Module 24:
Sleep, Dreams, and Body Rhythms

Overview

Sections

- Consciousness
- Body Rhythms
- Sleep and Sleep Deficit
- Why We Sleep
- Sleep Stages, REM, and Dreaming
- Sleep Disorders and Sleep Problems

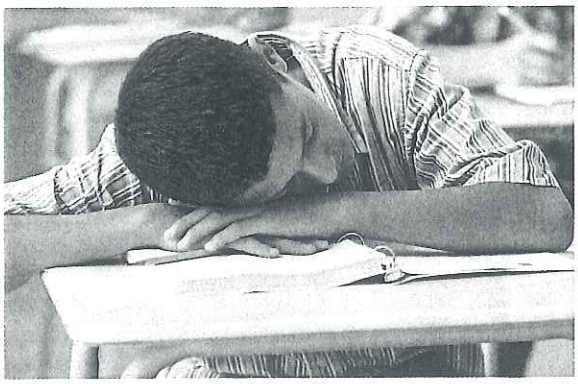
Learning goals

Students will be able to:

1. Define consciousness, and identify the different body rhythms humans experience.
2. Explain why we sleep and the effects of sleep deficits.
3. Discuss the stages of sleep and the paradoxical nature of REM.
4. Explain the four modern explanations of dreaming.
5. Describe common sleep disorders.

Vocabulary Previewing Key Terms and Key People:

consciousness
pseudoscientific claim
biological rhythms
circadian rhythms
ultradian rhythms
infradian rhythms
melatonin
electroencephalograph (EEG)
REM sleep
insomnia
sleep apnea
narcolepsy
somnambulism
night terrors
William Dement (1928–)



Blend Images/Alamy

Bored Senseless or Sleep Deprived? This student has clearly lost any struggle to stay awake.

Consciousness

THINKING CRITICALLY *What do psychologists mean by consciousness?*

Has this ever happened to you? You're watching a movie with friends or family late at night, and no matter how hard you fight it, you simply cannot keep your eyes open. Or perhaps you've waged a similar struggle while reading a textbook (but certainly not your psychology text). You fight it, but soon you nod off—sleep wins again.

You don't stand much of a chance in the tiredness battle; virtually every night, sleep wins. And when you do stay up later than you should, the effects are often obvious. The day a 10-page term paper is due, I can easily spot those students who, having waited until the last minute, spent most of the previous night at a keyboard. Fighting the "nods" (heads bobbing downward), they suddenly jerk.

To nod off is to temporarily lose waking **consciousness,** or awareness of yourself and your environment. Once in sleep's grasp, consciousness ceases as certain parts of the brain's cortex stop sending messages that would otherwise keep you awake (Massimini & others, 2005). Depriving yourself of sleep alters your body's natural rhythms, making it difficult to maintain normal, waking consciousness. Indeed, your body has several naturally occurring rhythms that affect wakefulness and sleep.

THINKING CRITICALLY SUMMARY *To a psychologist, consciousness is how aware we are of our environment and ourselves.*

Body Rhythms

THINKING CRITICALLY *What are body rhythms, and how do they affect us?*

An e-mail titled "Reliably Predict Your Mood for Free" once caught my eye. Closer investigation showed the predictions were anything but reliable, and certainly not free. This advertisement pitched something called a "biorhythm chart," which was a good example of a **pseudoscientific claim**—an assertion that attempts to appear scientific but is not really based on science. The e-mail guaranteed that after I typed in the time and date of my birth the chart could accurately predict my good and bad days, my illnesses and accidents, and even the days when I should gamble. (Gullibility level was not predicted.)

consciousness
Awareness of yourself and your environment.

pseudoscientific claim
Any assertion that is not based on science, even though in some circumstances attempts are made to appear scientific.

biological rhythms
Periodic physiological fluctuations.

Researchers have found that pseudoscientific biorhythm charts are useless (Hines, 1998). Your body does, however, have real **biological rhythms**—periodic physiological fluctuations—that affect body temperature, blood pressure, and the effectiveness of medicines. These biological rhythms fall into three main categories:

- **Circadian rhythms** are biological rhythms that occur approximately once every 24 hours (*circa* and *dies* in Latin mean "about" and "day," respectively). The sleep–wake cycle is an example of a circadian rhythm.
- **Ultradian rhythms** are biological rhythms that occur more than once a day. The most studied ultradian rhythm is the way we cycle through various stages of sleep each night. (You'll read more about these sleep stages shortly.)
- **Infradian rhythms** are biological rhythms that occur once a month or once a season. Examples include a woman's monthly menstrual cycle (see "Psychology Is a Science: Infradian Rhythms and PMS," pages 464–465) and a bear's winter hibernation (once a season).

circadian (ser-KAY-dee-un) rhythms
Biological rhythms (for example, of temperature and wakefulness) that occur approximately every 24 hours.

ultradian (ul-TRAY-dee-un) rhythms
Biological rhythms that occur more than once each day.

infradian (in-FRAY-dee-un) rhythms
Biological rhythms that occur once a month or once a season.

We are aware of some of these biological rhythms as we cycle through them, but most run on autopilot, rarely generating a second thought. An understanding of your body's natural rhythms may help you get more out of your day—and night.

THINKING CRITICALLY SUMMARY *Humans experience three types of body rhythms that occur in regular cycles—circadian, ultradian, and infradian. These body rhythms affect our consciousness and physiological processes.*

Sleep and Sleep Deficit

THINKING CRITICALLY *What happens to your body when you don't get enough sleep?*

Live to be 90, and you will have spent roughly 30 years of your life with your eyes closed, mostly oblivious to your surroundings. Ironically, few of us know much about the gentle tyrant that drives us to bed each night.

Brigitte Sporrer/zefa/Corbis

A More Likely Cause of Accidents Lack of sleep is a greater cause of accidental death than drunk driving for truck drivers. (National Transportation Safety Board, 1995.)

PSYCHOLOGY IS A SCIENCE

Infradian Rhythms and PMS

Controversy surrounds the concept of premenstrual syndrome (PMS). Over the objection of psychologists, premenstrual dysphoric disorder (PMDD) was added to the list of potential disorders (requiring further study) listed in the book that thousands of health care officials use to diagnose mental illness. To understand why psychologists objected, you need to know a bit more about PMS and infradian rhythms.

A woman's menstrual cycle is, on average, a 28-day infradian cycle. During this cycle, the woman's uterine wall is preparing for possible pregnancy. If conception does not occur, the uterine wall sloughs off its thickened lining and the cycle starts again. Do emotional or intellectual changes accompany these physical changes? Tradition says "yes," but psychologists doing research in this area give us reasons to reconsider this assumption.

Several studies (for example, Gallant & others, 1991; Hardie, 1997; McFarlane & others, 1988; Slade, 1984) have gathered data by polling women about their psychological and physical health. To avoid biasing the results, the researchers did not tell the women why they were gathering the data. They asked each woman for a single day's data, and later they ascertained the corresponding day of the woman's menstrual cycle. Some researchers compared their results with

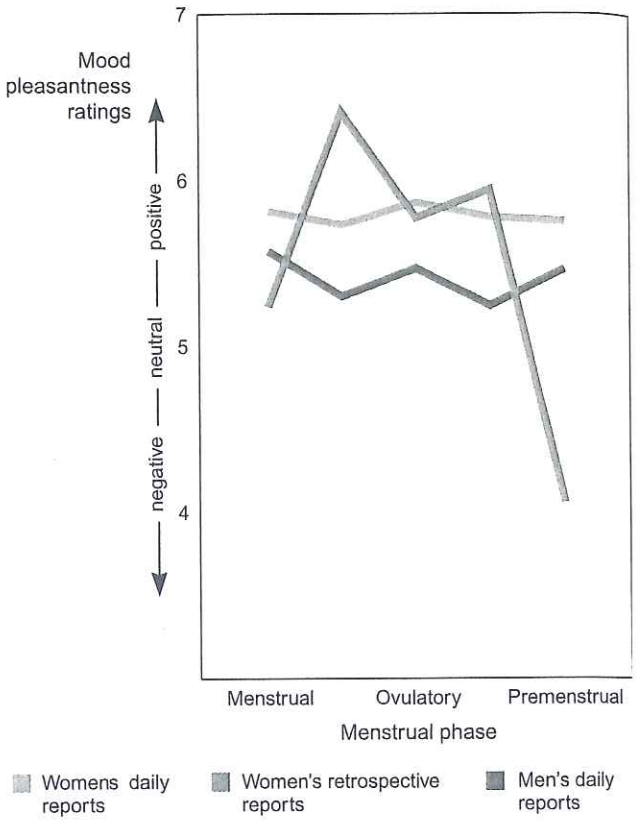


Figure 24.1 PMS or Normal Variation? Men's and women's moods fluctuate at a similar rate during any given month. However, the moods recalled by women do not match the actual moods reported day by day during the month (McFarland & others, 1989).

The research on sleep deprivation, however, could not be clearer:

- Lack of sleep decreases the levels of hormones necessary for proper immune system functioning. Sleep deprivation also increases levels of the stress hormone cortisol, which has been linked to the damage of brain cells responsible for learning and memory (Leproult & others, 1997).
- Citing the number of road deaths related to truck drivers and others who fall asleep while driving, the National Transportation Safety Board (1995) considers driver fatigue a bigger safety problem than

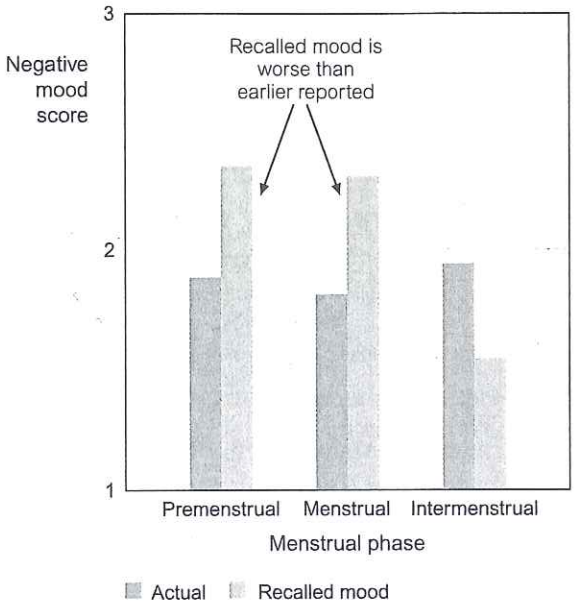


Figure 24.2 Actual Mood Versus Perceived Mood This graph shows that women's *recalled* moods do not reflect the *actual* moods they reported during the menstrual cycle.

data from men and data from women in other cultures. The findings were remarkably consistent:

- Gender differences in mood are nonexistent (see Figure 24.1). In one study (McFarlane & others, 1988), women and men report the same number of actual mood swings each month, although women later recalled having more mood swings (McFarland & others, 1989).
- The menstrual cycle has little effect on actual mood (see Figure 24.2) (McFarland & others, 1989).
- There is no reliable relationship between the menstrual cycle and memory, creativity, exam scores, problem solving, or work efficiency (Golub, 1992).
- From a cultural standpoint, the idea of a premenstrual set of symptoms is a uniquely Western phenomenon (Parlee, 1994).
- Women complaining of PMS and given a placebo (inactive pill) report just as much relief as those given an actual drug (Richardson, 1993).

These findings are out of sync with our traditional assumptions. Perhaps the definition of PMS can offer some insight. Checklists for PMS include sadness, irritability, headaches, insomnia, and lethargy. Doesn't everybody at some time or another experience these symptoms? Does that mean we all have PMS? Or could it mean that we need to reconsider PMS altogether?

alcohol use. Figure 24.3 on page 466, which dramatically illustrates the effect of 1 hour of lost sleep, supports this position.

- Sleep debt contributes to hypertension, impaired concentration, irritability, suppression of cancer-fighting immune cells, and premature aging (Dement, 1999; Horne, 1989; Spiegel & others, 1999).

With the evidence mounting against late nights, you'd think that a movement toward turning lights out earlier would gain momentum. Wrong. Teenagers are getting almost 2 hours less sleep now than they did 70 years ago, before the days of all-night drive-throughs, the

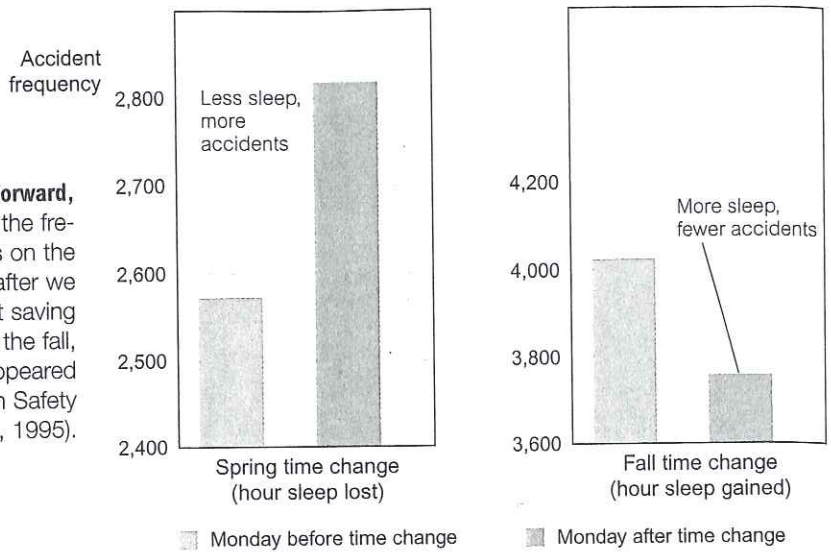


Figure 24.3 Spring Forward, Fall Back? Compare the frequency of accidents on the Mondays before and after we lose an hour to daylight saving time in the spring. In the fall, the opposite trend appeared (National Transportation Safety Board, 1995).

Internet, and late-night TV channels (Maas, 1998). Four out of five students are "dangerously sleep deprived," according to sleep researcher **William Dement** (1999). Dement states, "The brain keeps an accurate count of sleep debt," which helps explain why many high school students sleep effortlessly until noon on weekends if allowed. He matter-of-factly adds that, given the damage a lack of rest inflicts on your brain, a large sleep debt "makes you stupid." Are you getting the sleep you need? To find out, answer the questions in the "Psychology in the Real World" box. Most teens need 9 hours of sleep each night, and 80 percent of all teens in the United States wish they slept more on school nights (Mason, 2005). If you need an alarm to interrupt the sleep your body still wants, you're not getting enough.

THINKING CRITICALLY SUMMARY *Sleep deprivation causes physiological changes that can dramatically affect our moods, health, and ability to perform physically and mentally.*

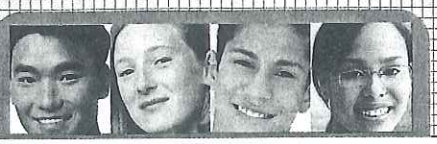
Why We Sleep

THINKING CRITICALLY *How do we benefit from sleeping?*

What causes us to sleep? One hundred years ago, Russian physiologist Ivan Pavlov believed sleep resulted from what he called "massive inhibition." Others suggested that neurons disconnected from one another, causing us to "drift off." Although we have come a long way technologically since the days of Pavlov, we still have no complete answer to the question of why we sleep. But scientists have gathered some partial answers by looking at the brain and nervous system.

William Dement (1928–)
Sleep researcher who coined the term *rapid eye movement (REM).*

PSYCHOLOGY IN THE REAL WORLD



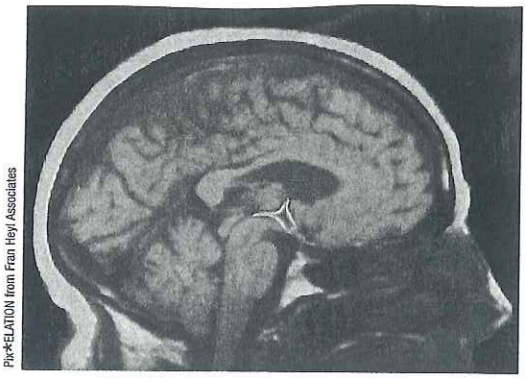
Are You Sleep Deprived?

Cornell University psychologist James Maas reports that most college students suffer the consequences of sleeping less than they should. To see if you are headed toward being in that group, answer the following true–false questions:

True	False	
✓		1. I need an alarm clock to wake up at the appropriate time.
		2. It's a struggle for me to get out of bed in the morning.
		3. Weekday mornings I hit the snooze bar several times to get more sleep.
✓		4. I feel tired, irritable, and stressed out during the week.
✓		5. I have trouble concentrating and remembering.
	✓	6. I feel slow with critical thinking, problem solving, and being creative.
	✓	7. I often fall asleep watching television.
	✓	8. I often fall asleep in boring meetings or lectures or in warm rooms.
	✓	9. I often fall asleep after heavy meals.
	✓	10. I often fall asleep while relaxing after dinner.
✓		11. I often fall asleep within 5 minutes of getting into bed.
	✓	12. I often feel drowsy while driving.
✓		13. I often sleep extra hours on weekend mornings.
		14. I often need a nap to get through the day.
		15. I have dark circles around my eyes.

If you answered "true" to three or more items, you probably are not getting enough sleep. To determine your sleep needs, Maas recommends that you "go to bed 15 minutes earlier than usual every night for the next week—and continue this practice by adding 15 more minutes each week—until you awaken without an alarm clock and feel alert all day." (Quiz reprinted with permission from Maas, 1999.)

The control center for the 24-hour rhythm of sleep appears to be the brain's hypothalamus. You have a sort of sensor in your hypothalamus that monitors changes in light and dark. Perceiving key changes in light level, your hypothalamus sends neurological messages to parts of your brain and body, initiating the changes that will put you to sleep. These physiological changes often involve the increase or decrease of hormones (chemical messengers) in your bloodstream.



Pix*ELATION from Fran Heyl Associates

Sleep Command Center The hypothalamus, colored red in this MRI brain scan photograph, sends messages to other parts of the brain, saying "Time to sleep."

One such hormone, **melatonin,** helps regulate the sleep–wake cycle (Haimov & Lavie, 1996). Wake up in the morning and turn on the light or open the curtains, and the melatonin levels that built up while you slept will start to drop. Your melatonin levels will continue to drop until the next time you turn out the lights, close your eyes, and go to sleep. Some people with insomnia respond favorably to medically controlled amounts of melatonin supplements.

So, we know something about *how* we go to sleep, but *why* do we need to sleep? Why can't we simply stay up, day after day, doing the things we want to do? Two possible answers to these questions revolve around the concepts of preservation and restoration.

If you've ever walked through your home in the dark without turning on lights and crashed into something, you can understand how sleep might help keep us safe. Such nighttime crashes must have been even more common for our ancestors, who lived in caves and on cliffs. Traveling or hunting at night (well before the invention of the flashlight) was treacherous, and perhaps those who attempted it did not survive long enough to reproduce and pass along their genes. Sleep provides *protection* from nighttime's dangers, at least for daytime mammals like us. The sleep cycles of other animals have adapted in different ways, depending on such factors as ability to hide and the need for nourishment (Webb, 1982). Bats, for example, sleep 20 hours a day. Cats sleep 15 hours, but elephants drift off for only 3 to 4 hours. The adaptation theory suggests that we sleep at times of the night or day that maximize our safety and survival.

Another prominent theory suggests that sleep is restorative, allowing us to recuperate from the everyday wear and tear we put ourselves through. Our brain and body remain active while we sleep. We may undergo a rebuilding process as tissues are restored, memories are consolidated, and things learned on the previous day are reorganized.

THINKING CRITICALLY SUMMARY *We sleep not only because doing so restores our bodies physically but also because in our evolutionary past sleeping helped protect us from nighttime dangers.*

Sleep Stages, REM, and Dreaming

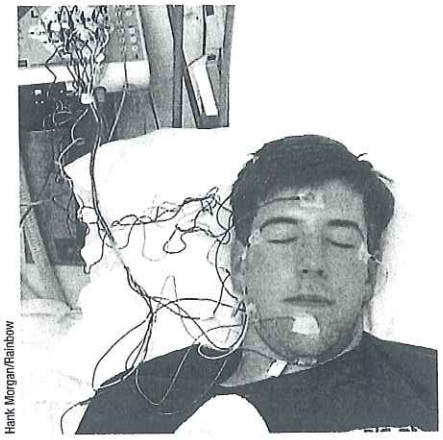
THINKING CRITICALLY *What stages do we go through as we sleep and what are the four modern explanations for dreaming?*

melatonin
Hormone that helps regulate daily biological rhythms.

Many people think of sleep and dreaming as virtually identical processes. In fact, your brain, your voluntary muscles, and your eyes are doing very different things while dreaming compared to their actions during the basic stages of sleep.

Stages of Sleep

The sleep–wake cycle itself is circadian, but we also have a 90-minute *ultradian* rhythm cycling throughout our night's sleep. During the 90-minute ultradian cycle, two types of sleep occur in a series of regular, repeating stages. How do we know this? Because sleep researchers have measured the brain waves, eye movements, and muscle tension of sleeping people. The challenges in gathering sleep data are twofold:



Hank Morgan/Rainbow

Nap Time? Could you sleep with electrodes attached to your face and head? Sleep research participants must and do adapt to this inconvenience.

1. The person whom you're studying must be asleep.
2. The person must also agree to have a minimum of five electrodes glued to his or her head (see Figure 24.4). The electrodes, which are connected to an **electroencephalograph (EEG),** are collecting brain-wave measurements (not delivering shocks!), so the procedure is painless.

Fortunately, thousands of volunteers have agreed to sleep under observation with electrodes on. Would you volunteer to be a participant in a sleep study? For a few minutes, let's suppose you would. Here's what would happen.

As you try to relax, drifting from wakefulness to sleep, your brain waves cycle more and more slowly. You might yawn, which speeds up heart rate in an attempt to move you toward alertness, but it's a losing battle (Moorcroft, 2003). As you nod off for the benefit of science, you will cycle through four stages of relatively quiet sleep before you go into a more active dreaming state (see Figure 24.5 on page 470). You will not

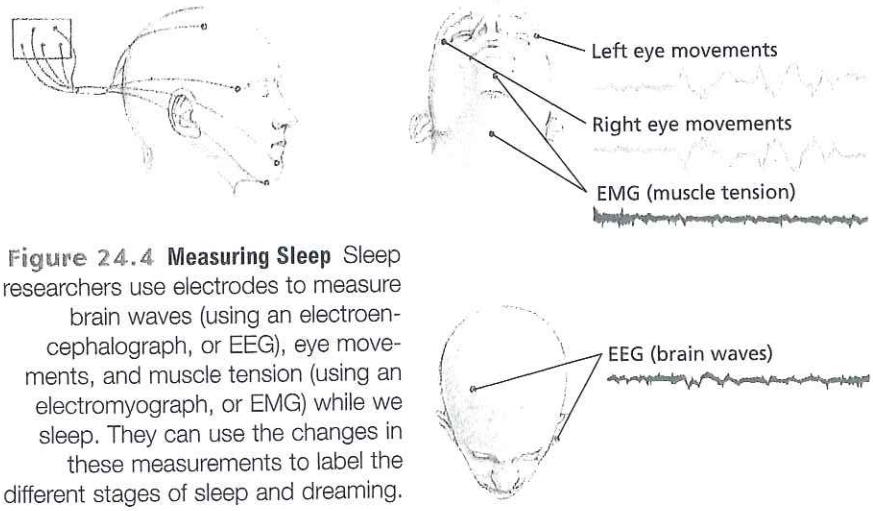


Figure 24.4 Measuring Sleep Sleep researchers use electrodes to measure brain waves (using an electroencephalograph, or EEG), eye movements, and muscle tension (using an electromyograph, or EMG) while we sleep. They can use the changes in these measurements to label the different stages of sleep and dreaming.

electroencephalograph (EEG) Machine that amplifies and records waves of electrical activity that sweep across the brain's surface; electrodes placed on the scalp measure these waves.

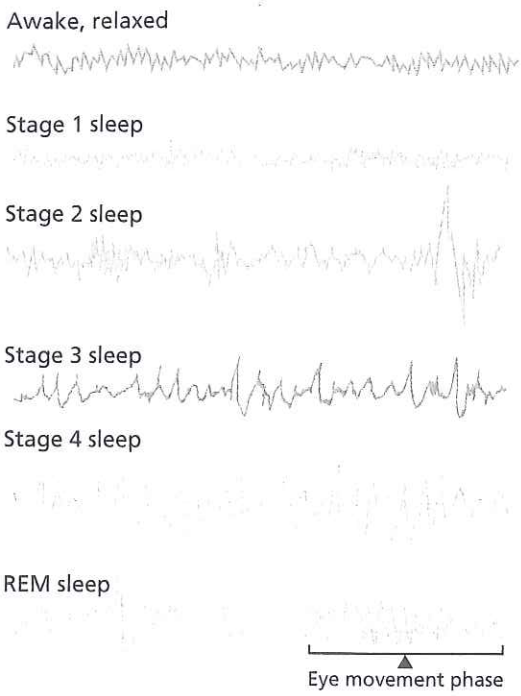
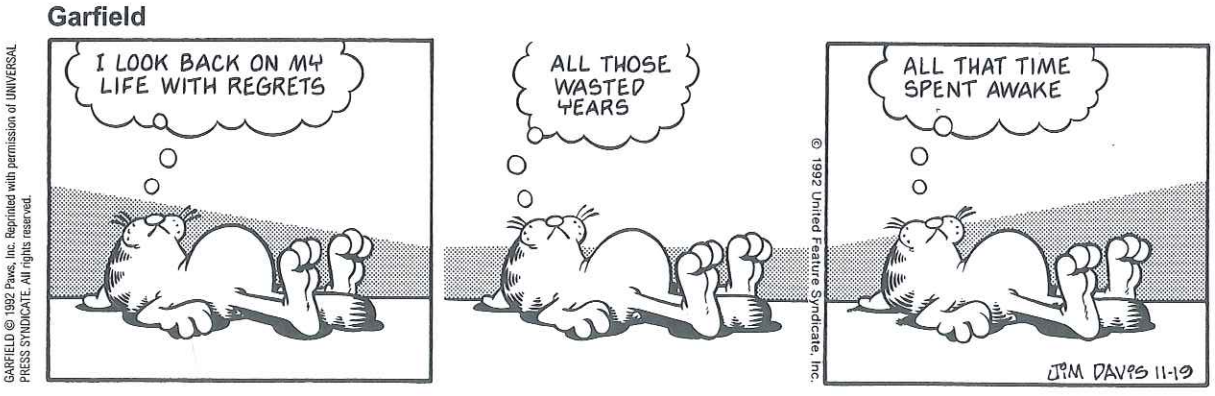


Figure 24.5 Brain Waves and Sleep Stages Brain waves slow as we cycle into the deeper stages of sleep.

be able to tell the exact moment you enter *Stage 1,* but a sleep researcher, noticing your slowed breathing and irregular brain waves, could accurately point to these first moments of sleep, which rarely last longer than 5 minutes (see Figure 24.6). It would be easy to awaken you from this stage, and if the sleep researcher did, you'd probably insist you had not been sleeping.

Figure 24.6 Entering the Land of Nod You wouldn't be able to say precisely when you fell asleep last night, but a sleep researcher charting your brain waves could pinpoint the time accurately.

But let's imagine that the researcher did not awaken you. As you exit Stage 1, your brain waves cycle more slowly and you slide into the deeper sleep of *Stage 2.* The first time you enter Stage 2, your stay lasts 20 minutes. Over the course of the night, you will spend up to half of your entire time asleep in this stage.



About 30 minutes after you fall asleep, your brain waves begin to slow way down as you drop into *Stages 3* and *4*. These two stages are called *slow-wave sleep*. Your brain waves slow to less than one cycle per second in Stages 3 and 4, compared with the 15 or so cycles per second you experienced just after you closed your eyes. The first time you travel through this ultradian cycle, the rejuvenating sleep of Stages 3 and 4 will last about 30 minutes.

Rapid eye movement (REM) sleep
Recurring sleep stage during which vivid dreams commonly occur; also known as *paradoxical sleep*, because muscles are relaxed but other body systems are active.

REM Sleep

Up to this point, you've been cycling down through the four stages of *non–rapid eye movement sleep*, or N-REM sleep. After you reach Stage 4, your brain waves will begin to pick up a little speed and strength. You will move back up through Stages 3, 2, and 1, and then you will enter your first period of rapid eye movement sleep, or **REM sleep,** a recurring sleep stage during which your eyes move rapidly under your closed lids and you dream vividly. Your initial REM period will not last long, and after it ends, the cycle will start again from Stage 1. This 90-minute ultradian rhythm continues all night, although Stages 3 and 4 drop out of the cycle after the second or third time through. The last 4 hours of sleep, assuming you get the 8 to 9 hours you're supposed to, are pretty much spent alternating between Stage 2 and REM (see Figure 24.7).

REM sleep is very different from any N-REM sleep stage. During REM sleep, your brain patterns more closely resemble those of relaxed wakefulness than any of the other sleep stages. Not only do the eyes dart about under closed eyelids, but the pulse quickens and breathing becomes faster and irregular. Blood flows into the genitals at a rate faster than it can be removed. But despite all this internal activity, the

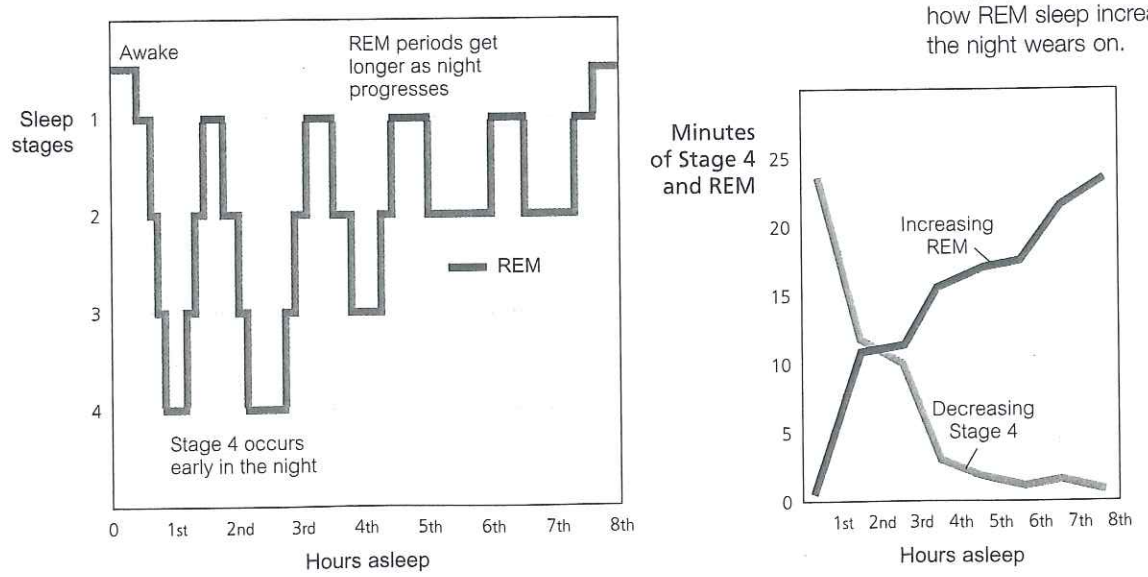


Figure 24.7 A Good Night's Sleep We cycle through sleep stages all night. The graph on the left shows that as we sleep we cycle down into deeper stages of sleep and back up, where we enter REM sleep. The graph on the right shows how REM sleep increases as the night wears on.

electrode measuring muscle tension in your chin would show a flat line on the EEG because you are, in essence, temporarily paralyzed during REM sleep. Your brainstem blocks messages from your motor cortex, the brain structure that controls your movements. This is why REM sleep is sometimes called *paradoxical* sleep: Internally, your body is aroused; externally, you're the picture of calm and hard to awaken.

What's going on in our brains to produce all that internal activity? We're dreaming. More than 80 percent of people awakened during REM sleep report that the wake-up call interrupted a dream. REM sleep consumes about 25 percent of your nightly sleep, which means that you spend 100 minutes each night dreaming, whether you remember a second of it or not. This holds true for everyone. We *all* dream every night of our lives.

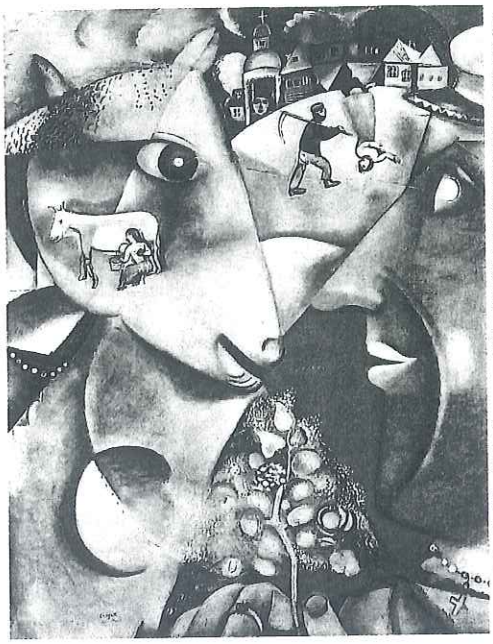
Why Do We Dream?

There are several theories of why we dream. Sigmund Freud contributed psychology's earliest dream theory. In his book *The Interpretation of Dreams,* published more than a century ago, Freud wrote that dreams were the key to understanding our inner conflicts. He believed that dreams were expressions of wish fulfillment and that analysis could trace most dreams back to erotic wishes (Freud, 1900). Modern theories of dreaming offer at least four more plausible explanations—information processing, physiological function, activation synthesis, and cognitive development:

- *Information processing*—Dreams serve an important memory-related function by sifting through the day's experiences and tying up loose ends. In other words, think of you brain as a computer that loses its Internet connection when it first goes to sleep but then comes back online during REM sleep to sort through some of the previous day's activities. Research shows that REM sleep facilitates memory storage and the amount of REM sleep increases following stressful times (McGrath & Cohen, 1978; Palumbo, 1978).
- *Physiological function*—Neural activity during REM sleep provides periodic stimulation for our brains. Infants, whose brains are developing at a fantastic rate, spend significantly more time than their adult counterparts do in REM sleep (see Figure 24.8). The discovery that the pituitary gland secretes a growth hormone *during* Stages 3 & 4 supports this theory. Weren't we always told as young children, "If you don't get your sleep, it will stunt your growth"? The growth hormone secreted while we sleep suggests we should have listened to this advice.
- *Activation synthesis*—Rather than ascribing any physiological or memory-related status to dreams, this activation-synthesis theory suggests that dreams are simply the mind's attempt to make sense

out of random neural firing in the various regions of the "sleeping" brain. That is, the brain's attempt to interpret random neural activity during sleep is what creates a dream.

- *Cognitive development*—Some evidence suggests that dreams are simply a part of the maturation process related to brain development (Domhoff, 2002). That is, the dreams of a third grader are far less dynamic and active and tell less of a story when compared to those of a 20-year-old. Dreams also reflect what we've learned and what we know. If we've never heard of a Native American sweat lodge or the ceremonies that take place inside such a lodge, we're not going to dream about them. Furthermore, some dreams take place outside of REM sleep. The dreams outside of REM show how parts of the brain that are active during dreaming need not be active for dreams to occur. So perhaps dreaming is little more than a reflection of normal cognitive development, the same way daydreams become more complex between the ages of 2 and 20. Dream researchers adopting this theory are likely to sharply disagree with both Freudian and activation-synthesis supporters.



Marc Chagall, "I and the Village," 1911. Oil on canvas, 6'3⅝" × 59⅝" (192.1 × 151.4 cm). The Museum of Modern Art, New York. Mrs. Simon Guggenheim Fund. Photograph © 1997 The Museum of Modern Art, New York

The Meaning of Dreams? Marc Chagall's painting *I and the Village* captures what a dream can look like to the dreamer: colorful, confusing, and possibly filled with meaning.

We are not the only animals who experience REM sleep. We don't know whether other animals are having dreams, but nearly all animals, from sheep to walruses, show measurable REM periods while hooked up to an EEG during sleep. (Just how do they keep the electrodes on the walruses?) Such evidence suggests a biological *need* for REM sleep. We do know that people don't feel rested unless their sleep has contained

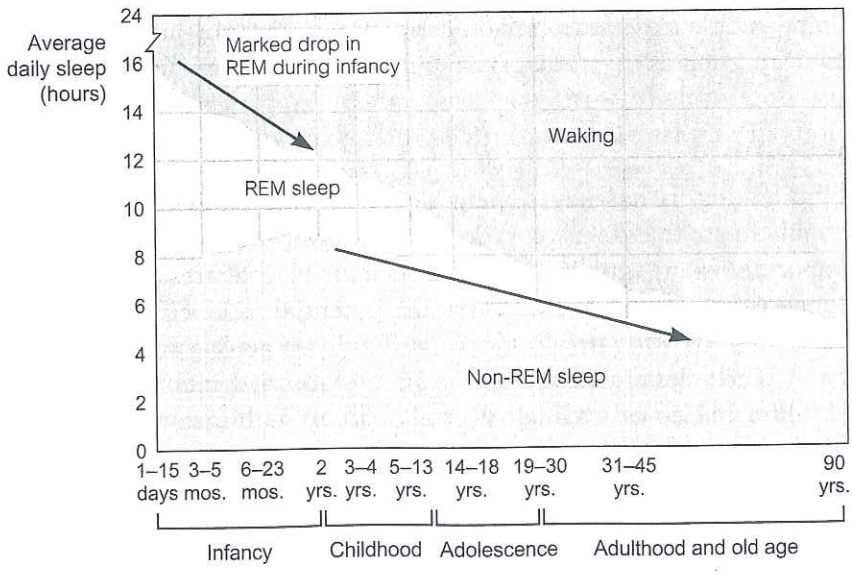
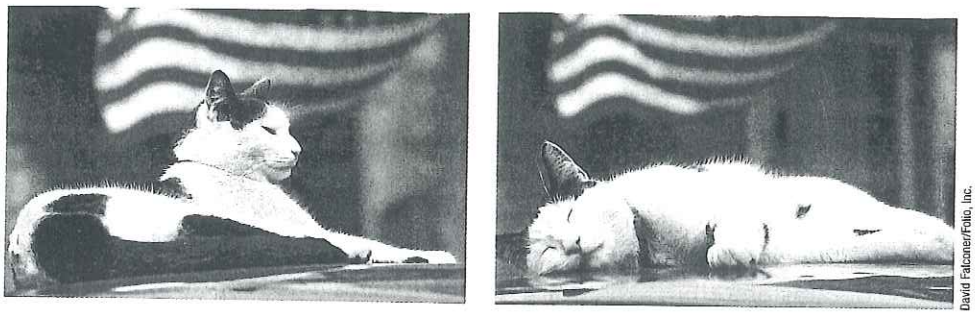


Figure 24.8 Sleep and Age Sleep patterns change as we grow older (Snyder & Snyder, 1972).



Cat Nap The cat in N-REM sleep (left) is sleeping comfortably. On entering REM sleep, the cat's brain stops sending the signals to the muscles that let the cat hold its head off the floor.

REM periods. Also, when finally allowed to sleep after a period of sleep deprivation, we tend to dive straight into REM sleep rather than following the normal cycle. Furthermore, REM does not occur in fish, whose behavior (unlike mammals) is governed more by instinct and less by learning, supporting the information-processing model of why we dream. The truth behind dreams, once discovered, will surely encompass both psychological and biological explanations.

THINKING CRITICALLY SUMMARY *As we sleep, we cycle through four stages of brain activity as our brain waves gradually speed up and slow down. The REM stage of sleep seems paradoxical because our brain waves show high levels of activity but our bodies are calm. The four modern explanations of dreams focus on how dreams may be related to memory encoding, brain development and random neural firing and how the content of our dreams may reflect our level of cognitive development.*

Sleep Disorders and Sleep Problems

THINKING CRITICALLY *What are sleep disorders, and how do they interfere with our sleep cycles?*

Not everyone follows the normal sleep patterns we've been discussing. Some people experience serious sleep disruptions or problems related to sleep, such as insomnia, sleep apnea, and narcolepsy.

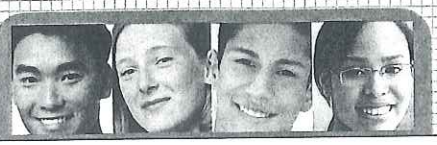
Insomnia

Who among us has never spent a restless night, tossing and turning, unable to get the sleep we so desperately desire? Thoughts of taking an important exam, anticipation of a special trip, or distress brought on by concern for a loved one all carry the potential to block the sleep we'd like to have. Fortunately for most, difficulty in getting to sleep is a rare event. Those less fortunate suffer from **insomnia,** recurring problems in falling asleep or staying asleep. For those with insomnia, getting to sleep or staying asleep can be a real nightmare.

insomnia
Recurring problems in falling asleep or staying asleep.

Oral medications for insomnia may actually worsen the problem. Sleeping pills can be addictive, and they inhibit or suppress REM sleep, leaving the sleep-hungry person feeling even worse than before. Alcohol

PSYCHOLOGY IN THE REAL WORLD



Increasing the Quality of Your Sleep

Do you have trouble falling asleep? Do you often wake up during the night? If so, don't sweat it. There are likely several steps you can take to improve the quality of your sleep while reducing the anxiety you might experience when sleep does not come easily. Consider the following:

- Do not consume caffeinated beverages or foods after 3:00 P.M. Skip that soda with dinner, and turn away from late-night chocolate snacks.
- Get up at the same time every morning. Sleeping late on weekends can make it difficult to get to sleep on Sunday night, leaving you extra tired on Monday morning. Naps can have the same effect: You may not be able to fall asleep at your normal bedtime.
- Avoid nighttime activities that rile you up. Video games, arguments, or a 10-mile run right before attempting to sleep are not good ideas.
- Try not to worry when you can't get to sleep. Remember that it's normal to take 15 minutes or more to fall asleep at night. Besides, sleeping poorly for one night won't cause any great harm, and often you'll be able to sleep better the following night.

also suppresses REM sleep: Those who have a drink at bedtime to "help me sleep" will find the cure to be worse than the disease.

Stanley Coren's (1996) research sheds some interesting light on insomnia. After collecting EEG data on those who complained about insomnia and those who did not, he asked both groups to estimate how long it took to get to sleep. Insomnia complainers estimated that it took them twice as long to get to sleep as it actually did. Furthermore, they dramatically miscalculated the amount of time they slept, estimating they'd slept half the time they actually had. Perhaps we should keep this research in mind the next time we think we haven't slept much the night before. It's a lot easier to remember, and exaggerate, the times during the night when we were awake than the times we were asleep. (In addition, "Psychology in the Real World: Increasing the Quality of Your Sleep," discusses improving your sleep.)

Sleep Apnea

Losing one night's sleep may not cause significant damage, but **sleep apnea**—a disorder characterized by repeated awakenings throughout the night as a result of not being able to breathe—can leave you exhausted. A person with sleep apnea is a loud snorer who stops breathing at the peak of a heavy, inhaled snore and whose breathing may cease for as long as a minute. The only way the person can breathe again is to briefly awaken, which may happen more than 400 times a night.

sleep apnea
Sleep disorder characterized by temporary cessations of breathing during sleep and consequent momentary reawakenings.

M.Fisher/Custom Medical Stock Photo

Sleeping Aid Those with sleep apnea can turn to this CPAP machine (and others like it) to help them get the sleep they need.

Apnea (meaning "with no breath") sufferers (usually male, overweight, and over 40) experience dreadful sleepiness even after a full night's sleep, but they may be unaware they are having such poor-quality sleep.

Some of you are probably thinking, "My dad is heavy and snores like a freight train. Does he have sleep apnea?" I'm not going to advise you to play sleep diagnostician, but if you have a relative or friend who fits this profile, you might want to find out a little more about sleep apnea and perhaps even suggest that the person be checked for this disorder. Roughly 4 percent of the population (millions of people) suffers from sleep apnea. The most common treatment involves use of a continuous positive airway pressure (CPAP) machine, which helps the person breathe during the night.

Narcolepsy

Can you imagine what it would be like to suddenly fall asleep because something made you laugh, cry, or feel infuriated? Such is the life of a person with **narcolepsy** (*narco* meaning "numbness," *lepsy* meaning "seizure"), a sleep disorder characterized by uncontrollable sleep attacks. Narcolepsy is a rare disease (striking 1 in 2000 people) that runs in families. Those with narcolepsy experience sleep attacks when their nervous systems become aroused, often from a strong emotion (Dement, 1978). When an attack occurs, they fall immediately into REM sleep, often at the most inopportune or dangerous times. Imagine being cut off in traffic, becoming angry at the other driver, and lapsing into sleep.

In recent years, researchers have isolated a narcolepsy-causing gene in dogs and have linked narcolepsy to the absence of the neurotransmitter hypocretin. (Taheri, 2004; Taheri & others, 2002). Both of these developments raise hope for the development of a lasting treatment that would, in essence, cure narcolepsy. Until then, physicians will continue to treat narcolepsy with a form of REM-inhibiting stimulant. If you don't have narcolepsy now, chances are you never will; the onset of this disorder accompanies puberty.

Other Sleep Problems

Other sleep-related problems don't qualify as sleep disorders, but they can be disruptive nonetheless. The first four on this list typically occur during N-REM sleep in Stages 3 and 4:

- **Somnambulism** is sleepwalking. Is it dangerous to awaken a sleepwalker? No, but it is difficult to awaken someone who is walking around with brain waves revving at 1 cycle per second. Is the sleepwalker acting out a dream? Again, no. Remember, most

"Wait! Don't! It can be dangerous to wake them!"

Is It Dangerous to Awaken a Sleepwalker? No. It's simply difficult to awaken someone whose brain waves are revving along at 1 cycle per second.

dreams occur during REM sleep, and during that type of sleep, we lose our ability to move around.

- **Night terrors** are characterized by high arousal and an appearance of being terrified. Night terrors most often afflict children, who look like they are awake and terrified even though they are sound asleep. The child rarely has any memory of the event when told about it in the morning. Night terrors are different from nightmares, which are dreams (so they occur during REM sleep). Night terrors occur within a few hours of falling asleep, during Stage 4 sleep.
- *Bruxism* is teeth grinding that sounds as though two bricks are being rubbed together. Adults with this problem often wear some kind of tooth guard to keep from wearing away enamel.
- *Enuresis* is bed wetting.
- *Myoclonus* is a sudden jerking of a body part that occurs in Stage 1 or 2. Everyone experiences myoclonus now and then, but acute cases can result in daytime symptoms similar to those accompanying sleep apnea.

Some people appear to get by on as few as 4 hours of sleep per night. However, most of these brief sleepers experience negative effects on their bodies, such as memory loss and premature aging, that we cannot immediately see. So when you're tired and it's time to sleep, pay attention to your body. Ignore that last text message, resist the urge to keep updating your Facebook after it gets late at night, and give in to the gentle tyrant that is your need for sleep.

THINKING CRITICALLY SUMMARY *All the sleep disorders (insomnia being the most common) interfere with our natural sleep cycles and may interfere with our cognitive and physiological functioning in dramatic ways. It is normal to experience some sleep problems that don't qualify as sleep disorders but may be disruptive if experienced frequently.*

narcolepsy
Sleep disorder characterized by uncontrollable sleep attacks; the sufferer may lapse directly into REM sleep, often at inopportune times.

somnambulism
Sleepwalking, which usually starts in the deeper stages of non–rapid eye movement (N-REM) sleep; the sleepwalker can walk and talk and is able to see but rarely has any memory of the event.

night terrors
Sleep-related problem characterized by high arousal and an appearance of being terrified; unlike nightmares, occurs during Stage 4 sleep, occurs within 2 or 3 hours of falling asleep, and are seldom remembered.

Module 24: Thinking About Sleep, Dreams, and Body Rhythms

LEARNING GOAL 1: Define consciousness, and identify the different body rhythms humans experience.

- Consciousness is the degree to which we are aware of our environment and ourselves.
- We go through three types of body rhythms that occur in regular cycles—circadian, ultradian, and infradian—and affect our consciousness and physiological processes.

LEARNING GOAL 2: Explain why we sleep and the effects of sleep deficits.

- Sleep deprivation causes physiological changes that can dramatically affect our moods, health, and ability to perform physically and mentally.
- Sleep helps restore our bodies physically and protect us from nighttime hazards.

LEARNING GOAL 3: Discuss the stages of sleep and the paradoxical nature of REM.

- We cycle through four stages of non–rapid eye movement (N-REM) sleep every night.
- The stages of sleep describe different levels of brain activity, measured by brain waves.
- The REM stage of sleep seems paradoxical because our brain waves show high levels of activity but our bodies are calm.

LEARNING GOAL 4: Explain the four modern explanations of dreaming.

- The four modern explanations of dreams focus on how dreams may be related to memory encoding, brain development and random neural firing and how the content of our dreams may reflect our level of cognitive development.

LEARNING GOAL 5: Describe common sleep disorders.

- Sleep disorders interfere with our sleep cycles and can affect us mentally and physically during our waking life.
- Insomnia is the most common sleep disorder, but it is treatable.
- Apnea and narcolepsy are two less common but serious sleep disorders.

Check Your Vocabulary

For each definition, choose the best-matching term from the list that follows.

Definitions

___ 1. Hormone that helps regulate daily biological rhythms.

___ 2. Machine that amplifies and records waves of electrical activity that sweep across the brain's surface; electrodes placed on the scalp measure these waves.

___ 3. Sleep disorder characterized by temporary cessations of breathing during sleep and consequent momentary reawakenings.

___ 4. Sleep disorder characterized by uncontrollable sleep attacks; the sufferer may lapse directly into REM sleep, often at inopportune times.

___ 5. Sleep-related problem characterized by high arousal and an appearance of being terrified; unlike nightmares, occurs during Stage 4 sleep, occurs within 2 or 3 hours of falling asleep, and is seldom remembered.

___ 6. Awareness of yourself and your environment.

___ 7. Biological rhythms (for example, of temperature and wakefulness) that occur approximately every 24 hours.

___ 8. Biological rhythms that occur more than once each day.

___ 9. Biological rhythms that occur once a month or once a season.

___ 10. Recurring sleep stage during which vivid dreams commonly occur; also known as paradoxical sleep, because muscles are relaxed but other body systems are active.

___ 11. Recurring problems in falling asleep or staying asleep.

___ 12. Sleepwalking, which usually starts in the deeper stages of non–rapid eye movement (N-REM) sleep; the sleepwalker can walk and talk and is able to see but rarely has any memory of the event.

___ 13. Sleep researcher who coined the term *rapid eye movement (REM).*

___ 14. Any assertion that is not based on science, even though in some circumstances attempts are made to appear scientific.

___ 15. Periodic physiological fluctuations.

Terms

a. biological rhythms
b. circadian rhythms
c. consciousness
d. electroencephalograph (EEG)
e. infradian rhythms
f. insomnia
g. melatonin
h. narcolepsy
i. night terrors
j. pseudoscientific claim
k. rapid eye movement (REM) sleep
l. sleep apnea
m. somnambulism
n. ultradian rhythms
o. William Dement (1928–)

Apply Your Knowledge

1. The psychological definition of consciousness involves
   a. a waking state in which we are aware of most sensations.
   b. ultradian and infradian rhythms.
   c. awareness of our inner and outer experiences.
   d. any state that does not involve unconsciousness.
2. The migration of monarch butterflies from the United States to Mexico that occurs every year is an example of
   a. a pseudoscientific rhythm.
   b. a circadian rhythm.
   c. an ultradian rhythm.
   d. an infradian rhythm.
3. Lack of sleep interferes with our health and ability to concentrate mainly because
   a. levels of necessary hormones decrease, affecting our immune system and brain operations.
   b. we are conditioned to sleep in infancy.
   c. dreaming is necessary to emotionally process significant events of the day.
   d. a lack of sleep causes us to cycle through various stages of sleep, causing tiredness.
4. The two major reasons psychologists think we sleep can be summarized as
   a. ultradian and infradian reasons.
   b. protective reasons and restorative reasons.
   c. rapid eye movement (REM) and non–rapid eye movement (N-REM) reasons.
   d. conscious and unconscious reasons.
5. Which of the following best describes our sleep cycles?
   a. After we fall asleep, our brain slows down to save energy, and it speeds up as we begin to awaken in the morning.
   b. Deep sleep is interrupted by bursts of activity called non–rapid eye movement (N-REM) sleep.
   c. Light sleepers spend all night with high levels of brain activity, and deep sleepers spend all night with low levels.
   d. We cycle through 4 stages of increasing and decreasing levels of brain activity.
6. Rapid eye movement (REM) is called paradoxical sleep because
   a. it cannot be measured on an electroencephalograph (EEG) like the other stages.
   b. it isn't really a sleep stage.
   c. many psychologists disagree about whether it exists or not.
   d. the brain is active but the body is still.
7. A sleep researcher looking at a computer printout of brain waves sees a pattern of long, slow waves (one per second). Which stage is the sleeper in?
   a. Stage 1
   b. Stage 2
   c. Stage 3
   d. Stage 4
8. Which of the following dream theories is mentioned in the text as being a modern explanation of dreams?
   a. Random neural firing