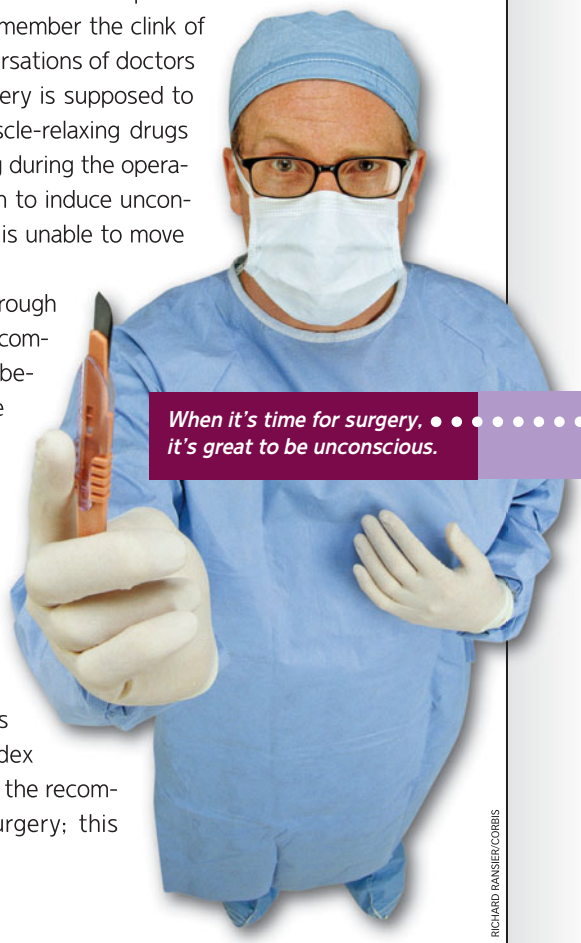
8

CHAPTER EIGHT

Consciousness

UNCONSCIOUSNESS IS SOMETHING YOU don't really appreciate until you need it. Belle Riskin needed it one day on an operating table. She awoke just as doctors were pushing a breathing tube down her throat. She felt she was choking, but she couldn't see, breathe, scream, or move. Unable even to blink an eye, she couldn't signal to the surgeons that she was conscious. "I was terrified. . . . It was like being buried alive," she explained later. "I knew I was conscious, that something was going on during the surgery. I had just enough awareness to know I was being intubated" (Groves, 2004).

How could this happen? Anesthesia for surgery is supposed to leave the patient unconscious, "feeling no pain," and yet in this case—and in about one in a thousand other operations (Sandin et al., 2000)—the patient regains consciousness at some point and even remembers the experience. Some patients remember pain; others remember the clink of surgical instruments in a pan or the conversations of doctors and nurses. This is not how modern surgery is supposed to go, but the problem arises because muscle-relaxing drugs are used to keep the patient from moving during the operation. Then, when the drugs that are given to induce unconsciousness fail to do the job, the patient is unable to move or tell doctors that there is a problem.



When it's time for surgery, it's great to be unconscious.

RICHARD RANSIER/CORBIS

Waking up in surgery sounds pretty rough all by itself, but this could cause additional complications. The conscious patient could become alarmed and emotional during the operation, spiking blood pressure and heart rate to dangerous levels. Fortunately, new methods of monitoring wakefulness are being developed. One system uses sensors attached to the person's head and gives readings on a scale from 0 (no electrical activity signaling consciousness in the brain) to 100 (fully alert), providing a kind of "consciousness meter." Anesthesiologists using this index deliver anesthetics to keep the patient in the recommended range of 40 to 65 during surgery; this

consciousness The person's subjective experience of the world and the mind.

Cartesian theater (after philosopher René Descartes) A mental screen or stage on which things appear to be presented for viewing by the mind's eye.

phenomenology How things seem to the conscious person.

problem of other minds The fundamental difficulty we have in perceiving the consciousness of others.

system reduces postsurgical reports of consciousness and memory for the surgical experience (Sigl & Chamoun, 1994). One of these devices in the operating room might have helped Belle Riskin settle into the unconsciousness she so dearly needed. ■

Most of the time, of course, consciousness is something we cherish. How else could we experience a favorite work of art; the mellow strains of an oldie on the radio; the taste of a sweet, juicy peach; or the touch of a loved one's hand? **Consciousness** is *a person's subjective experience of the world and the mind*. Although you might think of consciousness as simply "being awake," the defining feature of consciousness is experience, which you have when you're not awake but experiencing a vivid dream. Conscious experience is essential to what it means to be human. The anesthesiologist's dilemma in trying to monitor Belle Riskin's consciousness is a stark reminder, though, that it is impossible for one person to experience another's consciousness. Your consciousness is utterly private, a world of personal experience that only you can know.

How can this private world be studied? One way to explore consciousness is to examine it directly, trying to understand what it is like. Another way to explore consciousness is to examine its altered states: the departures from normal, everyday waking that occur during alternate states such as sleep, intoxication with alcohol and other drugs, and hypnosis and meditation. Like the traveler who learns the meaning of *home* by roaming far away, we can learn the meaning of consciousness by exploring its exotic variations.

Conscious and Unconscious: The Mind's Eye, Open and Closed

What does it feel like to be you right now? It probably feels as though you are somewhere inside your head, looking out at the world through your eyes. You can feel your hands on this book, perhaps, and notice the position of your body or the sounds in the room when you orient yourself toward them. If you shut your eyes, you may be able to imagine things in your mind. The philosopher Daniel Dennett called this "place in your head" where "you" are the **Cartesian Theater** (after philosopher René Descartes), *a mental screen or stage on which things appear to be presented for viewing by your mind's eye* (Dennett, 1991). Unfortunately, the Cartesian Theater isn't available on DVD, making it difficult to share exactly what's on our mental screen with our friends, a researcher, or even ourselves in precisely the same way a second time. As you'll recall from Chapter 1, Wilhelm Wundt encountered similar problems when studying consciousness in the earliest days of psychology.

"We keep this section closed off."

The Mysteries of Consciousness

Other sciences, such as physics, chemistry, and biology, have the great luxury of studying *objects,* things that we all can see. Psychology studies objects, too, looking at people and their brains and behaviors, but it has the unique challenge of also trying to make sense of *subjects*. A physicist is not concerned with what it is like to be a neutron, but psychologists hope to understand what it is like to be a human—that is, grasping the subjective perspectives of the people that they study. Psychologists hope to include an understanding of **phenomenology**, *how things seem to the conscious person,* in their understanding of mind and behavior. Phenomenology in psychology brings up mysteries pondered by

● What are the great mysteries of consciousness?

great thinkers almost since the beginning of thinking. Let's look at two of the more vexing mysteries of consciousness: the problem of other minds and the mind/body problem.

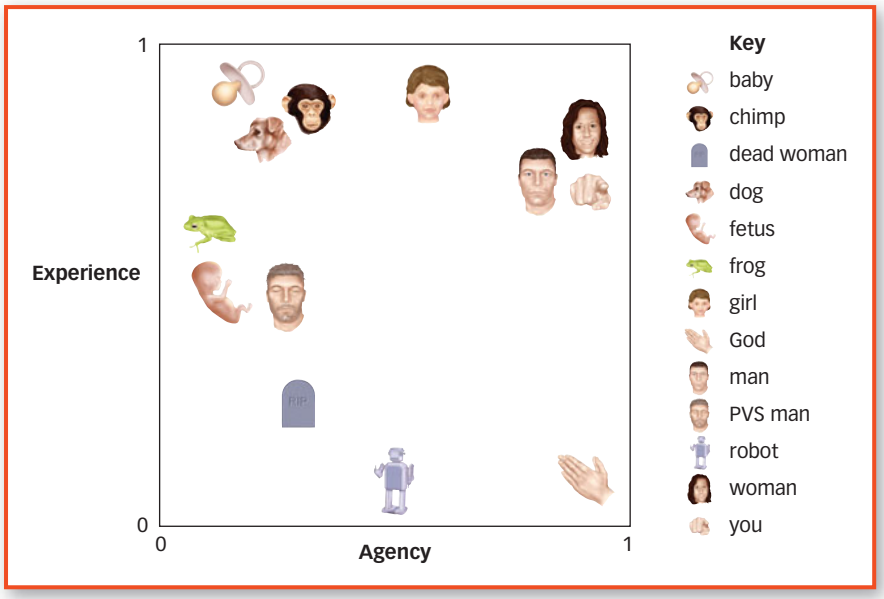
The Problem of Other Minds

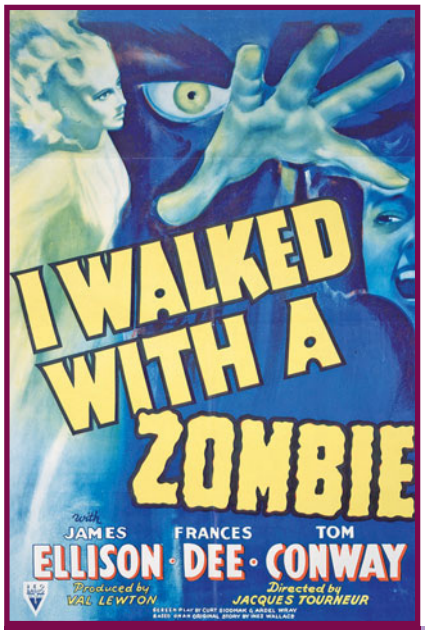
One great mystery is called the **problem of other minds**, *the fundamental difficulty we have in perceiving the consciousness of others*. How do you know that anyone else is conscious? People are often willing to describe in depth how they feel, how they think, and what they are experiencing. But perhaps they are just *saying* these things. There is no clear way to distinguish a conscious person from someone who might do and say all the same things as a conscious person but who is *not* conscious. Philosophers have called this hypothetical nonconscious person a "zombie," in reference to the living-yet-dead creatures of horror films (Chalmers, 1996). A philosopher's zombie could talk about experiences ("The lights are so bright!") and even seem to react to them (wincing and turning away) but might not be having any inner experience at all. No one knows whether there could be such a zombie, but then again, because of the problem of other minds, none of us will ever know for sure that another person is *not* a zombie.

Even the "consciousness meter" used by anesthesiologists falls short. It certainly doesn't give the anesthesiologist any special insight into what it is like to be the patient on the operating table; it only predicts whether patients will *say* they were conscious. We simply lack the ability to directly perceive the consciousness of others. In short, you are the only thing in the universe you will ever truly know what it is like to be.

The problem of other minds also means there is no way you can tell if another person's experience of anything is at all like yours. Although you know what the color red looks like to you, for instance, you cannot know whether it looks the same to other people. Maybe they're seeing what you see as blue and just *calling* it red. Of course, most people have come to trust each other in describing their inner lives, reaching the general assumption that other human minds are pretty much like their own. But they don't know this for a fact, and they can't know it directly. The perception of other minds is in fact something that happens in the mind of the perceiver.

How do people perceive other minds? Researchers conducting a large online survey asked people to compare the minds of 13 different targets, such as a baby, chimp, robot, man, and woman, on 18 different mental capacities, such as feeling pain, pleasure, hunger, and consciousness (see **FIGURE 8.1**, below) (Gray, Gray, & Wegner, 2007). The results suggested that people judge minds according to two major dimensions: the capacity for *experience* (such as the ability to feel pain, pleasure, hunger, consciousness, anger, or fear)





RKO/THE KOBAL COLLECTION

How would you know if you walked with a zombie? Could you perceive its lack of consciousness?

FIGURE 8.1
Dimensions of Mind Perception *When participants judged the mental capacities of 13 targets, two dimensions of mind perception were discovered (Gray et al., 2007). Participants perceived minds as varying in the capacity for experience (e.g., abilities to feel pain or pleasure) and in the capacity for agency (e.g., abilities to plan or exert self-control). They perceived normal adult humans (male, female, or "you," the respondent) to have minds on both dimensions, whereas other targets were perceived to have reduced experience or agency. The man in a persistent vegetative state ("PVS man"), for example, was judged to have only some experience and very little agency.*

and the capacity for *agency* (such as the ability for self-control, planning, memory, or thought). As shown in **FIGURE 8.1** (on page 235), respondents rated some targets as having little experience or agency (the dead person), others as having experiences but little agency (the baby), and yet others as having both experience and agency (adult humans). Still others were perceived to have agency without experiences (the robot, God).

Ultimately, the problem of other minds is a problem for psychological science. As you'll remember from Chapter 2, the scientific method requires that any observation made by one scientist should, in principle, be available for observation by any other scientist. But if other minds aren't observable, how can consciousness be a topic of scientific study? One radical solution is to eliminate consciousness from psychology entirely and follow the other sciences into total objectivity by renouncing the study of *anything* mental. This was the solution offered by behaviorism, and it turned out to have its own shortcomings, as you saw in Chapter 1. Despite the problem of other minds, modern psychology has embraced the study of consciousness. The astonishing richness of mental life simply cannot be ignored.

The Mind/Body Problem

Another mystery of consciousness is the **mind/body problem**, *the issue of how the mind is related to the brain and body.* French philosopher and mathematician René Descartes (1596–1650) is famous, among other things, for proposing that the human body is a machine made of physical matter but that the human mind or soul is a separate entity made of a "thinking substance." He proposed that the mind has its effects on the brain and body through the pineal gland, a small structure located near the center of the brain (see **FIGURE 8.2**). In fact, the pineal gland is not even a nerve structure but rather is an endocrine gland quite poorly equipped to serve as a center of human consciousness. We now know that, far from the tiny connection between mind and brain in the pineal gland that was proposed by Descartes, the mind and brain are connected everywhere to each other! In other words, "the mind is what the brain does" (Minsky, 1986, p. 287).

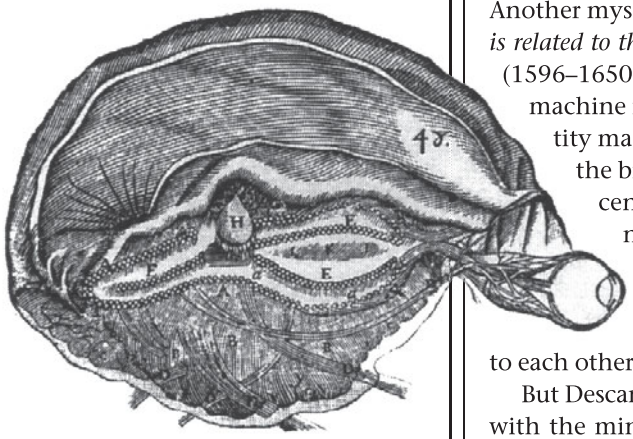


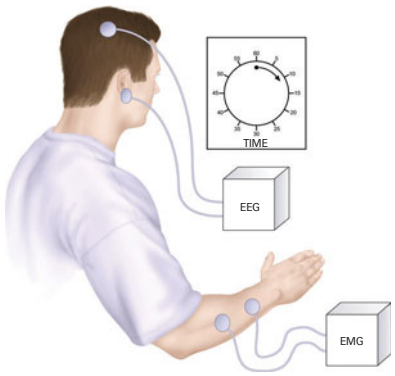
FIGURE 8.2
Seat of the Soul *Descartes imagined that the seat of the soul—and consciousness—might reside in the pineal gland located in the ventricles of the brain. This original drawing from Descartes (1662) shows the pineal gland (H) nicely situated for a soul, right in the middle of the brain.*

But Descartes was right in pointing out the difficulty of reconciling the physical body with the mind. Most psychologists assume that mental events are intimately tied to brain events, such that every thought, perception, or feeling is associated with a particular pattern of activation of neurons in the brain (see Chapter 3). Thinking about a particular duck, for instance, occurs with a unique array of neural connections and activations. If the neurons repeat that pattern, then you must be thinking of the duck; conversely, if you think of the duck, the brain activity occurs in that pattern.

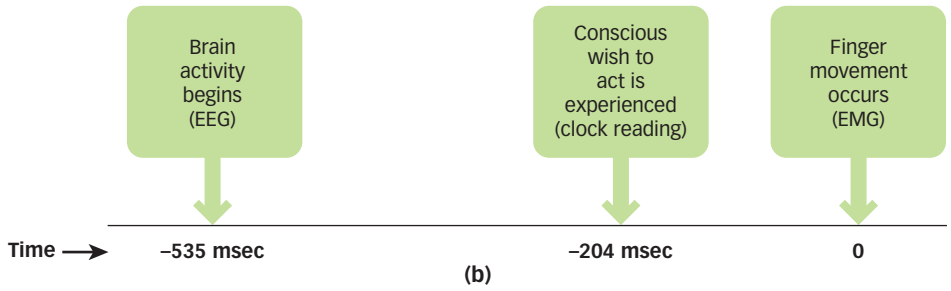
One telling set of studies, however, suggests that the brain's activities *precede* the activities of the conscious mind. The electrical activity in the brains of volunteers was measured using sensors placed on their scalps as they repeatedly decided when to move a hand (Libet, 1985). Participants were also asked to indicate exactly when they consciously chose to move by reporting the position of a dot moving rapidly around the face of a clock just at the point of the decision (**FIGURE 8.3a**, on page 237). As a rule, the brain begins to show electrical activity around half a second before a voluntary action (535 milliseconds, to be exact). This makes sense since brain activity certainly seems to be necessary to get an action started. Surprisingly, though, the brain also started to show electrical activity before the person's conscious decision to move. As shown in **FIGURE 8.3b**, the brain becomes active more than 300 milliseconds before participants report that they are consciously trying to move. Although your personal intuition is that you *think* of an action and *then* do it, these experiments suggest that your brain is getting started before *either* the thinking or the doing, preparing the way for both thought and action. Quite simply, it may appear to us that our minds are leading our brains and bodies, but the order of events may be the other way around (Wegner, 2002).

What comes first: brain activity or thinking?

mind/body problem The issue of how the mind is related to the brain and body.



(a)



(b)

FIGURE 8.3
The Timing of Conscious Will *(a) In Benjamin Libet's experiments, the participant was asked to move fingers at will while simultaneously watching a dot move around the face of a clock to mark the moment at which the action was consciously willed. Meanwhile, EEG sensors timed the onset of brain activation and EMG sensors timed the muscle movement. (b) The experiment showed that brain activity (EEG) precedes the willed movement of the finger (EMG) but that the reported time of consciously willing the finger to move follows the brain activity.*

The Nature of Consciousness

How would you describe your own consciousness? Researchers examining people's descriptions suggest that consciousness has four basic properties—intentionality, unity, selectivity, and transience—that it occurs on different levels, and that it includes a range of different contents. Let's examine each of these points in turn.

Four Basic Properties

The first basic property of consciousness is *intentionality:* the quality of being directed toward an object. Consciousness is always *about* something. But how long can consciousness be directed toward a object, and how many objects can it consider? Researchers have found that conscious attention is limited. Despite all the lush detail you see in your mind's eye, the kaleidoscope of sights and sounds and feelings and thoughts, the object of your consciousness at any one moment is just a small part of all of this (see **FIGURE 8.4**).

The second basic property of consciousness is *unity,* or resistance to division. This property becomes clear when you try to attend to more than one thing at a time. You may wishfully think that you

FIGURE 8.4
Bellotto's *Dresden* and Close-up *The people on the bridge in the distance look very finely detailed in* View of Dresden with the Frauenkirche at Left, *by Bernardo Bellotto (1720–1780) (left). However, when you examine the detail closely (right), you find that the people are made of brushstrokes merely suggesting people—an arm here, a torso there. Consciousness produces a similar impression of "filling in," as it seems to consist of extreme detail even in areas that are peripheral (Dennett, 1991).*

NORTH CAROLINA MUSEUM OF ART/CORBIS

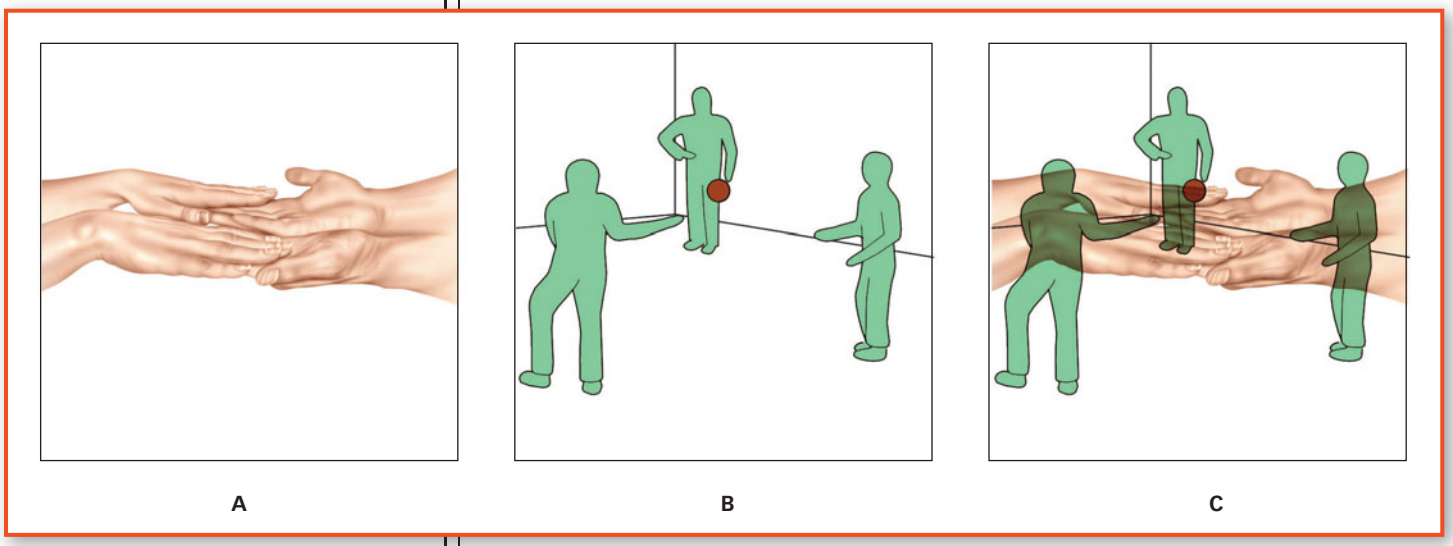


FIGURE 8.5
Divided Attention *Research participants presented with two different games (A and B) could easily follow each game separately. When participants tried to follow the action in the two different games simultaneously (C), they performed remarkably poorly (Neisser & Becklen, 1975).*

can study and watch TV simultaneously, for example, but research suggests not. One study had research participants divide their attention by reacting to two games superimposed on a television screen (see **FIGURE 8.5**). They had to push one button when one person slapped another's hands in the first game and push another button when a ball was passed in the second game. The participants were easily able to follow one game at a time, but their performance took a nosedive when they tried to follow both simultaneously. Their error rate when attending to the two tasks was eight times greater than when attending to either task alone (Neisser & Becklen, 1975). Your attempts to study, in other words, could seriously interfere with a full appreciation of your TV show.

● Why shouldn't you study and watch TV at the same time?

The third property of consciousness is *selectivity,* the capacity to include some objects and not others. The conscious system is most inclined to select information of special interest to the person. For example, in what has come to be known as the **cocktail party phenomenon**, *people tune in one message even while they filter out others nearby.* Perhaps you have noticed how abruptly your attention is diverted from whatever conversation you are having when someone else within earshot at the party mentions your name. Selectivity is not only a property of waking consciousness, however; the mind works this way in other states. People are more sensitive to their own name than others' names, for example, even during sleep (Oswald, Taylor, & Triesman, 1960). This is why when you are trying to wake someone up, it is best to use the person's name (particularly if you want to sleep with that person again).

The fourth and final basic property of consciousness is *transience,* or the tendency to change. Consciousness wiggles and fidgets like that toddler in the seat behind you on the airplane. The mind wanders not just sometimes, but incessantly, from one "right now" to the next "right now" and then on to the next (Wegner, 1997). William James, whom you met way back in Chapter 1, famously described consciousness as a stream: "Consciousness . . . does not appear to itself chopped up in bits. Such words as 'chain' or 'train' do not describe it. . . . It is nothing jointed; it flows. A 'river' or a 'stream' are the metaphors by which it is most naturally described" (James, 1890, Vol. 1, p. 239).

● How is consciousness like a karaoke "bouncing ball"?

The basic properties of consciousness are reminiscent of the "bouncing ball" that moves from word to word when the lyrics of a sing-along tune are shown on a karaoke machine. The ball always bounces on something (intentionality), there is only one ball (unity), the ball selects one target and not others (selectivity), and the ball keeps bouncing all the time (transience).

cocktail party phenomenon A phenomenon in which people tune in one message even while they filter out others nearby.

minimal consciousness A low-level kind of sensory awareness and responsiveness that occurs when the mind inputs sensations and may output behavior.

full consciousness Consciousness in which you know and are able to report your mental state.

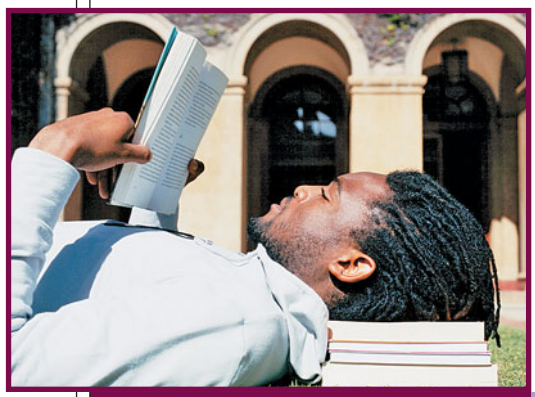
self-consciousness A distinct level of consciousness in which the person's attention is drawn to the self as an object.

Levels of Consciousness

Consciousness can also be understood as having levels, ranging from minimal consciousness to full consciousness to self-consciousness. These levels of consciousness would probably all register as "conscious" on that wakefulness meter for surgery patients you read about at the beginning of the chapter. The levels of consciousness that psychologists distinguish are not a matter of degree of overall brain activity but instead involve different qualities of awareness of the world and of the self.

In its minimal form, consciousness is just a connection between the person and the world. When you sense the sun coming in through the window, for example, you might turn toward the light. Such **minimal consciousness** is *consciousness that occurs when the mind inputs sensations and may output behavior* (Armstrong, 1980). This level of consciousness is a kind of sensory awareness and responsiveness, something that could even happen when someone pokes you during sleep and you turn over. Something seems to register in your mind, at least in the sense that you experience it, but you may not think at all about having had the experience.

Now consider the glorious feeling of waking up on a spring morning as rays of sun stream across your pillow. It's not just that you are having this experience; you are also *aware* that you are having this experience. The critical ingredient that accompanies **full consciousness** is that you *know and are able to report your mental state*. When you have a hurt leg and mindlessly rub it, for instance, you may be minimally conscious of the pain. It is only when you realize that it hurts, though, that you become fully conscious of the pain. Full consciousness involves not only thinking about things but also thinking about the fact that you are thinking about things (Jaynes, 1976).



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It's easy to zone out while reading: Your eyes continue to follow the print, but you're not processing the content and your mind has drifted elsewhere. Hello? Are you still paying attention while you're reading this?

Full consciousness fluctuates over time, coming and going throughout the day. You've no doubt had experiences of reading and suddenly realizing that you have "zoned out" and are not processing what you read. When people are asked to report each time they zone out during reading, they report doing this every few minutes (Schooler, Reichle, & Halpern, 2001). When you're zoned out, you are minimally conscious of wherever your mind has wandered, and you return with a jolt into the full consciousness that your mind had drifted away.

● What is "full consciousness"?

Full consciousness involves a certain consciousness of oneself; the person notices the self in a particular mental state ("Here I am, reading this sentence"). However, this is not quite the same thing as *self*-consciousness. Sometimes consciousness is entirely flooded with the self ("Gosh, I'm such a good reader!"), focusing on the self to the exclusion of almost everything else. William James (1890) and other theorists have suggested that **self-consciousness** is yet another distinct level of consciousness in which *the person's attention is drawn to the self as an object*. Most people report experiencing such self-consciousness when they are embarrassed, when they find themselves the focus of attention in a group, when someone focuses a camera on them, or when they catch sight of themselves in a mirror.

Most animals don't appear to have such self-consciousness. The typical dog, cat, or bird seems mystified by a mirror, ignoring it or acting as though there is some other critter back there. However, chimpanzees that have spent time with mirrors sometimes behave in ways that suggest they recognize themselves in a mirror. To examine this, researchers painted an odorless red dye over the eyebrow of an anesthetized chimp and then watched when the awakened chimp was presented with a mirror (Gallup, 1977). If the chimp interpreted the mirror image as a representation of some other chimp with an unusual approach to cosmetics, we would expect it just to look at the mirror or perhaps to reach toward it. But the chimp reached toward its *own eye* as it looked into the mirror—not the mirror image—suggesting that it recognized the image as a reflection of itself.

COGNITIVE EVOLUTION GROUP, UNIVERSITY OF LOUISIANA AT LAFAYETTE

A chimpanzee tried to wipe off the red dye on its eyebrow in the Gallup experiment. This suggests that some animals recognize themselves in the mirror.

Besides chimps, few other animals—possibly dolphins (Reiss & Marino, 2001) and elephants (Plotnik, de Waal, & Reiss, 2006)—can recognize their own mirror images. Dogs, cats, birds, monkeys, and gorillas have been tested and don't seem to know they

MICK ROESSLER/INDEXSTOCK

Self-consciousness is a curse and a blessing. Looking in a mirror can make people evaluate themselves on deeper attributes such as honesty as well as superficial ones such as looks.

are looking at themselves. Even humans don't have self-recognition right away. Infants don't recognize themselves in mirrors until they've reached about 18 months of age (Lewis & Brooks-Gunn, 1979). The experience of self-consciousness, as measured by self-recognition in mirrors, is limited to a few animals and to humans only after a certain stage of development.

Conscious Contents

What's on your mind? For that matter, what's on everybody's mind? One way to learn what is on people's minds is to ask them. For example, volunteers can be equipped with electronic beepers, and asked to record their current thoughts when beeped at random times throughout the day (Csikszentmihalyi & Larson, 1987). Such studies show that consciousness is dominated by the immediate environment, what the person is currently seeing, feeling, hearing, tasting, and smelling. Consciousness is also dominated by the person's *current concerns,* or what the person is thinking about repeatedly (Klinger, 1975). In one study, 175 college students were asked to report their current concerns; topics such as family relations, educational progress, health issues, and social activities (including dating) came up frequently (Goetzman, Hughes, & Klinger, 1994). Keep in mind that these concerns are ones the students didn't mind reporting to psychologists; their private preoccupations may have been different and probably far more interesting.

The current concerns that populate consciousness can sometimes get the upper hand, transforming everyday thoughts into rumination and worry. Thoughts that return again and again, or problem-solving attempts that never seem to succeed, can come to dominate consciousness. When this happens, people may exert **mental control**, *the attempt to change conscious states of mind.* For example, someone troubled by a recurring worry about the future ("What if I can't get a decent job when I graduate?") might choose to try not to think about this because it causes too much anxiety and uncertainty. Whenever this thought comes to mind, the person engages in **thought suppression**, the *conscious avoidance of a thought.* This may seem like a perfectly sensible strategy because it eliminates the worry and allows the person to move on to think about something else.

Or does it? The great Russian novelist Fyodor Dostoevsky (1863–1955) remarked on the difficulty of thought suppression: "Try to pose for yourself this task: not to think of a polar bear, and you will see that the cursed thing will come to mind every minute." Inspired by this observation, Daniel Wegner and his colleagues gave people this exact task in the laboratory (1987). Participants were asked to try not to think about a white bear for 5 minutes while they recorded all their thoughts aloud into a tape recorder. In addition, they were asked to ring a bell if the thought of a white bear came to mind. On average, they mentioned the white bear or rang the bell (indicating the thought) more than once per minute. Thought suppression simply didn't work and instead produced a flurry of returns of the unwanted thought. What's more, when some research participants later were specifically asked to change tasks and deliberately *think* about a white bear, they became oddly preoccupied with it.

Look away from the book for a minute and try not to think about a white bear. Can you do it?

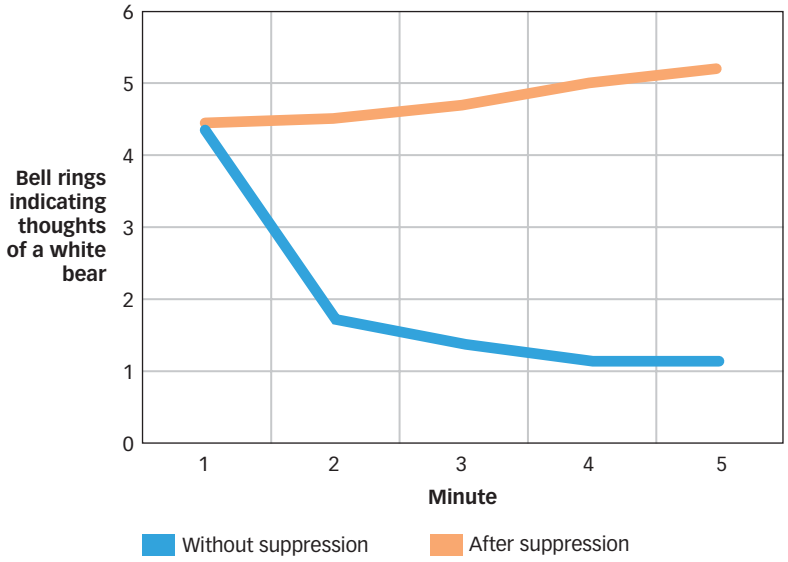
mental control The attempt to change conscious states of mind.

thought suppression The conscious avoidance of a thought.

rebound effect of thought suppression The tendency of a thought to return to consciousness with greater frequency following suppression.

ironic processes of mental control Mental processes that can produce ironic errors because monitoring for errors can itself produce them.

Dilbert



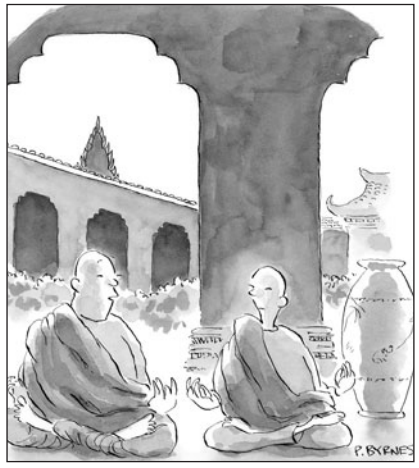
LARRY WILLIAMS/CORBIS

FIGURE 8.6
Rebound Effect *Research participants were first asked to try not to think about a white bear, and then they were asked to think about it and to ring a bell whenever it came to mind. Compared to those who were simply asked to think about a bear without prior suppression, those people who first suppressed the thought showed a rebound of increased thinking (Wegner et al., 1987).*

A graph of their bell rings in **FIGURE 8.6** shows that these participants had the white bear come to mind far more often than did people who had only been asked to think about the bear from the outset, with no prior suppression. This **rebound effect of thought suppression**, *the tendency of a thought to return to consciousness with greater frequency following suppression,* suggests that attempts at mental control may be difficult indeed. The act of trying to suppress a thought may itself cause that thought to return to consciousness in a robust way.

As with thought suppression, other attempts to "steer" consciousness in any direction can result in mental states that are precisely the opposite of those desired. How ironic: Trying to consciously achieve one task may produce precisely the opposite outcome! These ironic effects seem most likely to occur when the person is distracted or under stress. People who are distracted while they are trying to get into a good mood, for example, tend to become sad (Wegner, Erber, & Zanakos, 1993), and those who are distracted while trying to relax actually become more anxious than those who are not trying to relax (Wegner, Broome, & Blumberg, 1997). Likewise, an attempt not to overshoot a golf putt, undertaken during distraction, often yields the unwanted overshot (Wegner, Ansfield, & Pilloff, 1998). The theory of **ironic processes of mental control** proposes that such *ironic errors occur because the mental process that monitors errors can itself produce them* (Wegner, 1994a, 2009). In the attempt not to think of a white bear, for instance, a small part of the mind is ironically *searching* for the white bear (Wegner, 2004b).

Ironic processes are mental functions that are needed for effective mental control—they help in the process of banishing a thought from consciousness—but they can sometimes yield the very failure they seem designed to overcome. Ironic processes of mental control are among the mindbugs that the study of psychology holds up for examination. And because ironic processes occur outside consciousness, they remind us, too, that much of the mind's machinery may be hidden from our view, lying outside the fringes of our experience.



"Are you not thinking what I'm not thinking?"

The Unconscious Mind

Many mental processes are unconscious, in the sense that they occur without our experience of them. Just to put the role of consciousness in perspective, think for a moment about the mental processes involved in simple addition. What happens in consciousness between hearing a problem ("What's 4 plus 5?") and thinking of the

dynamic unconscious An active system encompassing a lifetime of hidden memories, the person's deepest instincts and desires, and the person's inner struggle to control these forces.

repression A mental process that removes unacceptable thoughts and memories from consciousness.

cognitive unconscious The mental processes that give rise to the person's thoughts, choices, emotions, and behavior even though they are not experienced by the person.

subliminal perception A thought or behavior that is influenced by stimuli that a person cannot consciously report perceiving.

answer ("9")? Probably nothing; the answer just appears in the mind. But this is a piece of calculation that must take at least a bit of thinking. After all, at a very young age you may have had to solve such problems by counting on your fingers. Now that you don't have to do that anymore (right?), the answer seems to pop into your head automatically, by virtue of a process that doesn't require you to be aware of any underlying steps and, for that matter, doesn't even *allow* you to be aware of the steps. The answer just suddenly appears. Nothing conscious seems to bridge this gap, but the answer comes from somewhere, and this emptiness points to the unconscious mind.

Freudian Unconscious

The true champion of the unconscious mind was Sigmund Freud. As you read in Chapter 1, Freud's psychoanalytic theory viewed conscious thought as the surface of a much deeper mind made up of unconscious processes. Far more than just a collection of hidden processes, Freud described a **dynamic unconscious**—*an active system encompassing a lifetime of hidden memories, the person's deepest instincts and desires, and the person's inner struggle to control these forces*. The dynamic unconscious might contain hidden sexual thoughts about one's parents, for example, or destructive urges aimed at a helpless infant—the kinds of thoughts people keep secret from others and may not even acknowledge to themselves. According to Freud's theory, the unconscious is a force to be held in check by **repression**, *a mental process that removes unacceptable thoughts and memories from consciousness and keeps them in the unconscious*. Without repression, a person might think, do, or say every unconscious impulse or animal urge, no matter how selfish or immoral. With repression, these desires are held in the recesses of the dynamic unconscious.

Freud looked for evidence of the unconscious mind in speech errors and lapses of consciousness, or what are commonly called "Freudian slips." Forgetting the name of someone you dislike, for example, is a mindbug that seems to have special meaning. Freud believed that such errors are not random and instead have some surplus meaning that may appear to have been created by an intelligent unconscious mind, even though the person consciously disavows them. For example, when Condoleezza Rice, serving as the National Security Advisor for President George W. Bush, was addressing an audience at a Washington, DC, dinner party, she reportedly said, "As I was telling my husba—" before breaking off and correcting herself: "As I was telling President Bush . . . ." Although no one seriously believes the single Rice and married Bush were an "item," you can almost hear her dynamic unconscious trumpeting the psychological intimacy they enjoyed.

What do Freudian slips tell us about the unconscious mind?

Many of the meaningful errors Freud attributed to the dynamic unconscious were not predicted in advance and so seem to depend on clever after-the-fact interpretations. That's not so good. Suggesting a pattern to a series of random events is quite clever, but it's not the same as scientifically predicting and explaining when and why an event should happen. Anyone can offer a reasonable, compelling explanation for an event after it has already happened, but the true work of science is to offer testable hypotheses that are evaluated based on reliable evidence. Condi Rice's curious slip about being married to President Bush may have been a random error, only meaningful in the minds of news commentators who found it amusing and worthy of explanation.

Cognitive Unconscious

Modern psychologists share Freud's interest in the impact of unconscious mental processes on consciousness and on behavior. However, rather than Freud's vision of the unconscious as a teeming menagerie of animal urges and repressed thoughts, the current study of the unconscious mind views it as the factory that builds the products of conscious thought and behavior (Kihlstrom, 1987; Wilson, 2002). The **cognitive unconscious** includes *all the mental processes that are not experienced by the person but that give rise to the person's thoughts, choices, emotions, and behavior.*

One indication of the cognitive unconscious at work is when the person's thought or behavior is changed by exposure to information outside consciousness. This happens in **subliminal perception**, when *thought or behavior is influenced by stimuli that a person cannot consciously report perceiving.* Worries about the potential of subliminal influence were first provoked in 1957, when a marketer, James Vicary, claimed he had increased concession sales at a New Jersey theater by flashing the words "Eat Popcorn" and "Drink Coke" briefly on-screen during movies. It turns out his story was a hoax, and many attempts to increase sales using similar methods have failed. But the very idea of influencing behavior outside consciousness created a wave of alarm about insidious "subliminal persuasion" that still concerns people (Epley, Savitsky, & Kachelski, 1999; Pratkanis, 1992).

Subliminal perception does occur, but the degree of influence it has on behavior is not very large (Dijksterhuis, Aarts, & Smith, 2005). One set of studies examined whether beverage choices could be influenced by brief visual exposures to thirst-related words while subjects were performing a computer task (Strahan, Spencer, & Zanna, 2002). Although the exposure did have an effect, the effect was small and mainly affected participants who reported already being thirsty at the start of the experiment.

Unconscious influences on behavior are not limited to cases of subliminal persuasion—they can happen when you are merely reminded of an idea in passing. For example, the thought of getting old can make a person walk more slowly. John Bargh and his colleagues discovered this by having college students complete a survey that called for them to make sentences with various words (Bargh, Chen, & Burrows, 1996). The students were not informed that most of the words were commonly associated with aging (*Florida, gray, wrinkled*), and even afterward they didn't report being aware of this trend. In this case, the "aging" idea wasn't presented subliminally, just not very noticeably. As these research participants left the experiment, they were clocked as they walked down the hall. Compared with those not exposed to the aging-related words, these people walked more slowly! Just as with subliminal perception, a passing exposure to ideas can influence actions without conscious awareness.

● What's an example of an idea that had an unconscious influence on you?

AP PHOTO/HO

President George W. Bush denied that Republican Party commercials used subliminal messages (which he called "subliminable") after Democrats complained that the word RATS subtly flashed on-screen in a TV spot criticizing his opponent Al Gore in the 2000 election. "One frame out of 900 hardly makes a conspiracy," he said in the ad's defense—although the ad was pulled off the air.

summary quiz [8.1]

1. The *cocktail party phenomenon*, in which people tune into one conversation while filtering out others nearby, illustrates which basic property of consciousness?
   a. intentionality
   b. unity
   c. selectivity
   d. transience

2. Watching your favorite TV show while studying could seriously interfere with your ability to master the material you are trying to study because of which basic property of consciousness?
   a. intentionality
   b. unity
   c. selectivity
   d. transience

3. When people are embarrassed or find themselves the focus of attention in a group, they are experiencing a state known as
   a. self-consciousness.
   b. full consciousness.
   c. minimal consciousness.
   d. unconsciousness.

4. All the mental processes that are not experienced by the person but that give rise to the person's thoughts and behaviors are known as
   a. repression.
   b. subliminal perception.
   c. the dynamic unconscious.
   d. the cognitive unconscious.

altered states of consciousness Forms of experience that depart from the normal subjective experience of the world and the mind.

circadian rhythm A naturally occurring 24-hour cycle.

REM sleep A stage of sleep characterized by rapid eye movements and a high level of brain activity.

Sleep and Dreaming: Good Night, Mind

What's it like to be asleep? Sometimes it's like nothing at all. Sleep can produce a state of unconsciousness in which the mind and brain apparently turn off the functions that create experience: The Cartesian Theater is closed. But this is an oversimplification because the theater actually seems to reopen during the night for special shows of bizarre cult films—in other words, dreams. Dream consciousness involves a transformation of experience that is so radical it is commonly considered an **altered state of consciousness**—*a form of experience that departs significantly from the normal subjective experience of the world and the mind.* Such altered states can be accompanied by changes in thinking, disturbances in the sense of time, feelings of the loss of control, changes in emotional expression, alterations in body image and sense of self, perceptual distortions, and changes in meaning or significance (Ludwig, 1966). The world of sleep and dreams, then, provides two unique perspectives on consciousness: a view of the mind without consciousness and a view of consciousness in an altered state.

● **Why are dreams considered an altered state of consciousness?**

Sleep

Consider a typical night. As you begin to fall asleep, the busy, task-oriented thoughts of the waking mind are replaced by wandering thoughts and images, odd juxtapositions, some of them almost dreamlike. Eventually, your presence of mind goes away entirely. Time and experience stop, you are unconscious, and in fact there seems to be no "you" there to have experiences. But then come dreams, whole vistas of a vivid and surrealistic consciousness you just don't get during the day, a set of experiences that occur with the odd prerequisite that there is nothing "out there" you are actually experiencing. More patches of unconsciousness may occur, with more dreams here and there. And finally, the glimmerings of waking consciousness return again in a foggy and imprecise form as you enter postsleep consciousness and then wake up, often with bad hair.

Sleep Cycle

The sequence of events that occurs during a night of sleep is part of one of the major rhythms of human life, the cycle of sleep and waking. This **circadian rhythm** is *a naturally occurring 24-hour cycle*—from the Latin *circa,* "about," and *dies,* "day." Even people who are sequestered in underground buildings without clocks and allowed to sleep whenever they want to, tend to have a rest-activity cycle of about 25.1 hours (Aschoff, 1965). This slight deviation from 24 hours is not easily explained (Lavie, 2001), but it may underlie the tendency many people have to want to stay up a little later each night and wake up a little later each day. We're 25.1-hour people living in a 24-hour world.

Dreamers, *by Albert Joseph Moore (1879/1882). Without measuring REM sleep, it's hard to know whether Moore's "Dreamers" are actually dreaming.*

MOORE, ALBERT JOSEPH/BIRMINGHAM MUSEUMS AND ART GALLERY/THE BRIDGEMAN ART LIBRARY

The sleep cycle is far more than a simple on/off routine, however, as many bodily and psychological processes ebb and flow in this rhythm. EEG (electroencephalograph) recordings of the human brain reveal a regular pattern of changes in electrical activity in the brain accompanying the circadian cycle. During waking, these changes involve alternation between high-frequency activity (called *beta waves*) during alertness and lower-frequency activity (*alpha waves*) during relaxation.

The largest changes in EEG occur during sleep. These changes show a regular pattern over the course of the night consisting of five sleep stages (see **FIGURE 8.7**, on page 245). In the first stage of

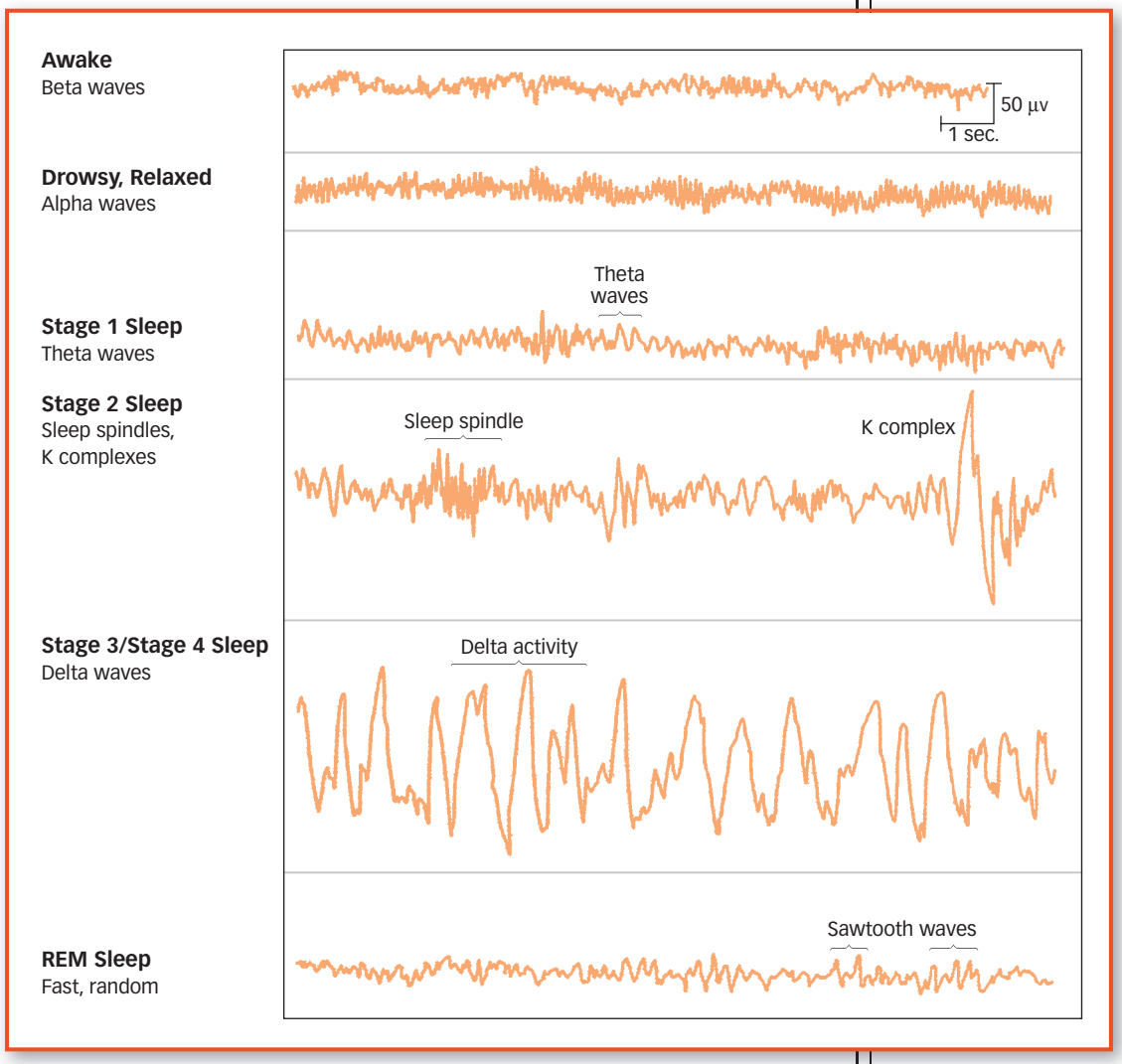


FIGURE 8.7
EEG Patterns during the Stages of Sleep *The waking brain shows high-frequency beta wave activity, which changes during drowsiness and relaxation to lower-frequency alpha waves. Stage 1 sleep shows lower-frequency theta waves, which are accompanied in Stage 2 by irregular patterns called sleep spindles and K complexes. Stages 3 and 4 are marked by the lowest frequencies, delta waves. During REM sleep, EEG patterns return to higher-frequency sawtooth waves that resemble the beta waves of waking.*

sleep, the EEG moves to frequency patterns even lower than alpha waves (*theta waves*). In the second stage of sleep, these patterns are interrupted by short bursts of activity, and the sleeper becomes somewhat more difficult to awaken. The deepest stages of sleep are 3 and 4, known as slow-wave sleep, in which the EEG patterns show activity called *delta waves*.

During the fifth sleep stage, **REM sleep**, *a stage of sleep characterized by rapid eye movements and a high level of brain activity,* EEG patterns become high-frequency sawtooth waves, similar to beta waves, suggesting that the mind at this time is as active as it is during waking (see **FIGURE 8.7**, above). During REM sleep, the pulse quickens, blood pressure rises, and there are telltale signs of sexual arousal. At the same time, measurements of muscle movements indicate that the sleeper is very still, except for a rapid side-to-side movement of the eyes. (Watch someone sleeping and you may be able to see the REMs through their closed eyelids. Be careful doing this with strangers down at the bus depot.)

Although many people believe that they don't dream much (if at all), some 80% of people awakened during REM sleep report dreams. Some dreams are also reported in other sleep stages (non-REM sleep) but not as many—and the dreams that occur at these times are described as less wild than REM dreams and more like normal thinking.

Putting EEG and REM data together produces a picture of how a typical night's sleep progresses through cycles of sleep stages (see **FIGURE 8.8**, on page 246). In the first hour

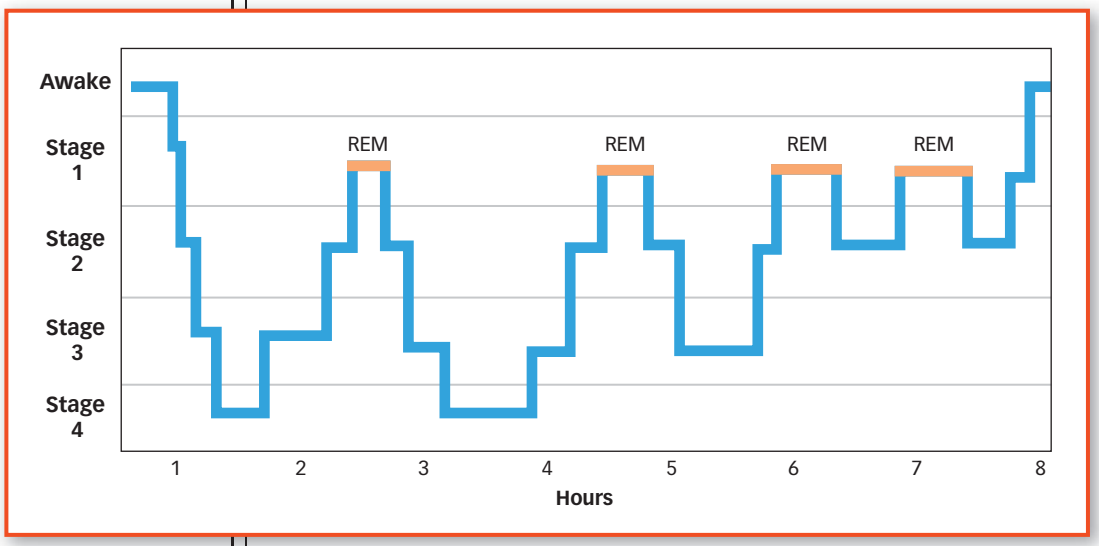


FIGURE 8.8
Stages of Sleep during the Night *Over the course of the typical night, sleep cycles into deeper stages early on and then more shallow stages later. REM periods become longer in later cycles, and the deeper slow-wave sleep of stages 3 and 4 disappears halfway through the night.*

of the night, you fall all the way from waking to the fourth and deepest stage of sleep, the stage marked by delta waves. These slow waves indicate a general synchronization of neural firing, as though the brain is doing one thing at this time rather than many—the neuronal equivalent of "the wave" moving through the crowd at a stadium, as lots of individuals move together in synchrony. You then return to lighter sleep stages, eventually reaching REM and dreamland. You then continue to cycle between REM and slow-wave sleep stages every 90 minutes or so throughout the night. Periods of REM last longer as the night goes on, and lighter sleep stages predominate between these periods, with the deeper slow-wave stages 3 and 4 disappearing halfway through the night. Although you're either unconscious or dream-conscious at the time, your brain and mind cycle through a remarkable array of different states each time you have a night's sleep.

● **What are the stages in a typical night's sleep?**

Sleep Needs and Deprivation

How much do people sleep? The answer depends on the age of the sleeper (Dement, 1999). Newborns will sleep 6 to 8 times in 24 hours, often totaling more than 16 hours. The typical 6-year-old child might need 11 or 12 hours of sleep, and the progression to less sleep then continues into adulthood, when the average is about 7 to 7½ hours per night. With aging, people can get along with even a bit less sleep than that. Over a whole lifetime, we get about 1 hour of sleep for every 2 hours we are awake.

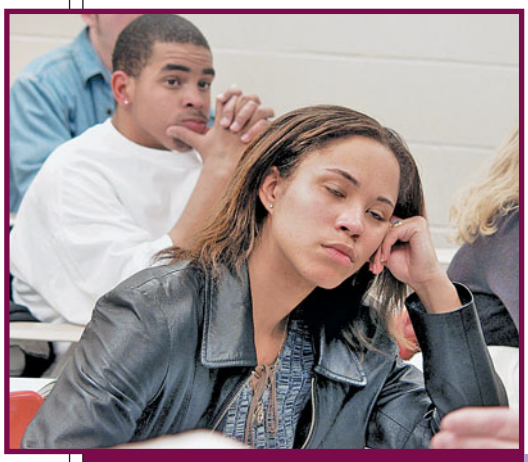
This is a lot of sleeping, and you might wonder whether, rather than sleeping our lives away, perhaps we can stay awake and enjoy life. The world record for staying awake belongs to Randy Gardner, who at age 17 stayed up for 264 hours and 12 minutes for a science project. Randy was followed around for much of the 11 days and nights by sleep researchers, who noted that he seemed remarkably chipper and easy to keep awake during the day—but that he struggled mightily at night, when fighting drowsiness required heroic measures. When Randy finally did go to sleep, he slept only 14 hours and 40 minutes and awakened essentially recovered (Dement, 1978).

● **What is the relationship between sleep and learning?**

Feats like this one suggest that sleep might be expendable. This is the theory behind the classic "all-nighter" that you may have tried on the way to a rough exam. But it turns out that this theory is mistaken. Robert Stickgold and his colleagues (2000b) found that when people learning a difficult perceptual task are kept up all night after they finished practicing the task, their learning of the task is wiped out. Even after two nights

of catch-up sleep, they show little indication of their initial training on the task. Sleep following learning appears to be essential for memory consolidation (see Chapter 5). It is as though memories normally deteriorate unless sleep occurs to help keep them in place. Studying all night may help you cram for the exam, but it won't make the material stick—which pretty much defeats the whole point.

Sleep turns out to be a necessity rather than a luxury in other ways as well. At the extreme, sleep loss can be fatal. When rats are forced to break Randy Gardner's human waking record and stay awake even longer, they have trouble regulating their body temperature and lose weight although they eat much more than normal. Their bodily systems break down, and they die, on average, in 21 days (Rechsthaffen et al., 1983). In healthy young humans, even a few hours of sleep deprivation each night can have a cumulative detrimental effect: reducing mental acuity and reaction time, increasing irritability and depression, and increasing the risk of accidents and injury (Coren, 1997).



SONDA DAWES/THE IMAGE WORKS

Sleep deprivation can often be diagnosed without the help of any psychologists or brain-scanning equipment.

Some studies have deprived people of different sleep stages selectively by waking them whenever certain stages are detected. Studies of REM sleep deprivation indicate that this part of sleep is important psychologically, as memory problems and excessive aggression are observed in both humans and rats after only a few days of being wakened whenever REM activity starts (Ellman et al., 1991). Deprivation from slow-wave sleep (in stages 3 and 4), in turn, has more physical effects, with just a few nights of deprivation leaving people feeling tired, fatigued, and hypersensitive to muscle and bone pain (Lentz et al., 1999).

It's clearly dangerous to neglect the need for sleep. But why would we have such a need in the first place? Insects don't seem to sleep, but most "higher" animals do, including fish and birds. Giraffes sleep less than 2 hours daily, whereas brown bats snooze for almost 20 hours. These variations in sleep needs, and the very existence of a need, are hard to explain. Is the restoration that happens during the unconsciousness of sleep something that simply can't be achieved during consciousness? Sleep is, after all, potentially costly in the course of evolution. The sleeping animal is easy prey, so the habit of sleep would not seem to have developed so widely across species unless it had significant benefits that made up for this vulnerability. Theories of sleep have not yet determined why the brain and body have evolved to need these recurring episodes of unconsciousness.

Sleep Disorders

In answer to the question "Did you sleep well?" comedian Stephen Wright said, "No, I made a couple of mistakes." Sleeping well is something everyone would love to do, but for many people, sleep disorders are mindbugs that can get in the way. Perhaps the most common sleep disorder is **insomnia**, *difficulty in falling asleep or staying asleep*. About 15% of adults complain of severe or frequent insomnia, and another 15% report having mild or occasional insomnia (Bootzin et al., 1993). Insomnia has many causes, including anxiety associated with stressful life events, so insomnia may sometimes be a sign of other emotional difficulties.

Insomnia can be exacerbated by worry about insomnia (Borkevec, 1982). No doubt you've experienced some nights on which sleeping was a high priority, such as before a class presentation or an important interview, and you've found that you were unable to fall asleep. In this situation, sleeping seems to be an emergency, and every wish to sleep takes you further from that goal. The desire to sleep initiates an ironic process of mental control—a heightened sensitivity to signs of sleeplessness—and this sensitivity can interfere with sleep (Ansfield, Wegner, & Bowser, 1996). The paradoxical solution for insomnia in some cases, then, may be to give up the pursuit of sleep and instead find something else to do.

Giving up on trying so hard to sleep is probably better than another common remedy—the use of sleeping pills. Although sedatives can be useful for brief sleep problems associated with emotional events, their long-term use is not effective. To begin with, most sleeping pills are addictive. People become dependent on the pills to sleep and may

insomnia Difficulty in falling asleep or staying asleep.

need to increase the dose over time to achieve the same effect. Even in short-term use, sedatives can interfere with the normal sleep cycle. Although they promote sleep, they reduce the proportion of time spent in REM and slow-wave sleep (Nishino, Mignot, & Dement, 1995), robbing people of dreams and their deepest sleep stages. As a result, the quality of sleep achieved with pills may not be high, and there may be side effects such as grogginess and irritability during the day. Finally, stopping the treatment suddenly can produce insomnia that is worse than before.

What are some problems caused by sleeping pills?

Sleep apnea is *a disorder in which the person stops breathing for brief periods while asleep.* A person with apnea usually snores, as apnea involves an involuntary obstruction of the breathing passage. When episodes of apnea occur for over 10 seconds at a time and recur many times during the night, they may cause many awakenings and sleep loss or insomnia. Apnea occurs most often in middle-age overweight men (Partinen, 1994) and may go undiagnosed because it is not easy for the sleeper to notice. Bed partners may be the ones who finally get tired of the snoring and noisy gasping for air when the sleeper's breathing restarts. Therapies involving weight loss, drugs, or surgery may solve the problem.

Another common sleep disorder is **somnambulism,** commonly called sleepwalking, which occurs when *a person arises and walks around while asleep.* Sleepwalking is more common in children, peaking around the age of 11 or 12, with as many as 25% of children experiencing at least one episode (Empson, 1984). Sleepwalking tends to happen early in the night, usually in slow-wave sleep, and sleepwalkers may awaken during their walk or return to bed without waking, in which case they will probably not remember the episode in the morning. Sleepwalking is not usually linked to any additional problems and is only problematic in that sleepwalkers can hurt themselves, tripping over furniture or falling down stairs. Contrary to popular belief, it is safe to wake sleepwalkers or lead them back to bed.

Is it safe to wake a sleepwalker?

Other sleep disorders are less common. **Narcolepsy** is *a disorder in which sudden sleep attacks occur in the middle of waking activities.* Narcolepsy involves the intrusion of a dreaming state of sleep (with REM) into waking and is often accompanied by unrelenting excessive sleepiness and uncontrollable sleep attacks lasting from 30 seconds to 30 minutes. This disorder appears to have a genetic basis, as it runs in families, and it can be treated effectively with medication. **Sleep paralysis** is *the experience of waking up unable to move* and is sometimes associated with narcolepsy. This eerie experience usually lasts only a few moments and may occur with an experience of pressure on the chest (Hishakawa, 1976). **Night terrors** (or sleep terrors) are *abrupt awakenings with panic and intense emotional arousal.* These terrors, which occur mainly in boys ages 3 to 7, happen most often in non-REM sleep early in the sleep cycle and do not usually have dream content the sleeper can report.

To sum up, there is a lot going on when we close our eyes for the night. Humans follow a pretty regular sleep cycle, going through five stages of non-REM and REM sleep during the night. Disruptions to that cycle, from either sleep deprivation or sleep disorders, can produce consequences for waking consciousness. But something else happens during a night's sleep that affects our consciousness, both while asleep and when we wake up. It's dreaming.

Dreams

Pioneering sleep researcher William C. Dement (1959) said, "Dreaming permits each and every one of us to be quietly and safely insane every night of our lives." Indeed, dreams do seem to have a touch of insanity about them. We experience crazy things in dreams, but even more

ONLY HUMAN

DUBIOUS TEENAGER EXCUSE #53

Authorities are investigating how a sleepwalking London teenager ended up asleep atop a 130-foot crane in the middle of the night. A passerby spotted the girl around 1:30 a.m. and called the police, thinking she was going to jump. A firefighter climbed up and inched along the beam to where the girl was sleeping. He was very cautious about startling her as he secured the unidentified teen in a safety harness. A special rescue truck was called, which deployed a hydraulic ladder to get the girl down after 2½ hours. The girl's parents were called to the scene and told police their daughter is a frequent sleepwalker (Sleepwalker found dozing high atop crane, 2005).

ESTHALTO/MATTHIEU SPOHN/GETTY IMAGES

Sleepwalkers in cartoons have their arms outstretched and eyes closed, but that's just for cartoons. A real-life sleepwalker usually walks normally with eyes open, sometimes with a glassy look.

bizarre is the fact that we are the writers, producers, and directors of the crazy things we experience. Just what are these experiences, and how can the experiences be explained?

Dream Consciousness

Dreams depart dramatically from reality. You may dream of being naked in public, of falling from a great height, of sleeping through an important appointment, of your teeth being loose and falling out, of being chased, or even of flying (Holloway, 2001). These things don't happen much in reality unless you have a very bad life.

The quality of consciousness in dreaming is also altered significantly from waking consciousness. There are five major characteristics of dream consciousness that distinguish it from the waking state (Hobson, 1988). For one, we intensely feel *emotion,* whether it is bliss or terror or love or awe. Second, dream *thought* is illogical: The continuities of time, place, and person don't apply. You may find you are in one place and then another, for example, without any travel in between—or people may change identity from one dream scene to the next. Third, *sensation* is fully formed and meaningful; visual sensation is predominant, and you may also deeply experience sound, touch, and movement (although pain is very uncommon). A fourth aspect of dreaming is *uncritical acceptance,* as though the images and events were perfectly normal rather than bizarre. A final feature of dreaming is the *difficulty of remembering* the dream after it is over. People often remember dreams only if they are awakened during the dream and even then may lose recall for the dream within just a few minutes of waking. If waking memory were this bad, you'd be standing around half naked in the street much of the time, having forgotten your destination, clothes, and probably your lunch money.

What distinguishes dream consciousness from the waking state?

Some of the most memorable dreams are nightmares, as these frightening dreams often wake up the dreamer. One set of daily dream logs from college undergraduates suggested that the average student has about 24 nightmares per year (Wood & Bootzin, 1990), although some people may have them as often as every night. Children have more nightmares than adults, and people who have experienced traumatic events are inclined to have nightmares that relive those events. Following the 1989 earthquake in the San Francisco Bay Area, for example, college students who had experienced the quake reported more nightmares than those who had not and often reported that the dreams were about the quake (Wood et al., 1992). This effect of trauma may not only produce dreams of the traumatic event: When police officers experience "critical

sleep apnea A disorder in which the person stops breathing for brief periods while asleep.

somnambulism (sleepwalking) Occurs when the person arises and walks around while asleep.

narcolepsy A disorder in which sudden sleep attacks occur in the middle of waking activities.

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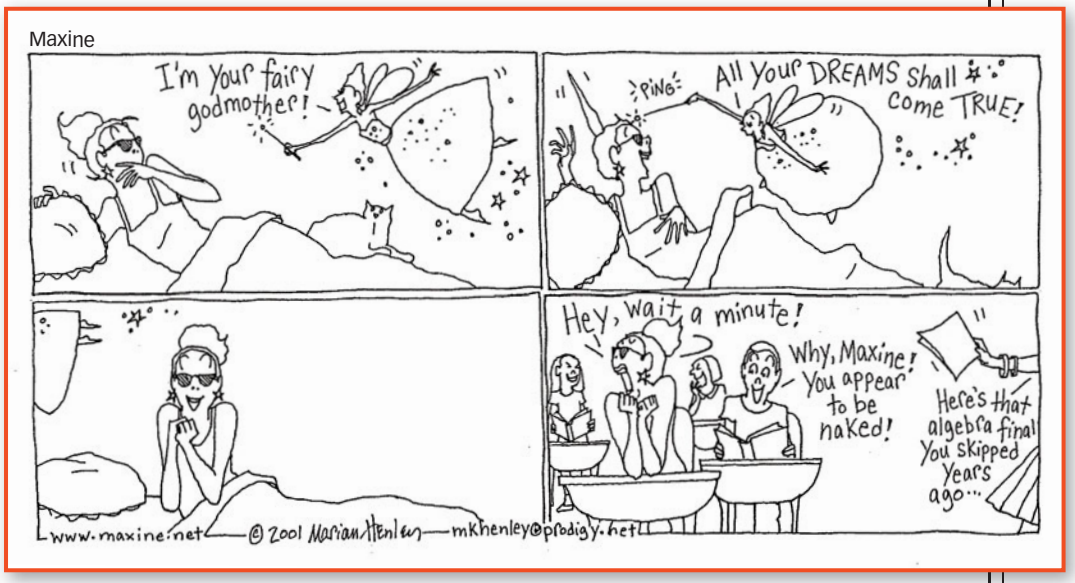


GOETHE HOUSE AND MUSEUM/SNARK/ART RESOURCE, NY

The Nightmare, *by Henry Fuseli (1790). Fuseli depicts not only a mare in this painting but also an incubus—an imp perched on the dreamer's chest that is traditionally associated with especially horrifying nightmares.*

incidents" of conflict and danger, they tend to have more nightmares in general (Neylan et al., 2002).

Not all of our dreams are fantastic and surreal, however. We also dream about mundane topics that reflect prior waking experiences or "day residue." Current conscious concerns pop up (Nikles et al., 1998), along with images from the recent past. A dream may even incorporate sensations experienced during sleep, as when sleepers in one study were led to dream of water when drops were sprayed on their faces during REM sleep (Dement & Wolpert, 1958). The day residue does not usually include episodic memories—that is, complete daytime events replayed in the mind. Rather, dreams that reflect the day's experience tend to single out sensory experiences or objects from waking life. One study had research participants play the computer game Tetris and found that participants often reported dreaming about the Tetris geometric figures falling down—even though they seldom reported dreams about being in the experiment or playing the game (Stickgold et al., 2001). Even severely amnesic patients who couldn't recall playing the game at all reported Tetris-like images appearing in their dreams (Stickgold et al., 2000b). The content of dreams takes snapshots from the day rather than retelling the stories of what you have done or seen. This means that dreams often come without clear plots or storylines, so they may not make a lot of sense.

Dream Theories

Dreams are puzzles that cry out to be solved. How could you *not* want to make sense out of these experiences? Dreams are emotionally riveting, filled with vivid images from your own life, and they seem very real. The search for dream meaning goes all the way back to biblical figures, who interpreted dreams and looked for prophecies in them. In the Old Testament, the prophet Daniel (a favorite of the authors of this book) curried favor with King Nebuchadnezzar of Babylon by interpreting the king's dream. Unfortunately, the meaning of dreams is usually far from obvious.

In the first psychological theory of dreams, Freud (1900/1965) proposed that dreams are confusing and obscure because the dynamic unconscious creates them precisely *to be* confusing and obscure. According to Freud's theory, dreams represent wishes, and some of these wishes are so unacceptable, taboo, and anxiety producing that the mind can only express them in disguised form. For example, a dream about a tree burning down in the park across the street from where a friend once lived might represent a camouflaged wish for the death of the friend. In this case, wishing for the death of a friend is unacceptable, so it is disguised as a tree on fire. The problem with this approach is that any dream can have an infinite number of potential interpretations, and finding the correct one is a matter of guesswork—and of convincing the dreamer that one interpretation is superior to the others.

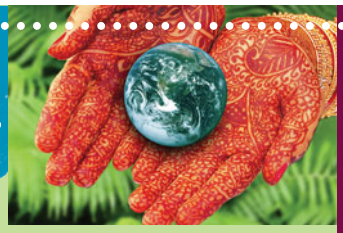
What is the evidence that we dream about our suppressed thoughts?

Although dreams may not represent elaborately hidden wishes, evidence indicates that they do feature the return of suppressed thoughts. Researchers asked volunteers to think of a personal acquaintance and then to spend 5 minutes before going to bed writing down whatever came to mind (Wegner, Wenzlaff, & Kozak, 2004). Some participants were asked to suppress thoughts of this person as they wrote, others were asked to focus on thoughts of the person, and yet others were asked just to write freely about anything. The next morning, participants wrote dream reports. Overall, all participants mentioned dreaming more about the person they had named than about other people. But they most often dreamed of the person they named if they were in the group that had been assigned to suppress thoughts of the person the night before. This finding suggests that Freud was right to suspect that dreams harbor unwanted thoughts. Perhaps this is why actors dream of forgetting their lines, travelers dream of getting lost, and football players dream of fumbling the ball.

activation-synthesis model The theory that dreams are produced when the brain attempts to make sense of activations that occur randomly during sleep.

Another key theory of dreaming is the **activation-synthesis model** (Hobson & McCarley, 1977). This theory proposes that *dreams are produced when the mind attempts to make sense of random neural activity that occurs in the brain during sleep.* During waking

Culture & Community

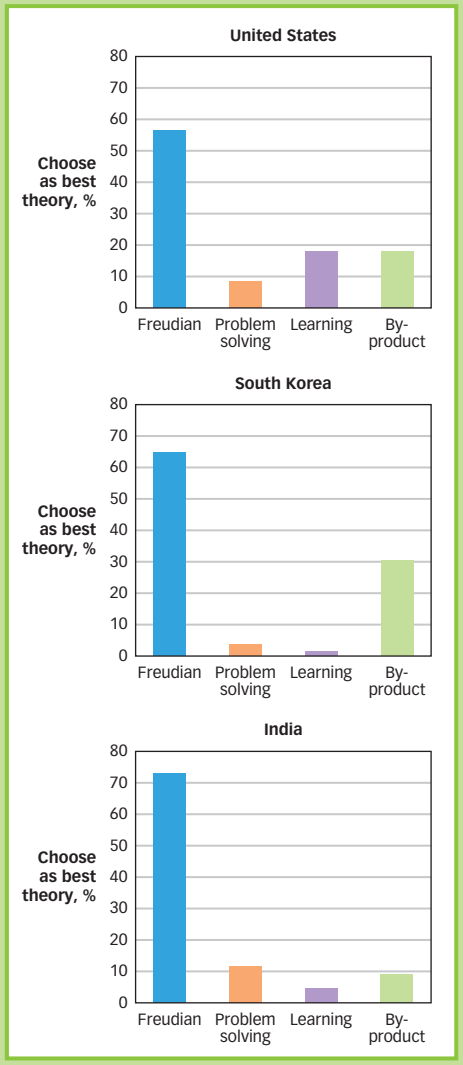


What Do Dreams Mean to Us Around the World?

A recent study (Morewedge & Norton, 2009) assessed how people from three different cultures evaluate their dreams. Participants were asked to rate different theories of dreaming on a scale of 1 (do not agree at all) to 7 (agree completely).

A significant majority of students from the United States, South Korea, and India agreed with the Freudian theory that dreams have meanings. Only small percentages believed the other options, that dreams provide a means to solve problems, promote learning, or are by-products of unrelated brain activity.

The figure to the right illustrates the findings across all three cultural participants. It appears that in many parts of the world, people have an intuition that dreams contain something deep and relevant.



consciousness, the mind is devoted to interpreting lots of information that arrives through the senses. You figure out that the odd noise you're hearing during class is your cell phone vibrating, for example, or you realize that the strange smell in the hall outside your room must be from burned popcorn. In the dream state, the mind doesn't have access to external sensations, but it keeps on doing what it usually does: interpreting information. Because that information now comes from neural activations that occur without the continuity provided by the perception of reality, the brain's interpretive mechanisms can run free (see the Hot Science box on the next page). This might be why, for example, a person in a dream can sometimes change into someone else. There is no actual person being perceived to help the mind keep a stable view. In the mind's effort to perceive and give meaning to brain activation, the person you view in a dream about a grocery store might seem to be a clerk but then change to be your favorite teacher when the dream scene moves to

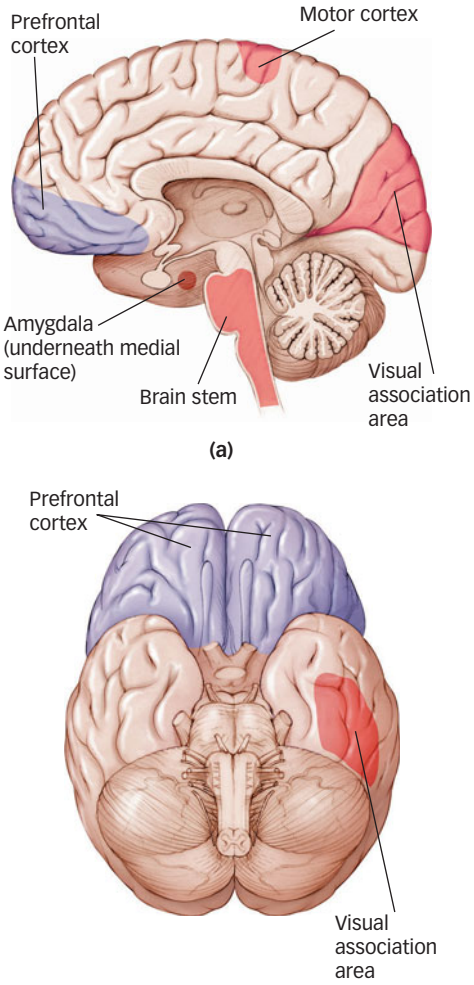
[HOT SCIENCE]

Dreaming and the Brain

What happens in the brain when we dream? Several studies have made fMRI scans of people's brains during sleep, focusing on the areas of the brain that show changes in activation during REM periods. These studies show that the brain changes that occur during REM sleep correspond clearly with certain alterations of consciousness that occur in dreaming. The figure shows some of the patterns of activation and deactivation found in the dreaming brain (Schwartz & Maquet, 2002).

One notable feature that distinguishes dreams from waking consciousness, for instance, is their scariness. Nightmares by definition are terrifying, but even your common, run-of-the-mill dream is often populated with anxiety-producing images (Neilson, Deslauriers, & Baylor, 1991). There are heights to look down from, dangerous people lurking, the occasional monster, lots of minor worries, and at least once in a while that major exam you've forgotten about until you walk into class. These thoughts suggest that the brain areas responsible for fear or emotion somehow work overtime in dreams. And indeed, the amgydala—which is involved in responding to threatening or stressful events—is quite active during REM sleep.

The typical dream is also a visual wonderland, with visual events present in almost all dreams. This dream "picture show" doesn't involve actual perception, of course, just the imagination of visual events. It turns out that the areas of the brain responsible for visual perception are *not* activated during dreaming, whereas the visual association areas in the occipital lobe that are responsible for visual imagery *do* show activation (Braun et al., 1998), as shown in the figure. Your brain is smart enough to realize that it's not really seeing bizarre images but acts instead as though it's imagining bizarre images.



Brain activation and deactivation during REM sleep. Brain areas shaded red are activated during REM sleep; those shaded blue are deactivated. (a) The medial view shows the activation of the amygdala, the visual association areas, the motor cortex, and the brain stem and the deactivation of the prefrontal cortex. (b) The ventral view shows the activation of other visual association areas and the deactivation of the prefrontal cortex (Schwartz & Maquet, 2002).

During REM, the prefrontal cortex shows relatively less arousal than it usually does during waking consciousness. What does this mean for the dreamer? As a rule, the prefrontal areas are associated with planning and executing actions, and often dreams seem to be unplanned and rambling. Perhaps this is why dreams often don't have very sensible storylines; they've been scripted by an author whose ability to plan is inactive.

Another odd fact of dreaming is that while the eyes are moving rapidly, the body is otherwise very still. During REM sleep, the motor cortex is activated, but spinal neurons running through the brain stem inhibit the expression of this motor activation (Lai & Siegal, 1999). This turns out to be a useful property of brain activation in dreaming; otherwise, you might get up and act out every dream! In fact, when this inhibitory area is lesioned in cats, they become highly active during REM sleep (Jouvet & Mounier, 1961). Normally, the brain inhibits movement during dreams, perhaps to keep us from hurting ourselves.

Brain scans may also someday help solve the intriguing question of whether people can be aware that they are dreaming. Some people report that they sometimes know they are dreaming while the dream is ongoing—they experience the dream equivalent of full consciousness. Such *lucid dreaming,* the awareness of dreaming during the dream, has been described often (LaBerge & Rheingold, 1990) but is still a matter of controversy because evidence of such dreams comes only from these descriptions reported by the dreamers. One goal of brain imaging research is to examine how the brain may be involved in the creation of such elusive states of mind. Researchers have not yet established whether there are differences in brain activation between minimal consciousness and full consciousness during waking, but perhaps if they do, brain research can corroborate the reports of lucid dreamers.

your school. The great interest people have in interpreting their dreams the next morning may be an extension of the interpretive activity they've been doing all night.

The Freudian theory and the activation-synthesis theory differ in the significance they place on the meaning of dreams. Dream research has not yet sorted out whether one of these theories or yet another might be the best account of the meaning of dreams.

summary quiz [8.2]

5. Dreaming is most likely to occur during which stage(s) of sleep?
   a. the first stage, as we begin to drift off into sleep
   b. the second stage, marked by short bursts of electric activity in the brain
   c. the third and fourth stages, which are the deepest stages of sleep
   d. the fifth stage, characterized by rapid eye movements and a high level of brain activity

6. The sleep disorder in which a person stops breathing for brief periods while asleep is called
   a. insomnia.
   b. sleep apnea.
   c. somnambulism.
   d. narcolepsy.

7. One of the characteristics of dream consciousness that distinguishes it from the waking state is
   a. our emotions are muted.
   b. our sensations are weaker.
   c. we uncritically accept bizarre images and events as normal.
   d. dream thought is more logical and consistent.

8. The theory of dreaming that proposes that dreams are produced when the mind attempts to make sense of random neural activity that occurs in the brain during sleep is called
   a. the activation-synthesis model.
   b. Freud's psychoanalytic theory.
   c. the altered state of consciousness model.
   d. the cognitive unconscious theory.

psychoactive drug A chemical that influences consciousness or behavior by altering the brain's chemical message system.

Drugs and Consciousness: Artificial Inspiration

The author of the antiutopian novel *Brave New World,* Aldous Huxley, once wrote of his experiences with the drug mescaline. His essay "The Doors of Perception" described the intense experience that accompanied his departure from normal consciousness. He described "a world where everything shone with the Inner Light, and was infinite in its significance. The legs, for example, of [a] chair—how miraculous their tubularity, how supernatural their polished smoothness! I spent several minutes—or was it several centuries?—not merely gazing at those bamboo legs, but actually *being* them" (Huxley, 1954).

Being the legs of a chair? This is better than being a seat cushion, but it still sounds like an odd experience. Still, some people seek out such experiences, often through using drugs. **Psychoactive drugs** are *chemicals that influence consciousness or behavior by altering the brain's chemical message system.* As you read in Chapter 3, information is communicated in the brain through neurotransmitters that convey neural impulses to neighboring neurons. Drugs alter these neural connections by preventing the bonding of neurotransmitters to sites in the postsynaptic neuron or by inhibiting the reuptake of or enhancing the bonding and transmission of neurotransmitters. Different drugs can intensify or dull transmission patterns, creating changes in brain electrical activity that mimic natural operations of the brain. For example, a drug such as Valium (benzodiazepine) induces sleep but prevents dreaming and so creates a state similar to naturally occurring slow-wave sleep. Other drugs prompt patterns of brain activity that do not occur naturally, however, and their influence on consciousness can be dramatic. Like

The seat of consciousness.

BRENT MADISON

Huxley experiencing himself becoming the legs of a chair, people using drugs can have experiences unlike any they might find in normal waking consciousness or even in dreams.

Drug Use and Abuse

Why do children sometimes spin around until they get dizzy and fall to the ground? There is something strangely attractive about states of consciousness that depart from the norm, and people throughout history have sought out these altered states by dancing, fasting, chanting, meditating, and ingesting a bizarre assortment of chemicals to intoxicate themselves (Tart, 1969). People pursue altered consciousness even when there are costs, from the nausea that accompanies dizziness to the life-wrecking obsession with a drug that can come with addiction. In this regard, the pursuit of altered consciousness can be a malicious mindbug.

Often, drug-induced changes in consciousness begin as pleasant and spark an initial attraction. Researchers have measured the attractiveness of psychoactive drugs by seeing how much laboratory animals will work to get them. In one study, researchers allowed rats to intravenously administer cocaine to themselves by pressing a lever (Bozarth & Wise, 1985). Rats given free access to cocaine increased their use over the course of the 30-day study. They not only continued to self-administer at a high rate but also occasionally binged to the point of giving themselves convulsions. They stopped grooming themselves and eating until they lost on average almost a third of their body weight. About 90% of the rats died by the end of the study.

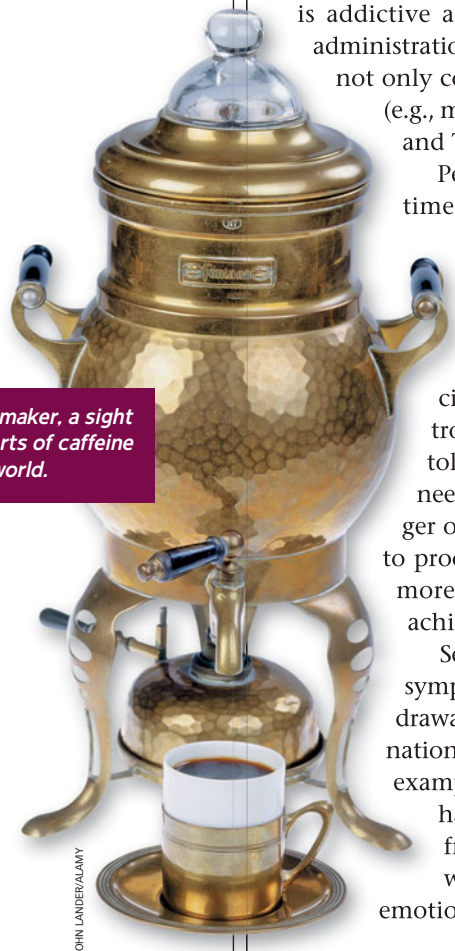
What is the allure of altered consciousness?

Rats are not tiny humans, of course, so such research is not a firm basis for understanding human responses to cocaine. But these results do make it clear that cocaine is addictive and that the results of such addiction can be dire. Studies of self-administration of drugs in laboratory animals show that animals will work to obtain not only cocaine but also alcohol, amphetamines, barbiturates, caffeine, opiates (e.g., morphine and heroin), nicotine, phenylcycladine (PCP), MDMA (ecstasy), and THC (tetrahydrocannabinol, the active ingredient in marijuana).

People usually do not become addicted to a psychoactive drug the first time they use it. They may experiment a few times, then try again, and eventually find that their tendency to use the drug increases over time due to several factors, such as drug tolerance, physical dependence, and psychological dependence. **Drug tolerance** is *the tendency for larger drug doses to be required over time to achieve the same effect.* Physicians who prescribe morphine to control pain in their patients are faced with tolerance problems because steadily greater amounts of the drug may be needed to dampen the same pain. With increased tolerance comes the danger of drug overdose; users find they need to use more and more of a drug to produce the same high. But then, if a new batch of heroin or cocaine is more concentrated than usual, the "normal" amount the user takes to achieve the same high can be fatal.

What problems arise with morphine prescriptions?

Self-administration of addictive drugs can also be prompted by withdrawal symptoms, which result when the drug is abruptly discontinued. Some withdrawal symptoms signal *physical dependence,* when pain, convulsions, hallucinations, or other unpleasant symptoms accompany withdrawal. A common example is the "caffeine headache" some people complain of when they haven't had their daily jolt of java. Other withdrawal symptoms result from *psychological dependence,* a strong desire to return to the drug even when physical withdrawal symptoms are gone. Drugs can create an emotional need over time that continues to prey on the mind, particularly in



JOHN LANDER/ALAMY

The antique coffee maker, a sight that warms the hearts of caffeine lovers around the world.

circumstances that are reminders of the drug. Some ex-smokers report longing wistfully for an after-dinner smoke, for example, even years after they've successfully quit the habit.

Drug addiction reveals a human mindbug: our inability to look past the immediate consequences of our behavior. Although we would like to think that our behavior is guided by a rational analysis of future consequences, there is something intensely inviting about the prospect of a soon-to-be-had pleasure and something pale, hazy, and distant about the costs this act might bring at some future time. The immediate satisfaction associated with taking most drugs may outweigh a rational analysis of the later consequences that can result from taking those drugs, such as drug addiction.

JEFF GREENBERG/THE IMAGE WORKS

People will often endure significant inconveniences to maintain their addictions.

The psychological and social problems stemming from addiction are major. For many people, drug addiction becomes a way of life, and for some, it is a cause of death. But a life of addiction is not the only possible endpoint of drug use. Stanley Schachter (1982) suggested that the visibility of addiction is misleading and that in fact many people overcome addictions. He found that 64% of a sample of people who had a history of cigarette smoking had quit successfully, although many had to try again and again to achieve their success. One study of soldiers who became addicted to heroin in Vietnam found that 3 years after their return, only 12% remained addicted (Robins et al., 1980). Although addiction is dangerous, it may not be incurable.

It may not be accurate to view all recreational drug use under the umbrella of "addiction." Many people at this point in the history of Western society, for example, would not call the repeated use of caffeine an addiction, and some do not label the use of alcohol, tobacco, or marijuana in this way. In other times and places, however, each of these has been considered a terrifying addiction worthy of prohibition and public censure. In the early 17th century, for example, tobacco use was punishable by death in Germany, by castration in Russia, and by decapitation in China (Corti, 1931). Not a good time to be traveling around waving a cigar. By contrast, cocaine, heroin, marijuana, and amphetamines have each been popular and even recommended as medicines at several points throughout history (Inciardi, 2001). Rather than viewing *all* drug use as a problem, it is important to consider the costs and benefits of such use and to establish ways to help people choose behaviors that are informed by this knowledge (Parrott et al., 2004).

"Hi. My name is Barry, and I check my E-mail two to three hundred times a day."

Types of Psychoactive Drugs

Four in five North Americans use caffeine in some form every day, but not all psychoactive drugs are this familiar. To learn how both the well-known and lesser-known drugs influence the mind, let's consider several broad categories of drugs: depressants, stimulants, narcotics, hallucinogens, and marijuana. **TABLE 8.1** (on page 256) summarizes what is known about the potential dangers of these different types of drugs.

Depressants

Depressants are *substances that reduce the activity of the central nervous system.* Depressants have a sedative or calming effect, tend to induce sleep in high doses, and can arrest breathing in extremely high doses. Depressants can produce both physical and psychological dependence.

drug tolerance The tendency for larger doses of a drug to be required over time to achieve the same effect.

depressants Substances that reduce the activity of the central nervous system.

TABLE 8.1

Dangers of Drugs

Drug	Dangers		
	Overdose (Can taking too much cause death or injury?)	Physical Dependence (Will stopping use make you sick?)	Psychological Dependence (Will you crave it when you stop using it?)
Depressants			
Alcohol	X	X	X
Barbiturates/benzodiazepines	X	X	X
Toxic inhalants	X	X	X
Stimulants			
Amphetamines	X	X	X
MDMA (Ecstasy)	X		?
Cocaine	X	X	X
Narcotics (opium, heroin, morphine, methadone, codeine)	X	X	X
Hallucinogens (LSD, mescaline, psilocybin, PCP, ketamine)	X		?
Marijuana			?

Alcohol is "king of the depressants," with its worldwide use beginning in prehistory, its easy availability in most cultures, and its widespread acceptance as a socially approved substance. Fifty-two percent of Americans over 12 years of age report having had a drink in the past month, and 15% have binged on alcohol (over five drinks in succession) in that time. Young adults (ages 18 to 25) have even higher rates, with 60% reporting a drink last month and 31% reporting a binge (*Health, United States,* 2001; National Center for Health Statistics, 2001). Drinking while driving is a main cause of auto accidents, contributing to 32% of crash fatalities in 2006 (U.S. Department of Transportation, 2008). A survey of undergraduates revealed that alcohol contributes to as many as 90% of rapes and 95% of violent crimes on campus (Wechsler et al., 1994).

Alcohol's initial effects, euphoria and reduced anxiety, feel pretty positive. As it is consumed in greater quantities, drunkenness results, bringing slowed reactions, slurred speech, poor judgment, and other reductions in the effectiveness of thought and action. The exact way in which alcohol influences neural mechanisms is still not understood, but like other depressants, alcohol increases activity of the neurotransmitter GABA (De Witte, 1996). As you read in Chapter 3, GABA normally inhibits the transmission of neural impulses, so one effect of alcohol is as a disinhibitor—a chemical that lets transmissions occur that otherwise would be held in check. But there are many contradictions. Some people using alcohol become loud and aggressive, others become emotional and weepy, others become sullen, and still others turn giddy—and the same person can experience each of these effects in different circumstances. How can one drug do this? Two theories have been offered to account for these variable effects: *expectancy theory* and *alcohol myopia*.

● **Why do people experience being drunk differently?**

Expectancy theory suggests that *alcohol effects are produced by people's expectations of how alcohol will influence them in particular situations* (Marlatt & Rohsenow, 1980). So, for instance, if you've watched friends or family drink at weddings and notice that this often produces hilarity and gregariousness, you could well experience these effects yourself should you drink alcohol on a similarly festive occasion. Seeing people getting drunk and fighting in bars, in turn, might lead to aggression after drinking.

expectancy theory The idea that alcohol effects can be produced by people's expectations of how alcohol will influence them in particular situations.

alcohol myopia A condition that results when alcohol hampers attention, leading people to respond in simple ways to complex situations.

stimulants Substances that excite the central nervous system, heightening arousal and activity levels.

Another approach to the varied effects of alcohol is the theory of **alcohol myopia**, which proposes that *alcohol hampers attention, leading people to respond in simple ways to complex situations* (Steele & Josephs, 1990). This theory recognizes that life is filled with complicated pushes and pulls, and our behavior is often a balancing act. Imagine that you are really attracted to someone who is dating your friend. Do you make your feelings known or focus on your friendship? The myopia theory holds that when you drink alcohol, your fine judgment is impaired. It becomes hard to appreciate the subtlety of these different options, and the inappropriate response is to veer full-tilt one way or the other. So, alcohol might lead you to make a wild pass at your friend's date or perhaps just cry in your beer over your timidity—depending on which way you happened to tilt in your myopic state.

Compared to alcohol, the other depressants are much less popular but still are widely used and abused. *Barbiturates* such as Seconal or Nembutal are prescribed as sleep aids and as anesthetics before surgery. *Benzodiazepines* such as Valium and Xanax are also called minor tranquilizers and are prescribed as antianxiety drugs. These drugs are prescribed by physicians to treat anxiety or sleep problems, but they are dangerous when used in combination with alcohol. Physical dependence is possible because withdrawal from long-term use can produce severe symptoms (including convulsions), and psychological dependence is common as well.

Finally, *toxic inhalants* are perhaps the most alarming substances in this category. These drugs are easily accessible even to children in the vapors of glue, gasoline, or propane. Sniffing or "huffing" these vapors can promote temporary effects that resemble drunkenness, but overdoses are sometimes lethal, and continued use holds the potential for permanent brain damage (Fornazzari et al., 1983).

"Hey, what is this stuff? It makes everything I think seem profound."

Stimulants

The **stimulants** are *substances that excite the central nervous system, heightening arousal and activity levels*. They include caffeine, amphetamines, nicotine, cocaine, and ecstasy (MDMA) and sometimes have a legitimate pharmaceutical purpose. *Amphetamines* (also called "speed"), for example, were originally prepared for medicinal uses and as diet drugs; however, amphetamines such as Methedrine and Dexedrine are widely abused, causing insomnia, aggression, and paranoia with long-term use. Stimulants increase the levels of dopamine and norepinephrine in the brain, thereby inducing higher levels of activity in the brain circuits that depend on these neurotransmitters. As a result, they increase alertness and energy in the user, often producing a euphoric sense of confidence and a kind of agitated motivation to get things done. All stimulants produce physical and psychological dependence, and their withdrawal symptoms involve depressive effects such as fatigue and negative emotions.

Ecstasy is an amphetamine derivative also known as MDMA, "X," or "e." It is a stimulant, but it has added effects somewhat like those of hallucinogens. (We'll talk about those shortly.) Ecstasy is particularly known for making users feel empathic and close to those around them. It is used often as a party drug to enhance the group feeling at dances or raves, but it has dangerous side effects such as interfering with the regulation of body temperature, making users highly susceptible to heatstroke and exhaustion. Although ecstasy is not as likely as some other drugs to cause physical or psychological dependence, it nonetheless can lead to some dependence. Ecstasy's potentially toxic effect on serotonin-activated neurons in the human brain is under intense debate, and a good deal of research attention is being devoted to studying the effects of this drug on humans.

Cocaine is derived from leaves of the coca plant, which has been cultivated by indigenous peoples of the Andes for millennia and chewed as a medication. Yes, the urban legend is true: Coca-Cola contained cocaine until 1903 and still may use coca leaves (with cocaine removed) as a flavoring—although the company's not telling. (Pepsi-Cola never contained cocaine and is probably made from something brown.) Freud tried

DANNY LEHMAN/CORBIS

Coca-Cola has been a popular product for more than 100 years. In the early days, one of the fatigue-relieving ingredients was a small amount of cocaine.

cocaine and wrote effusively about it for a while. Cocaine (usually snorted) and crack cocaine (smoked) produce exhilaration and euphoria and are seriously addictive, both for humans and the rats you read about earlier in this chapter. Withdrawal takes the form of an unpleasant "crash," cravings are common, and antisocial effects like those generated by amphetamines—aggressiveness and paranoia—are frequent with long-term use. Although cocaine has enjoyed popularity as a "party drug," its extraordinary potential to create dependence should be taken very seriously.

Narcotics

Opium, which comes from poppy seeds, and its derivatives *heroin*, morphine, methadone, and codeine (as well as prescription drugs such as Demerol and Oxycontin), are known as **narcotics** or **opiates**, *drugs derived from opium that are capable of relieving pain*. Narcotics induce a feeling of well-being and relaxation that is enjoyable but can also induce stupor and lethargy. The addictive properties of narcotics are powerful, and long-term use produces both tolerance and dependence. Because these drugs are often administered with hypodermic syringes, they also introduce the danger of diseases such as HIV when users share syringes. Unfortunately, these drugs are especially alluring because they are external mimics of the brain's own internal relaxation and well-being system.

The brain produces **endorphins** or **endogenous opioids**, which are *neurotransmitters that are closely related to opiates*. Endorphins play a role in how the brain copes internally with pain and stress. These substances reduce the experience of pain naturally. When you exercise for a while and start to feel your muscles burning, for example, you may also find that there comes a time when the pain eases—sometimes even *during* the exercise. Endorphins are secreted in the pituitary gland and other brain sites as a response to injury or exertion, creating a kind of natural remedy (like the so-called runner's high) that subsequently reduces pain and increases feelings of well-being. When people use narcotics, the brain's endorphin receptors are artificially flooded, however, reducing receptor effectiveness and possibly also depressing the production of endorphins. When external administration of narcotics stops, withdrawal symptoms are likely to occur.

● **Why are narcotics especially alluring?**

Hallucinogens

The drugs that produce the most extreme alterations of consciousness are the **hallucinogens**, *drugs that alter sensation and perception, often causing hallucinations*. These include LSD (lysergic acid diethylamide), or acid; mescaline; psilocybin; PCP (phencyclidine); and ketamine (an animal anesthetic). Some of these drugs are derived from plants (mescaline from peyote cactus, psilocybin or "shrooms" from mushrooms) and have been used by people since ancient times. For example, the ingestion of peyote plays a prominent role in some Native American religious practices. The other hallucinogens are largely synthetic. LSD was first made by chemist Albert Hofman in 1938, leading to a rash of experimentation with hallucinogens that influenced popular culture in the 1960s.

The experiment was not a great success. These drugs produce profound changes in perception. Sensations may seem unusually intense, objects may seem to move or change, patterns or colors may appear, and these perceptions may be accompanied by exaggerated emotions ranging from blissful transcendence to abject terror. These are the "I've become the legs of a chair!" drugs. But the effects of hallucinogens are dramatic and unpredictable, creating a psychological roller-coaster ride that some people find intriguing but others find deeply disturbing. Hallucinogens are the main class of drugs that animals *won't* work to self-administer, so it is not surprising that in humans these

narcotics or **opiates** Highly addictive drugs derived from opium that relieve pain.

endorphins or **endogenous opiates** Neurotransmitters that have a similar structure to opiates and that appear to play a role in how the brain copes internally with pain and stress.

hallucinogens Drugs that alter sensation and perception and often cause visual and auditory hallucinations.

marijuana The leaves and buds of the hemp plant.

drugs are unlikely to be addictive. Hallucinogens do not induce significant tolerance or dependence, and overdose deaths are rare. Although hallucinogens still enjoy a marginal popularity with people interested in experimenting with their perceptions, they have been more a cultural trend than a dangerous attraction.

Marijuana

Marijuana is derived from the *leaves and buds of the hemp plant.* When smoked or eaten, either as is or in concentrated form as *hashish,* this drug produces an intoxication that is mildly hallucinogenic. Users describe the experience as euphoric, with heightened senses of sight and sound and the perception of a rush of ideas. Marijuana affects judgment and short-term memory and impairs motor skills and coordination—making driving a car or operating heavy equipment a poor choice during its use ("Where did I leave the darn bulldozer?"). The active ingredient in marijuana is known as THC, and researchers have found that receptors in the brain that respond to THC (Stephens, 1999) are normally activated by a neurotransmitter called *anandamide* that is naturally produced in the brain (Wiley, 1999). Anandamide is involved in the regulation of mood, memory, appetite, and pain perception and has been found temporarily to stimulate overeating in laboratory animals, much as marijuana does in humans (Williams & Kirkham, 1999). Some chemicals found in dark chocolate also mimic anandamide, although very weakly, perhaps accounting for the well-being some people claim they enjoy after a "dose" of chocolate.

● What are the risks of marijuana use?

The addiction potential of marijuana is not strong; tolerance does not seem to develop, and physical withdrawal symptoms are minimal. Psychological dependence is possible, however, and some people do become chronic users. Marijuana use has been widespread throughout the world for recorded history, both as a medicine for pain and/or nausea and as a recreational drug, but its use remains controversial. States such as California and Oregon have passed legislation favoring medical uses, as has British Columbia in Canada, but the U.S. federal government classifies marijuana as a "Schedule I Controlled Substance," recognizing no medical use and maintaining that marijuana has the same high potential for abuse as heroin. All told, it seems that the greatest danger of marijuana is that its use is illegal.

MARTIN SHARP © PRIVATE COLLECTION/THE BRIDGEMAN ART LIBRARY

Psychedelic art and music of the 1960s were inspired by some visual and auditory effects of drugs such as LSD.

summary quiz [8.3]

9. The tendency for larger drug doses to be required over time to achieve the same effect is known as
a. psychological dependence.
b. drug tolerance.
c. physical dependence.
d. drug addiction.

10. Which class of depressants is prescribed to treat anxiety?
a. benzodiazepines
b. toxic inhalants
c. amphetamines
d. barbiturates

11. Which of the following stimulants increases alertness and energy but can lead to insomnia, aggression, and paranoia?
a. cocaine
b. ecstasy
c. marijuana
d. amphetamines

12. Neurotransmitters produced by the brain that are closely related to opiates and that increase feelings of well-being are called
a. dopamines.
b. serotonins.
c. endorphins.
d. GABAs.

Hypnosis: Open to Suggestion

You may have never been hypnotized, but you have probably heard or read about it. Its wonders are often described with an air of amazement, and demonstrations of stage hypnosis make it seem very powerful and mysterious. When you think of hypnosis, you may envision people down on all fours acting like farm animals or perhaps "regressing" to early childhood and talking in childlike voices. Some of what you might think is true, but many of the common beliefs about hypnosis are false. **Hypnosis** is *an altered state of consciousness characterized by suggestibility and the feeling that one's actions are occurring involuntarily.* In other words, it is mainly a state of mind in which people follow instructions readily and feel that their actions are things that are happening to them rather than things they are doing (Lynn, Rhue, & Weekes, 1990).

AP PHOTO/MARSHALL INDEPENDENT, GREG DEVEREAX

Stage hypnotists often perform an induction on a whole audience and then bring some of the more susceptible members onstage for further demonstrations. This hypnotist seems to think it is entertaining to see people slump over.

Induction and Susceptibility

The essence of hypnosis is in leading people to expect that certain things will happen to them that are outside their conscious will (Wegner, 2002). To induce hypnosis, then, a hypnotist may ask the person to be hypnotized to sit quietly and focus on some item (e.g., a spot on the wall) and then suggest to the person what effects hypnosis will have ("Your eyelids are slowly closing" or "Your arms are getting heavy"). These are "suggestions," ideas the hypnotist mentions to the volunteer about what the volunteer will do. Some of these ideas seem to cause the actions—just thinking about their eyelids slowly closing, for instance, may make many people shut their eyes briefly or at least blink. Just as you may find yawning contagious when you see someone else yawning, many different behaviors can be made more common just by concentrating on them. In hypnosis, a series of behavior suggestions can induce in some people a state of mind that makes them susceptible to even very unusual suggestions, such as getting down on all fours and sniffing in the corner.

Not everyone is equally hypnotizable. Susceptibility varies greatly, such that some hypnotic "virtuosos" are strongly influenced, most people are only moderately influenced, and some people are entirely unaffected. One of the best indicators of a person's susceptibility is the person's own judgment. So, if you think you might be hypnotizable, you may well be (Hilgard, 1965). People with active, vivid imaginations, or who are easily absorbed in activities such as watching a movie, are also somewhat more prone to be good candidates for hypnosis (Sheehan, 1979; Tellegen & Atkinson, 1974).

What makes someone easy to hypnotize?

Hypnotic Effects

Hypnotists often claim that their volunteers can perform great feats not possible when the volunteers are fully conscious. One of the claims for superhuman strength involves asking a hypnotized person to become "stiff as a board" and lie unsupported with shoulders on one chair and feet on another. However, many people can do this without hypnosis. Similarly, the claim that people will perform extreme actions when hypnotized fails to take into account that people will also perform these actions when they are simply under a lot of social pressure. Some early studies reported, for instance, that hypnotized people could be led to throw what they thought was a flask of acid in an experimenter's face (Rowland, 1939; Young, 1948). In further examinations of this phenomenon, participants who were not hypnotized were asked to *simulate* being hypnotized (Orne & Evans, 1965). They were instructed to be so convincing in faking

hypnosis An altered state of consciousness characterized by suggestibility and the feeling that one's actions are occurring involuntarily.

hypnotic analgesia The reduction of pain through hypnosis in people who are susceptible to hypnosis.

their hypnosis that they would fool the experimenter. These people, just like the hypnotized participants, threw what they thought was acid in the experimenter's face! Clearly, hypnotic induction was not a necessary requirement to produce this behavior in the research participants.

Hypnosis also has been touted as a cure for lost memory. The claim that hypnosis helps people unearth memories that they are not able to retrieve in normal consciousness seems to have surfaced because hypnotized people often make up memories to satisfy the hypnotist's suggestions. For example, Paul Ingram, a sheriff's deputy accused of sexual abuse by his daughters in the 1980s, was asked by interrogators in session after session to relax and imagine having committed the crimes. He emerged from these sessions having confessed to dozens of horrendous acts of "satanic ritual abuse." These confessions were called into question, however, when independent investigator Richard Ofshe used the same technique to ask Ingram about a crime that Ofshe had simply made up out of thin air, something of which Ingram had never been accused. Ingram produced a three-page handwritten confession, complete with dialogue (Ofshe, 1992). Still, prosecutors in the case accepted Ingram's guilty plea, and he was only released in 2003 after a public outcry and years of work on his defense. After a person claims to remember something, even under hypnosis, it is difficult to convince others that the memory was false (Loftus & Ketchum, 1994).

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A hypnotist stands on a subject who has been rendered "stiff as a board" by hypnosis.

Although all the preceding claims for hypnosis are somewhat debatable, one well-established effect is **hypnotic analgesia**, *the reduction of pain through hypnosis in people who are hypnotically susceptible*. For example, one study (see **FIGURE 8.9**, below) found that for pain induced in volunteers in the laboratory, hypnosis was more effective than morphine, diazepam (Valium), aspirin, acupuncture, or placebos (Stern et al., 1977). For people who are hypnotically susceptible, hypnosis can be used to control pain in surgeries and dental procedures, in some cases more effectively than any form of anesthesia (Druckman & Bjork, 1994; Kihlstrom, 1985). Evidence for pain control supports the idea that hypnosis is a different state of consciousness and not entirely a matter of skillful role-playing on the part of highly motivated people.

Why do some argue that hypnosis is indeed a different state of consciousness?

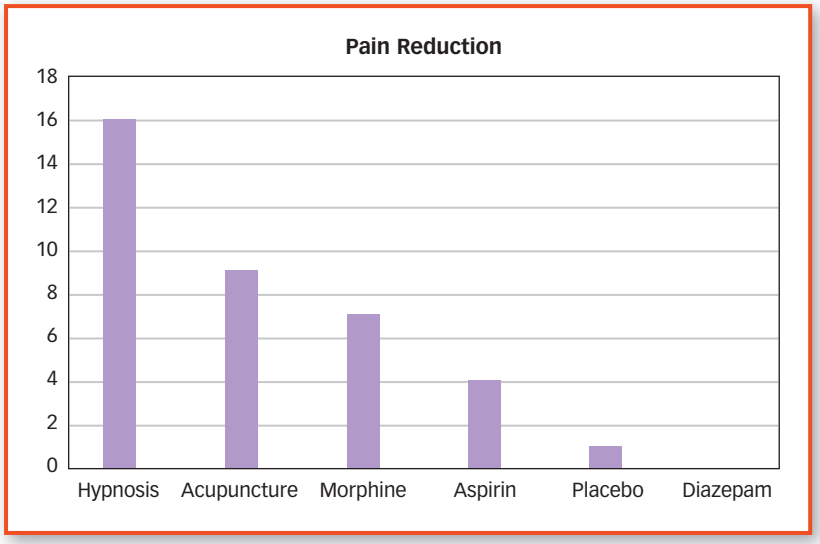


FIGURE 8.9
Hypnotic Analgesia *The degree of pain reduction reported by people using different techniques for the treatment of laboratory-induced pain. Hypnosis wins. From Stern et al., 1977.*

FIGURE 8.10
Brain Activity during Hypnosis
Researchers found right anterior cingulate cortex activation in hypnotized research participants both when they were hearing a target sentence and when they were following the suggestion to hallucinate the sentence. The right anterior cingulated cortex is involved in the regulation of attention. The brain is viewed here in two cross-sectional scans: (a) upright and (b) horizontal.

The conscious state of hypnosis is accompanied by unique patterns of brain activation. In one study, researchers prescreened highly hypnotizable people for their ability to hallucinate during hypnosis (Szechtman et al., 1998). After a standard hypnotic induction, participants' brains were scanned while they performed each of three tasks: perception, imagination, and hypnotic hallucination. For the perception task, participants heard a recording of the sentence "The man did not speak often, but when he did, it was worth hearing what he had to say." For the imagination task, they were asked to imagine hearing this line again. For the hypnotic hallucination task, they listened as the hypnotist suggested that the tape was playing once more (although it was not). The researchers expected this last suggestion to prompt an auditory hallucination of the line, and participants indeed reported thinking they heard it.

The PET scan revealed that the right anterior cingulate cortex, an area involved in the regulation of attention, was just as active while the participants were hallucinating as when they were actually hearing the line. However, there was less activation in this brain area when participants were merely imagining the sentence. **FIGURE 8.10** shows where the right anterior cingulate area was activated in the hypnotizable participants both during hearing and hallucinating. This pattern of activation was not found in people who were not highly hypnotizable. The researchers concluded that hypnosis stimulated the brain to register the hallucinated voice as real rather than as imagined.

summary quiz [8.4]

13. Which of the following four individuals is *least* likely to be a good candidate for hypnosis?
a. Jake, who spends lots of time watching movies
b. Ava, who is convinced she is easily hypnotizable
c. Evan, who has an active, vivid imagination
d. Isabel, who loves to play sports

14. One well-established effect of hypnosis is
a. retrieving lost memories.
b. reducing pain.
c. giving people the physical strength to lie unsupported with shoulders on one chair and feet on another.
d. making people perform extreme actions such as throwing acid in someone's face.

15. Your textbook describes research in which highly hypnotizable individuals were given standard hypnotic induction instructions. They were then asked to listen to a voice on tape, and then were told that the tape was playing again (although it was not). What brain area was activated during both tasks?
a. right anterior cingulate cortex
b. medial forebrain bundle
c. auditory association area
d. amygdala

Meditation and Religious Experiences: Higher Consciousness

Some altered states of consciousness occur without hypnosis, without drugs, and without other external aids. In fact, the altered states of consciousness that occur naturally or through special practices such as meditation can provide some of the best moments in life. Abraham Maslow (1962) described these "peak experiences" as special states of mind in which you feel fully alive and glad to be human. Sometimes these come from simple pleasures—a breathtaking sunset or a magical moment of personal creativity—and other times they can arise through meditative or religious experiences.

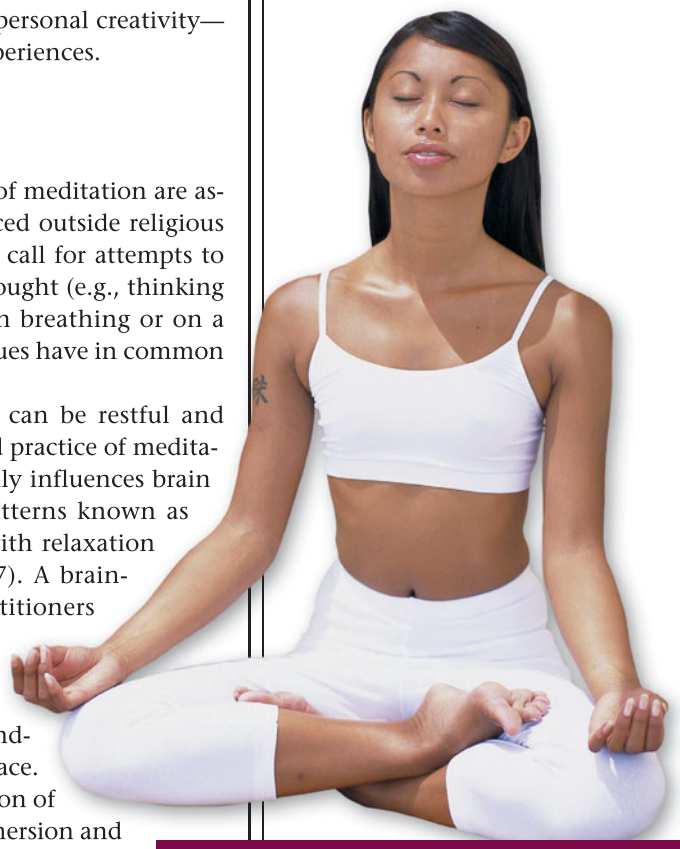
meditation The practice of intentional contemplation.

Meditation

Meditation is *the practice of intentional contemplation*. Techniques of meditation are associated with a variety of religious traditions and are also practiced outside religious contexts. The techniques vary widely. Some forms of meditation call for attempts to clear the mind of thought, others involve focusing on a single thought (e.g., thinking about a candle flame), and still others involve concentration on breathing or on a mantra, a repetitive sound such as *om*. At a minimum, the techniques have in common a period of quiet.

Why would someone meditate? The time spent meditating can be restful and revitalizing, and according to meditation enthusiasts, the repeated practice of meditation can enhance psychological well-being. Meditation temporarily influences brain activation, usually producing patterns known as *alpha waves* that are associated with relaxation (Dillbeck & Orme-Johnson, 1987). A brain-scanning study of Buddhist practitioners during meditation found especially low levels of activation in the posterior superior parietal lobe (Newberg et al., 2001). This area is normally associated with judging physical space and orienting oneself in space—knowing angles, distances, and the physical landscape and distinguishing between the self and other objects in space. When this area is deactivated during meditation, its normal function of locating the self in space may subside to yield an experience of immersion and a loss of self.

What are some positive outcomes of meditation?



PICTURE PRESS/PHOTONICA/GETTY

Meditation can confer physical and psychological benefits on its practitioners, but research has not yet determined how it might work.

Ecstatic Religious Experiences

In some religious traditions, people describe personal experiences of altered consciousness—feelings of ecstasy, rapture, conversion, or mystical union. Members of a religious group may "speak in tongues," or the celebrants may go into trances, report seeing visions, or feel as though they are possessed by spirits. These altered states may happen during prayer or worship or without any special religious activity. Altered states of consciousness of one sort or another are associated with religious practices around the world (Bourguignon, 1968).

What is the relationship between religious fervor and epilepsy?

Like meditation, certain brain activation patterns are associated with ecstatic religious experiences. Some people who experience religious fervor show the same type of brain activation that occurs in some cases of epilepsy. Several prophets, saints, and founders of religions have been documented as having epilepsy—Joan of Arc, for example, had symptoms of epilepsy accompanying the religious visions that inspired her and her followers (Saver & Rabin, 1997). People asked to describe what it is like to have a seizure, in turn, sometimes report feeling what they call a religious "aura." One patient described his seizures as consisting of feelings of incredible contentment, detachment, and fulfillment, accompanied by the visualization

KERIM OKTEN/EPA/CORBIS

Whirling dervishes of the Mevlevi order of Sufism perform the Sema, a spiritual ceremony that aids in their quest for divine illumination.

of a bright light and soft music; sometimes he also saw a bearded man he assumed was Jesus Christ (Morgan, 1990). Surgery to remove a tumor in the patient's right anterior temporal lobe eliminated the seizures but also stopped his religious ecstasies. Cases such as this suggest the right anterior temporal lobe might be involved when people without epilepsy experience profound religious feelings. The special moments of connection that people feel with God or the universe may depend on the way in which brain activation promotes a religious state of consciousness.

The states of religious ecstasy and meditation are just two of the intriguing varieties of experience that consciousness makes available to us. Our consciousness ranges from the normal everyday awareness of walking, thinking, or gazing at a picture to an array of states that are far from normal or everyday—sleep, dreams, drug intoxication, hypnosis, and beyond. These states of mind stand as a reminder that the human mind is not just something that students of psychology can look at and study. The mind is something each of us looks *through* at the world and at ourselves.

summary quiz [8.5]

16. According to the textbook, meditation and ecstatic religious experience are altered states of consciousness that occur
- a. naturally.
- b. through hypnosis.
- c. by taking certain drugs.
- d. in the zone between sleeping and waking.

17. Meditation usually produces what kind of brain activity?
- a. delta waves
- b. alpha waves
- c. beta waves
- d. theta waves

18. Ecstatic religious experiences may have a basis in the same brain region associated with
- a. somnambulism.
- b. meditation.
- c. epilepsy.
- d. hypnotic analgesia.

WhereDoYouStand?

Drugs and the Regulation of Consciousness

Why does everyone have an opinion about drug use? Given that it's not possible to perceive what happens in anyone else's mind (that pesky "other minds" mystery of consciousness), why does it matter so much to us what people do to their own consciousness? Is consciousness something that governments should be able to legislate, or should people be free to choose their own conscious states (McWilliams, 1993)? After all, how can a "free society" justify regulating what people do inside their own heads?

Individuals and governments alike answer these questions by pointing to the costs of drug addiction, both to the addict and to the society that must "carry" unproductive people, pay for their welfare, and often even take care of their children. Drug users appear to be troublemakers and criminals, the culprits behind all those "drug-related" shootings, knifings, robberies, and petty thefts you see in the news day after day. It makes sense that their behavior appears to be caused by drug use, and widespread anger about the drug problem has surfaced in the form of the "War on Drugs," a federal government program that has focused on drug use as a criminal offense and has attempted to stop drug use through the imprisonment of users.

IAN CUMMING/AXIOM/AURORA HEIGHTS

In the Netherlands, marijuana use is not prosecuted. The drug is sold in "coffee shops" to those over 18.

Social commentators such as economist Milton Friedman and psychiatrist Thomas Szasz believe that the War on Drugs is much like the era of Prohibition, the federal government's 1920–1933 ban on alcohol (Trebach & Zeese, 1992). This famous experiment failed because the harm produced by the policy outweighed the damage produced by legal alcohol consumption. Illegal alcohol became wildly expensive, and the promise of large profits led to the rapid growth of organized criminal suppliers, an entire criminal subculture complete with gang killings and turf wars over distribution rights. With the huge jump in organized crime came a parallel wave of crime by "users"; illegal alcohol was so expensive that people who were dependent on it begged, stole, or sold anything to get money to buy it. The current War on Drugs has led to the same buildup of criminal supply systems, along with an increase in crimes committed by users to get drug money. These observations bring up the question of whether it is the drug use that causes social problems or the *prohibition* of drug use that causes these problems.

What should be done? One possibility is the *harm reduction approach,* a response to high-risk behaviors that focuses on reducing the harm such behaviors have on *people's lives* (Marlatt, 1998). This approach (which originated in the Netherlands and England) focuses on reducing drug harm rather than reducing drug use. Harm reduction involves tactics such as providing intravenous drug users with sterile syringes to help them avoid contracting HIV and other infections from shared needles. A harm reduction idea for alcoholics, in turn, is to allow moderate drinking; the demand to be cold sober may keep many alcoholics on the street and away from any treatment at all (Marlatt et al., 1993). Harm reduction strategies may not always find public support because they challenge the popular idea that the solution to drug and alcohol problems must always be prohibition: stopping use entirely.

Harm reduction seems to be working in the Netherlands. The Netherlands Ministry of Justice (1999) reported that the decriminalization of marijuana there in 1979 has not led to increased use and that the use of other drugs remains at a level far below that of other European countries and the United States. A comparison of drug users in Amsterdam and San Francisco revealed that the city in which marijuana is criminalized—San Francisco—had higher rates of drug use for both marijuana and other drugs (Reinarman, Cohen, & Kaal, 2004).

Should the United States, like the Netherlands, legalize use of psychoactive drugs? If yes, which ones? What about caffeine and alcohol? Should there be restrictions on when or where these substances are used? For a legal drug, should there be age limits restricting use? Where do you stand?

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Prohibition was an attempt to legislate self-control that eventually produced so many problems that people campaigned in the streets to repeal the law.

CHAPTER REVIEW

Summary

Conscious and Unconscious: The Mind's Eye, Open and Closed

- Consciousness is a mystery of psychology because other people's minds cannot be perceived directly and because the relationship between mind and body is perplexing.
- Consciousness has four basic properties: intentionality, unity, selectivity, and transience. It can also be understood in terms of levels: minimal consciousness, full consciousness, and self-consciousness.
- Unconscious processes influence a person's conscious thoughts and behaviors without that person's awareness.

Sleep and Dreaming: Good Night, Mind

- Sleep and dreaming present a view of the mind with an altered state of consciousness.
- During a night's sleep, the brain passes in and out of five stages of sleep; most dreaming occurs in the REM sleep stage.
- Sleep can be disrupted through various disorders; deprivation from sleep and dreams has psychological and physiological costs.
- In dreaming, the dreamer uncritically accepts changes in emotion, thought, and sensation but poorly remembers the dream on awakening.
- Theories of dreaming include Freud's psychoanalytic theory and more current views such as the activation-synthesis model.

Drugs and Consciousness: Artificial Inspiration

- Psychoactive drugs influence consciousness by altering the brain's chemical messaging system.
- Drug tolerance can result in overdose, and physical and psychological dependence can lead to addiction.
- Major types of psychoactive drugs include depressants, stimulants, narcotics, hallucinogens, and marijuana.

Hypnosis: Open to Suggestion

- Hypnosis is an altered state of consciousness characterized by suggestibility.
- Although many claims for hypnosis overstate its effects, hypnosis can create the experience that one's actions are occurring involuntarily, create analgesia, and even change brain activations in ways that suggest that hypnotic experiences are more than imagination.

Meditation and Religious Experiences: Higher Consciousness

- Meditation and religious ecstasy can be understood as altered states of consciousness.
- Meditation involves contemplation that may focus on a specific thought, sound or action, or it may be an attempt to avoid any focus; it promotes relaxation.
- Ecstatic religious experiences may have a basis in the same brain region—the right anterior temporal lobe—associated with some forms of epilepsy.

Key Terms

consciousness (p. 234)
Cartesian Theater (p. 234)
phenomenology (p. 234)
problem of other minds (p. 235)
mind/body problem (p. 236)
cocktail party phenomenon (p. 238)
minimal consciousness (p. 239)
full consciousness (p. 239)
self-consciousness (p. 239)
mental control (p. 240)
thought suppression (p. 240)
rebound effect of thought suppression (p. 241)
ironic processes of mental control (p. 241)
dynamic unconscious (p. 242)
repression (p. 242)
cognitive unconscious (p. 242)
subliminal perception (p. 243)
altered state of consciousness (p. 244)
circadian rhythm (p. 244)
REM sleep (p. 245)
insomnia (p. 247)
sleep apnea (p. 248)
somnambulism (p. 248)
narcolepsy (p. 248)
sleep paralysis (p. 248)
night terrors (p. 248)
activation-synthesis model (p. 250)
psychoactive drugs (p. 253)
drug tolerance (p. 254)
depressants (p. 255)
expectancy theory (p. 256)
alcohol myopia (p. 257)
stimulants (p. 257)
narcotics or opiates (p. 258)
endorphins or endogenous opiates (p. 258)
hallucinogens (p. 258)
marijuana (p. 259)
hypnosis (p. 260)
hypnotic analgesia (p. 261)
meditation (p. 263)

Critical Thinking Questions

1. Freud theorized that dreams represent unacceptable or anxiety-producing wishes that the mind can only express in disguised form. A different theory of dreaming, the activation-synthesis model, proposes that dreams are produced when the mind attempts to make sense of random neural activity that occurs in the brain during sleep.

   Suppose a man is expecting a visit from his mother-in-law; the night before her arrival, he dreams that he comes home from work to find that his mother-in-law has driven a bus through the living room window of his house. How might Freud have interpreted such a dream? How might the activation-synthesis model interpret such a dream?

2. Alcohol has many effects, which can differ from person to person and from situation to situation. Expectancy theory suggests that alcohol's effects are influenced by people's expectations of how alcohol will influence them. The theory of alcohol myopia proposes that alcohol hampers attention, leading people to respond in simple ways to complex situations.

   Which one of these theories views a person's response to alcohol as being (at least partially) learned, through a process similar to observational learning?

3. Psychoactive drugs are chemicals that, when ingested, influence consciousness or behavior by altering the brain's chemical message system. Stimulant drugs can influence brain activity and often produce a sense of euphoria and well-being. Meditation is the practice of internal contemplation, and it can also temporarily influence brain activity and enhance the sense of well-being.

   Why do you think many cultures view psychoactive drugs as dangerous but meditation as healthful?

Answers to Summary Quizzes

Summary Quiz 8.1
1. c; 2. b; 3. a; 4. d

Summary Quiz 8.2
5. d; 6. b; 7. c; 8. a

Summary Quiz 8.3
9. b; 10. a; 11. d; 12. c

Summary Quiz 8.4
13. d; 14. b; 15. a

Summary Quiz 8.5
16. a; 17. b; 18. c