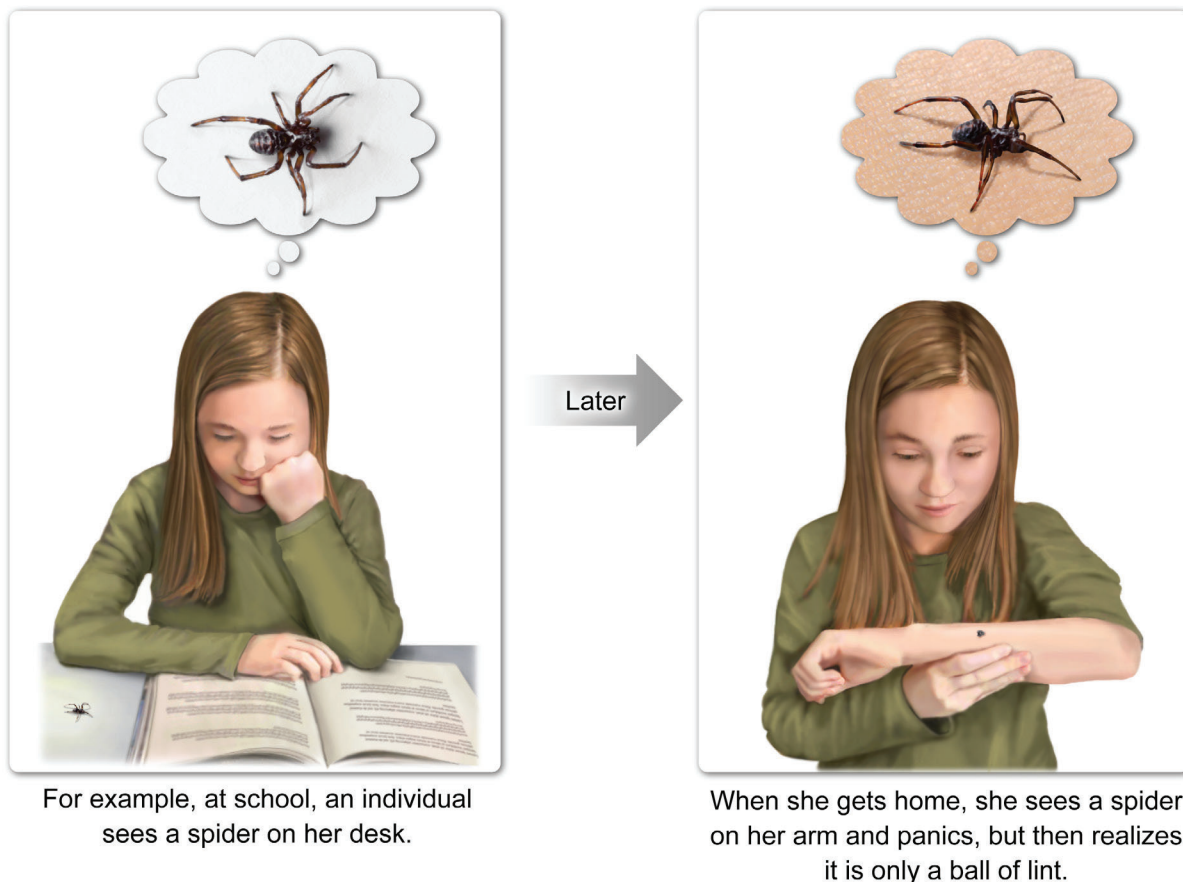


Figure 2.2 Top-down processing example.

2.1.02 Additional Factors that Influence Perception

[2.1.A.2][2.1.A.3]

An individual's perception is impacted by their schemas and perceptual sets (internal factors); the external world can shape schemas and perceptual sets through culture, context, or experience.

Schemas

Mental representations based on culture and experience that guide expectations are called **schemas**. For example, a schema guides the expectations for student and teacher behavior in a classroom setting.

Schemas also influence perception. For example, when research participants estimated people's heights from photographs, they tended to judge men as taller than women, even when the people pictured were the same height. This demonstrates that a schema (eg, men are generally taller than women) can influence how people perceive others' height. See Figure 2.3.

A schema is a mental representation based on culture and experience that guides expectations (eg, men are generally taller than women).

For example, when research participants were shown photographs of men and women pictured alone and asked to estimate their height...



...participants tended to judge the men as taller than the women, even when the people in the photos were of the same height.

Figure 2.3 Schema example.

Perceptual sets

A **perceptual set** describes the tendency to focus on certain details of a stimulus while overlooking other details. Numerous factors such as culture, experiences, mood, and expectations can influence one's perceptual set. For example, when viewing a movie about the Revolutionary War, a theater major and a history major might focus on different aspects of the movie (eg, acting vs. historical inaccuracies, respectively).

2.1.03 Gestalt Principles

[2.1.A.4]

The **Gestalt principles of perceptual organization** describe how humans perceive sensory stimuli as a whole greater than the sum of their parts. Gestalt principles apply to many types of sensory stimuli (eg, the grouping of musical tones) but are most often used to describe the perception of visual stimuli.

Examples of Gestalt principles (Figure 2.4) include:

- Similarity is the tendency to group together objects that share similar features (eg, shape, color).

- Figure and ground refers to the tendency to perceive objects (ie, figures) as distinct from a background (ie, the ground).
- Closure is the tendency to perceive a whole object by filling in gaps.
- Proximity is the tendency to perceive things that are physically closer to one another as a group (eg, letters that are closer together are grouped as a word).

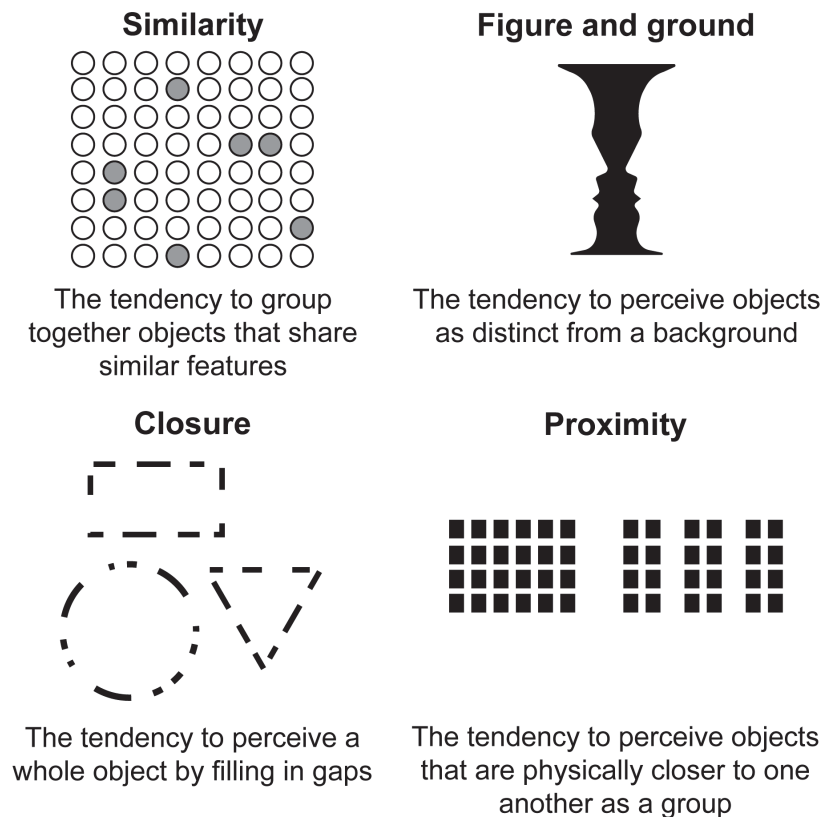


Figure 2.4 Gestalt principles.

2.1.04 The Role of Attention

[2.1.A.5] [3.7.A.5]

Selective versus divided attention

Only a small fraction of the sensory information from the environment is consciously processed.

Attention refers to the cognitive processes that filter some sensory inputs to focus on others.

- **Selective attention** refers to focusing on one stimulus in the environment while ignoring others (eg, while in a busy restaurant with many TVs displaying different games, an individual focuses on watching one football game while ignoring the others).
- **Divided attention** (sometimes referred to as multitasking) describes when an individual attends to more than one stimulus or task simultaneously (eg, talking on the phone while driving). However, individuals generally cannot attend to multiple stimuli at the same time, so "divided attention" actually refers to rapidly switching one's attention among different stimuli or tasks.

The **cocktail party effect** is a selective attention process that occurs when an unconsciously processed stimulus triggers a person's attention, bringing it into conscious awareness. For example, when in a crowded cafeteria, an individual must tune out competing noise to focus on a conversation. But if they hear their name mentioned in the background (an unconsciously processed stimulus), their conscious attention quickly shifts to that conversation (Figure 2.5).

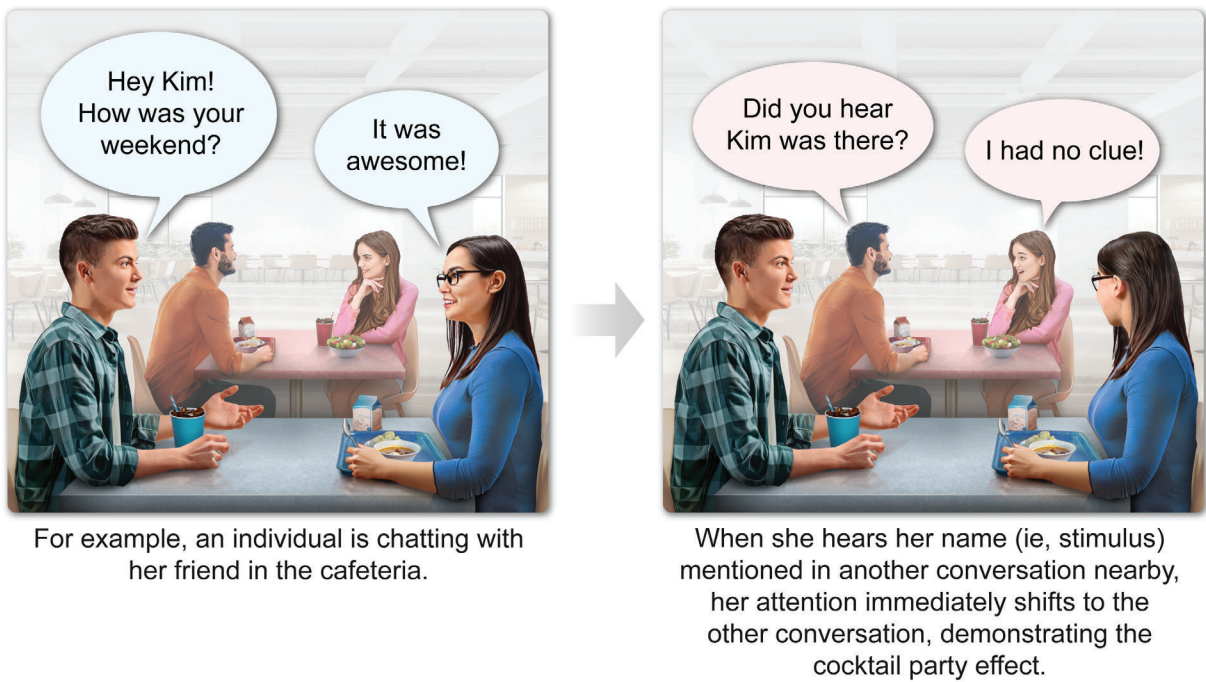


Figure 2.5 Cocktail party effect example.

Habituation

Habituation is characterized by a decrease in a behavioral response after repeated exposure to a stimulus. For example, a student might initially notice flickering overhead lights (stimulus) but notice them less (decreased response) over time (Figure 2.6).

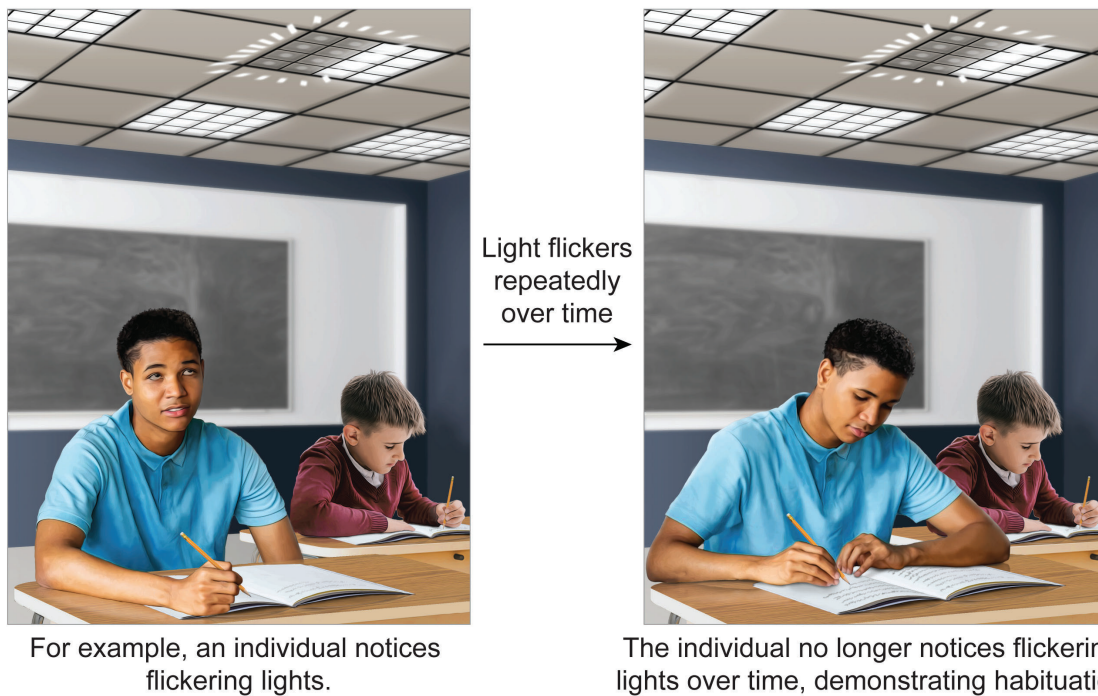


Figure 2.6 Habituation example.

Change blindness

Inattention may result in **change blindness**: the failure to detect that aspects of the environment have changed. For example, in a study where an experimenter began a conversation with a pedestrian, but a confederate (ie, actor) secretly switched places with the experimenter while the pedestrian's view was blocked by a door, half of the participants failed to notice that the person they were speaking with changed.

2.1.05 Monocular and Binocular Depth Cues

[2.1.B.1][2.1.B.2]

The ability to see in three dimensions is called **depth perception** and is enabled by the brain's interpretation of the two-dimensional information in the eye. Depth cues contribute to depth perception; monocular depth cues use information from just one eye, whereas binocular cues require both eyes.

The **binocular depth cues** contribute to depth perception through the integration of slightly different information from the left and right eyes. Binocular depth cues (Figure 2.7) include:

- **Retinal disparity** describes how the brain judges the distance of an object based on the difference between the visual information from each retina.
- **Convergence** describes how the eyes move together (ie, converge) to view a close object and the brain interprets the degree of convergence as an indication of the object's distance.

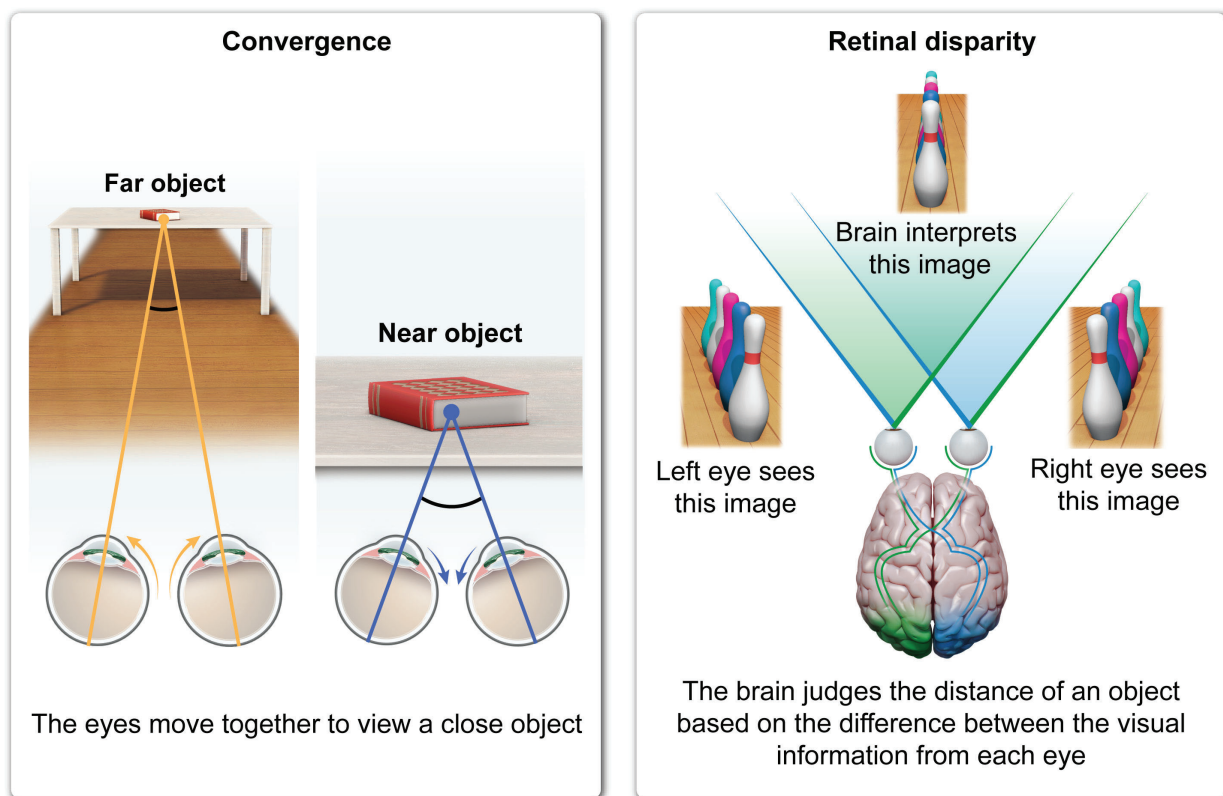


Figure 2.7 Binocular depth cues.

The **monocular depth cues** (Figure 2.8) include:

- Relative clarity is a cue wherein objects that are blurrier or less clear are perceived as further away.
- Relative size is a cue wherein if an individual assumes two objects are a similar size, then the one that appears smaller is perceived as further away.

- Texture gradient is a cue wherein closer objects show more fine detail than objects that are further away.
- Linear perspective results in parallel lines appearing to come together in the distance.
- Interposition is a cue wherein an object that is partially blocked by another object is perceived as further away.

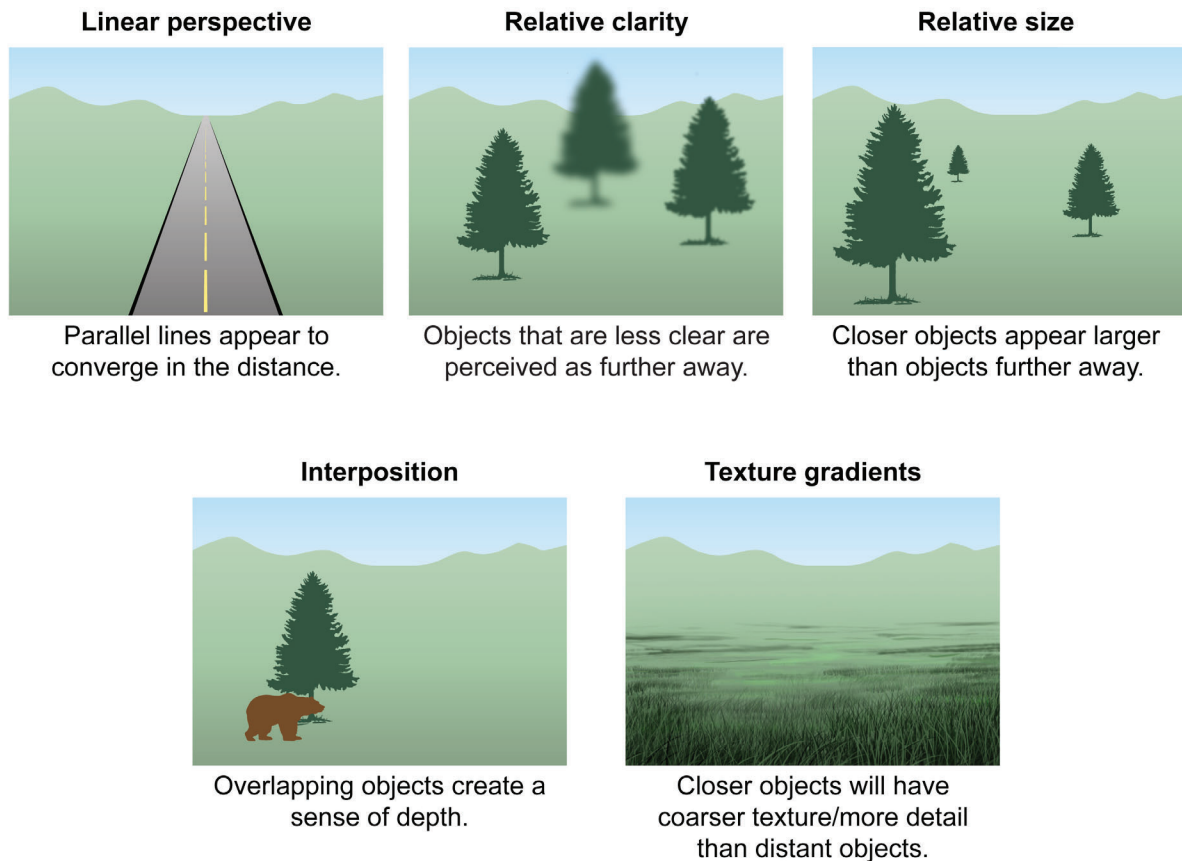


Figure 2.8 Monocular depth cues.

2.1.06 Perceptual Constancies and Apparent Motion

[2.1.B.3] [2.1.B.4]

The principle of **perceptual constancy** describes the tendency to perceive an object as unchanging despite slight changes to the object that occur while one is viewing it (eg, light or movement causing alterations to color, size, brightness, or shape) (Figure 2.9). For example, size constancy results in an object appearing to not change size despite changing distance, such as a bird flying away not appearing to shrink.

Shape constancy

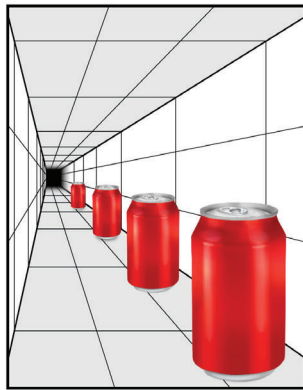
Shape of door appears to be the same whether opened or closed

**Color constancy**

Colors of fruit appear to remain the same under different lighting conditions

**Size constancy**

Distant object appears to be the same size as near object

**Brightness constancy**

Block B appears to be same brightness as C (really matches A)

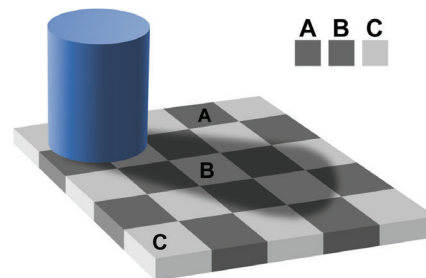


Figure 2.9 Perceptual constancy.

Visual principles of perceptual organization help explain why perceptual illusions occur. These principles allow the brain to use mental shortcuts to process visual information more quickly, which can enable optical illusions. For example, the **phi phenomenon** describes how adjacent flashing lights create the perception of motion (ie, **apparent movement**, also called apparent motion: the lights appear to move even though they are stationary).

Topic 2.1 Perception

Check for Understanding Quiz

1. Bottom-up processing is most accurately described as
 - A. sensory receptors converting information from the environment into neural signals
 - B. perception guided by the details of the sensory input
 - C. using mental shortcuts to process information more quickly
 - D. perception guided by preexisting information or beliefs

2. Which of the following is a monocular depth cue in which parallel lines appear to converge in the distance?
 - A. Closure
 - B. Convergence
 - C. Interposition
 - D. Linear perspective

Note: Answers to this quiz are in the back of the book (appendix).