Discrete Emotions Theory: Emotions as Evolved Expressions

According to **discrete emotions theory**, humans experience a small number of distinct emotions, even if they combine in complex ways (Griffiths, 1997; Izard, 1994; Tomkins, 1962). Advocates of this theory propose that emotions have distinct biological roots and serve evolutionary functions. Each emotion, they suggest, is associated with a distinct "motor program": a set of genetically influenced physiological responses that are essentially the same in all of us (Ekman & Friesen, 1971). They further argue that because the brain's cortex, which plays a key role in thinking, evolved later than the limbic system, which plays a key role in emotion, our emotional reactions to situations precede our thoughts about them (Zajonc, 1984, 2000).

SUPPORT FOR AN EVOLUTIONARY BASIS OF EMOTIONS. The fact that some emotional expressions emerge even without direct reinforcement suggests that they may be by-products of innate motor programs (Freedman, 1964; Panksepp, 2007). Newborn infants smile spontaneously during REM sleep, the sleep stage during which most vivid dreaming occurs (see Chapter 5). At about six weeks, babies start to smile whenever they see a favorite face, and at about three months, they may smile when they're learning to do something new, even when no one's around (Plutchik, 2003). Irenäus Eibl-Eibesfeldt (1973) showed that even three-month-old babies who are blind from birth smile in response to playing and tickling, and frown and cry when left alone.

Consider the emotion of *disgust*, which derives from the Latin term for "bad taste" (see Chapter 4). Imagine we asked you to swallow a piece of food that you find repulsive, like a dried-up cockroach (apologies to those of you reading this chapter over lunch or dinner). The odds are high you'd wrinkle your nose, contract your mouth, stick out your tongue, turn your head slightly to one side, and close your eyes at least partly (Phillips et al., 1997). Discrete emotions theorists would say that this coordinated set of reactions is evolutionarily adaptive. When you wrinkle your nose and contract your mouth, you're reducing the chances you'll ingest this substance; by sticking out your tongue, you're increasing the chances you'll expel it; by turning your head, you're doing your best to avoid it; and by closing your eyes, you're limiting the damage it can do to your visual system. Other emotions similarly prepare us for biologically important actions (Frijda, 1986). When we're afraid, our eyes open wide, allowing us to better spot potential dangers, like predators, lurking in our environment. When we're angry, our teeth and fists often become clenched, readying us to bite and fight.

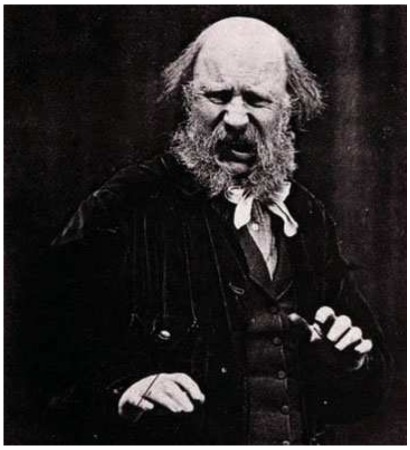
Charles Darwin (1872) was among the first to point out the similarities between the emotional expressions of humans and many nonhuman animals. He noted that the angry snarl of dogs, marked by the baring of their fangs, is reminiscent of the dismissive sneer of humans. Eugene Morton (1977, 1982) showed deep-seated similarities in communication across most animal species, especially mammals and birds, further suggesting that the emotions of humans and nonhuman animals share the same evolutionary heritage. For example, across the animal kingdom high-pitched sounds are associated with friendly interactions, and low-pitched sounds with hostile interactions. Jaak Panksepp (2005) discovered that rats emit a high-pitched chirp, perhaps similar to human laughter, when tickled. The high-pitched panting of dogs during play also seems similar in many ways to human laughter.

Of course, the mere fact that two things are superficially similar doesn't prove that they share evolutionary roots. Birds and bats both have wings, but their wings evolved independently of each other. In the case of emotions, however, we know that all mammals share an evolutionary ancestor. The fact that many mammals display similar emotional reactions during similar social behaviors, such as tickling and play, lends itself to a parsimonious hypothesis: Perhaps these reactions share the same evolutionary origins.

occam's razor
DOES A SIMPLER EXPLANATION FIT THE DATA JUST AS WELL?

CULTURE AND EMOTION. Another way of evaluating claims that discrete emotions are products of evolution is to examine the *universality* of emotional expressions. If we humans evolved to express emotions a certain way, we'd expect expressions to communicate the same meaning across cultures.

Recognition of Emotions across Cultures. One telling piece of evidence for discrete emotions theory derives from research showing that people recognize and generate the same emotional expressions across cultures (Izard, 1971). Nevertheless, this re-



People have recognized the facial reaction of disgust for centuries. This is a photograph from Charles Darwin's book on the expression of emotions, published in 1872.

David Matsumoto and Bob Willingham, themselves former national judo competitors, examined the facial expressions of judo competition winners and losers at the 2004 Athens Olympics. They found that competitors in 35 countries across six continents displayed extremely similar smiles and other facial reactions after winning a match or receiving a medal (Matsumoto & Willingham, 2006).

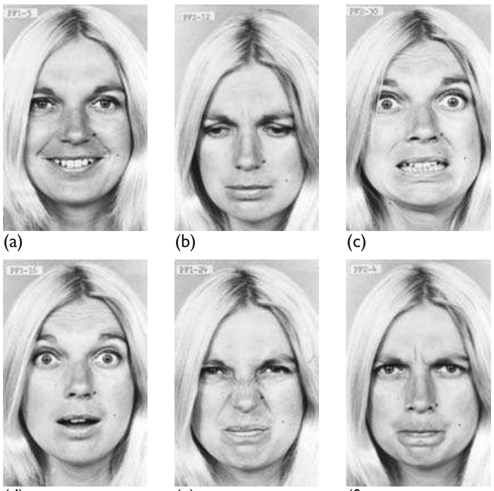
discrete emotions theory
theory that humans experience a small number of distinct emotions that are rooted in our biology

ruling out rival hypotheses

HAVE IMPORTANT ALTERNATIVE EXPLANATIONS FOR THE FINDINGS BEEN EXCLUDED?

search is vulnerable to a rival explanation: Because these people have all been exposed to Western culture, the similarities may be due to shared experiences rather than a shared evolutionary heritage.

To rule out this explanation, in the late 1960s American psychologist Paul Ekman traveled to the wilds of southeastern New Guinea to study a group of people who'd been essentially isolated from Western culture and still used Stone Age tools. With the aid of a translator, Ekman read them a brief story (for example, "His mother has died, and he feels very sad"), along with a display of photographs of Americans depicting various emotions, like happiness, sadness, and anger. Then, Ekman asked them to select the photograph that matched the story. He later went further, asking U.S. college students to guess which emotions the New Guineans were displaying (Ekman & Friesen, 1971).



(a) (b) (c) (d) (e) (f)

? Six of the seven primary emotions identified by Paul Ekman and his colleagues. **Can you match each face to the corresponding emotions of anger, disgust, fear, happiness, sadness, and surprise?** (See answer upside down at bottom of page.)

Ekman (1999) and his colleagues (Ekman & Friesen, 1986) concluded that a small number of **primary emotions**—perhaps seven—are cross-culturally universal. Specifically, they found that the facial expressions associated with these emotions are recognized across most, if not all, cultures. Discrete emotions theorists call these emotions "primary" because they're presumably the biologically based emotions from which other emotions arise:

- Happiness
- Sadness
- Surprise
- Anger
- Disgust
- Fear
- Contempt

Recent research suggests that pride may also be a cross-culturally universal emotion, although the evidence for this claim is preliminary (Tracy & Robins, 2007).

Ekman and his colleagues found that certain primary emotions are easier to detect than others. Happiness tends to be the most easily recognized emotion (Elfenbein & Ambady, 2002); their New Guinea subjects correctly recognized happiness in Americans more than 90 percent of the time (Ekman, 1994). In contrast, negative emotions are more difficult to recognize; many subjects confuse disgust with anger, anger with fear, and fear with surprise (Elfenbein & Ambady, 2002; Tomkins & McCarter, 1964). Although people across widely different cultures don't always agree on which facial expressions go with which emotions (Feldman Barrett & Bliss-Moreau, 2009; Russell, 1994), they agree often enough to provide support for discrete emotions theory. **Simulate**

Simulate Recognizing Facial Expressions of Emotions on **mypsychlab.com**

Some psychologists believe that pride is also a discrete emotion. Pride tends to be associated with a smile, along with the head pushed back, the chest pushed forward, and one's hands on the hips or in the air (Tracy & Robins, 2007)—as shown here.

Primary emotions don't tell the whole story of our feelings. Just as talented painters create a magnificently complex palette of secondary paint colors, like various shades of green and purple, from a few primary paint colors, like blue and yellow (see Chapter 4), our brains "create" an enormous array of *secondary emotions* from a small number of primary emotions. The secondary emotion of "alarm" seems to be a mixture of fear and surprise, and the secondary emotion of "hatred" seems to be a mixture of anger and disgust (Plutchik, 2000).

Some of these complex emotion blends possess names in other languages, but lack an equivalent in English. Take *schadenfreude*, a German term referring to the glee we experience at witnessing the misfortune of others, especially those we see as arrogant (Ortony, Clore, & Collins, 1988). It seems to be a hybrid of several emotions, like happiness, anger, and pride. We experience *schadenfreude* when we feel secretly happy when a classmate who brags about getting A-pluses on his exams unexpectedly gets an F.

Cultural Differences in Emotional Expression: Display Rules. The finding that certain emotions exist across most or all cultures doesn't mean that cultures are identical in their emotional expressions. In part, that's because cultures differ in **display rules**, societal

primary emotions
small number (perhaps seven) of emotions believed by some theorists to be cross-culturally universal

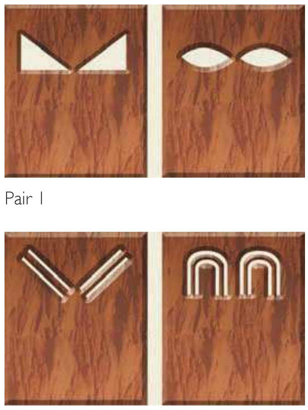
display rules
cross-cultural guidelines for how and when to express emotions

Answers: (a) happiness; (b) sadness; (c) fear; (d) surprise; (e) disgust; (f) anger guidelines for how and when to express emotions (Ekman & Friesen, 1975; Matsumoto et al., 2005). In Western culture, parents teach most boys not to cry, whereas they typically teach girls that crying is acceptable (Plutchik, 2003). Americans can be taken aback when a visitor from South America, the Middle East, or some European countries, like Russia, greets them by planting a kiss on their cheek.

In April 2007, American actor Richard Gere scandalized much of India by kissing Indian actress Shilpa Shetty's cheek on stage at an AIDS awareness rally. This action even resulted in a warrant being placed for Gere's arrest in India; it was later dropped. Gere was apparently unaware of display rules in India that strictly forbid kissing in public.

In a study of display rules, Wallace Friesen (1972) videotaped Japanese and American college students without their knowledge. He asked both groups of students to watch two film clips, one of a neutral travel scene (the control condition) and one of an incredibly gory film depicting a ritual genital mutilation (the experimental condition). When these students were alone, their facial reactions to the films were similar: Both groups showed little emotional reaction to the neutral film but clear signs of fear, disgust, and distress to the gory film. Yet when an older experimenter entered the room, the role of culture became apparent. Although American students' reactions to the films didn't change, Japanese students typically smiled during the gory film, concealing their negative emotional reactions. In Japanese culture, deference to authority figures is the norm, so the students acted as though they were happy to see the films. In many cases, culture doesn't influence emotion itself; it influences its overt expression (Fok et al., 2008).

ACCOMPANIMENTS OF EMOTIONAL EXPRESSIONS. According to discrete emotions theorists, each primary emotion is associated with a distinctive constellation of facial expressions. In anger, our lips consistently narrow and our eyebrows move downward. In contempt, we frequently lift and tighten our lips on one side of our face, generating a smirk (Matsumoto & Ekman, 2004), or roll our eyes upward, in effect communicating "I'm above (superior to) you" (see **FIGURE 11.1**). Interestingly, John Gottman and his colleagues have found that contempt, and the facial expressions that go along with it, are among the best predictors of divorce in married couples (Gottman & Levenson, 1999).



Pair 1

Pair 2

FIGURE 11.1 Which Mask Conveys a Threat? In hunter–gatherer societies, people often construct masks to convey threat, especially anger. These two pairs of shapes are based on wooden masks worn in these societies. In both cases, the shape on the left communicates more threat. Even American college students can distinguish the threatening from nonthreatening mask at higher than chance levels. (*Source:* Aronoff, Barclay, & Stevenson, 1988)

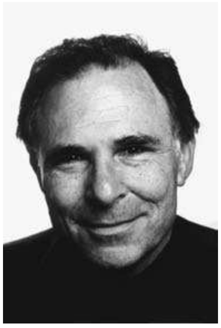
Emotions and Physiology. We can differentiate at least some primary emotions by their patterns of physiological responding (Ax, 1953; Rainville et al., 2006). The mere act of making a face associated with a specific emotion alters our bodily reactions in characteristic ways (Ekman, Levenson, & Friesen, 1983). Our heart rates tend to increase more when we make angry and fearful than happy or surprised facial expressions (Cacioppo et al., 1997), probably because the first two emotions are more closely linked to the emergency reactions we experience when threatened (see Chapters 3 and 12). Our heart kicks into high gear when we're in danger, mobilizing us for action (Frijda, 1986). Yet even fear and anger differ physiologically. When we're afraid, our digestive systems tend to slow down. In contrast, when we're angry, our digestive systems tend to speed up, which explains why our "stomachs churn" when we're furious (Carlson & Hatfield, 1992).

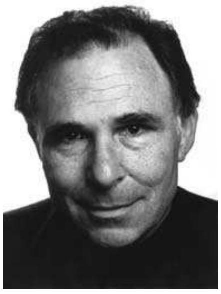
Brain imaging data also provide at least some evidence for discrete emotions. Fear, disgust, and anger tend to show different patterns of brain activation (Murphy, Nimmo-Smith, & Lawrence, 2003). Fear is relatively specific to the amygdala (see Chapter 3), disgust to the *insula*, a region within the limbic system, and anger to a region of the frontal cortex behind our eyes.

Yet in other cases we can't distinguish different emotions by means of their physiology (Cacioppo, Tassinary, & Bernstson, 2000; Feldman Barrett et al., 2007). Surprisingly, happiness and sadness aren't terribly different in their patterns of brain activation (Murphy et al., 2003). Moreover, there's almost certainly no single "fear processor," "disgust processor," and so on, in the brain, because multiple brain regions participate in all emotions (Schienle et al., 2002).

FACTOID

The word "supercilious," which refers to feeling contemptuously superior to others, literally means "above the eyebrow." Facial expressions associated with contempt often communicate a sense that others are "beneath" us.





? Psychologist Paul Ekman, shown here, is demonstrating two smiles: a Duchenne (genuine) smile and a non-Duchenne smile. **Which is the Duchenne smile?** (See answer upside down at bottom of page.)

cognitive theories of emotion
theories proposing that emotions are products of thinking

James-Lange theory of emotion
theory proposing that emotions result from our interpretations of our bodily reactions to stimuli

Real versus Fake Emotions. We can use certain components of facial expressions to help us distinguish real from fake emotions. In genuine happiness, we see an upward turning of the corners of the mouth, along with a drooping of the eyelids and a crinkling of the corners of the eyes (Ekman, Davidson, & Friesen, 1990). Emotion theorists distinguish this genuine expression, called the *Duchenne smile* after the neurologist who discovered it, from the fake or *Pan Am smile*, which is marked by a movement of the mouth but not the eyes. The term *Pan Am smile* derives from an old television commercial featuring the now defunct airline Pan Am, in which all of the flight attendants flashed obviously fake smiles. If you page through your family albums, you'll probably find an abundance of Pan Am smiles, especially in posed photographs. Interestingly, among subjects asked to produce facial expressions, only Duchenne smiles are associated with increased activity of the front region of the left hemisphere, which appears specialized for positive emotions (Ekman et al., 1990).

Cognitive Theories of Emotion: Think First, Feel Later

As we've seen, discrete emotions theorists emphasize the biological underpinnings of emotion. For them, emotions are largely innate motor programs triggered by certain stimuli, and our emotional reactions to these stimuli precede our interpretation of them. Advocates of **cognitive theories of emotion** disagree. For them, emotions are products of thinking rather than the other way around. What we feel in response to a situation is determined by how we interpret it (Scherer, 1988). As we'll learn in Chapter 12, the way we appraise situations influences whether we find them stressful (Lazarus & Folkman, 1984). If we see an upcoming job interview as a potential catastrophe, we'll be hopelessly stressed out; if we see it as a healthy challenge, we'll be appropriately geared up for it. Moreover, for cognitive theorists, there are no discrete emotions, because the boundaries across emotions are fuzzy and there are as many different emotions as there are kinds of thoughts (Feldman Barrett & Russell, 1999; Ortony & Turner, 1990).

JAMES-LANGE THEORY OF EMOTION. Perhaps the oldest cognitive theory of emotion owes its origins to the great American psychologist William James (1890), whom we met in Chapter 1. Because Danish researcher Carl Lange (1885) advanced a similar version of this theory around the same time, psychologists refer to it as the **James-Lange theory of emotion**. According to the James-Lange theory, emotions result from our interpretations of our bodily reactions to stimuli.

correlation vs. causation
CAN WE BE SURE THAT A CAUSES B?

To take James's example, let's imagine that while hiking through the forest, we come upon a bear. What happens next? Common wisdom tells us that we first become scared and then run away. Yet as James recognized, the link between our fear and running away is only a correlation; this link doesn't demonstrate that our fear *causes* us to run away. Indeed, James and Lange argued that the causal arrow is reversed: *We're afraid because we run away.* That is, we observe our physiological and behavioral reactions to a stimulus, in this case our hearts pounding, our palms sweating, and our feet running, and then conclude that we must have been scared (see **FIGURE 11.2**).

In support of this theory, a researcher examined five groups of patients with injuries in different regions of their spinal cord (Hohmann, 1966). Patients with injuries high in their spinal cord had lost almost all of their bodily sensation, and those with lower injuries had lost only part of their bodily sensation. Just as James and Lange would have predicted, patients with higher spinal cord damage reported less emotion—fear and anger—than those with lower spinal cord damage. Presumably, patients with lower injuries could feel more of their bodies, which allowed them a greater range of emotional reactions. Still, some researchers have criticized these findings because of a possible experimenter expectancy effect (see Chapter 2): the researcher knew which spinal cord patients were which when he assessed their emotions, which could have biased the results (Prinz, 2004). Moreover, some investigators haven't replicated these findings: One research team found no differences in the happiness of patients with or without spinal cord injuries (Chwalisz, Diener, & Gallagher, 1988).

replicability
CAN THE RESULTS BE DUPLICATED IN OTHER STUDIES?

Answer: Photo on top. One simple clue is more movement of the eyes in a Duchenne smile.

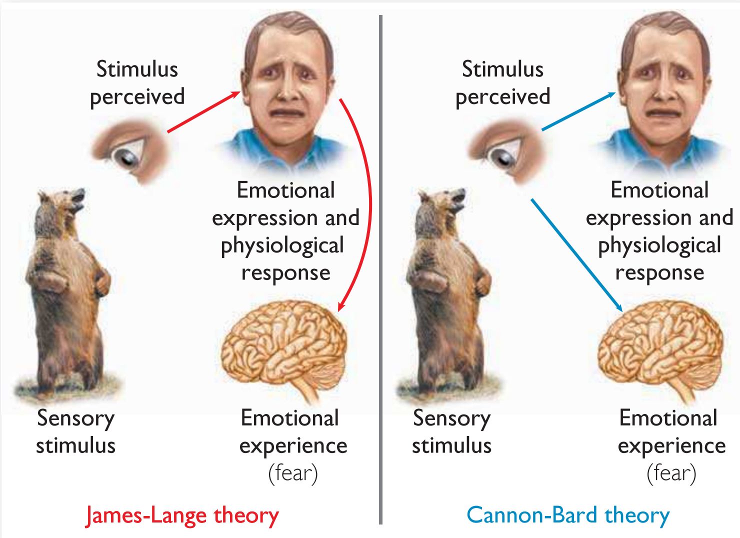


FIGURE 11.2 What Triggers Emotions? The James-Lange and Cannon-Bard theories differ in their views of how emotions are generated. (*Source:* Adapted from Cardoso)

Few scientists today are strict believers in the James-Lange theory, but it continues to influence modern-day thinking about emotion. Antonio Damasio's (1994) **somatic marker theory** (*somatic* means "physical") proposes that we unconsciously and instantaneously use our "gut reactions"—especially our autonomic responses, like our heart rate and sweating (see Chapter 3)—to gauge how we should act. According to Damasio, if we feel our hearts pounding during a first date, we use that information as a "marker" or signal to help us decide what to do next, like ask that person out for a second date. Elliott, whom we met in this chapter's opening, may have made irrational decisions because he'd lost much of his frontal cortex, the input station for information from the brain's sensory regions. In turn, he may have lost access to somatic markers of emotion (Damasio, 1994). Still, there's evidence that people can make decisions solely on the basis of external knowledge and without any bodily feedback (Maia & McClelland, 2004). One team of investigators examined patients who suffered from a rare condition called *pure autonomic failure* (PAF), which is marked by a deterioration of autonomic nervous system neurons beginning in middle age (Heims et al., 2004). These patients don't experience increases in autonomic activity, such as heart rate or sweating, in response to emotional stimuli. Yet these patients had no difficulty on a gambling task that required them to make decisions about monetary risks. These findings don't completely falsify somatic marker theory, as it's possible that somatic markers are helpful to us when making decisions. But they suggest that somatic markers aren't *necessary* for wise choices, even if they sometimes give us a bit of extra guidance.

falsifiability

CAN THE CLAIM BE DISPROVED?

CANNON-BARD THEORY OF EMOTION. Walter Cannon (1929) and Philip Bard (1942) pointed out several flaws with James's and Lange's reasoning. They noted that most physiological changes occur too slowly—often taking at least a few seconds—to trigger emotional reactions, which happen almost instantaneously. Cannon and Bard also argued that we aren't aware of many of our bodily reactions, like the contractions of our stomach or liver. As a consequence, we can't use them to infer our emotions.

Cannon and Bard proposed a different model for the correlation between emotions and bodily reactions. According to the **Cannon-Bard theory**, an emotion-provoking event leads simultaneously to both an emotion and bodily reactions. To return to James's example, Cannon and Bard would say that when we see a bear while hiking in the forest, the sight of that bear triggers both fear and running at the same time (again refer to Figure 11.2).

somatic marker theory
theory proposing that we use our "gut reactions" to help us determine how we should act

Cannon-Bard theory
theory proposing that an emotion-provoking event leads simultaneously to an emotion and to bodily reactions

Cannon and Bard further proposed that the *thalamus*, which is a relay station for the senses (see Chapter 3), triggers both an emotion and bodily reactions. Cannon and Bard were probably wrong about that, because later researchers showed that numerous regions of the limbic system, including the hypothalamus and the amygdala, also play key roles in emotion (Carlson & Hatfield, 1992; Lewis, Haviland-Jones, & Feldman Barrett, 2008; Plutchik & Kellerman, 1986). Still, their model of emotion has encouraged investigators to explore the bases of emotion in the brain.

According to Schachter and Singer's two-factor theory of emotion, we first experience arousal after an emotion-provoking event, like a car accident, and then seek to interpret the cause of that arousal. The resulting label we attach to our arousal is the emotion.

TWO-FACTOR THEORY OF EMOTION. Stanley Schachter and Jerome Singer (1962) argued that both the James-Lange and Cannon-Bard models were too simple. They agreed with James and Lange that our cognitive interpretations of our bodily reactions play a crucial role in emotions, but disagreed with James and Lange that these bodily reactions are sufficient for emotion. According to their **two-factor theory** of emotion (Schachter & Singer, 1962), two psychological events are required to produce an emotion:

1. After encountering an emotion-provoking event, we experience an undifferentiated state of arousal, that is, alertness. By "undifferentiated," Schachter and Singer meant that this arousal is the same across all emotions.
2. We seek to explain the source of this autonomic arousal. Once we attribute the arousal to an occurrence, either one within us or in the external environment, we experience an emotion. Once we figure out what's making us aroused, we "label" that arousal with an emotion. This labeling process, Schachter and Singer proposed, typically occurs so rapidly that we're not aware of it. According to this view, emotions are the explanations we attach to our arousal.

To illustrate, imagine we're hiking in the forest yet again (you'd think we'd have learned by now that we might find a bear there!). Then, sure enough, we come upon a bear. According to Schachter and Singer, we first become physiologically aroused; evolution assures that we do so that we're ready to fight—probably not an especially smart idea in this case—or flee (see Chapter 12). Then, we try to figure out the source of that arousal. One need not have a Ph.D. in psychology to infer that our arousal probably has something to do with the bear. So we label this arousal as fear, and that's the emotion we experience.

It's a good story, but do our emotions really work this way? In a classic study, Schachter and Singer (1962) decided to find out. As a "cover story," they informed subjects that they were testing the effectiveness of a new vitamin supplement—"Suproxin"—on vision. In reality, they were testing the effects of *adrenaline*, a chemical that produces physiological arousal (see Chapter 3). Schachter and Singer randomly assigned some subjects to receive an injection of Suproxin (again, actually adrenaline) and others an injection of placebo. While the adrenaline was entering their systems, Schachter and Singer randomly assigned subjects to two additional conditions: one in which a confederate (an undercover research assistant) acted in a happy fashion while completing questionnaires, and second in which a confederate acted in an angry fashion while completing questionnaires. The confederate was blind to whether subjects had received adrenaline or placebo. Finally, Schachter and Singer asked participants to describe how strongly they were experiencing different emotions.

Schachter and Singer's results dovetailed with two-factor theory. The emotions of subjects who'd received the placebo weren't influenced by the behavior of the confederate, but the emotions of the subjects who received adrenaline were. Subjects exposed to the

two-factor theory
theory proposing that emotions are produced by an undifferentiated state of arousal along with an attribution (explanation) of that arousal

happy confederate reported feeling happier, and those exposed to the angry confederate reported feeling angrier—but in both cases *only* if they'd received adrenaline. Emotion, Schachter and Singer concluded, requires *both* physiological arousal *and* an attribution of that arousal to an emotion-inducing event.

The award for the most creative test of the two-factor theory probably goes to two researchers (Dutton & Aron, 1974), who asked an attractive female confederate to approach male undergraduates on the University of British Columbia campus. She asked them for help with a survey and gave them her phone number in case they had any questions. Half of the time, she approached them on a sturdy bridge that didn't move, and half of the time she approached them on a swaying bridge suspended 200 feet above a river. Although only 30 percent of males in the first condition called her, 60 percent of males in the second condition did. The wobbly bridge in the second condition presumably increased male students' arousal, leading them to feel more intense romantic emotions. In a related study of "love at first fright," investigators approached participants immediately either before or after a roller-coaster ride, and showed them a photograph of an attractive member of the opposite sex. Participants who'd just gotten off the roller coaster rated the person in the photograph as more attractive—and indicated more of an interest in dating him or her—than did those who were just about to get on the roller coaster (Meston & Frohlich, 2003).

This swaying suspension bridge on the University of British Columbia campus allowed psychologists to test Schachter and Singer's two-factor theory of emotion.

Still, the support for two-factor theory has been mixed. Not all researchers have replicated Schachter and Singer's (1962) results (Marshall & Zimbardo, 1979; Maslach, 1979). Moreover, research suggests that although arousal often intensifies emotions, emotions can occur in the absence of arousal (Reisenzein, 1983). Contrary to what Schachter and Singer claimed, arousal isn't necessary for all emotional experiences.

replicability

CAN THE RESULTS BE DUPLICATED IN OTHER STUDIES?

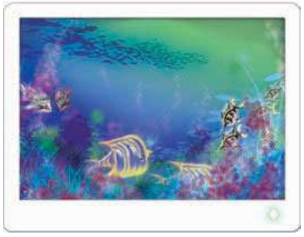
PUTTING IT ALL TOGETHER. So which of these theories should we believe? As is so often the case in psychology, there's probably a kernel of truth in several explanations. Discrete emotions theory is probably correct that our emotional reactions are shaped in part by natural selection and that these reactions serve crucial adaptive functions. Nevertheless, discrete emotions theory doesn't exclude the possibility that our thinking influences our emotions in significant ways, as cognitive theorists propose. Indeed, the James-Lange and somatic marker theories are probably correct in assuming that our inferences concerning our bodily reactions can influence our emotional states. Finally, two-factor theory may be right that physiological arousal plays a key role in the intensity of our emotional experiences, although it's unlikely that all emotions require such arousal.

Unconscious Influences on Emotion

In recent decades, researchers have become especially interested in *unconscious influences on emotion*: variables outside our awareness that can affect our feelings. One piece of evidence for unconscious influences on emotion comes from research on *automatic behaviors*.

AUTOMATIC GENERATION OF EMOTION. As we learned in Chapter 1, research suggests that a good deal of our behavior is produced automatically, that is, with no voluntary influence on our part (Bargh & Ferguson, 2000; see Chapter 14). Yet we often perceive such behavior as intentional (Kirsch & Lynn, 1999; Wegner, 2002). The same may hold for our emotional reactions; many may be generated automatically, much like the knee-jerk reflex that our doctor elicits when she taps on our knees with a hammer.

Two investigators presented some subjects visually with a set of words describing positive stimuli (like *friends* and *music*) and other subjects with words describing negative stimuli (like *cancer* and *cockroach*). These stimuli appeared so quickly that they were *subliminal,* that is, below the threshold for awareness (see Chapter 4). Even though subjects couldn't identify what they saw at better than chance levels, those exposed to positive stimuli reported being in a better mood than those exposed to negative stimuli



Stimuli can influence our emotional behavior even when we don't recognize them as the culprits. In one study, subjects subtly reminded of money by watching a computer screensaver of floating currency *(above)* later put more physical distance between themselves and a stranger than did subjects who watched a screensaver of floating fish *(below)*, presumably because thinking of money makes people more self-centered (Vohs, Meade, & Goode, 2006).

(Bargh & Chartrand, 1999). Other research shows that subliminal exposure to faces displaying a specific emotion, like fear, happiness, or disgust, changes participants' moods in the direction of that emotion (Ruys & Stapel, 2008) and even produces changes in facial muscles corresponding to that emotion (Dimberg, Thunberg, & Elmehed, 2000).

MERE EXPOSURE EFFECT.

Psychology: From Inquiry to Understanding
Psychology: From Inquiry to Understanding
Psychology: From Inquiry to Understanding
Psychology: From Inquiry to Understanding

After reading the four lines above, how do you feel about our textbook? Do you like it better or worse than you did before? (We hope you answered "better.")

Popular wisdom would say no. It tells us that "familiarity breeds contempt": The more often we've seen or heard something, the more we come to dislike it. There's surely a grain of truth to this notion, as most of us have had the experience of hearing a jingle on the radio that grates on our nerves increasingly with each passing repetition. Yet research by Robert Zajonc and others on the **mere exposure effect** suggests that the opposite is more common: that is, familiarity breeds *comfort* (Zajonc, 1968). The mere exposure effect refers to the fact that repeated exposure to a stimulus makes us more likely to feel favorably toward it (Bornstein, 1989; Kunst-Wilson & Zajonc, 1980).

Of course, the finding that we like things we've seen many times before isn't itself terribly surprising. This correlation could be due to the fact that we repeatedly seek out things we like. If we love ice cream, we're likely to spend more time seeking ice cream than are people who hate ice cream, assuming such human beings actually exist. Better evidence for the mere exposure effect derives from experiments using meaningless material, for which individuals are unlikely to have any prior feelings. Experiments show that repeated exposure to various stimuli, such as nonsense syllables (like "zab" and "gar"), Chinese letters (to non-Chinese subjects), and polygons of various shapes, results in greater liking toward these stimuli compared with little or no exposure (see **FIGURE 11.3**). These effects have been replicated by multiple investigators using quite different stimuli, attesting to their generality. The mere exposure effect even extends to faces. We tend to prefer an image of ourselves as we appear in the mirror to an image of ourselves as we appear in a photograph (Mita, Dermer, & Knight, 1977), probably because we see ourselves in the mirror just about every day. Our friends, in contrast, generally prefer the photographic image. Of course, advertisers are well aware of the mere exposure effect and capitalize on it mercilessly (Baker, 1999; Fang, Singh, & Ahluwalia, 2007). Repetitions of a commercial tend to increase our liking for the product, especially if we're positively inclined toward it to begin with.

replicability

CAN THE RESULTS BE DUPLICATED IN OTHER STUDIES?

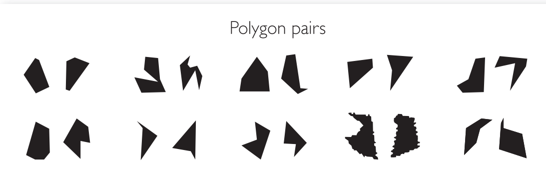


FIGURE 11.3 Which Polygon Do You Prefer? Pairs of polygons used in the mere exposure research of Robert Zajonc and his colleagues. Subjects exposed repeatedly to only one polygon within the pair prefer that polygon, even if they don't recall having seen it. (*Source:* Epley, 2006)

There's evidence that the mere exposure effect can operate unconsciously, because it emerges even when experimenters present meaningless stimuli subliminally (Bornstein, 1992; Zajonc, 2001). Even when people aren't aware of having seen a stimulus, like a specific polygon, they report liking it better than stimuli, like slightly different polygons, they've never seen. Mere exposure effects may be even larger for subliminally than for *supraliminally* (consciously) presented stimuli (Bornstein, 1989). Still, there's controversy about just how enduring the mere exposure effect is. It seems to influence short-term preferences, but not long-term emotions (Lazarus, 1984).

No one knows why mere exposure effects occur. They may reflect *habituation*, a primitive form of learning we encountered in Chapter 6. The more frequently we encounter a stimulus without anything bad happening, the more comfortable we feel in its presence. Alternatively, we may prefer things we find easier to process (Harmon-Jones & Allen, 2001; Mandler, Nakamura, & Van Zandt, 1987). The more often we experience something, the less effort it typically takes to comprehend it. Recall from Chapter 2 that we're *cognitive misers:* We prefer less mental work to more. So all else being equal, you'll like this

mere exposure effect
phenomenon in which repeated exposure to a stimulus makes us more likely to feel favorably toward it

paragraph better after having read it a few times than after you read it the first time. That's a not-so-subtle hint to read it again!

FACIAL FEEDBACK HYPOTHESIS. If no one is near you, and you're not afraid of looking foolish, make a big smile and hold it for a while, maybe for 15 seconds. How do you feel (other than silly)? Next, make a big frown, and again hold it for a while. How do you feel now?

According to the **facial feedback hypothesis**, you're likely to feel emotions that correspond to your facial features—first happy, and then, sad or angry (Adelmann & Zajonc, 1989; Goldman & de Vignemont, 2009; Niedenthal, 2007). This hypothesis originated with none other than Charles Darwin (1872), although Robert Zajonc revived it in the 1980s. Zajonc went beyond Darwin by proposing that changes in the blood vessels of the face "feed back" temperature information to the brain, altering our emotions in predictable ways. Like James and Lange, Zajonc argued that our emotions typically arise from our behavioral and physiological reactions. But unlike James and Lange, Zajonc viewed this process as purely biochemical and noncognitive, that is, as involving no thinking. Moreover, according to Zajonc, it operates outside of our awareness (Zajonc, Murphy, & Inglehart, 1989).

There's scientific support for the facial feedback hypothesis. In one study, researchers asked subjects to rate how funny they found various cartoons (Strack, Martin, & Stepper, 1988). They randomly assigned some subjects to watch cartoons while holding a pen with their teeth, others to watch cartoons while holding a pen with their lips. If you try this one at home, you'll discover that when you hold a pen with your teeth, you tend to smile; when you hold a pen with your lips, you tend to frown. Sure enough, subjects who held a pen with their teeth rated the cartoons as funnier than did other subjects.

Still, it's not clear that these effects work by means of facial feedback to the brain, as Zajonc claimed. An alternative hypothesis for these effects is classical conditioning (see Chapter 6). Over the course of our lives, we've experienced countless conditioning "trials" in which we smile while feeling happy and frown while feeling unhappy. Eventually, smiles become conditioned stimuli for happiness, frowns for unhappiness.

Most people prefer their mirror image to their image as taken by a photographer. In this case, this subject is more likely to prefer the photograph on the left, presumably because he is more accustomed to this view of himself.

facial feedback hypothesis
theory that blood vessels in the face feed back temperature information in the brain, altering our experience of emotions

ruling out rival hypotheses
HAVE IMPORTANT ALTERNATIVE EXPLANATIONS FOR THE FINDINGS BEEN EXCLUDED?

Study and **Review** on **mypsychlab.com**

assess your knowledge — FACT OR FICTION?

1. Psychological research demonstrates that emotion and reason are direct opposites of each other. **True / False**
2. Some emotions, like happiness, appear to be recognized by a substantial majority of people in all cultures. **True / False**
3. According to the James-Lange theory, emotions follow from our bodily reactions. **True / False**
4. Two-factor theory proposes that arousal is necessary for emotion. **True / False**
5. The mere exposure effect refers to the finding that repeated presentations of a stimulus lead to less liking of that stimulus. **True / False**

Answers: 1. F (p. 406); 2. T (p. 408); 3. T (p. 410); 4. T (p. 412); 5. F (p. 414)

FACTOID

The results of a small study suggest that the chemical *Botox,* used to treat wrinkles by paralyzing the skin around them, may be helpful in treating depression (Finzi & Wasserman, 2006). Although this finding requires replication, it's consistent with the facial feedback hypothesis, because *Botox* may decrease the sad facial expressions of depressed people, in turn dampening their sad emotions.