Think About It

Can we trust people's reports that they've been abducted by aliens?

Does a person's consciousness leave the body during an out-of-body experience?

Do people who have a near-death experience truly catch a glimpse of the afterlife?

Does hypnosis produce a trance state?

Is alcohol a stimulant drug?

Sleep paralysis has been reported in many cultures, with the terrifying nighttime visitors ranging from an "old hag" to demonlike entities, as depicted in this painting, *The Nightmare,* by Henry Fuseli.

RULING OUT RIVAL HYPOTHESES ▶
Have important alternative explanations for the findings been excluded?

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Consider this summary of a fascinating story related by a participant in Susan Clancy's (2005) landmark research on people who come to believe they were kidnapped by aliens.

The participant reported that he awakened from what seemed to be the worst dream he ever experienced, with something that wasn't human on top of him, suffocating and immobilizing him. The experience was so memorable and disturbing that he shared it with his therapist. Troubling images of aliens like those he saw in the movie *Signs* with Mel Gibson started to come to mind, and he couldn't turn off the thought that he was abducted. His therapist referred him to a psychologist who treated people with similar beliefs. When he broke down tearfully in the psychologist's office, the therapist reassured him that this was a normal response to his emerging awareness of what happened and that people can recover memories of what really took place if they undergo hypnosis (Clancy, 2005, pp. 30–31).

This person isn't alone. Nearly one-fifth of college students in one survey endorsed the belief that extraterrestrials (ETs) can actually visit us in dreams, and 10 percent claimed to have "experienced or met an extraterrestrial" (Kunzendorf et al., 2007–2008). But did they *really* encounter ETs, as Clancy's participants claimed? Clancy and her Harvard University colleagues (Clancy et al., 2002; McNally & Clancy, 2005) say there's a slim chance at best. But they happened on a startling discovery that may explain the abduction reports.

Many of the people they interviewed shared a history of **sleep paralysis**—a strange experience of being unable to move just after falling asleep or immediately upon awakening. This puzzling phenomenon is surprisingly common. One-third to one-half of college students have had at least one episode of sleep paralysis, which typically is no cause for concern (Fukuda et al., 1998). Sleep paralysis is caused by a disruption in the sleep cycle and is often associated with anxiety or even terror, feelings of vibrations, humming noises, and the eerie sense of menacing figures close to or on top of the immobile person. There are cultural differences in how people interpret this strange experience. In Thailand, people attribute it to a ghost, but in Newfoundland, people attribute it to an "old hag"—an elderly witch sitting on the person's chest. According to Susan Blackmore (2004), the "latest sleep paralysis myth may be alien abduction" (p. 315).

Unfortunately, the therapist that Clancy's participant consulted didn't consider sleep paralysis as an alternative explanation for her symptoms. Nor did he tell his client that hypnosis isn't a trustworthy means of unearthing accurate memories. In fact, we'll soon learn that hypnosis can often help to create false memories. In many of the cases Clancy reported, it's not a big leap for people who suspect they were abducted to elaborate on their story during hypnosis and to imagine that aliens performed medical experiments on them. After all, that's what filmmakers and science fiction writers often lead people to believe happens when the aliens come calling.

Sleep paralysis is only one of many remarkable sleep-related experiences we'll encounter in this chapter, along with other fascinating examples of alterations in **consciousness**—our subjective experience of the world and ourselves. Consciousness encompasses our ever-changing awareness of thoughts, emotions, bodily sensations, events, and actions. By one definition, "Consciousness is what you lose when you fall into a deep sleep at night and what you gain when you wake up in the morning" (Sanders, 2012, p. 22). Yet we'll see that even when we sleep, some of us retain self-awareness and know we're dreaming on occasion.

Our sleeping and waking experiences shade subtly into one another. On average, we spend about 30 percent of our waking hours mind-wandering, fantasizing, and flitting from one task-irrelevant or dream-like thought to another (Kane et al., 2007; Klinger, 2000; Smallwood & Schooler, 2006). Some so-called *fantasy-prone personalities* (about 2–4 percent of the population) say they spend at least half of their waking lives caught up in vivid daydreams and fantasies (Lynn & Rhue, 1988; Wilson & Barber, 1981). A common view is that is fantasy is an unhealthy escape from reality. However, fantasies and daydreams are perfectly normal and can help us plan for the future, solve problems, and express our creativity (Klinger, 1988). Honed by hundreds of thousands of years of natural selection, most of us can easily focus our attention when needed to respond to virtually any

sleep paralysis
state of being unable to move just after falling asleep or right before waking up

consciousness
our subjective experience of the world, our bodies, and our mental perspectives

situation or threat efficiently, seamlessly, and often unconsciously (Kirsch & Lynn, 1998; Wegner, 2004).

In this chapter, we'll encounter numerous examples of how the spotlight of our awareness and level of alertness changes continually and how consciousness is sensitively attuned to changes in our brain chemistry, expectations, and culture. We'll come to appreciate how scientists are taking advantage of high tech tools to measure neural events and explore the most basic biological processes that sculpt our stream of consciousness. Finally, we'll examine how the unity of consciousness can break down in unusual ways, such as during sleepwalking, when we're unconscious yet move about as if awake, and déjà vu, when we feel as though we're reliving an event we've never experienced (Voss, Baym, & Paller, 2008). As in many cases in psychology, abnormalities in functioning can often shed light on normal functioning (Cooper, 2003; Harkness, 2007; see Chapter 15).

Factoid

In the extremely rare condition called locked-in syndrome, people may be misdiagnosed as being in a coma, yet actually be awake and alert. They can appear unconscious to onlookers because virtually all of their voluntary muscles are paralyzed, rendering them unable to speak or move. The famous Parisian journalist Jean-Dominique Bauby could control only his left eyelid after he suffered a stroke. However, he wrote a memoir using a special alphabet code devised by his therapist and blinking his eye to dictate one letter at a time.

Explore in **MyPsychLab** the **Concept:** The Big Picture: States of Consciousness

The Biology of Sleep

5.1 Explain the role of the circadian rhythm and how our bodies react to a disruption in our biological clocks.

5.2 Identify the different stages of sleep and the neural activity and dreaming behaviors that occur in each.

5.3 Identify the features and causes of sleep disorders.

We spend as much as one-third or more of our lives in one specific state of consciousness. No, we don't mean zoning out during a boring lecture. We're referring to sleep. Although it's clear that sleep is of central importance to our health and daily functioning, psychologists still don't know for sure why we sleep. Some theories suggest that sleep plays a critical role in storing memories and remembering emotional information (Payne & Kensinger, 2010); others suggest that it's critical for the immune system (see Chapters 6 and 12). Other models emphasize the possible role of sleep in promoting insight and problem solving (Wagner, et al., 2004) as well as neural development and neural connectivity more generally (Bushey et al., 2011; Mignot, 2008) (see Chapter 3). J. Allan Hobson (2009) suggested that brain activation during sleep is essential to waking consciousness and our ability to plan, reason, and function to the best of our ability. Alternatively, some evolutionary theorists have proposed that sleep contributes to our survival by conserving our energy, taking us out of circulation at times when we might be most vulnerable to unseen predators, and restoring our strength to fend them off (Siegel, 2005). There may be considerable truth to several or even all of these explanations.

The Circadian Rhythm: The Cycle of Everyday Life

Long before scientists began to probe the secrets of sleep in the laboratory, primitive hunters were keenly aware of daily cycles of sleep and wakefulness. **Circadian rhythm** is a fancy term ("circadian" is Latin for "about a day") for changes that occur on a roughly 24-hour basis in many of our biological processes, including hormone release, brain waves, body temperature, and drowsiness. Popularly known as the brain's **biological clock**, a meager 20,000 neurons located in the hypothalamus make us feel drowsy at different times of the day and night (see Chapter 3). Many of us have noticed that we feel like taking a nap at around three or four in the afternoon. Indeed, in many European and Latin American countries, a midafternoon nap (a "siesta" in Spanish) is part of the daily ritual. This sense of fatigue is triggered by our biological clocks. The urge to snooze comes over us at night as well because levels of the hormone *melatonin*, which triggers feelings of sleepiness, increase after dark (see Chapter 3).

The biological clock even ticks in marine algae and red blood cells too (Edgar et al., 2012). When humans' biological clocks are disrupted, such as when we work late shifts, or travel across time zones and experience jet lag, it disturbs sleep and increases the risk of injuries, fatal accidents, and health problems, including diabetes and heart disease

circadian rhythm
cyclical changes that occur on a roughly 24-hour basis in many biological processes

biological clock
term for the area of the hypothalamus that's responsible for controlling our levels of alertness

The tragic crash of Colgan Air Flight 3409 outside of Buffalo, New York, has been blamed on sleep deprivation, as both the pilot and co-pilot had been sleep-deprived prior to the flight.

Watch in **MyPsychLab** the **Video:** In the Real World: Sleep, Memory, and Learning

(Åkerstedt et al., 2002; Kirkcaldy, Levine, & Shephard, 2000). Scientists are hot on the trail of drugs that target melatonin receptors in the brain to re-sync our brain's biological clock (Rajaratnam et al., 2009). That's because melatonin plays a key role in regulating circadian rhythms.

How much sleep do we need? The answer varies, but most of us need about 7 to 10 hours. Newborns are gluttons for sleep and need about 16 hours over the course of a day. At the other extreme are the lucky few—less than 1 percent of the population—who carry a mutation in a gene called DEC2 that allows them to get away with sleeping as little as six hours a night without "crashing" the next day (He et al., 2009). College students may need as many as nine hours of sleep a night, although most sleep no more than six hours (Maas, 1999), creating a powerful urge to nap the next day (Rock, 2004). One common misconception is that the elderly need less sleep than the rest of us, only six or seven hours a night. In reality, they probably need just as much sleep, but they sleep more fitfully (Ohayon, 2002).

Ordinarily, there don't seem to be many negative consequences of losing one night's sleep other than feeling edgy, irritable, and unable to concentrate well the next day. Yet after a few nights of sleep deprivation, we feel more "out of it" and begin to accumulate a balance of "sleep debt," which can require at least several nights of sleeping a few extra hours to pay off. People deprived of multiple nights of sleep, or who cut back drastically on sleep, often experience mild depression, difficulties in learning new information and paying attention, problems in thinking clearly and solving problems, and slowed reaction times (Cohen, et al., 2010; Gangswisch et al., 2010). After more than four days of severe sleep deprivation, we may even experience brief hallucinations, such as hearing voices or seeing things (Wolfe & Pruitt, 2003). Sleep deprivation is associated with a variety of adverse health outcomes: weight gain (we burn off a lot of calories just by sleeping); increased risk for high blood pressure, diabetes, and heart problems; and a less vigorous immune response to viral infections (Dement & Vaughan, 1999; Motivala & Irwin, 2007). This last effect probably explains why you're more likely to get a cold after going for several days with little sleep (see Chapter 12). Some researchers even believe that the massive increase in obesity and diabetes in the United States over the past few decades is due largely to Americans' chronic sleep deprivation (Buxton et al., 2012; Hasler et al., 2004), although this claim is scientifically controversial (see Chapter 11). Loss of sleep has also been tied to friendly fire incidents in the 1991 Persian Gulf War, in which soldiers mistook their comrades for the enemy, resulting in senseless casualties (Kennedy, 2009).

RULING OUT RIVAL HYPOTHESES ▶
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Recent data point to a racial dimension to sleep loss as well: minorities, African-Americans in particular, appear to sleep less—and less well—than Whites. The reasons for this difference aren't clear. It remains even after taking into account differences between African-Americans and Whites in social class and education, so other factors, like race differences in everyday life stressors, appear to be at play (Carnethon et al., 2012; Quenqua, 2012).

Stages of Sleep

For much of human history, people believed there was something like a switch in our brains that turned consciousness on when we were awake and off when we snoozed. But one night in 1951, a discovery in Nathaniel Kleitman's sleep laboratory at the University of Chicago changed how we think about sleep and dreaming. Eugene Aserinsky, Kleitman's graduate student, monitored his 8-year-old son's eye movements and brain waves while he slept. Aserinsky was astonished to observe that his son's eyes danced periodically back and forth under his closed lids. Whenever the eye movements occurred, the boy's brain pulsed with electrical activity, as measured by an electroencephalogram (EEG), much as it did when he was awake (Aserinsky, 1996) (see Chapter 3).

The fledgling scientist had the good sense to know that he was onto something of immense importance. The slumbering brain was hardly an inert tangle of neurons; rather, it was abuzz with activity, at least at various intervals. Aserinsky further suspected that his

son's eye movements reflected episodes of dreaming. Aserinsky and Kleitman (1953) confirmed this hunch when they awakened participants while they were displaying **rapid eye movement (REM)**. In almost all cases, they reported vivid dreams. In contrast, participants were much less likely to report vivid dreams when researchers awakened them from sleep when they were not displaying REM, although later research showed that vivid dreams occasionally happened then, too.

In landmark research using all night-recording devices, Kleitman and William Dement (Dement & Kleitman, 1957) went on to discover that during sleep we pass repeatedly through five stages every night. Each cycle lasts about 90 minutes, and each stage of sleep is clearly distinguishable from awake states, as shown in **FIGURE 5.1**.

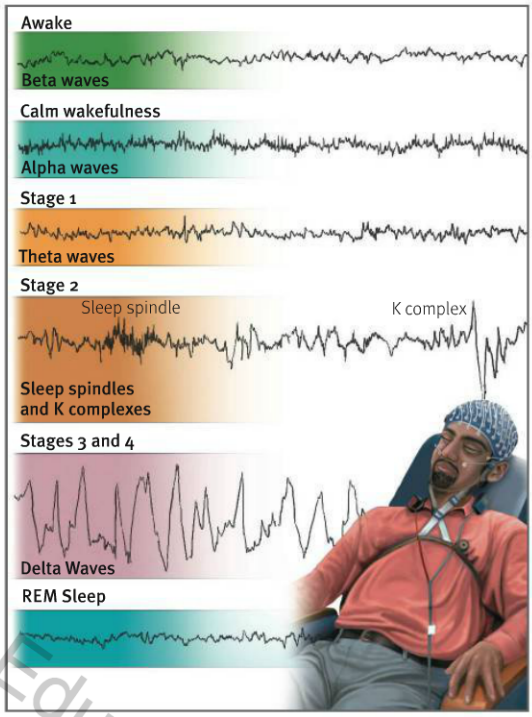

FIGURE 5.1 The Stages of Sleep. The EEG allows scientists to distinguish among the major stages of sleep, along with two levels of wakefulness. As we can see, brain activity during REM sleep is similar to that when we're awake and alert, because our brains during REM are typically engaged in vivid dreaming.

Watch in **MyPsychLab** the **Video:** The Basics: Rhythms of Consciousness

STAGE 1 SLEEP. Has someone ever nudged you to wake up, and you weren't even sure whether you were awake or asleep? Perhaps you even replied, "No, I wasn't really sleeping," but your friend insisted, "Yes, you were. You were starting to snore." If so, you were probably in stage 1 sleep. In this light stage of sleep, which lasts for 5 to 10 minutes, our brain activity powers down by 50 percent or more, producing *theta* waves, which occur four to seven times per second. These waves are slower than the *beta* waves of 13 or more times per second produced during active alert states, and the alpha waves of eight to 12 times per second when we're quiet and relaxed. As we drift off to deeper sleep, we become more relaxed, and we may experience *hypnagogic imagery*—scrambled, bizarre, and dream-like images that flit in and out of consciousness. We may also experience sudden jerks (sometimes called *myoclonic jerks*) of our limbs as if being startled or falling. In this state of sleep, we're typically quite confused. Some scientists speculate that many reports of ghosts and other spirits stem from hypnagogic imagery that sleepers misinterpret as human figures (Hines, 2003).

STAGE 2 SLEEP. In stage 2 sleep, our brain waves slow down even more. Sudden intense bursts of electrical activity called sleep spindles of about 12–14 cycles a second, and occasional sharply rising and falling waves known as K-complexes, first appear in the EEG (Aldrich, 1999). K-complexes appear only when we're asleep. As our brain activity decelerates, our heart rate slows, our body temperature decreases, our muscles relax even more, and our eye movements cease. We spend as much as 65 percent of our sleep in stage 2.

STAGES 3 AND 4 SLEEP. After about 10 to 30 minutes, light sleep gives way to much deeper slow-wave sleep, in which we can observe *delta waves,* which are as slow as one to two cycles a second, in the EEG. In stage 3, delta waves appear 20 to 50 percent of the time, and in stage 4, they appear more than half the time. To feel fully rested in the morning, we need to experience these deeper stages of sleep throughout the night. In this context, a common myth is that drinking alcohol is a good way to catch up on sleep. Not quite. Having several drinks before bed usually puts us to bed sooner, but it usually makes us feel more tired the next day, because alcohol suppresses delta wave sleep. Children are famously good sleepers because they spend as much as 40 percent of their sleep time in "deep sleep" and are difficult to awaken. In contrast, adults spend only about one-quarter of their sleep "sleeping like a baby," in deep sleep.

STAGE 5: REM SLEEP. After 15 to 30 minutes, we return to stage 2 before our brains shift dramatically into high gear, with high frequency, low-amplitude waves resembling those of wakefulness. We've entered stage 5, known commonly as **REM sleep**. In contrast, stages 1–4 are known as **non-REM (NREM) sleep**.

Our hyped brain waves during REM sleep are accompanied by increased heart rate and blood pressure, as well as rapid and irregular breathing, a state that occupies about 20 to 25 percent of our night's sleep. After 10 to 20 minutes of REM sleep, the cycle starts up again, as we glide back to the early stages of sleep and then back into deeper sleep yet

rapid eye movement (REM)
darting of the eyes underneath closed eyelids during sleep

REM sleep
stage of sleep during which the brain is most active and during which vivid dreaming most often occurs

non-REM (NREM) sleep
stages 1 through 4 of the sleep cycle, during which rapid eye movements do not occur and dreaming is less frequent and vivid

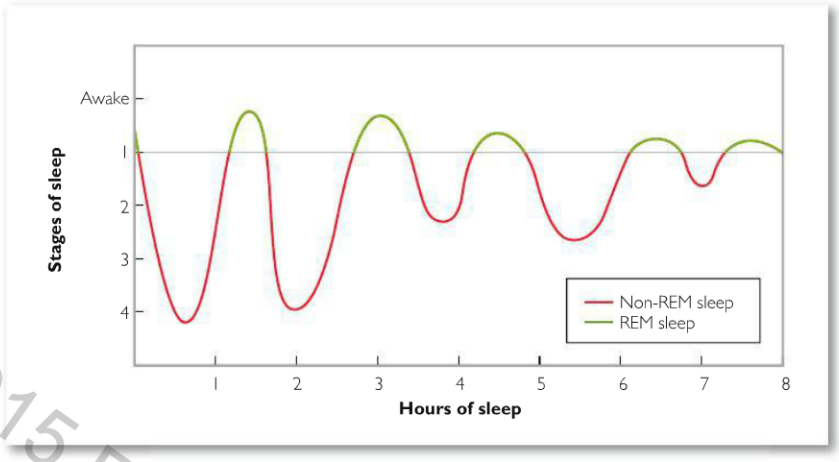

FIGURE 5.2 Stages of Sleep in a Typical Night. The graph shows the typical progression through the night of stages 1–4 and REM sleep. Stages 1–4 are indicated on the *y* axis, and REM stages are represented by the green curves on the graph. The REM periods occur about every 90 minutes throughout the night (Dement, 1974).

Factoid

Dolphins and some other aquatic animals (such as seals and sea lions) "sleep" with one of their brain's hemispheres asleep and the other awake. The eye on the side opposite the sleeping hemisphere typically remains shut, with the other eye remaining open. After a few hours, the other hemisphere and eye take over as sleep continues. This remarkable arrangement permits these animals to sleep while remaining on the lookout for predators and obstacles, as well as to rise periodically to the surface of the water to breathe (Ridgway, 2002).

again. Each night, we circle back to REM sleep five or six times (see **FIGURE 5.2**). Contrary to a belief held by Sigmund Freud and others, dreams occur for more than a few seconds. In fact, our later REM periods toward the early morning typically last for half an hour or more, compared with the 10 to 20 minutes we spend in REM after falling asleep. So if it seems like one of your dreams has lasted for 45 minutes, that's often because it has.

We don't dream *only* during REM sleep, although we dream *more* in REM (Domhoff, 1996, 1999). Many REM dreams are emotional, illogical, and prone to sudden shifts in plot (Foulkes, 1962; Hobson, Pace-Schott, & Stickgold, 2000). In contrast, non-REM dreams often are shorter (Antrobus, 1983; Foulkes & Rechtschaffen, 1964), more thought-like and repetitive, and deal with everyday topics of current concern to us, like homework, shopping lists, or taxes (Hobson, 2002; Rechtschaffen, Verdone, & Wheaton, 1963). Nevertheless, as the night wears on, dream reports from NREM sleep (starting with stage 2) resemble REM dream reports, leading some researchers to suggest that REM and NREM dreams aren't as distinct as once believed (Antrobus, 1983; Foulkes & Schmidt, 1983; McNamara et al., 2005).

REM sleep is biologically important and probably essential. Depriving rats of REM sleep typically leads to their death within a few weeks (National Institute on Alcohol Use and Alcoholism, 1998), although rats die even sooner from total sleep deprivation (Rechtschaffen, 1998). When we humans are deprived of REM for a few nights, we experience *REM rebound:* The amount and intensity of REM sleep increases, suggesting that REM serves a critical biological function (Ocampo-Garces et al., 2000). Many of us have observed REM rebound when we haven't slept much for a few nights in a row. When we finally get a good night's sleep, we often experience much more intense dreams, even nightmares, probably reflecting a powerful bounce-back of REM sleep. Yet scientists are still debating the biological functions of REM sleep.

Some researchers once believed that the darting movements of REM sleep served to scan the images of dreams (Dement, 1974; Siegel, 2005). William Dement once observed a person during REM engaging in a striking pattern of back-and-forth horizontal eye movements. When Dement awakened him, he reported dreaming of a Ping-Pong match. Nevertheless, the evidence for this "scanning hypothesis" of REM is mixed, and the fact that individuals who are blind from birth engage in REM calls it into question (Gross, Byrne, & Fisher, 1965). During REM the muscles of our middle ears become active, almost as though they're assisting us to hear sounds in the dream (Pessah & Roffwarg, 1972; Slegel et al., 1991).

During REM sleep, our supercharged brains are creating dreams, but our bodies are relaxed and, for all practical purposes, paralyzed. For this reason, scientists sometimes call REM sleep *paradoxical sleep* because the brain is active at the same time the body is inactive. If REM didn't paralyze us, we'd act out our dreams, something that people with a

? Research demonstrates that REM and non-REM dreams tend to differ in content. Would this dream image be more likely in a REM dream or a non-REM dream? (See answer upside-down below.)

Answer: It would be more likely in a REM dream.

strange—and fortunately very rare—condition called REM behavior disorder (RBD) do on occasion. In one case of RBD, for 20 years a 77-year-old minister acted out violent dreams in his sleep and occasionally injured his wife (Mahowald & Schenck, 2000). Fortunately, only about one person in 200 has symptoms of RBD, which occurs most frequently in men over the age of 50. In this condition, the brain stem structures that ordinarily prevent us from moving during REM sleep don't function properly (see Chapter 3). Recently, it has come to light that RBD may be a very early marker of dementia and Parkinson's disease, with RBD emerging an average of 14 to 25 years before major symptoms of neurodegenerative diseases first appear (Boeve, 2010; Schenck, Boeve, & Mahowald, 2013).

Classic work by Michel Jouvet (1962) showed that lesioning a brain stem region called the locus coeruleus, which is responsible for keeping us paralyzed during REM, leads cats to act out their dreams. If Jouvet gave cats a ball of yarn to play with during the day, they'd often reenact this play behavior in their dreams.

Lucid Dreaming

We've been talking about sleeping and waking as distinct stages, but they may blend gradually into one another (Antrobus, Antrobus, & Fisher, 1965; Voss et al., 2009). A phenomenon that challenges the idea that we're either totally asleep or totally awake is described in the following example: "I briefly looked back. The person following me did not look like an ordinary human being; he was as tall as a giant…. Now it was fully clear to me that I was undergoing a dream…. Then it suddenly occurred to me that I did not have to escape but was capable of doing something else…So… I turned around, and allowed the pursuer to approach me. Then I asked him what it actually was that he wanted. His answer was: "How am I supposed to know?! After all, this is your dream and, moreover, you studied psychology and not me." (Tholey, 1987, p. 97 translated in Metzinger, 2009, p. 146).

If, like this slumberer, you've ever dreamed and known you were dreaming, you've experienced **lucid dreaming** (Blackmore, 1991; LaBerge, 1980, in press; Van Eeden, 1913). Most of us have experienced at least one lucid dream, and about one-fifth of Americans report dreaming lucidly on a monthly basis (Snyder & Gackenbach, 1988). Many lucid dreamers become aware they're dreaming when they see something so bizarre or improbable that they conclude (correctly) that they're having a dream.

Watch in **MyPsychLab** the **Video:** Lucid Dreaming

Using brain imaging, researchers (Dresler et al., 2012) recently discovered that when participants experience a lucid dream, parts of their cerebral cortex associated with self-perceptions and with evaluating thoughts and feelings rev up with activity. Another study (Voss, Holzmann, Tuin, & Hobson, 2009), which measured electrical activity in the brain, suggested that lucid dreams are a hybrid or mixed state of consciousness with features of both waking and REM sleep. If these studies can be replicated, it would imply that it's possible to remain asleep yet self-aware, and that we don't merely report that dreams have a lucid quality after we awaken.

REPLICABILITY
Can the results be duplicated in other studies?

Lucid dreaming opens up the possibility of controlling our dreams (Kunzendorf et al., 2006–2007). The ability to become lucid during a nightmare usually improves the dream's outcome (Levitan & LeBerge, 1990; Spoormaker & Van den Bout, 2006). Nevertheless, there's no good evidence that changing our lucid dreams can help us to overcome depression, anxiety, or other adjustment problems, despite the claims of some popular psychology books, Internet sites, and even telephone applications that claim to increase dream lucidity (Mindell, 1990).

Disorders of Sleep

Watch in **MyPsychLab** the **Video:** Special Topics: Sleep Disorders

Nearly all of us have trouble falling asleep or staying asleep from time to time. When sleep problems recur, interfere with our ability to function at work or school, or affect our health, they can exact a dear price. The cost of sleep disorders in terms of lost work productivity alone amounts to as much as $63 billion per year in the United States (Kessler et al, 2011). We can also gauge the cost in terms of human lives, with an estimated 1,500 Americans who fall asleep at the wheel killed each year (Fenton, 2007). These grim statistics are understandable given that 30 to 50 percent of people report some sort of sleep problem (Althius et al., 1998; Blay, Andreoli, & Gastal, 2008).

lucid dreaming
experience of becoming aware that one is dreaming

To ensure that the effects of sleeping pills don't carry over to when we're awake, it's important to monitor how we react to them and ensure that we have plenty of time to sleep before needing to be active again.

INSOMNIA. The most common sleep disturbance is insomnia. **Insomnia** can take the following forms: (a) having trouble falling asleep (regularly taking more than 30 minutes to doze off), (b) waking too early in the morning, and (c) waking up during the night and having trouble returning to sleep. An estimated 9 to 15 percent of people report severe or longstanding problems with insomnia (Morin & Edinger, 2009).

People who suffer from depression, continual pain, or a variety of medical conditions report especially high rates of insomnia (Katz & McHorney, 2002; Smith & Haythornthwaite, 2004). Brief bouts of insomnia are often due to stress and relationship problems, medications and illness, working late or variable shifts, jet lag, drinking caffeine, or napping during the day. Insomnia can become recurrent if we become frustrated and anxious when we can't fall asleep right away (Spielman, Conroy, & Glovinsky, 2003). Many people don't realize that even most "good sleepers" take 15 to 20 minutes to fall asleep. If you have trouble drifting off to sleep and counting sheep doesn't help, James Maas (1999) recommends that you try the following: hide clocks to avoid becoming preoccupied with the inability to fall asleep quickly; sleep in a cool room; go to sleep and wake up at regular times; and avoid caffeine, naps during the day, reading in bed, and watching television or surfing the Web right before bedtime.

Although sleeping pills can be effective in treating insomnia, researchers have discovered that brief psychotherapy is more effective than Ambien, a popular sleeping pill (Jacobs et al., 2004). Recently, it's come to light that in rare instances, people who use Ambien engage in odd and even dangerous behaviors, including preparing food and eating raw food, walking, making phone calls, and even driving while asleep. Like Ambien, another popular sleeping medication, Lunesta, can cause amnesia for events that occur after taking it (Schenck, 2006). Longstanding use of many sleeping pills can create dependency and make it more difficult to sleep once people stop taking them. So, in an ironic twist, sleeping pills can actually cause insomnia (Bellon, 2006).

Lucas Carlton suffers from narcolepsy and sleeps 20 hours a day. He's shown here at home in England in one of his narcoleptic states.

NARCOLEPSY. Narcolepsy is a dramatic disorder in which people experience bouts of sudden sleep lasting anywhere from a few seconds to several minutes and, less frequently, as long as an hour. The overwhelming urge to sleep can strike at any moment, as in the case of a patient with narcolepsy who fell asleep in all sorts of situations: during his favorite movies, in the shower, and while driving. He was a prison guard, but he couldn't stay awake on the job. He feared his boss would fire him and stifled many a yawn in his presence.

Surprise, elation, or other strong emotions—even those associated with laughing at a joke or engaging in sexual intercourse—can lead some people with narcolepsy to experience *cataplexy,* a complete loss of muscle tone. During cataplexy, people can fall because their muscles become limp as a rag doll. Cataplexy occurs in healthy people during REM sleep. But in narcolepsy, people experiencing cataplexy remain alert, even though they can't move. Ordinarily, sleepers don't enter REM sleep for more than an hour after they fall asleep. But when people who experience an episode of narcolepsy doze off, they plummet into REM sleep immediately, suggesting that it results from a sleep–wake cycle that's badly off-kilter. Vivid hypnagogic hallucinations often accompany the onset of narcoleptic episodes, raising the possibility that REM intrusions are one cause of brief waking hallucinations.

Genetic abnormalities boost the risk of narcolepsy, and some people develop narcolepsy after an accident that causes brain damage. The hormone *orexin* plays a key role in triggering sudden attacks of sleepiness (Mieda et al., 2004). Indeed, people with narcolepsy have abnormally few brain cells that produce orexin. When sleep-deprived rhesus monkeys were given orexin in a nasal spray their performance on cognitive tasks equaled that of well-rested monkeys (Deadwyler et al., 2007). Medications that either replace orexin or mimic its effects in the brain may one day cure narcolepsy.

insomnia
difficulty falling and staying asleep

narcolepsy
disorder characterized by the rapid and often unexpected onset of sleep

SLEEP APNEA. In 2008, a 53-year-old Go Airlines pilot and his copilot fell asleep during the flight, failed to respond to air traffic controllers for nearly 20 minutes, and overshot the runway by about 30 miles before they woke up (CNN, August 3, 2009).

What happened? The pilot suffered from **sleep apnea**, a serious sleep disorder that afflicts between 2 and 20 percent of the general population, depending on how broadly or narrowly it's defined (Shamsuzzaman, Gersh, & Somers, 2003; Strohl & Redline, 1996). Apnea is caused by a blockage of the airway during sleep, as shown in **FIGURE 5.3**. This problem causes people with apnea to snore loudly, gasp, and sometimes stop breathing for more than 20 seconds. Struggling to breathe rouses the person many times—often several hundred times—during the night and interferes with sleep, causing fatigue the next day. Yet most people with sleep apnea have no awareness of these multiple awakenings. A lack of oxygen and the buildup of carbon dioxide can lead to many problems, including night sweats, weight gain, fatigue, hearing loss, an irregular heartbeat (Sanders & Givelber, 2006) and up the risk for dementia or other cognitive impairments (Yaffe et al., 2011). A 10-year study of 6,441 men and women underscored the dangerous effects of sleep apnea. The researchers found that the disorder raised the overall risk of death by 17 percent; in men 40–70 years old with severe apnea, the increase in risk shot up to 46 percent compared with healthy men of the same age (Punjabi et al., 2009).

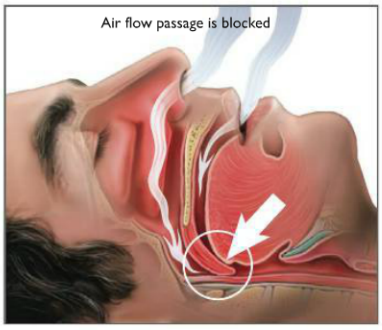

FIGURE 5.3 Flow of Air and Quality of Sleep. When the flow of air is blocked, as in sleep apnea, the quality of sleep can be seriously disrupted.

Person using a device to combat sleep apnea at home

Because apnea is associated with being overweight, doctors typically recommend weight loss as a first treatment option. When enlarged tonsils cause apnea in children, doctors can remove them surgically. But in adults, surgical procedures often don't work well. Many people benefit from wearing a facemask attached to a machine that blows air into their nasal passages, forcing the airway to remain open. Nevertheless, adjusting to this rather uncomfortable machine can be challenging (Wolfe & Pruitt, 2003).

NIGHT TERRORS. Night terrors are often more disturbing to onlookers than to sleepers. Parents who witness a child's night terrors can hardly believe that the child has no recollection of what occurred. Screaming, crying, perspiring, confused, and wide-eyed, the child may thrash about before falling back into a deep sleep. Such episodes usually last for only a few minutes, although they may seem like an eternity to a distraught parent.

Despite their dramatic nature, **night terrors** are typically harmless events that occur almost exclusively in children. Parents often learn not to overreact and even ignore the episodes if the child isn't in physical danger. Night terrors occasionally occur in adults, especially when they're under intense stress. Despite what most people believe, night terrors aren't associated with vivid dreaming; in fact, they occur exclusively in non-REM sleep.

? What's wrong with this picture? **Does it capture how a sleepwalking person would actually appear to an onlooker?** (See answer upside down at bottom of page.)

Answer: Sleepwalkers typically walk just like regular people, not like zombies.

SLEEPWALKING AND SEXSOMNIA. For many of us, the image of a "somnambulist," or sleepwalker, is a person with eyes closed, arms outstretched, and both hands at shoulder height, walking like a zombie. In actuality, a sleepwalking person often acts like any fully awake person,

Factoid

Moms and dads typically worry about their sleep-deprived teenagers. But the parents of 15-year-old Louisa Ball, who lives in south England, were concerned for another reason—their daughter routinely slept for two weeks straight without interruptions, unless she received medication. Louisa suffers from a rare neurological condition called Kleine-Levin Syndrome, aptly nicknamed "Sleeping Beauty Disorder." Her parents need to wake her every 22 hours to feed her and take her to the bathroom, after which she falls immediately asleep.

sleep apnea
disorder caused by a blockage of the airway during sleep, resulting in daytime fatigue

night terrors
sudden waking episodes characterized by screaming, perspiring, and confusion followed by a return to a deep sleep

Factoid

We can fall asleep with our eyes open. In a 1960 study, an investigator taped the eyes of three volunteers—one of them severely sleep-deprived—wide open while flashing bright lights at them, blasting loud music into their ears, and administering periodic electric shocks to their legs. They fell sound asleep within 12 minutes (Boese, 2007).

although a sleepwalker may be somewhat clumsier. Some 15 to 30 percent of children and 4 to 5 percent of adults sleepwalk occasionally (Mahowald & Bornemann, 2005). **Sleepwalking**—walking while fully asleep—often involves relatively little activity, but sleepwalkers have been known to drive cars and turn on computers while asleep (Underwood, 2007). In fact, a few people who committed murder have used sleepwalking as a legal defense. In one controversial case, a young man who drove almost 20 miles, removed a tire iron from a car, and used it to kill his mother-in-law. He also strangled his father-in-law to unconsciousness and stabbed them both with a knife. The man was declared innocent because he had slept through the whole event and wasn't responsible for his behavior (McCall, Smith, & Shapiro, 1997).

In a strange condition known as sleep sex or *sexsomnia*, people engage in sexual acts while asleep and don't remember what occurred after they awaken. In a number of controversial legal cases, people have been found not guilty of sexual assault by claiming they suffered from sexsomnia (Bothroyd, 2010).

Contrary to popular misconception, sleepwalkers aren't acting out their dreams, because sleepwalking almost always occurs during non-REM (especially stage 3 or 4) sleep. For most people, sleepwalking is harmless, and sleepwalkers rarely remember their actions after awakening. If someone is sleepwalking, it's perfectly safe to wake him or her up, despite what we may have seen in movies (Wolfe & Pruitt, 2003).

Study and Review in MyPsychLab

Assess Your Knowledge FACT or FICTION?

1. The average adult needs about six hours of sleep a night. True / False
2. People move slowly through the first four stages of sleep but then spend the rest of the night in REM sleep. True / False
3. When we dream, our brains are much less active than when awake. True / False
4. Sleep apnea is more common in thin than in overweight people. True / False
5. Night terrors usually last only a few minutes and are typically harmless. True / False

Answers: 1. F (p. 172); 2. F (p. 173); 3. F (p. 174); 4. F (p. 177); 5. T (p. 177)

Dreams

5.4 Describe Freud's theory of dreams.

5.5 Explain three major modern theories of dreaming.

Dreaming is a virtually universal experience. Some people insist they never dream, but research shows this phenomenon is almost always due to a failure to recall their dreams rather than a failure to experience them. When brought into a sleep laboratory, just about everyone reports vivid dreaming when awakened during a REM period (Dement, 1974; Domhoff & Schneider, 2004), although a mysterious handful of people don't (Butler & Watson, 1985; Pagel, 2003). Even people who are blind dream. But whether their dreams contain visual imagery depends on when they became blind. People blinded before age 4 don't experience visual dream imagery, whereas those blinded after age 7 do so, suggesting that between ages 4 to 6 is the window within which the ability to generate visual imagery develops (Kerr, 1993; Kerr & Domhoff, 2004).

Whether we're researchers in Timbuktu or New York City, we'll find cross-culturally consistent patterns in dreaming. Virtually all of us experience dreams that contain more aggression than friendliness, more negative than positive emotions, and more misfortune than good fortune. At least a few differences in dreams are associated with cultural factors.

sleepwalking
walking while fully asleep

For example, the dreams of people in more technologically advanced societies feature fewer animals than those in small, traditional societies (Domhoff, 1996, 2001a).

Scientists still don't know for sure why we dream, but evidence from a variety of sources suggests that dreams are involved in (a) processing emotional memories (Maquet & Franck, 1997); (b) integrating new experiences with established memories to make sense of and create a virtual reality model of the world (Hobson, 2009; Stickgold, James, & Hobson, 2002); (c) learning new strategies and ways of doing things, like swinging a golf club (Walker et al., 2002); (d) simulating threatening events so we can better cope with them in everyday life (Revonsuo, 2000); and (e) reorganizing and consolidating memories (Crick & Mitchison, 1983; Diekelmann & Born, 2010). Still, the function of dreams remains a puzzle because research evidence concerning the role of learning and memory in dreams is mixed. We'll discuss four major theories of dreams, beginning with the granddaddy of them all: Sigmund Freud.

Factoid

People express consistent biases in interpreting their dreams. Individuals are most likely to believe that their negative dreams are meaningful when they're about someone they dislike, and that their positive dreams are meaningful when they're about a friend (Morewedge & Norton, 2009).

Freud's Dream Protection Theory

Humans have been trying to decipher the meaning of dreams for thousands of years. The Babylonians believed that dreams were sent by the gods, the Assyrians thought that dreams contained signs or omens, the Greeks built dream temples in which visitors awaited prophecies sent by the gods during dreams, and North American Indians believed that dreams revealed hidden wishes and desires (Van de Castle, 1994).

Sigmund Freud sided with the Native Americans. In his landmark book, *The Interpretation of Dreams* (1900), Freud described dreams as the guardians of sleep. During sleep, the ego, which acts as a sort of mental censor, is less able than when awake to keep sexual and aggressive instincts at bay by repressing them (see Chapter 14). If not for dreams, these instincts would bubble up, disturbing sleep. The *dream-work* disguises and contains the threatening sexual and aggressive impulses by transforming them into symbols that represent *wish fulfillment*—how we wish things could be (see Chapter 14).

According to Freud, dreams don't surrender their secrets easily—they require interpretation to reverse the dream-work and reveal their true meaning. He distinguished between the details of the dream itself, which he called the *manifest content,* and it's true, hidden meaning, which he called the *latent content*. For example, a dream about getting a flat tire (manifest content) might signify anxiety about the loss of status at our job (latent content).

Most scientists have rejected the dream protection and wish fulfillment theories of dreams (Domhoff, 2001a). Contrary to Freud's dream protection theory, some patients with brain injuries report that they don't dream, yet sleep soundly (Jus et al., 1973). If, as Freud claimed, "wish fulfillment is the meaning of each and every dream" (Freud, 1900, p. 106), we'd expect dream content to be mostly positive. Yet although most of us have occasional dreams of flying, winning the lottery, or being with the object of our wildest fantasies, these themes are less frequent than dreams of misfortune. Freud also believed that many or most dreams are sexual in nature. But sexual themes account for as little as 10 percent of the dreams we remember (see **TABLE 5.1**) (Domhoff, 2003). Of course, though a determined Freudian might argue that we're merely forgetting about many sexual dreams, this hypothesis has never been tested.

Another challenge to Freud's dream theory is that many dreams don't appear to be disguised, as he contended. As many as 90 percent of dream reports are straightforward descriptions of everyday activities and problems, like talking to friends (Domhoff, 2003; Dorus, Dorus, & Rechtschaffen, 1971). A final problem with wish fulfillment theory is that people who've experienced highly traumatic events often experience repetitive nightmares (Barratt, 1996). But nightmares clearly aren't wish fulfillments, and they aren't at all uncommon in either adults or children. So, if you have an occasional nightmare, rest assured: It's perfectly normal.

TABLE 5.1 Most Frequent Dream Themes.

1. Being chased or pursued
2. Being lost, late, or trapped
3. Falling
4. Flying
5. Losing valuable possessions
6. Sexual dreams
7. Experiencing great natural beauty
8. Being naked or dressed oddly
9. Injury or illness

(*Source:* Domhoff, 2003)

◀ **FALSIFIABILITY**
Can the claim be disproved?

Nightmares are most frequent in children, but are also common in adults.