16

A Good Night's Sleep

Cycles, Naps, Dreams, and Nightmares

"What a delightful thing rest is! The bed has become a place of luxury to me. I would not exchange it for all the thrones in the world."

—Napoléon Bonaparte

A good night's sleep should be declared a basic human right. Research is growing nearer to establishing the purpose of sleep. For example, Robert Stickgold (1998), reviewing studies on sleep and memory, points out that among rats, sleep deprivation prevents memory formation. This chapter reviews findings that may be helpful in understanding both what a good night's sleep is and how we can manage to get one.

TOPIC 16.1 The Sleep Cycle

The infant averages 14 hours of sleep, the mature adult 7½ hours, and the senior adult (over 75) averages 6. Before the invention of electric lights, typical adults slept for 9 hours. When all cues to time of day are removed, typical adults will average 10.3 hours of sleep daily, similar to their cousins, the apes and monkeys. However, studies show that the length of sleep is not what causes us to be refreshed upon waking. The key factor is the number of complete sleep cycles we enjoy. Each sleep cycle contains five distinct phases, which exhibit different brain wave patterns (see more in chapter 2):

Pre-sleep: beta waves, or normal alertness.

Phase 1 sleep: alpha waves, the mind at rest, eyes closed, breathing slowed, images beginning to appear; these images can be voluntarily controlled—you are at this point still conscious.

Phase 2 sleep: theta waves, or light sleep.

Phase 3 sleep: delta waves, or deep sleep.

Phase 4 sleep: rapid eye movement (REM) sleep, or dreaming.

Phase 5 sleep: theta waves, or light sleep, signaling the end of a cycle.

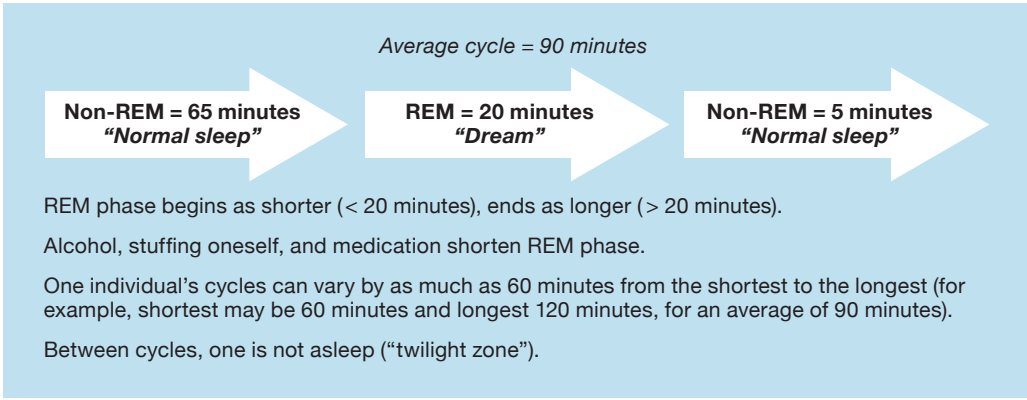

Figure 16.1. The Sleep Cycle

Phases 1–3 together average 65 minutes, followed by an average of 20 minutes for phase 4 (REM) sleep, with phase 5 lasting only 5 minutes on average. For a complete description, see *The Mind in Sleep* (Arkin, Antrobus, and Ellman, 1978) or *Sleep: The Gentle Tyrant* (Webb, 1992). For our purposes, it suffices to say that one sleep cycle lasts an average of 90 minutes (see figure 16.1).

If we were to sleep completely naturally, with no alarm clocks or other sleep disturbances, we would wake up, on the average, after a multiple of 90 minutes—for example, after 4½ hours, 6 hours, 7½ hours, or 9 hours, but not after 7 or 8 hours, which are not multiples of 90 minutes. In the period between cycles we are not actually sleeping; this is a sort of twilight zone from which, if we are not disturbed (by light, cold, a full bladder, noise), we move into another 90-minute cycle. A person who sleeps only four cycles (6 hours) will feel more rested than someone who has slept for 8–10 hours but who has not been allowed to complete any one cycle because of being awakened before it was completed. Within a single individual, cycles can vary by as much as 60 minutes from the shortest cycle to the longest one. For example, someone whose cycles average 90 minutes might experience cycles that vary in length from 60 to 120 minutes. The standard deviation for adult length of sleep is 1 hour, which means that roughly two-thirds of all adults will sleep between 6½ and 8½ hours, based on an average of 7½ hours.

A friend once told me, "All this stuff about cycles is a bunch of bunk. I wake up every morning when the sun rises." After talking about his sleep patterns, he discovered that he was self-disciplined in such a way that his bedtime was consistently about 7½ hours before sunrise. He was waking between cycles, and the song of a bird, the cry of a baby, or the pressing of a full bladder could have been equally as effective as the sunrise in waking him. All it takes to awaken someone between cycles, especially if he has had sufficient sleep, is a gentle stimulus.

When my alarm goes off during the last half of my cycle, for a few hours I feel as if a truck has hit me. When it goes off during the first half of my cycle, it is like waking after a 15- to 20-minute nap, and I feel refreshed. Our motor output system from the brain is completely shut down during REM sleep; that is why we dream we are moving but don't actually move and why we feel so lifeless when we wake during REM sleep. Our motor output system hasn't kicked back in yet!

Applications

❶ Keep a sleep journal. Record the beginning and waking times for each natural sleep episode that is uninterrupted by an alarm or any other disturbance. Find the common multiple. For example, if your recorded sleep periods were 400, 500, 400, 200, and 700 minutes, the common multiple is 100, so you would conclude that your personal sleep cycle typically lasts for 100 minutes, or about 1.6 hours.

❷ Once you know the length of your typical sleep cycle (if you haven't kept a journal, you might assume 90 minutes), then, where possible, plan your waking accordingly. For example, my cycle is 90 minutes. If I am ready for bed at 11:00 P.M. and I know that I must rise at 6:00 A.M. in order to make a 7:00 breakfast meeting, I read for about 45 minutes to avoid having the alarm go off during the last half of my cycle. Conversely, if I go to bed at midnight, I set my alarm for 6:30 A.M. and rush to get ready, rather than being interrupted toward the end of my fourth cycle.

❸ In support of waking naturally, William Moorcroft, professor emeritus at Luther College, reported that if we get the same amount of sleep each night, we don't really need an alarm clock, except as a backup (*Sleep,* January 1997). Subjects who were asked to visualize their time of waking on an imaginary clock face were generally able to rise at the desired time without an alarm. The key techniques: get the same amount of sleep nightly, choose your own time, visualize before sleep onset, and use a backup (a clock set 15 minutes later than your target rising time).

❹ We all are awake between cycles. However, most of us are not aware of this, because we go straight into the next cycle. When we "wake up" during the night, it is because some sensory stimulus (e.g., cold, heat, noise, or light) has penetrated our consciousness between cycles. It only *appears* that our "sleep" has been disturbed, when in fact we were not asleep at all. Many people worry about these "interruptions" of sleep. Don't. Realize that being awake between cycles is perfectly normal, and just surrender to your next cycle. As we age, it is even more common to be aware of being awake between cycles. Again, don't let it cause worry, as it is perfectly normal.

❺ For an intriguing description of the biology of sleep, see chapter 5 of John Medina's book *The Genetic Inferno* (2000).

TOPIC 16.2 The Purpose and Benefits of Sleep

Cornell University professor of psychology James B. Maas (in *Power Sleep,* 1998) says sleeping less than a normal night's sleep (e.g., slavishly obeying an alarm clock) negatively affects energy, performance, memory, learning, thinking, alertness, productivity, creativity, safety, health, longevity, and quality of life.

Maas stresses the importance of REM sleep, most of which occurs during the later hours of a night's sleep. Without REM sleep, we lose what we have learned the day preceding sleep. The specific mechanism by which REM sleep transforms experience into long-term memory is the *sleep spindle.* A 1- to 2-second outburst of brain waves at extreme frequencies, a sleep spindle serves (1) to transport memories in the form of neural patterns to the hippocampus, and (2) to resupply one's system with neurotransmitters used up during the previous day. Without REM sleep and this spindling process, memories dissipate. So if you spend good money learning a new tennis stroke and fail to get a natural night's sleep afterward, Maas says it is like having never had the lesson. You may remember the elements of the new stroke from an academic perspective, but the absence of spindling fails to convert the motor neural patterns into long-term memory.

In related research with rats, Matthew Wilson (MIT) and Allan Hobson (Harvard) found that the brain wave patterns of rats during sleep mimicked the patterns obtained while running a maze the previous day, so much so that the researchers could actually tell what area of the maze the rats were dreaming about by comparing the brain waves to actual maze-running wave patterns. These researchers found that rats deprived of sleep after maze running performed the mazes less well on following days.

Application

1. Organize your time so that you are able to wake up naturally, in a way that does not disrupt a sleep cycle.

2. When you have spent effort learning something new, make it a point to get a "natural" night's sleep afterward, without an alarm clock.

TOPIC 16.3 The Circadian Rhythm

From the Latin *circa* ("about") and *dies* ("days"), the term *circadian* simply means "about a day." Researchers have located the part of the brain that runs our body clock—the *suprachiasmatic nucleus* (SCN). We have assumed for centuries that our bodies' circadian rhythm has a 24-hour cycle. Thus, we should be renewed and refreshed after every 24-hour period. Research by Charles Czeisler of

Table 16.1. An Ideal Sleep-Shift Progression

Day	Shift Starts	Shift Ends	Bedtime	Waking Time
1	12:00 MIDNIGHT	8:00 A.M.	1:30 P.M.	9:00 P.M.
2	(OFF)		2:30 P.M.	10:00 P.M.
3	(OFF)		3:30 P.M.	11:00 P.M.
4	8:00 A.M.	4:00 P.M.	4:30 P.M.	12:00 MIDNIGHT
5	8:00 A.M.	4:00 P.M.	5:30 P.M.	1:00 A.M.
6	8:00 A.M.	4:00 P.M.	6:30 P.M.	2:00 A.M.
7	8:00 A.M.	4:00 P.M.	7:30 P.M.	2:30 A.M.
8	8:00 A.M.	4:00 P.M.	9:30 P.M.	5:00 A.M.
9	(OFF)		10:30 P.M.	6:00 A.M.
10	(OFF)		11:30 P.M.	7:00 A.M.
11	4:00 P.M.	12:00 MIDNIGHT	1:00 A.M.	8:30 A.M.
12	4:00 P.M.	12:00 MIDNIGHT	2:00 A.M.	9:30 A.M.
13	4:00 P.M.	12:00 MIDNIGHT	3:00 A.M.	10:30 A.M.
14	4:00 P.M.	12:00 MIDNIGHT	4:00 A.M.	11:30 A.M.
15	4:00 P.M.	12:00 MIDNIGHT	5:00 A.M.	12:30 P.M.
16	(OFF)		6:30 A.M.	2:00 P.M.
17	(OFF)		7:30 A.M.	3:00 P.M.
18	12:00 MIDNIGHT	8:00 A.M.	9:00 A.M.	4:30 P.M.
19	12:00 MIDNIGHT	8:00 A.M.	10:00 A.M.	5:30 P.M.
20	12:00 MIDNIGHT	8:00 A.M.	11:00 A.M.	6:30 P.M.
21	12:00 MIDNIGHT	8:00 A.M.	12:00 NOON	7:30 P.M.

Harvard University and the Center for Circadian and Sleep Disorders at Brigham and Women's Hospital in Boston, as well as research by others, suggested that in fact many of us have a body clock set for a 25-hour day and most of us have a natural tendency to stay up later and wake later than we do.

Czeisler has discovered that when 24-hour shift work is necessary, there is an optimum schedule based on this 25-hour rhythm. The shifts should progress from day to evening to night, each lasting several weeks, with workers going to sleep progressively later. In this manner, when workers who have worked up to an 11:00 P.M. bedtime end a day shift, they start an evening shift; they keep the 11:00 P.M. bedtime for several days and move to a midnight bedtime, then, after several days, to a 1:00 A.M. bedtime, and so on, until several weeks later they are going to bed at 7:00 A.M. and rising to start an evening shift at 4:00 P.M. This schedule takes advantage of the body's natural tendency to go to bed later and rise later—that is, to live a 25-hour day. (Table 16.1 illustrates how we may take advantage of this 25-hour circadian rhythm while working shifts.)

It was thought that Saturday sleep-ins were symptomatic of this 25-hour cycle. However, Czeisler (*Science,* June 25, 1999) has recently demonstrated that the 25-hour cycle was a premature announcement. In a study with two dozen men and women living in subdued light and no clues as to time of day, the body clock appeared be set at 24 hours, 11 minutes. The tendency to sleep later on the weekend he now attributes not to a 25-hour cycle but rather to exposure to bright lights in the evenings, which apparently sets the body clock forward about 10 minutes for every hour of exposure. He has also found that the urge to sleep becomes strongest at 10:00 P.M., and the urge to wake begins at 4:00 A.M., in conjunction with the times when body temperature begins to fall in the evening and rise in the morning, respectively.

For a person working normal days, the body clock seems to be set as follows:

Time	Effect on Body
6:00 P.M. to midnight	Stomach acid is high; hormone levels drop; blood pressure, pulse rate, and body temperature drop.
Midnight to 6:00 A.M.	Lowest body temperature is between 2:00 and 3:00 A.M. Body is at its lowest level of efficiency between 4:00 and 6:00 A.M. (3:00 to 5:00 A.M.

	for early birds, 5:00 to 7:00 A.M. for night owls). This is a highly accident-prone period, characterized by low body temperature and low kidney, heart, respiratory, and mental functions.
6:00 A.M. to noon	Upon waking, pulse rate and blood pressure rise sharply; body temperature rises; blood clotting activity is high. Rote memory is at its sharpest.
Noon to 6:00 P.M.	The sense of smell is better. Body temperature is at its highest between 2:00 and 3:00 P.M. Grip strength is at its highest. Tolerance for alcohol peaks around 5:00 P.M.

Research is discovering more and more hormones and other body chemicals whose levels rise and fall with circadian regularity, so much so, in fact, that a new term, *chronotherapy,* has arisen to describe the practice of coordinating pharmaceutical and other treatments with time of day. William Hrushesky (1994), of Oncology Analytics, West Orange, NJ, summarizes the circadian aspects of several major illnesses:

Rheumatoid arthritis: Worst in morning

Nonrheumatoid arthritis: Worst in evening

Asthma: Worst in early morning (2:00 to 6:00 A.M.)

Cardiovascular disease: Highest risk in morning

Various cancers: Optimal times for treatment are highly rhythmic

See Hrushesky (1994) for a more detailed discussion.

The body's clock can get thrown out of kilter by disease, aging, travel, and other factors. Because the clock seems to be triggered by the daily pattern of sunrise and sunset, it can be reset by the use of bright lights. (Light treatments have also been found effective in relieving winter depression.) Czeisler reported in a May 3, 1990, press release that looking into a four-foot-square array of sixteen 40-watt bulbs according to his schedule can successfully reset the body clock up to 10 hours in two days. To set a person's clock back, light treatment should be administered after the body's low-temperature point (4:00 to 6:00 A.M.); to set the body clock forward, light treatment should be

administered before the low point. Light inhibits the body's release of melatonin, a neurotransmitter associated with sleep, whereas darkness triggers its release. Czeisler's light treatment apparently resets the body's time for shutting down melatonin release. He also recommends using an eye cover or lightproofing the sleeping quarters of someone who must sleep during the day or in a lighted room. Sleeping in total darkness maximizes the chance of obtaining sufficient melatonin release. According to Scott Campbell (Cornell University Medical College, White Plains, New York), the light does not have to enter the body through the optic nerve. In recent research, Campbell aimed lights behind the knee and achieved the same circadian changes as those achieved through eye-borne light.

On early risers versus those who sleep into the morning, Sydney Harris once commented in his daily syndicated newspaper column, "Some say there are morning people and night people—it isn't so—night people are just teenagers who've never grown up!" Recent research, however, has shown that there really is such a thing as "morningness," or the tendency to awaken as much as two hours before those who don't have morningness. Researchers at Stanford University and the University of Wisconsin report that morningness is genetically controlled (*Sleep,* October 1998). They have identified a specific gene whose variations from individual to individual appear to be associated with whether one is an early bird or a night owl.

Roberts and Kyllonen (1999) explored the relation of morningness to cognitive ability. Using 420 U.S. Air Force recruits in the sixth week of basic training, they found that cognitive ability was positively correlated with eveningness and negatively correlated with morningness. They cite Sternberg's doctrine that flexibility is associated with intelligence, and that adapting to the electrically lighted evening hours would be an example of such flexibility. Interesting, that those of us who, evolutionarily speaking, have adapted to become night owls, and not rigidly adhered to thousands of years of early to rise, early to bed routine, show greater signs of intelligence. I like that!

Applications

❶ Don't get up early (4:00 to 6:00 A.M.) to finish a project; stay up later if you must. Research documents the futility of getting up early. You're fighting your natural tendency to sleep later, as well as working during the period of your body's lowest efficiency.

❷ As 4:00 A.M. approaches, go to sleep. If you must stay awake and safety is an issue (for example, if you are driving or operating other equipment), then try to have someone to talk to. Social interaction appears to be the best stimulant. Caffeine also helps. Take breaks. Keep cool. Avoid heavy carbohydrate or fatty snacks; stick to proteins and light complex carbohydrates. Bright lights help (especially full-spectrum lights), as does your attitude; think about something that excites you. If you know ahead of time that you will have to be up and alert during these early-morning hours, take a nap the afternoon before. David Dinges, a sleep researcher on the faculty of the University of Pennsylvania, has done research that shows that people who nap before staying up all night perform better than those who don't (Dinges and Broughton, 1989).

❸ With around 200 sleep clinics in the United States and many others spread throughout the world, don't accept what you perceive as a problem with sleep. Check yourself in for observation. For information on various sleep programs, contact Associated Professional Sleep Societies, LLC, 2510 North Frontage Road, Darien, IL 60561 (www.apss.org).

❹ See the applications for topic 16.4.

❺ If you must sleep during daylight hours, use an eye covering and earplugs to better simulate the darkness and quiet of night.

❻ Dark places are associated with depression for a reason: they have insufficient light to shut down melatonin production. If you or a friend have a tendency toward depression, avoid dairy products and choose bright, well-lighted, sunny environments.

❼ Avoid setting your alarm for earlier than 6:00 A.M. Prepare the night before if getting up at 6:00 A.M. will be a rush for you: lay out your clothes; prepare breakfast, such as a bagel or yogurt; put coffee on a timer or premake it and zap it in the microwave at 6:00 A.M. Take a nap the afternoon before if you must rise early.

❽ If you must regularly get up before 6:00 A.M., reset your body clock by ensuring darkness and quiet for an early-to-bed schedule and waking up to bright lights. Remember, sunrise is the trigger for the typical body clock.

❾ Adolescents have a sleep cycle different from those of both older and younger individuals. They need to go to sleep later, and wake later. See the specifics at topic 5.4.

❿ If you or someone close to you suffers from a major illness, ask your physician about the optimal time of day for medication and other forms of treatment. If your doctor is unfamiliar with chronotherapy and the circadian aspects of treatment, you should ask elsewhere. Start with Hrushesky (1994).

⓫ For current sleep information and research results, visit the National Sleep Foundation's website at www.sleepfoundation.org.

TOPIC 16.4 Time Zone Changes

Extraverted people adapt more quickly to time zone and shift changes, whereas the physiology of introverted people resists time changes. The principal problem is resetting the body's clock; introverted people need more help in doing this. The major factors in resetting the body clock are the neurotransmitters serotonin and melatonin. Serotonin can be controlled by diet, melatonin both by diet and by the use of available light. Carbohydrates, fats, and dairy products in general tend to increase serotonin, and total darkness hastens the flow of melatonin. (Incidentally, melatonin is a metabolite of serotonin.)

Applications

❶ If you have a more introverted personality, make an extra effort when you must travel through different time zones or change shifts. Light therapy helps (see discussion in topic 16.3); in addition, avoid caffeine, alcohol, artificial sweeteners, and food additives for six hours before you try to sleep after a time-zone change. Consume dairy products, carbohydrates, and fats for maximum facilitation of sleep (milk and cookies, cheese and bread).

❷ If you are responsible for managing shift schedules, remember that more extraverted personalities are less disrupted by time-zone or shift changes. This doesn't mean that introverts can't be called on to work night shifts, but you should (a) be sure that they know the precautions to take for minimum disruption and (b) accept their bodily resistance to time changes as normal and not as an attitude problem.

❸ Try the following pattern, or something like it, if traveling across time zones gets you down. This pattern assumes a 6:00 P.M. departure in the United States from the East Coast and an 8:00 A.M. (local time) arrival in Europe or Africa, with your body operating as though it were actually 2:00 A.M. You are, in essence, being asked to skip one night's sleep. The solution is to sleep once you arrive or to sleep on the plane. Sleeping once you arrive is best, if you can arrange it. Remember, consume no caffeine or other stimulants for six hours before the flight, and use an eye mask and earplugs. In order to sleep on the plane, however, you must trick your body into thinking it's bedtime shortly after you take off. Following this schedule the week before you leave can help (assume a 6:00 P.M. Saturday departure):

Day	Rising Time	Bedtime
Sunday	7:00 A.M.	11:00 P.M.
Monday	6:30 A.M.	10:30 P.M.
Tuesday	6:00 A.M.	10:00 P.M.
Wednesday	5:30 A.M.	9:30 P.M.
Thursday	5:00 A.M.	9:00 P.M.
Friday	4:30 A.M.	8:30 P.M.
Saturday	4:00 A.M.	8:00 P.M. (airborne)

If you can manage this schedule, you should get at least a few 90-minute cycles of sleep; you will feel much better for it. Remember, use an eye mask and earplugs, and consume no caffeine, alcohol, or artificial sweeteners after 1:00 P.M. on the day of departure. Your body will then feel as if it's early morning instead of the middle of the night when you land. And when 10:00 P.M. (local time overseas) rolls around on Sunday, your body clock will feel as if it's about 1:30 A.M. (since, if you were following the above pattern at home, you'd go to sleep about 7:30 P.M., or 1:30 A.M. local time). If you don't follow this pattern, when it's 10:00 P.M. on Sunday night, your body will feel as if it's 4:00 A.M. Clear? It won't work for everyone, but give it a try if eastward overseas flights really bother you. Westward flights don't bother most people because it's just like staying up later but being able to have a normal night's sleep, in accordance with the body's naturally advancing rhythms.

❹ The late Charles F. Ehret of the Argonne (Illinois) National Laboratory recommends the anti-jet-lag diet (Yepsen, 1987), an alternating pattern of fasting and feasting that proceeds as follows:

- Three days before the flight, have high-protein feasts at breakfast and lunch and consume only complex carbohydrates for supper; take caffeine only between 3:00 and 5:00 P.M.
- Two days before the flight, fast on broth soups, salad, and fruit; follow the same caffeine rule.
- One day before the flight, follow the same pattern and the same caffeine rule as three days before (feast).
- Flight day is fast day: for east-west flights, fast only half a day, with caffeine in the morning; for west-east flights, fast all day, with caffeine between 6:00 and 11:00 P.M.
- Upon arrival, sleep until breakfast; all three meals on the day of arrival are feasts. Begin and continue on the day of arrival with all the lights turned on and remain active.

❺ If you live on the East Coast of the United States and must fly to the West Coast, decide whether you will actually be there long enough to justify going through a change of body clock. Jane Howard says, "Often I will go to a two-day meeting in the West, go to bed on Eastern time, and pretend I'm still in the East with respect to meals and caffeine. I go to bed around 9:00 P.M. West Coast time and wake up around 4:30 A.M. Reentry to the East Coast is a breeze; my body clock remains unchanged. I miss out on night life with this plan, but marrieds should feel okay about that."

❻ Dr. John Hermann, director of the Sleep Disorder Clinic at Children's Medical Center of Dallas, recommends this simple approach to minimizing the disruption of time zone travel (i.e., more efficient resetting of your body clock):

a. Take 6 mg of melatonin (remember, the laboratory kind, not the animal-extracted variety) prior to departure when it is 11:30 P.M. in the destination time zone. In other words, if you're departing at 5:00 P.M. and your destination is five time zones to the east, you would take your melatonin 1½ hours after your departure.
b. As soon as possible after arriving at your destination, immerse yourself in the sun—go for a walk, bicycle ride, sunbathe, you get the idea.
c. In the evening after your arrival, take another 3 mg of melatonin one hour before your desired bedtime.

For your trip back home, follow the same three steps, but with your home town as the destination.

TOPIC 16.5 Sleep and Exercise

Exercising tends to elicit cortical alertness—not what you want when going to sleep. Exercise relaxes you after experiencing stress, but good aerobic exercise generally puts your nervous system in a state of moderate arousal. In this condition, you are ideally suited for mental tasks. In order to sleep soon after a workout, you would need to consume carbohydrates and dairy products.

Applications

❶ Exercise no later than several hours before bedtime.

❷ If you must exercise just before retiring for the evening (I know a television sports announcer who exercises after a night game because he's so keyed up), try reading a relatively unemotional book in bed rather than an exciting one (for example, Plato rather than Dan Brown) to help you get to sleep.

TOPIC 16.6 Sleep and Diet

Milk products stimulate melatonin production, which improves sleep. Whether skim or fat, milk (like complex carbohydrates) contains *L-tryptophan,* the amino acid that is a precursor of melatonin (and serotonin). The folk remedy of imbibing a cup of warm milk to enable sleep is in fact appropriate—warmer dairy products metabolize more quickly than cooler ones, so they bring on sleep sooner.

Simple sugars and fats decrease the oxygen supply to the brain, which decreases alertness and makes you sleepy.

Alcohol consumption reduces the relative amount of time spent in REM sleep; therefore, sleep following alcohol consumption is not as restful as alcohol-free sleep. The more alcohol we consume, the less REM sleep we get and the less rested we are in the morning.

Food additives in general and artificial sweeteners in particular tend to increase alertness, which interferes with sleep. Eating a large meal in the evening also interferes with sleep.

Applications

❶ To maximize the chances of a good night's sleep, avoid snacks with additives or artificial sweeteners before bedtime and eat moderately.

❷ To increase your chances of a good night's sleep, have a milk product or light carbohydrate snack shortly before bedtime. *Warning:* If you have the classic warm milk, don't sweeten it with artificial sweetener. Have it plain or with honey, sugar, or some other natural flavoring.

❸ If you drink alcohol in the evening, plan to allow at least one hour for the alcohol to metabolize before you go to sleep; allow more time for more consumption. Also, alcohol dehydrates and water rehydrates, so it helps to drink water between the time you stop drinking alcohol and the time you go to bed. For example, if you've been drinking alcohol throughout an evening dinner party at your home, clean up that night, not the next day, as a way of giving the alcohol time to metabolize, and drink water while you're cleaning. Or go for a gentle walk or stroll before retiring, then read for a while—and drink water. If you want a restful night's sleep, switch to a nonalcoholic beverage before the evening is over. My rule of thumb is one 8-ounce glass of water for every ounce of alcohol. You may get up a lot to pass the water on to Mother Earth, but you'll feel better the next morning! Besides, your bladder is not waking you up, but rather gently urging you to pay attention to it when you naturally are awake between cycles.

❹ When flying across time zones, drink milk rather than caffeine or alcohol.

TOPIC 16.7 Sleep and Weight

The amount of sleep we require is directly related to our body weight—that is, skinnier people require less sleep; heavier people sleep more.

Application

❶ If you would like to require less sleep, get trimmer.

TOPIC 16.8 The Effect of Odors on Sleep

Peter Badia, of Bowling Green State University in Ohio, reports from his sleep lab research that most odors disrupt sleep; the heart rate increases, and brain waves quicken. One odor, *heliotropine,* which has a vanilla-almond fragrance, does not disrupt sleep and may help (Kallan, 1991). (See topic 16.9 on the use of herbal scents and cinnamon in Japanese stress reduction.)

Applications

❶ Try Amaretto liqueur or almond extract in your hot milk before going to sleep. Or try a few drops of vanilla extract in your bedtime milk.

❷ Eliminate strong odors before going to sleep. Sleeping with an open window can help to diffuse odors.

TOPIC 16.9 The Effects of Sleep Deprivation

David Dinges, an award-winning sleep researcher at the University of Pennsylvania School of Medicine, points out (in *Monitor on Psychology,* July–August 2004, p. 61), that three out of five Americans (1) get less than seven hours sleep nightly and (2) have trouble sleeping several nights a week. He notes that three of every four workers in the U.S. consider the quality of their decisions to be negatively affected by sleep deprivation. Sleep-deprived people, according to Dinges, fall into deep sleep just four minutes after shutting their eyes, whereas those with non-sleep-deprived histories take 40 minutes to get to deep sleep, and that continued sleep loss affects performance stability to the same extent as one night without sleep.

People who are significantly deprived of sufficient sleep engage in microsleep, brief periods in which they lose consciousness. Microsleep

is not restorative; it is a warning that you have lost control. A person who has begun to microsleep is a safety hazard. It is possible to drift in and out of microsleep and not be aware of it. Torbjorn Akerstedt, who conducts sleep research at the Karolinska Institute in Stockholm, connected 11 railroad operators to wire monitors. He found that six exhibited microsleep (that is, they dozed at the helm according to the electrode measurements), yet only four were aware that they had dozed. Two plowed through warning signals while asleep (Long, 1987).

In the September 11, 1997, issue of the *New England Journal of Medicine,* the same phenomenon was reported for long-haul truck drivers, with half of the drivers studied exhibiting signs of drowsiness for at least 6 minutes during a week on the road. Drivers in the United States get 8 hours off after driving 10. The study shows, however, that they average only 4 hours 47 minutes of sleep, with the other 3 hours devoted to a variety of unwinding activities. Understandably, the drivers don't want to spend all their off time sleeping. Some researchers recommend expanding the off time to 10 hours.

Eve Van Cauter, a sleep researcher at the University of Chicago, has studied the chemical effects of sleep deprivation. She has found that the loss of even an hour or so of sleep for two or three nights in a row results in attendant increases of cortisol and decreases in growth hormone and prolactin. All three of these changes are the opposite of those that occur during a normal good night's sleep (around 7½ to 8 hours for most people). Typically, following a normal night's sleep, prolactin and growth hormone increase while cortisol decreases. Another chemical change involves the reduced production of *adenosine triphosphate* (ATP). During sleep, the body produces ATP to replace what was burned up during the previous waking episode as a source of energy. A by-product of burning ATP is *adenosine,* which, as it accumulates throughout the waking episode, ultimately signals the brain that fatigue is coming on. Failure to get a good night's sleep results in (1) an inadequate supply of ATP for the next waking episode and (2) an excess of fatigue-signaling adenosine. Alexandros Vgontzas, psychiatrist and professor at the Milton S. Hershey Medical Center, Hershey, Pennsylvania, has discovered that one night of sleep deprivation (one night with no sleep preceded by four nights of normal sleep) results in elevated levels of *interleukin-6* (IL-6) during the following day. IL-6 is a *cytokine,* a protein that regulates immune function, and excessive levels of the protein are associated with bone and tissue (especially cardiovascular tissue) damage.

The consequences of all these chemical changes include deple-

tion of the immune system, the growth of fat rather than muscle, possible harm to brain cells, acceleration of the aging process, memory impairment, and an increasing risk of depression. Van Cauter warns that a good night's sleep should be as high a priority for fitness buffs as aerobic exercise and proper nutrition. Many cultures, however, praise those who "need" less sleep and refer to those desirous of a good night's sleep as "wimps" or "wusses."

Amy Wolfson, a psychology professor at the College of the Holy Cross, Worcester, Massachusetts, reported at the American Psychological Association's Women's Health Conference in 1996 that women working 40-hour weeks averaged about one hour's less sleep than they needed. The deprivation is greater when children under 18 are at home. Thomas Roth, head of the Sleep Disorders and Research Center at Detroit's Henry Ford Hospital, proposes a simple test for sleep debt: if you fall asleep in less than 6 minutes, the chances are that you are sleep-deprived. People typically take more than 6 minutes and upward of 15 minutes to fall asleep. Of course, exceptions occur.

June Pilcher (now at Clemson University) and Allen Huffcutt, psychologists at Bradley University, Peoria, Illinois, reviewed 19 studies of sleep deprivation, with a total of 1,932 subjects (*Sleep,* June 1996). Their conclusion was that sleep deprivation has the largest effect on mood (it fosters a more negative mood), with a somewhat smaller effect on cognitive tasks and an even smaller effect on physical tasks. Overall, the average performance of sleep-deprived individuals was around the ninth percentile among the 1,932 total subjects.

An Associated Press news article dated July 30, 1999, identifies an increasing recognition of sleep disorders among harried Japanese workers. Attributing it to the stress of crowding, commuting, long work hours, and financial woes, Japanese researchers estimate that one in five workers suffers from insomnia. The male suicide rate is up in Japan, and depression stemming from lack of sleep is viewed as a major cause. An industry is emerging that specializes in stress reduction and sleep induction. Healing Garden, for example, is a salon where the stressed-out get rubdowns, listen to soporific music, and whiff appropriate herbal scents, such as cinnamon, which is known to help achieve sleep onset. In operation since 1994, Healing Garden serves about 1,400 customers monthly. One planetarium holds concerts intended to make people sleep! (See also topic 16.8.)

The safety hazards of severe sleep deprivation—several days without sleep—can be eliminated by one night of natural, uninterrupted sleep (typically 9–10 hours). The effects of long-term sleep

deprivation (e.g., less than 7–8 hours a night for 10 years) includes increased risk of heart disease, weight control hormones going out of sync (causing higher fat storage and less efficient burning of fat), depression, anxiety, insulin resistance, and increased risk for accidents (*Prevention,* March 2004, p. 198).

Applications

❶ If you must experience severe sleep deprivation, nap whenever possible.

❷ If you have experienced severe sleep deprivation and are engaging in a safety-related activity such as driving or operating large machinery, take appropriate safety precautions: alert a backup, take frequent breaks and move around, take deep breaths, sip a caffeine drink, have someone to talk with, talk to yourself, or yawn (a lot!).

❸ The maximum sleep deprivation possible without posing a major safety hazard is either (a) two to three days on no sleep, (b) six days with 1½ hours' sleep each day, or (c) nine days with 3 hours' sleep each day (Webb, 1982).

❹ Support naps and extended sleep periods for operators of long-haul vehicles.

❺ Stand up for your rights. Don't let your peers sneer at you for getting proper sleep. They're the losers. Don't wake up early to have your workout; the stress from sleep loss cancels the benefits of the exercise.

TOPIC 16.10 Sleep and Medication

In the first edition of this book, I pointed out that European research on melatonin as the sleep neurotransmitter was far ahead of research in the United States. I'm happy to report that the United States has now caught up. The production of melatonin, a naturally occurring hormone, is triggered by the pineal gland in the absence of sunlight; the reappearance of sunlight suppresses the production of melatonin (even for the blind). Melatonin is produced by the protein AA-NAT. As the brain perceives darkness, AA-NAT levels

rise and so do melatonin levels. When the lights come back on, AA-NAT levels fall, and melatonin falls. (Some researchers call melatonin the "Dracula hormone" because it simulates the effect of nighttime.) Melatonin is available from most health food stores, drugstores, and even supermarkets. The most common dosages range from 0.5 mg to 10 mg. Although no harmful side effects have been reported (people do dream more vividly), most folks are taking too much. Dosage should begin at 0.5 mg and increase by 0.5-mg increments until the optimum level is found. A friend of ours, deprived of melatonin by lactose intolerance (melatonin is also a metabolite of dairy products), started out with a 3-mg capsule and found himself getting a good night's sleep for the first time in years. I encouraged him to cut back and find the lowest possible dosage; he's settled in at 1.5 mg.

Caution: Just to be on the safe side with melatonin, purchase only pills synthesized in the laboratory, and avoid pills extracted from animals. Animal-derived melatonin carries a small chance of bringing along viruses and who knows what else. Check the label and/or consult with your pharmacist. Also, be aware that not everyone has endorsed melatonin as a sleep medication. Clifford Saper (1996), Putnam Professor of Neurology and Neuroscience at Harvard Medical School, writes, "At present, taking melatonin for sleep is both without sound basis and potentially dangerous, as the long term effects of it have never been studied adequately" (p. 3). He is especially concerned about lack of certification that the pills contain no contaminants.

Steve Henriksen, of the Western University of Health Sciences in Pomona, California, reported in *Science,* June 9, 1995, that a compound identified as cis-9,10-octadecenoamide, dubbed *oleamide,* when injected into rats, even well-rested ones, results in a quick, deep sleep. The sleep appears to exhibit the features of natural sleep, including the lowering of body temperature. The compound, a lipid that occurs naturally in the cerebrospinal fluid of cats, rats, and humans, is found at higher levels in sleep-deprived cats, lower levels in rested cats. When injected animals were roused from a deep sleep, they showed no apparent ill ("hangover") effects from the injections. The Scripps laboratory has successfully synthesized oleamide. Eventually, treatment will be available for humans either in the form of oleamide-based pills, which increase levels of oleamide, or *oleamide hydrolase inhibitors,* agents that prevent the breakdown of naturally occurring oleamide, thus optimizing one's natural supply.

The sleeping pills Dalmane and Halcion, while inducing sleep, have a negative effect on brain function, causing memory loss, withdrawal

symptoms, and loss of coordination. Some insomniacs are helped by taking a small dose of calcium and magnesium (such as Citracal Plus with Magnesium) at bedtime on an empty stomach. Beware too much magnesium, however, as it can lead to diarrhea. Physician and sleep researcher Andrew Krystal of Duke University found that insomniacs taking the drug Estorra (now called Lunesta) nightly for six months report falling to sleep faster, sleeping longer (by up to 40 minutes), and feeling more alert during the day than other insomniacs taking a placebo. No serious side effects have been reported. Lunesta (made by Sepracor) has proven to be effective when taken for up to a year, with no next-day groggy feelings. Indiplon and Ramelteon are two more recent drugs with good records. Two other drugs, Ambien and Sonata, tend to become addictive after a week or two, can cause dizziness, grogginess, or memory problems the next day, and should not be taken along with alcohol. Both drugs should be taken only when you can sleep for at least four hours afterward. However, the general recommendation is to take one of these drugs only long enough to break the pattern of insomnia—say, for a week or two.

Applications

❶ People in their 20s should take melatonin infrequently and only for insomnia. Those in their 30s to 50s may take it more frequently for insomnia; those over 60, daily.

❷ Begin with 0.5 mg of melatonin two hours before desired sleep onset, and increase by 0.5 mg until desired sleep quality is attained.

❸ For jet lag associated with travel involving time-zone changes, try 1 mg of melatonin for each time zone crossed. Take your dosage a few hours before bedtime at your destination and again when you return.

❹ Consult your physician if you are taking other medications, or if your dosage of melatonin exceeds 10 mg.

❺ Take melatonin only in the evenings, unless you are taking it for help with sleep problems associated with changing work shifts. In that case, take your dosage two hours before desired sleep onset, regardless of the time of day. A 70-year-old friend lamented that he'd tried melatonin before bedtime, but he still tossed and turned. I asked when he'd taken it.

He said, right before I turned out the light. I said, from now on, take it two hours before you turn out the light. He has, and it now works.

❻ Prefer natural sleep inducers (see the summary at the end of this chapter) over developing a dependency on prescription medication. If nothing works for you, consult your physician.

❼ Blind people should continue to have eye checkups to ensure that they retain the capacity to register light. Otherwise, they lose the regularity of their biorhythms. In particular, they should not replace their natural eyes with artificial eyes that may be more pleasing for others to look at; again, that amounts to cutting off the receptors that tell the pineal gland to stop producing melatonin.

TOPIC 16.11 Naps

First, let me be very clear: napping is not sleeping! The goal of napping is to move from beta waves to alpha waves (see final page of chapter 2, and topic 16.1). Alpha waves are associated not with sleep, but rather with a kind of trance or meditative state. I nap every afternoon, usually somewhere around 2 o'clock. I turn out the lights, go to the recliner by my window, recline or lie down, read from my iPad for ten minutes or so, then shut my eyes and just lie there, thinking about whatever, but allowing my mind to be empty or busy, whatever it chooses. In about 5 or 10 minutes, images start dancing in my mind's eye, images that I can manipulate and play with, making them change and perform to my liking. This is alpha state. No matter how drowsy I am when I lie down, my eyes pop open when I reach alpha state, as if my mind and body were saying, "Thank you, Pierce. I needed that." I then return to my workstation refreshed, usually accompanied by a fresh cup of tea (I put the water in the microwave before lying down!). If you should attempt to nap, and let yourself actually get beyond alpha state and into theta state, you're in trouble! You're then officially asleep, and when you wake (unless you sleep for a full cycle), you'll feel groggy, like a truck had hit you, especially if you stay under long enough to get into delta state, or deep sleep. Before I had a recliner in my office, I napped on the floor, spread-eagle on my back—a good way to make sure I didn't actually go to sleep!

People who nap consistently live longer and show a 30 percent

lower incidence of heart disease. My 89-year-old father-in-law (now deceased) took a daily nap after lunch for 70 years and outlived all the men in his family. The ideal time for a nap, according to David Dinges, a University of Pennsylvania sleep researcher, seems to be 12 hours after the midpoint of one's previous night's sleep. So if I sleep from 11:00 P.M. to 6:00 A.M., my nap urge should be around 2:30 P.M. The ideal length seems to be 30 minutes. Evening naps appear to interfere with sleep. The worst time to nap is at the bottom of the circadian rhythm, between 3:00 and 6:00 A.M. (Webb, 1982).

Rossi and Nimmons (1991) talk of "ultradian breaks" and recommend two or three 20-minute naps a day. The urge to nap occurs in a natural rhythm, and denying this urge has a negative effect on health, productivity, and general well-being. This denial occurs most commonly among office workers who stoically resist throughout the day. The result is chronic mild arousal.

Psychologists Mark Rosekind, of the NASA Fatigue Countermeasures Program (now with the National Transportation Safety Board), and David Dinges, of the University of Pennsylvania Medical School, have teamed up to measure fatigue in pilots crossing multiple time zones (transmeridian flights). They found that pilots who were allowed a planned 40-minute rest period including a nap never lapsed in their performance. Both rested and unrested pilots showed physiological measures of fatigue during the last 90 minutes of flight, but the unrested group had twice as many measurably sleepy episodes as the rested group. Performance was measured by a timed response to a visual cue (*APA Monitor,* May 1996).

Lydia Dotto (1990) points out that the effects of napping are different for the sleep-deprived and the nondeprived. She found that for the sleep-deprived, napping improves performance but not mood; for normal sleepers, napping improves mood but not performance.

Applications

❶ When possible, take a 15- to 30-minute nap in early to midafternoon to get recharged. Some people practice meditation to achieve the same effect. Minimize your reliance on caffeine for recharging. *Viva la siesta!*

❷ Although naps are generally recommended, they are crucial for people who do not get an uninterrupted night's sleep. The First Napper, former President Bill Clinton, reportedly sleeps 4–6 hours, then naps at least

once daily, anywhere from 5 to 30 minutes, and awakes refreshed. He claims to be able to nap leaning against a wall.

❸ Provide a nap room at work. *(Contributed by Vicki Halsey of Blanchard Training)*

TOPIC 16.12 Naps at Work

Rossi and Nimmons (1991) cite support for two or three 20-minute naps per day. That is the ideal number for maximum quality, productivity, sense of well-being, and overall health and longevity. Studies show that nappers outproduce non-nappers; however, a goal of three naps a day is out of reach for most people. Perhaps a minimum of one 15- to 30-minute nap per day should be voted a basic human right.

Neurologist Roger Broughton of the University of Ottawa concludes from his 20 years of sleep research that "humans are born to nap" (*BrainWork: The Neuroscience Newsletter,* March–April 1998). He suggests about a 20-minute timed nap that occurs about 12 hours after the midpoint of the previous night's sleep. The improvement in alertness from such a brief nap is being acknowledged by the corporate world, as witnessed by the *Wall Street Journal*'s report that several companies are providing employee nap rooms. See more in chapter 16.

Applications

❶ Many companies have official policies that prohibit employees from napping during the workday. These policies serve public relations purposes and are not consistent with research on productivity. Don't associate reasonable napping with laziness; associate it with productivity.

❷ Some people should not be permitted to nap for safety reasons, but even they would be safer workers if they were allowed to go off-duty for a short nap.

❸ If you are a citizen and spot a public worker napping, resist calling in to report it as laziness and a waste of the taxpayers' dollars. Appreciate the productivity, quality, safety, and health benefits associated with a

nap. Of course, if you see a public worker snoozing the day away, that's another matter!

TOPIC 16.13 Shift Work

For workers who must work a night shift, such as midnight to 8:00 A.M., two issues are important: (1) ensuring good sleep and (2) ensuring alertness at work. Because the body appears to work on a cycle of just over 24 hours (see topic 16.3), rotating shifts should advance, not regress; in other words, day shifts should be followed by afternoon shifts, then by night shifts. Following a day shift with a night shift conflicts with the natural body clock.

Timothy Monk, a psychiatry professor at the University of Pittsburgh School of Medicine, has identified eight common risks associated with rotating shift work (Slon, 1997):

1. Chronic fatigue
2. Depression and loneliness
3. Susceptibility to colds and flu
4. Stomach problems
5. Erratic menstrual cycles
6. Obesity
7. Heart disease
8. Accidents

Physician Acacia Aguirre reports that the 24 million Americans who work night shifts are at five times greater risk for stomach ulcers, twice as likely to smoke or use stimulants, at higher risk for high blood pressure, heart attack, and breast cancer, and, if they have kids, are three to six times more likely to divorce. He recommends sleep, exercise, and limiting oneself to one dose of caffeine (1 mg/lb of body weight) during any seven-hour period of being awake, or, two doses daily.

Long term, the best remedy is to relieve your body of the stress of night work. Ichiro Kawachi, an associate professor of health and social behavior at the Harvard School of Public Health, has found that working the night shift for more than six years nonstop results in a

50 percent increase in the risk of heart disease (Slon, 1997). Timothy Monk reports that many career night-shift workers "hit the wall" and lose their adaptability to night work. When this happens, they should find day work.

For the many other factors that affect the quality of sleep, browse through chapter 9.

Applications

❶ Monk has a variety of recommendations for helping rotating shift workers maximize the chances of a good night's sleep, including these:

- Take sleep seriously: avoid TV, don't fall asleep on the couch.
- Prepare a quiet room. Ensure total darkness: use blindfolds; avoid clocks that glow in the dark, or put tape over the glow; use black window shades, even black garbage bags and duct tape if necessary. Use earplugs (some foam rubber plugs are form-fitting and unnoticeable); disable telephone and doorbell ringers; buy a "white noise" machine to mask a variety of sounds; listen to a tape recording of waterfalls or something equally soothing.
- Use a "do not disturb" sign (or a sign that says, "Quiet! Shift worker sleeping inside").
- Set the thermostat so the bedroom is 65–68° F when you try to sleep; cooler temperatures make sleeping easier.
- If you don't sleep a full episode, try napping during the afternoon lull between 2:00 and 4:00 P.M. (15–30 minutes if you've slept 4 cycles or about 6 hours; 1½ hours if you've only slept 2–3 cycles or about 3–4½ hours).
- Avoid exercising just before going to sleep; instead, exercise upon waking. The exercise makes you alert, not sleepy.
- Expose yourself to bright lights while at work at night; full-spectrum light is best (see a discussion of full-spectrum light and the color rendering index in topic 10.8, especially application 1).
- Don't drink caffeinated drinks within six hours of desired sleep onset; it takes that long for the caffeine to metabolize.
- Eat your largest meal at "lunch" during the night shift, then eat a light "dinner" with carbohydrates and your daily fat allowance (see the discussion of nutrition and alertness in topic 14.8). If healthy

snacks are unavailable, take small portions of fresh fruit and vegetables, low-fat yogurt, air-popped popcorn, or some other snack that does not contribute to the tendency to gain weight during night work.

- Try taking a 10-minute brisk walk during breaks. You will burn calories and increase alertness, rather than consuming them and getting sleepy, even around 4:00 A.M., when circadian rhythms foster sleepiness.
- Avoid sunlight as much as possible on the drive home in the morning (drive on shady streets) so daylight doesn't get a foothold on your biorhythms. Monk recommends welder's goggles, but they are unsafe for driving, so try close-fitting wraparound sunglasses.
- Resist eating a big meal in the morning before going to bed. It interferes with sleep, causes indigestion, and leads to weight gain (you have no exertion afterward to burn off the calories).
- Go straight to bed. Don't do chores or watch TV; instead, read something with the aid of a weak light.
- Avoid alcohol as a sleep inducer: it deprives you of rapid-eye-movement (REM), or dream-stage, sleep, and although you might get to sleep more quickly, it prevents the most relaxing form of sleep.

❷ Wake up to bright lights to help reset your body clock. (See topic 9.3 for the recommended light strength and pattern.) Work areas, break areas, and toilets should be especially well lit for shift workers.

❸ For an ideal 21-day shift progression built on the 24-plus-hour cycle, refer to table 16.1 in topic 16.3, "The Circadian Rhythm."

❹ Monk recommends going to bed the same time every night (or day). If you are working nights during the week and you want to catch a daytime activity with your family on Saturday, then go to bed on Saturday morning at the regular time, get up for the event, and take a long nap afterward. That way, your body doesn't have to keep resetting its clock.

❺ Monk says that the ideal shift work is "rapid change forward" shifts: two "on" days, two "on" evenings, two "on" nights, then several days off; just make sure to go to bed the same time every night and catch up on the sleep you miss on the two night shifts.

6 The French have a reputation for treating night workers well. One key, apparently, is their tendency to ask night workers what would help to reduce their stress. The workers ask, for example, to have more flexibility in taking time off for vacations and holidays. This gives them a greater sense of control (and we know that this is a major stress reducer).

7 Provide protein snacks for night workers to minimize the drowsiness that results from consuming fats and high-glycemic carbohydrates.

TOPIC 16.14 Dreams

Everybody dreams. Dreaming takes place during REM sleep, which first begins around the 14th to 16th week in the womb. The REM sleep of infants occupies about 45–60 percent of their total sleep time; that of mature and senior adults, about 20–25 percent. During REM, the nervous system's sensory output, external sensory input, and inhibition or control are blocked. Physiologically, this is accompanied by a drastic drop in production of the neurotransmitters serotonin and norepinephrine. Meanwhile, as the inhibiting effect of the serotonin and norepinephrine disappears, the neurotransmitter acetylcholine increases in the brain stem and activates a flood of internal memories and perceptions. The fact that we exert no management of these internal perceptions results in an often bizarre collage of whatever comes to the big screen during this central core dump.

Research by Allan Braun of the National Institutes of Health and Thomas Balkin of Walter Reed Army Institute of Research revealed that brain scans of dreaming subjects contained no activity in the frontal area of the brain, which is involved in planning and higher reasoning, thereby confirming the "unmanaged" nature of dreams. Interestingly, and in additional partial confirmation of the "unmanaged" theory, David Maurice, a professor of ocular biology at New York's Columbia-Presbyterian Medical Center, says that the primary purpose of rapid eye movement is to restore levels of oxygen to the cornea.

Hobson (1988) has defined a theory of dreams he calls the *activation-synthesis model,* which states that dreams are made (synthesized) out of the uncontrolled internal images and perceptions that bounce off each other (are activated) during REM sleep. He argues, accordingly, that "the meaning of dreams . . . is thus transparent rather than opaque. The content of most dreams can be read directly, with-

out decoding. Since the dream state is open-ended, individual dreams are likely to reveal specific cognitive styles, specific aspects of an individual's projective view of the world, and specific historical experiences" (p. 219). Hobson points out that the physiology and content of dreams are similar to those of mental illness. The difference, he says, is that in dreaming we don't expect to have control of our minds, whereas the mentally ill have poor or no control of their memories and images where we would expect control to exist. He also presents a highly readable review of dream research, including its history, a neurobiological description of dreaming, and a discussion of the interpretation of dreams.

Applications

❶ Regard your dreams as a form of brainstorming, in which a flood of unevaluated and unmanaged images and ideas piggyback off each other and merge in often bizarre ways.

❷ Understand that the search for latent, hidden meanings in dreams is a game with a potential for inappropriate results. I had a dream one night about trying to destroy a toy train before a Japanese woman prevented me; my wife was setting the charge as I kicked off on my bicycle. Each of these images represented something I had read about recently: major rail accidents in Manhattan and South Carolina and an article in *Time* magazine about a Japanese executive who was forced to take a vacation. Don't ask *why* these images occur in your dreams; more appropriately, ask *where* they come from. Remember that bizarre combinations can result from zero management control.

TOPIC 16.15 Nightmares

Visualization techniques have proved to be a big help in reducing or eliminating nightmares. They consist of re-creating a visual scene or episode with one's eyes closed and can include actual physical movements; watch Olympic skiers visualize a run with movements before starting. These techniques can be self-taught and self-administered, or they can be learned with the help of a therapist, sleep clinic, or dream specialist.

Applications

❶ If you want to try teaching yourself visualization techniques for nightmare reduction, try the following:

- Recall your most recent nightmare in full detail.
- Alter a significant detail in the nightmare (change a tiger to a cat, a man to a woman, a knife to a feather).
- Play through the complete nightmare, substituting this new detail throughout.
- Continue this sequence until the nightmare stops or becomes acceptable.

❷ Visit a sleep clinic for professional help.

TOPIC 16.16 Sleep Differences Between the Sexes

The National Sleep Foundation reports that women are 50 percent more likely to have disturbed sleep than men (www.sleepfoundation.org). An average of 2.5 nights of sleep disturbance are associated with the early stage of menstruation in 71 percent of women, totaling 30 days of poor sleep annually; disturbed sleep is reported by 79 percent of pregnant women; and menopause disrupts an average of five nights monthly in 56 percent of women. For the latter group, estrogen replacement therapy appears to ease insomnia.

Applications

❶ Don't be one of the 7 percent of pregnant women who drink alcohol to help them sleep. It not only doesn't help you sleep (see topic 16.6), it also puts the fetus at risk.

❷ Be aware of the normal tendency for menstruation, menopause, and pregnancy to disrupt normal sleep. Try the specific recommendations listed in this chapter for help in getting to sleep, and see the summary list at the end of this chapter. When sleep disruption persists, reserve the right to take a nap to counter the effects of sleep deprivation.

TOPIC 16.17 Getting Back to Sleep

If you've awakened in the middle of the night and can't get back to sleep, it's a good bet that you've somehow become aroused. What you need to do is shut down your aroused state. Several of the strategies mentioned earlier in this chapter will minimize the chance of your waking. However, if the worst happens and you become wakeful, there are several ways to lower your level of arousal.

Applications

❶ Often sleep eludes us because our thoughts race around trying to keep from being forgotten. Keep a pad and pen beside your bed and take a mental dump by writing down all those thoughts that are bumping into each other. You can then sleep peacefully and deal with them tomorrow.

❷ Sometimes our sleep is disturbed by an emotionally arousing disturbance, such as a phone call or a surprise intrusion. You need to come down from this state of limbic arousal—in other words, you need to get bored again. Try reading the most sleep-inducing book you can think of.

❸ Get out of bed, leave the bedroom, and engage in a constructive but boring activity in subdued light. Getting up to a large dose of bright light will suppress melatonin production, which you don't want to happen. Associate your bed only with sleep.

❹ Drink a cup of warm milk with honey; eat cheese, yogurt, ice cream. Recently I awoke in the middle of the night and just couldn't get back to sleep. I got up, went downstairs, got a couple of ounces of cheese and some walnuts, sat in my favorite reading chair, and munched and read for about 45 minutes. I started to get sleepy, returned to bed, and went to sleep immediately. I think I had gone to bed hungry, and when I awoke, my empty tummy interfered with getting back to sleep.

❺ Take a melatonin pill.

❻ Check to make sure that your room is pitch-black; use wide, long, opaque shades that block out all light, or an eye mask.

❼ Meditate.

❽ If you can, simply enjoy resting.

❾ If self-help such as this fails, try finding a therapist who will do cognitive-behavioral therapy (CBT) with you (see chapter 15). Gregg Jacobs, sleep expert with the University of Massachusetts Medical School, in his book *Say Good Night to Insomnia*, suggests a possible joint approach using a pharmaceutical like Ambien or Sonata to help get you started with regular sleeping, but relying on behavior change to complete the job over time, eventually discontinuing drugs. The CBT techniques are similar to many others mentioned elsewhere in this book, from not reading in bed and regular sleep onset times to relaxation techniques.

❿ Get a copy of *The Harvard Medical School Guide to Getting a Good Night's Sleep* by Lawrence Epstein and Steven Mardon (2006). Amazon customers rate it four stars out of five—much better than the last one we recommended!

TOPIC 16.18 Stability in Sleep Patterns

A study that related pilot error in landings to the interval between sleep periods (Webb, 1991) found that the more variable the interval between sleep periods, the more likely a pilot is to make an error in landing. In other words, for a five-day period, if pilot A is up for 17 hours the first day, 12 the second, and then 20, 15, and 21 hours on consecutive days, and pilot B is up for 16, 18, 17, 18, and 16 hours on the same five days, then pilot A will be more likely to make an error in landing (or other similar errors) than pilot B, whose intervals between sleep periods showed less variation from day to day.

Cross-cultural studies by Sara Harkness, professor in the School of Family Studies, University of Connecticut, found that quality of sleep in infants was related to lifestyle issues. For example, Harkness found that Dutch parents tend to pick up infants less during the day, encourage less stimulating activities during the day (for example, they do not appear to take infants to shopping malls), and put them to bed nightly at the same time. This preference for rest and regularity, according to Harkness, results in Dutch babies sleeping longer than American ba-

bies and sleeping through the night at an earlier age than American babies (reported by the Associated Press, February 21, 1995).

Applications

❶ Pilots, and others in jobs with major safety implications that require continuing alertness, should minimize day-to-day variations in the number of hours between getting up and going to sleep.

❷ Be aware that your infant's sleep patterns may reflect your lifestyle. For more regular sleep, prefer a more routine and less stimulating lifestyle.

TOPIC 16.19 If You *Don't* Want to Sleep!

Drug manufacturer Cephalon markets Provigil (modafinil), a drug that allows one to stay awake, alert, focused, and able to handle complex issues, for upward of two days. Modafinil does not entail the bothersome side effects of caffeine and other stimulants. Designed originally for narcoleptics, it was approved by the FDA for other medical conditions. However, experiments have been under way for use with jet lag, military situations, shift work, and other contexts that require relief from the urge to sleep. Perhaps our national leaders should have a supply available for clear thinking in case of a round-the-clock crisis.

Application

❶ If you feel that you have a legitimate need for sleep suppression, consult with your physician about the possibility of prescribing modafinil.

TOPIC 16.20 Apnea and Restless Legs

Some people stop breathing repeatedly during sleep. This disorder is called *sleep apnea.* Untreated, apnea can cause high blood pressure, memory problems, weight gain, impotence,

headaches, job difficulties, and equipment operation accidents. Apnea can be effectively diagnosed and treated by submitting yourself to a sleep clinic. Several Note to editor: My wife's bariatric surgery cured her apnea! If those who see you sleeping report that you quit breathing from time to time, or if you experience significant drowsiness during the day or the feeling that you can't get a good night's sleep, you should consider going to a sleep clinic for evaluation.

Restless legs has no clearly known cause and no single effective treatment. Those who have the disorder report feeling that their legs (and sometimes arms) are creeping, crawling, tingling, or pulling, or are simply painful, resulting in an irresistible urge to move the affected limb, thus making sleep difficult. The disorder is thought to be associated with anemia, diabetes, kidney problems, Parkinson's disease, and pregnancy, and is often treated by addressing one of these underlying conditions. Other treatments include dietary modifications, exercise, and bathing.

Applications

❶ For complete information and support on these two disorders, visit these websites: www.sleepapnea.org and www.restlessleg.net.

❷ If you suspect you have sleep apnea, check yourself into a sleep clinic for evaluation.

A Final Word on Sleep

Here are some of the major principles associated with good sleep:

Getting to Sleep

- Consume dairy products (the warmer the better).
- Avoid artificial sweeteners.
- Avoid food additives.
- Avoid caffeine within six hours of bedtime.
- Keep to a regular bedtime.
- Consume carbohydrates and fats.

- Avoid protein.
- Read or view unexciting material.
- Avoid exercise within four hours of bedtime.
- Sleep in absolute darkness (use an eye cover if necessary).
- Maintain quiet (use earplugs if necessary).
- Do not take naps after 3:00 P.M.
- Meditate.
- Avoid beans, raw onions, cruciferous vegetables (broccoli, cauliflower, cabbage), and spicy foods before bedtime.
- Take melatonin pills.

Getting Quality Sleep

- Lose weight.
- Avoid alcohol within three hours of bedtime, and replace each ounce of alcohol with eight ounces of water.
- Plan sleep according to sleep cycles and circadian rhythms.
- Do aerobic exercise regularly, but not close to bedtime.

Getting Back to Sleep

- Write down what's on your mind.
- Read something unexciting.
- Drink warm milk with honey.

SUGGESTED RESOURCES

Arkin, A. M., J. S. Antrobus, and S. J. Ellman (Eds.). (1978). *The Mind in Sleep.* Hillsdale, N.J.: Erlbaum.

Coren, S. (1996). *Sleep Thieves.* New York: Free Press.

Hobson, J. A. (1988). *The Dreaming Brain.* New York: Basic Books.

Sahelian, R. (1997). *Melatonin: Nature's Sleeping Pill* (2nd ed.). Garden City Park, N.Y.: Avery Publishing Group.

Webb, W. B. (1992). *Sleep: The Gentle Tyrant* (2nd ed.). Bolton, Mass.: Anker.

Websites

Sleep Research Society:
www.sleepresearchsociety.org

National Sleep Foundation:
www.sleepfoundation.org