

Unit 3: States of Consciousness



**McMurray/Tarshish
History Division
Spring 2016**



States of Consciousness Schedule

Topic: States of Consciousness

Weeks: 4

Essential Questions: What are states of consciousness? How does our sleep impact our lives? Why and how do we dream?

Assessments: Quizzes, Sleep and Dream Journals

Week 1

Monday 14	Tuesday 15	Wednesday 16	Thursday 17	Friday 18
<ul style="list-style-type: none"> Finish Inside Out Discussion Mouse Party 	<ul style="list-style-type: none"> Finish Mouse Party 	Shortened Periods Wrestling Assembly <ul style="list-style-type: none"> Intro Unit National Sleep IQ Quiz Start Readings 	<ul style="list-style-type: none"> SoC Lecture 	Due: SoC Notes 1 <ul style="list-style-type: none"> SoC Lecture (as needed) Start Sleep Hygiene Infographics
HW: Missing Work for Q3	HW: Missing Work for Q3	HW: SoC Notes 1 due Friday	HW: SoC Notes 1 due Friday	HW: SoC Notes 2 due Monday

Week 2

Monday 21	Tuesday 22	Wednesday 23	Thursday 24	Friday 25
Due: SoC Notes 2 <ul style="list-style-type: none"> Finish Sleep Hygiene Infographics 	<ul style="list-style-type: none"> Dream Jigsaw 	Due: SoC Notes 3 <ul style="list-style-type: none"> Dream Jigsaw 	<ul style="list-style-type: none"> 60 Minutes the Sleep Cycle Video 	No School Spring Break
HW: SoC Notes 3 Due Wednesday	HW: SoC Notes 3 Due Wednesday	HW: None	HW: None	HW: Get Sleep

Week 3

Monday 4	Tuesday 5	Wednesday 6	Thursday 7	Friday 8
<ul style="list-style-type: none"> Share about Break Introduce Sleep and Dream Log Dreams and Disorders Lecture 	<ul style="list-style-type: none"> Finish Dreams and Disorders 	<ul style="list-style-type: none"> Inception 	<ul style="list-style-type: none"> Inception 	<ul style="list-style-type: none"> Inception
HW: Sleep and Dream Log	HW: Sleep and Dream Log	HW: Sleep and Dream Log	HW: Sleep and Dream Log	HW: Sleep and Dream Log

Week 4

Monday 11	Tuesday 12	Wednesday 13	Thursday 14	Friday
<ul style="list-style-type: none"> Inception Begin article on Lucid Dreaming 	<ul style="list-style-type: none"> Small group discussion on film and article 	<ul style="list-style-type: none"> Inception Explained Work on Sleep and Dream Reflection 	<ul style="list-style-type: none"> Work on Sleep and Dream Reflection 	<ul style="list-style-type: none"> Discuss and Submit Sleep and Dream Journals w/Reflection Introduce next unit
HW: Sleep and Dream Log	HW: Sleep and Dream Log	HW: Sleep and Dream Log	HW: Sleep and Dream Reflection	HW: None

Note: This document presents a tentative outline of the calendar and assignments. It is subject to change.

States of Consciousness

Module 20

Sleep, Dreams, and Body Rhythms

Module 21

Hypnosis

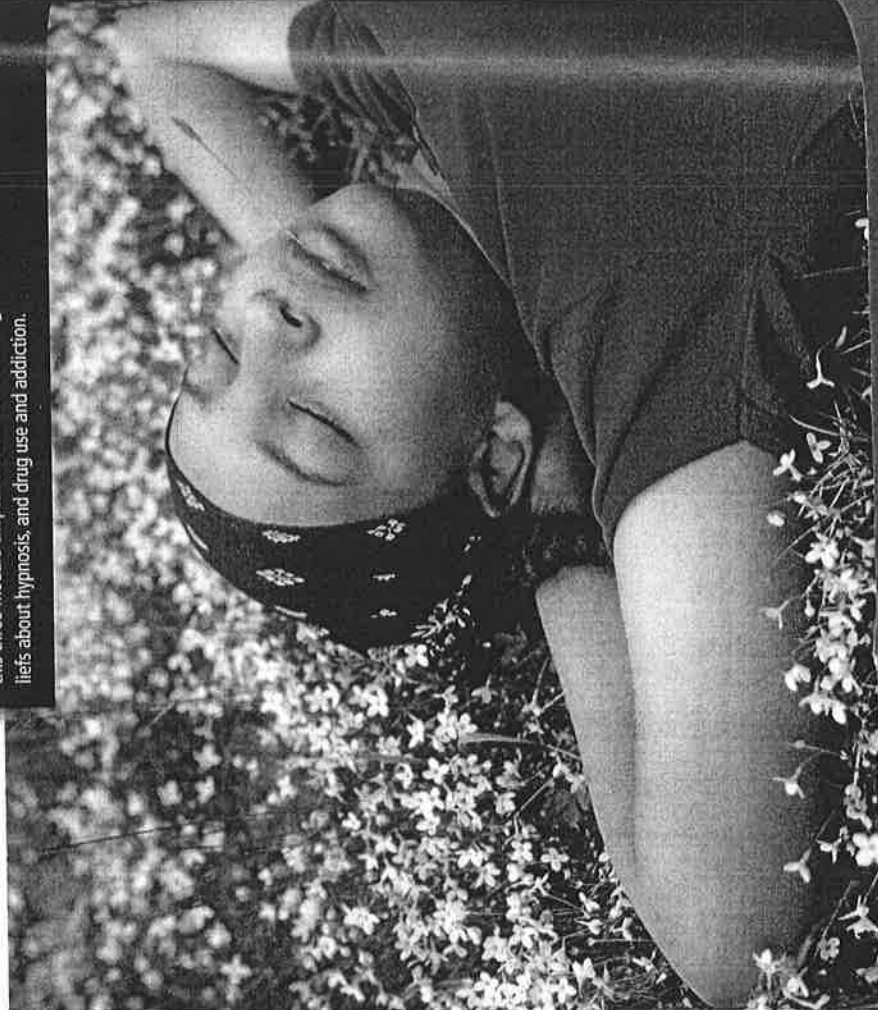
Module 22

Drugs

I had been unfairly accused of taking something though I couldn't really remember what it was. Nobody wanted to hear my side of the story. My friends and family wouldn't listen, and they actually started chasing me in hopes of turning me into the authorities. Presumed guilty instead of innocent, I feared I was going to be arrested, tried, and convicted without any hope of legal assistance. Cornered and frightened, with no place to hide, I thankfully woke up.

The emotions and events of this dream seemed so real that I had a lot of trouble getting back to sleep. There was even a slight moment of pause, after waking, where I had to reassure myself, "That was a dream, right? Yes. Phew!"

Dreaming is merely one of the altered states of consciousness we will examine in this three-module chapter. We also will be taking a close look at the research and beliefs about hypnosis, and drug use and addiction.



MODULE 20

Sleep, Dreams, and Body Rhythms

Body Rhythms

Sleep and Sleep Deficit

Why We Sleep

Sleep Stages, REM, and Dreaming

Sleep Disorders and Sleep Problems

What's the Point?

1. What is 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) late at night. 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 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 upright after a brief trip to never-never land.



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

To nod off is to temporarily lose waking consciousness, or awareness of yourself and your environment. 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 affecting wakefulness and sleep.

Body Rhythms

2. How do your body's natural rhythms differ from one another?

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, their 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.)

Researchers have found that pseudoscientific biorhythm charts are useless (Hines, 1998). Researchers who have drawn random samples from regular users of these charts could not produce replicable results—meaning that if you recreate the same test, under the same conditions, the results will vary. Your body does, however, have real biological rhythms, which affect physiological processes such as body temperature, blood pressure, and the effectiveness of medicines. These rhythms fall into three main categories:

- **Circadian rhythms** occur approximately once during a 24-hour period (*circa* and *dies* in Latin mean "about" and "day," respectively). The sleep-wake cycle is an example of a circadian rhythm.
- **Ultradian rhythms** 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 stages very shortly.)
- **Infradian rhythms** take place less than once a day. They may occur once a month, as with a woman's menstrual cycle (see Thinking Critically: Infradian Rhythms and PMS, pages 380–381), or once a season, as with a bear's winter hibernation.

We are aware of some of these 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.

► **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

► **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.

Sleep and Sleep Deficit

3. What are the costs 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 at all about the gentle tyrant that drives us to bed each night. We may know even less about what happens to our mind and body if we don't get the sleep we need. 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 (Leprout & 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 alcohol use. Figure 20.1, which dramatically illustrates the effect of one 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).

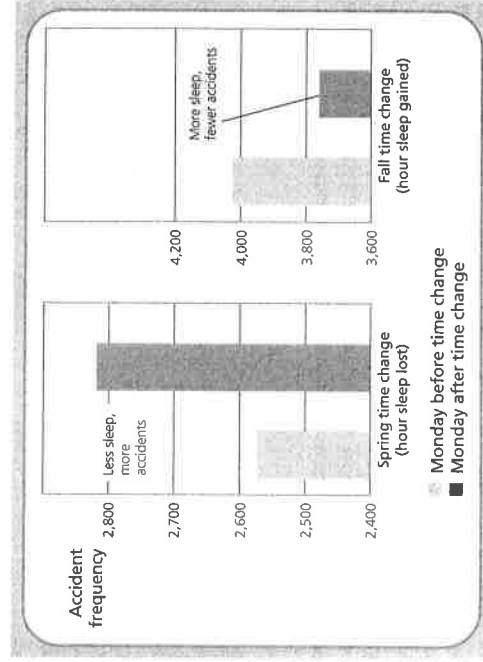


Figure 20.1 Spring Forward, Fall Back? Compare the frequency of accidents on the Mondays before and after we lose an hour to daylight saving time in the spring. In the fall, the opposite trend appeared (National Transportation Safety Board, 1995).

Infradian Rhythms and PMS

Controversy surrounds the concept of PMS, or "premenstrual syndrome." Over the objection of psychologists, PMDD (premenstrual dysphoric disorder) 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

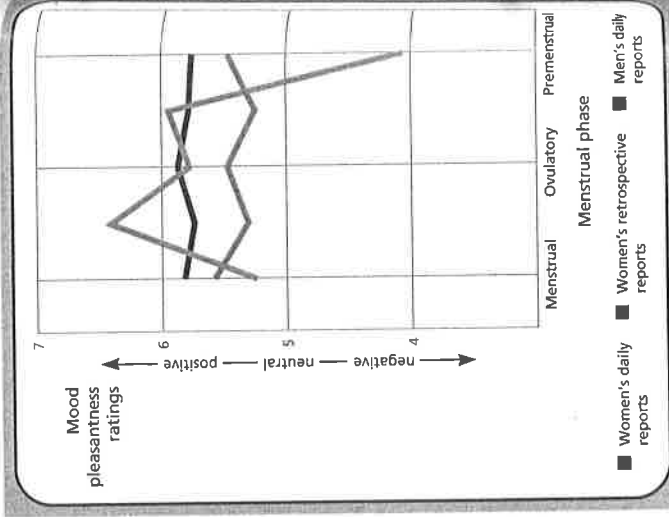


Figure 20.2 PMS or Normal Variation? Men's and women's moods fluctuate at about the same rate during any given month. However, the moods recalled by women do not match the actual moods reported day-by-day during the month (McFarlane & others, 1989).

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 two hours less sleep now than they did 70 years ago, before the days of all-night drive-throughs, the 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

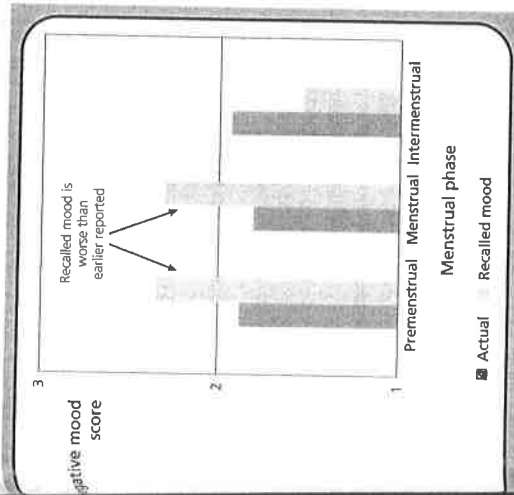


Figure 20.3 Actual Mood Versus Perceived Mood This graph shows that women's *recalled* moods do not reflect the *actual* moods they reported during the menstrual cycle.

later they ascertained the corresponding day of the woman's menstrual cycle. Some of the researchers compared their results with data from men and data from women in other cultures. The findings were remarkably consistent:

- Gender differences in mood are nonexistent (Figure 20.2). 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 (McFarlane & others, 1989).
- The menstrual cycle has little effect on actual mood (Figure 20.3) (McFarlane & 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?

► **William Dement** (1928–)
Sleep researcher who coined the term REM.

cally since the days of Pavlov, we still have no complete answer to this question. But scientists have gathered some partial answers by looking at the brain and nervous system.

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, which monitors changes in light and dark. Perceiving certain 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.

One such hormone, melatonin, has been linked to regulation of the sleep-wake cycle (Haimov & Lavie, 1996). Wake up in the morning, turn on the light or open the curtains, and the melatonin levels that built up while you slept will start to drop again. 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 night-time 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, species-specific habits, and need for nourishment (Webb, 1982). Bats, for example, sleep 20 hours a day. Cats sleep 15, but elephants drift off for only 3 to 4 hours. The adaptation theory holds 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.



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."

TABLE 20-1 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	<input type="checkbox"/>	1. I need an alarm clock in order to wake up at the appropriate time.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	2. It's a struggle for me to get out of bed in the morning.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	3. Weekday mornings I hit the snooze bar several times to get more sleep.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	4. I feel tired, irritable, and stressed out during the week.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	5. I have trouble concentrating and remembering.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	6. I feel slow with critical thinking, problem solving, and being creative.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	7. I often fall asleep watching TV.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	8. I often fall asleep in boring meetings or lectures or in warm rooms.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	9. I often fall asleep after heavy meals.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	10. I often fall asleep while relaxing after dinner.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	11. I often fall asleep within five minutes of getting into bed.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	12. I often feel drowsy while driving.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	13. I often sleep extra hours on weekend mornings.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	14. I often need a nap to get through the day.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	15. I have dark circles around my eyes.	<input type="checkbox"/>

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 wake without an alarm clock and feel alert all day." (Quiz reprinted with permission from James B. Maas, *Power sleep: The revolutionary program that prepares your mind and body for peak performance* [New York: HarperCollins, 1999].)

Why We Sleep

4. 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." Though we have come a long way technologi-

Sleep Stages, REM, and Dreaming

The Stages of Sleep

5. What are the four stages of nondreaming sleep?

The sleep-wake cycle itself is circadian, but we all have a 90-minute *ultradian* rhythm cycling throughout our night's sleep. During the 90-minute 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:

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 (Figure 20.4)! The electrodes, which are connected to an electroencephalograph (EEG), are collecting brain wave measurements (not delivering shocks!), so the procedure is painless.

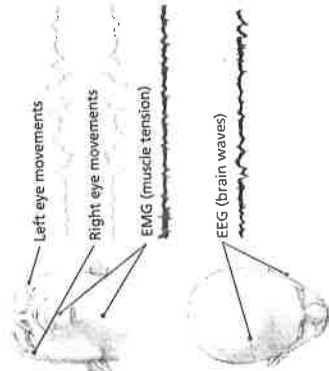
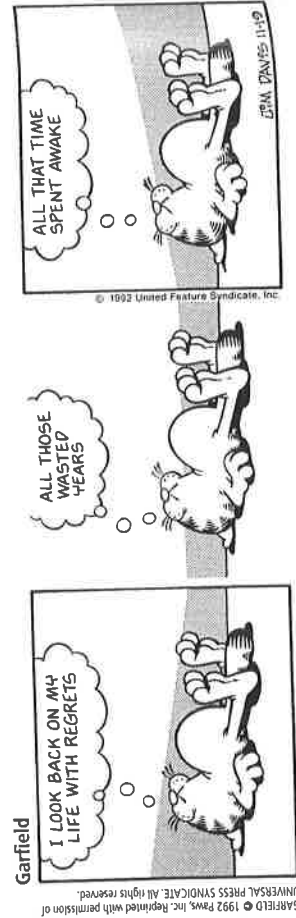


Figure 20.4 Measuring Sleep Sleep researchers use electrodes to measure brain waves, eye movements, and muscle tension while we sleep. They can use the changes in these measurements to label the different stages of sleep and dreaming.

sleep, your brain waves cycle more and more slowly. 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 (Figure



20.5). You will not 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 five minutes (Figure 20.6). It would be easy to awaken you from this stage, and if we did, you'd probably insist you had not been sleeping. You may also report that you had fantastic, dreamlike sensations, such as falling.

But let's imagine that we 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*. Little brain wave bursts called *spindles* characterize this stage. 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, identified by the increasing percentage of large, slow *delta wave* cycles per second, together are called *slow-wave sleep*, or *delta sleep*. Your brain waves slow down to less than one cycle per second in *delta sleep*, 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, your rejuvenating *delta sleep* will last about 30 minutes.

REM Sleep

6. Why is REM sleep sometimes called "paradoxical" sleep?

Up to this point, you've been cycling down through the four stages of N-REM sleep, or *non-rapid eye movement 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

Figure 20.5 Brain Waves and Sleep Stages Brain waves slow down as we cycle into the deeper stages of sleep.

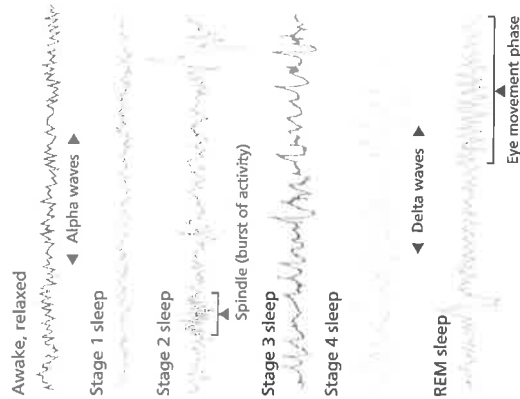


Figure 20.6 Entering the Land of Nod You wouldn't be able to say precisely when you fell asleep last night, but a sleep researcher charting your brain waves could pinpoint the time very accurately.



- ▶ **electroencephalograph (EEG)** A machine that amplifies and records waves of electrical activity that sweep across the brain's surface. Electrodes placed on the scalp measure these waves.
- ▶ **spindles** Bursts of brain-wave activity that characterize *Stage 2* of N-REM sleep.
- ▶ **delta sleep** *Stages 3 and 4* of N-REM sleep, characterized by large, slow delta waves; *delta sleep* is minimal during the last four hours of sleep.
- ▶ **N-REM sleep (non-rapid eye movement sleep)** The period of sleep in which *Stages 1 through 4* occur; not characterized by eye movement or vivid dreams.

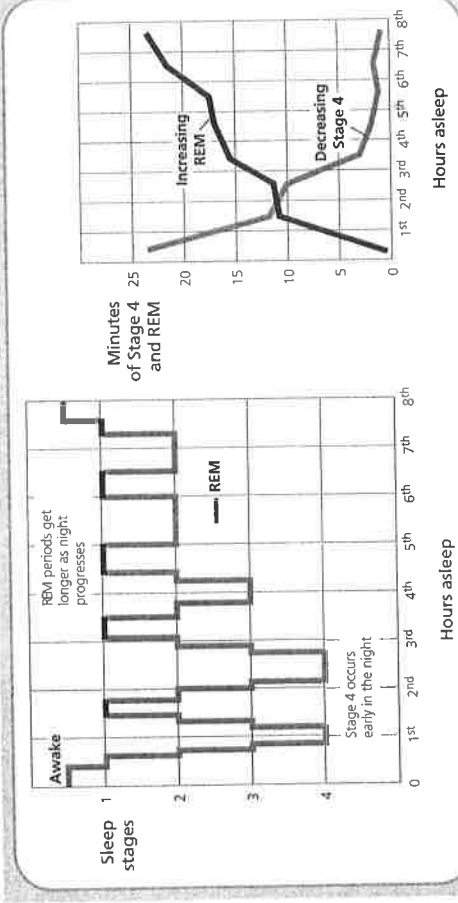
► **REM sleep** Rapid eye movement sleep; a recurring sleep stage during which vivid dreams commonly occur. Also known as *paradoxical sleep*, because muscles are relaxed but other body systems are active.

your first period of rapid eye movement sleep, or REM sleep, a type of sleep in 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, though delta sleep drops out of the cycle after the second or third time through. The last four hours of sleep, assuming you get the eight to nine hours you're supposed to, are pretty much spent alternating between Stage 2 and REM (Figure 20.7).

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 also 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 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. Over 80 percent of people awakened during REM sleep report that the wak-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.

Figure 20.7 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.



Why Do We Dream?

7. What are three modern explanations of dreaming?

There are several theories of why we dream. Sigmund Freud contributed psychology's earliest dream theory. In his book *The Interpretation of Dreams*, published over 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 most dreams could be "traced back through analysis to erotic wishes." Modern theories of dreaming offer at least three more plausible explanations:

- **Information-processing** Dreams serve an important memory-related function by sorting and sifting through the day's experiences and tying up loose ends. Research shows 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 (Figure 20.8). The discovery that the pituitary gland secretes a growth hormone *during* delta sleep 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.

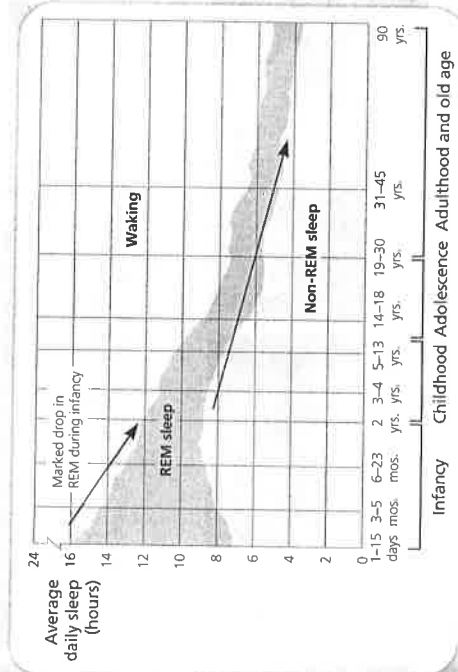
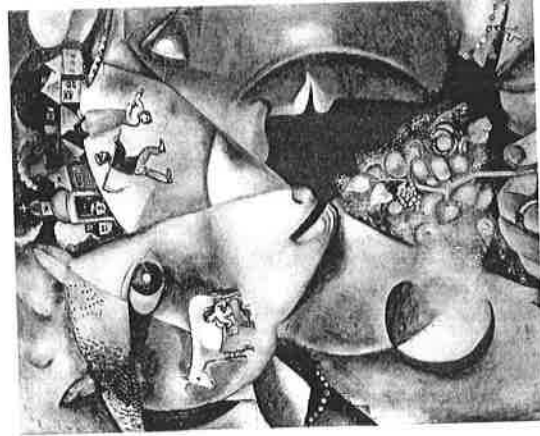


Figure 20.8 Sleep and Age Sleep patterns change as we grow older (Snyder & Scott, 1972).



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.

- **Activation-synthesis** Rather than ascribing any physiological or memory-related status to dreams, this 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 creates a dream.

We are not the only animals who experience REM sleep. We don't know if other animals are actually 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 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. Further, REM does not occur in fish, whose behavior (unlike mammals) is governed more by instinct and less by learning, supporting the information-processing model. The truth behind dreams, once discovered, will surely encompass both psychological and biological explanations.

Sleep Disorders and Sleep Problems

8. What are some common sleep disorders, and what are their consequences?

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.



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.



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. For those less fortunate, who suffer insomnia, getting to sleep or staying asleep can be a real nightmare.

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 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 than it actually did. Further, 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!

Still, there are several things you can do to increase the quality of your sleep:

- 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? Not a good idea.
- Try not to sweat it 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.

► **Insomnia** Recurring problems in falling asleep or staying asleep.

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



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. 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. Apnea 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 suffers from sleep apnea. The most common treatment involves use of a CPAP (Continuous Positive Airway Pressure) 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 (*nar* meaning "numbness," *lepsy* meaning "seizure"), a rare disease (striking 1 in 2000 people) that runs in families. Those with narcolepsy experience sleep attacks when their nervous systems get 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. Imag-

▶ **sleep apnea** A sleep disorder characterized by temporary cessations of breathing during sleep and consequent momentary reawakenings.

▶ **narcolepsy** A sleep disorder characterized by uncontrollable sleep attacks. The sufferer lapses directly into REM sleep, often at inopportune times.

ine being cut off in traffic, getting angry at the other driver, and lapsing into sleep! Fortunately, such incidents are avoidable because narcolepsy is treatable with prescription drugs. 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 very disruptive, nonetheless. The first four on this list typically occur during N-REM delta sleep (Stages 3 and 4).

- **Somnambulism** is sleepwalking. Is it dangerous to wake a sleepwalker? No, but it is difficult to awaken someone who is walking around with brain waves revving up at 1 cycle per second. Is the sleepwalker acting out a dream? Again, no. Remember, most dreams occur during REM sleep, and during that type of sleep, we lose our ability to move around.
- **Night terrors** most often afflict children, who look to all the world 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. Nightmares are dreams, so they occur during REM sleep. Night terrors are different. They 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 occurring 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 four hours of sleep per night. However, the vast majority 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. Cut that last phone call to a friend short, turn off the TV, and give in to the gentle tyrant that is your need for sleep.



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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.

Module 20: Sleep, Dreams, and Body Rhythms

What's the Point?

1. *What is consciousness?*
Consciousness is awareness of yourself and your environment. In sleep, we lose waking consciousness.

Body Rhythms

2. *How do your body's natural rhythms differ from one another?*

Our bodies have naturally recurring biological rhythms that affect physical processes. Circadian rhythms, such as the sleep-wake cycle, occur approximately once during a 24-hour period. Ultradian rhythms, such as the sleep stages, occur more than once a day. Infradian rhythms, such as bears' hibernation, occur once a month or once a season.

Sleep and Sleep Deficit

3. *What are the costs to your body when you don't get enough sleep?*
About 80 percent of all students get too little sleep, according to William Dement, a leading sleep researcher. Sleep deprivation decreases the levels of hormones that the body requires for proper functioning, and increases the level of the stress hormone, cortisol, which has been linked to damaged brain cells. Sleep deprivation also is associated with higher risk of accidents, hypertension, concentration problems, and other health problems.

Why We Sleep

4. *How do we benefit from sleeping?*
Although we know some of the consequences of sleep deprivation, we don't completely understand why sleep is necessary or what sleep does for our bodies. We do know that part of the brain, the hypothalamus, monitors light patterns and triggers bodily changes that make us sleep. The adaptation theory suggests that we sleep at times that help us stay safe, and that sleep aids survival. Others believe that sleep lets our bodies rebuild tissues, consolidate memories, and organize thoughts.

Sleep Stages, REM, and Dreaming

5. *What are the four stages of nondreaming sleep?*
We have two types of sleep, N-REM sleep, in which we dream very little, and REM sleep, in which we have vivid dreams. The N-REM portion of our sleep has four stages that repeat throughout the night:
 - Stage 1, which lasts about 5 minutes and may contain sensations like the feeling of falling.
 - Stage 2, characterized by spindles (little bursts of brain-wave activity) and higher-amplitude waves.
 - Stages 3 and 4, which combined are known as slow wave, or delta, sleep.

Delta sleep diminishes in the second half of a normal night of sleep.

6. *Why is REM sleep sometimes called "paradoxical" sleep?*

REM (rapid eye movement) sleep usually appears after the first full cycle of N-REM sleep, though it may appear earlier if the sleeper is seriously sleep-deprived. REM sleep is the period of sleep in which we have vivid dreams. The term "paradoxical sleep" reflects two seemingly contradictory and coexistent physical states: internal arousal (rapid eye movements, high pulse and breathing rates, and so on), and external calm and absence of movement. The brainstem blocks messages from the motor cortex during REM sleep, producing temporary paralysis.

7. *What are three modern explanations of dreaming?*

Sigmund Freud proposed that all dreams are the expression of conflicts over erotic wishes. Modern theories of dreaming propose instead that dreams perform one or more of the following functions: processing information we have collected during waking periods; stimulating the brain and enabling growth; and attempting to make sense of random firing of brain cells in a sort of "connect-the-dots" exercise.

Key Terms

consciousness, p. 378
pseudoscientific claim, p. 378
biological rhythms, p. 378
circadian rhythms, p. 378
ultradian rhythms, p. 378
infradian rhythms, p. 378
melatonin, p. 383
electroencephalograph (EEG), p. 384
spindles, p. 385
delta sleep, p. 385
N-REM sleep, p. 385
REM sleep, p. 386
insomnia, p. 389
sleep apnea, p. 390
narcolepsy, p. 390
somnambulism, p. 391
night terrors, p. 391

Sleep Disorders and Sleep Problems

8. *What are some common sleep disorders, and what are their consequences?*
Insomnia is difficulty getting to sleep or staying asleep, often because we are preoccupied with some problem or upcoming event. Medications, alcohol, and other drugs can suppress REM sleep and worsen insomnia. Sleep apnea is characterized by loud snoring and repeated short periods in which breathing stops. Sleep quality is poor, because these sleepers must briefly wake up and catch their breath each time breathing stops. Most people with sleep apnea are middle-aged, overweight men. Narcolepsy is the most dramatic sleep disorder. A person with narcolepsy falls into REM sleep with no warning, usually in the middle of some strongly emotional situation. Other more common sleep problems include sleepwalking (somnambulism), night terrors, teeth grinding (bruxism), bed wetting (enuresis), and sudden jerking movements (myoclonus).

Key People

William Dement, p. 380

Create a Sleep Hygiene Infographic:

Directions: Work with a partner to create a visual infographic on proper sleep hygiene. Your infographic should include both illustrations and information presented in your articles. You will be graded based on the accuracy and magnitude of information provided. In addition, your infographic will be assessed on clarity.

You must include at MINIMUM:

- 3 Warnings - Essentially, things that can go wrong or to avoid in regard to sleep habits.
- 3 Recommendations - Things that are important to do to promote healthy sleep habits.
- 3 Images - These should correspond to the content above, in at least one or multiple ways. Examples would be pictures depicting sleep issues, charts, graphs, etc.
- 1 Catchy Slogan to summarize the mission/message of your infographic. Example: "Sleep, it's what's after dinner."

Worth 10 points

Due by _____

Article 1: <http://www.sleepeducation.com/essentials-in-sleep/healthy-sleep-habits>

Healthy Sleep Habits

Your behaviors can have a major impact on your sleep and can contribute to sleeplessness. Your actions during the day, and especially before bedtime, can make it difficult to fall asleep, stay asleep or get restful sleep.

Your daily routines – what you eat and drink, the medications you take, how you schedule your days and how you choose to spend your evenings – can significantly impact your quality of sleep. Even a few slight adjustments can, in some cases, mean the difference between sound sleep and a restless night. Completing a two-week sleep diary can help you understand how your routines affect your sleep.

The term “sleep hygiene” refers to a series of habits and rituals that can improve your ability to fall asleep and stay asleep. Board certified sleep physicians recommend following a series of common-sense, healthy sleep habits to promote better sleep. These healthy sleep habits are a cornerstone of cognitive behavioral therapy, the most effective long-term treatment for patients with insomnia. CBT-I can help you address the detrimental thoughts and behaviors that are preventing you from sleeping. It also includes techniques for stress reduction, relaxation and sleep schedule management.

Sleep specialists recommend that you follow the healthy sleep habits that are highlighted in this article. If you have difficulty sleeping or want to improve your sleep, try following these sleep hygiene tips. If your sleep problem persists, the AASM recommends that you seek help from the sleep team at an AASM accredited sleep center.

Quick Sleep Tips

Follow these tips to establish healthy sleep habits:

- Keep a consistent sleep schedule. Get up at the same time every day, even on weekends or during vacations.
- Set a bedtime that is early enough for you to get at least seven hours of sleep.
- Don't go to bed unless you are sleepy.
- If you don't fall asleep after 20 minutes, get out of bed.
- Establish relaxing bedtime rituals.
- Use your bed only for sleep and sex.
- Make your bedroom quiet and relaxing. Keep the room at a comfortable, cool temperature.
- Limit exposure to light in the evenings.
- Don't eat a large meal before bedtime. If you are hungry at night, eat a light, healthy snack.
- Exercise regularly and maintain a healthy diet.
- Avoid consuming caffeine in the late afternoon or evening.
- Avoid consuming alcohol before bedtime.
- Reduce your fluid intake before bedtime.

Article 2: <https://sleepfoundation.org/ask-the-expert/sleep-hygiene>

What is sleep hygiene?

Sleep hygiene is a variety of different practices that are necessary to have normal, quality nighttime sleep and full daytime alertness.

What are some examples of good sleep hygiene?

The most important sleep hygiene measure is to maintain a regular wake and sleep pattern seven days a week. It is also important to spend an appropriate amount of time in bed, not too little, or too excessive. This may vary by individual; for example, if someone has a problem with daytime sleepiness, they should spend a minimum of eight hours in bed, if they have difficulty sleeping at night, they should limit themselves to 7 hours in bed in order to keep the sleep pattern consolidated. In addition, good sleep hygiene practices include:

- **Avoid napping during the day.** It can disturb the normal pattern of sleep and wakefulness.
- **Avoid stimulants such as caffeine, nicotine, and alcohol too close to bedtime.** While alcohol is well known to speed the onset of sleep, it disrupts sleep in the second half as the body begins to metabolize the alcohol, causing arousal.
- **Exercise can promote good sleep.** Vigorous exercise should be taken in the morning or late afternoon. A relaxing exercise, like yoga, can be done before bed to help initiate a restful night's sleep.
- **Food can be disruptive right before sleep.** Stay away from large meals close to bedtime. Also dietary changes can cause sleep problems, if someone is struggling with a sleep problem, it's not a good time to start experimenting with spicy dishes. And, remember, chocolate has caffeine.
- **Ensure adequate exposure to natural light.** This is particularly important for older people who may not venture outside as frequently as children and adults. Light exposure helps maintain a healthy sleep-wake cycle.
- **Establish a regular relaxing bedtime routine.** Try to avoid emotionally upsetting conversations and activities before trying to go to sleep. Don't dwell on, or bring your problems to bed.
- **Associate your bed with sleep.** It's not a good idea to use your bed to watch TV, listen to the radio, or read.
- **Make sure that the sleep environment is pleasant and relaxing.** The bed should be comfortable, the room should not be too hot or cold, or too bright.

Why is it important to practice good sleep hygiene?

Sleep hygiene is important for everyone, from childhood through adulthood. A good sleep hygiene routine promotes healthy sleep and daytime alertness. Good sleep hygiene practices can prevent the development of sleep problems and disorders.

How does someone know if his or her sleep hygiene is poor?

Sleep disturbances and daytime sleepiness are the most telling signs of poor sleep hygiene. If one is experiencing a sleep problem, he or she should evaluate their sleep routine. It may take some time for the changes to have a positive effect.

How do I know the best sleep hygiene routine for me?

If you're taking too long to fall asleep, or awakening during the night, you should consider revising your bedtime habits. Most important for everyone is to maintain a regular sleep-wake schedule throughout the week and consider how much time you spend in bed, which could be too much or too little.

How to Control Your Dreams

By Micaela

1

Since the age of Freud, and probably the dawn of man, dreams have fascinated human beings. They give us the power to make our own realities and may even show us a glimpse inside our subconscious or parts of ourselves we never knew existed. Today's infographic ramps up our dreaming lives by exploring the concept of lucid dreaming (dreaming in which you are aware that you're dreaming).

Lucid dreams allow us to control what's happening in our minds while we sleep. While everyone is capable of this kind of dreaming, it takes a lot of practice and mind training to have a lucid dream. The infographic below recommends some helpful techniques to achieve this state of snoozing. Writing down your dreams as soon as you wake up, for example, makes it easier to remember them and helps you keep track of reoccurring patterns or instances. You may notice a certain element, such as water, or a certain person, maybe a deceased relative, reappearing over and over again in your dreams. Once you recognize common themes, it may become easier to analyze and debunk their meanings, and eventually you may be able to change what these motifs mean to you.

The mind is a powerful instrument that can be fine tuned even in sleep. "If you must sleep through a third of your life, why should you sleep through your dreams, too?" This is a question posed by lucid dream expert, Dr. Stephen LaBerge, that I urge you to explore with the help of today's infographic.

Sweet dreams!

REM STAGES OF SLEEP



REM stands for
RAPID EYE MOVEMENT

When in REM sleep, your eyes move back and forth under your eyelids. These movements relate to where you're looking in your dream.

We enter the REM stage approximately



90

MINUTES

after falling asleep.

REM sleep in adults typically occupies

20-25%



of all sleep.

LUCID DREAMING OCCURS IN THE REM STAGES OF SLEEP

MRI scan of 40 Hz brain waves when...

AWAKE



LUCID DREAMING



DEEP SLEEP



Brain Wave Activity

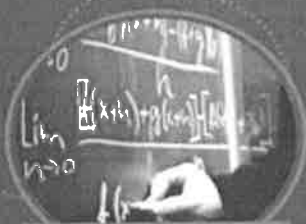
high

low

Research shows that lucid dreamers seem to share certain personality traits. They...



Are creative



Are problem orientated



Believe in personal responsibility

But anyone can start to control their dreams with practice and some tips...

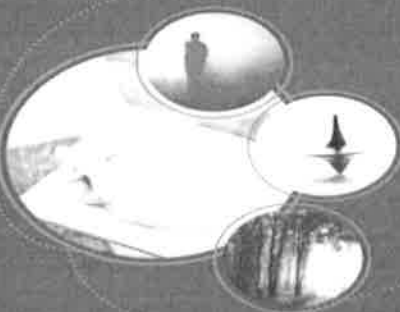
HOW TO LUCID DREAM

RECALL YOUR DREAMS

Being able to recall a dream will help you to become aware of what you are dreaming about and see the recurring themes.

Keep a dream journal

- As soon as you wake up, lie still and try to remember your dream.
- Write down what your dream was about.
- Focus on the detail and build a vivid picture of the dream.



DISCOVER DREAMSIGNS

Once you have kept a dream journal for 2 - 3 weeks, you can start analysing and recognising events that keep happening.

This could be anything: a certain person, object or place that keeps cropping up.

REALITY CHECK

Reality checks allow you to determine if you're dreaming when you encounter a dreamsign. This makes it easier to enter a lucid dream. Try these now.

NUMBER CHECKING

Check your watch, look away, then check it again.

When dreaming, the brain finds it harder to continue sequences. If the time is radically different the second time you look, you're dreaming!



SUPERPOWERS



Try to fly



Try breathing while holding your nose and your mouth closed

CHANGED APPEARANCE



Look in a mirror
Do you look different?



Look at your hands
Have you got extra or missing fingers?



TELEKENETIC ABILITIES

Try turning off the lights with your mind.

GETTING TO DREAMLAND

Melatonin in foods has been linked to inducing lucid dreams.

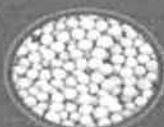
Boosts REM Sleep



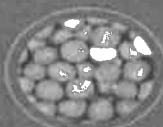
Makes dreams more vivid



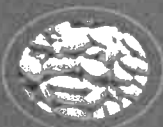
FOODS THAT CONTAIN MELATONIN [measured in nano grams]



White mustard
378 ng/tsp



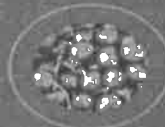
Black mustard
258 ng/tsp



Almonds
39 ng/g



Sunflower seeds
29 ng/g



Cherries
15 ng/g



Flax seeds
12 ng/g



Oats
18 ng/g



Rice, red radishes, poppy seeds,
tomatoes and bananas
0.5 to 1 ng/g

By making dreams more vivid, they will be easier to recall and allow you to become aware of the fact you are dreaming.



ALCOHOL

prohibits the REM stage of sleep, meaning fewer dreams that are hazy and difficult to control.

IF YOU MUST SLEEP THROUGH A THIRD OF YOUR LIFE, WHY SHOULD YOU SLEEP THROUGH YOUR DREAMS, TOO?

Dr Stephen LaBerge



By Dennis Drabelle

Tuesday, November 27, 2007

My friend Rachel and I are pumped because we get to see Ang Lee's new movie free of charge. There's a hitch, though: Instead of passes, we have to bring medallions to the theater, and we can't just hand these over at the door. We must wear them on our noses, embedded in our flesh. A free flick is nothing to sniff at, so we fasten the medallions on. (They come with handy little points.) Miraculously, they don't cause pain, though mine keeps threatening to fall off. I can't say how good the movie was -- we never got that far.

As you may have guessed, the above was a dream. On awakening, I recalled having read a squib about Ang Lee and his ultra-sexy new film, "Lust, Caution," the day before, but that pretty much exhausted the real-world triggers for my scenario. Though the dream was trifling, I liked it for its silliness and simplicity. And as dreamers are wont to do, I wondered if it might have a meaning, if it revealed something unknown to my waking mind about what makes me tick. To see what could be made of it, I consulted the psychological literature and got in touch with experts in the field. In doing so, I discovered that I've had the wrong idea about dreams, which turn out to be not so much puzzles to be solved as mirrors to be gazed at.

Freud called dreaming "the royal road to the unconscious," and Freudian theory would say that my nose-medallion dream stemmed from some repressed wish, probably left over from childhood and tucked away in my unconscious, where my alert self didn't have to confront it. For all I know, having to wear the medallion could be a reprimand for wanting to ogle the naked bodies of Lee's actors. I might object that I'm too old for piercing and that built-in jewelry would clash with my self-image, but could the unconscious me harbor a longstanding perforation wish just the same?

I doubt it: People didn't even pierce their ears when I was a kid, and the very thought of having it done makes me cringe. When I told Rachel my dream, she cringed, too; I hadn't known this, but she's so allergic to metal that, after putting on earrings for her wedding, she had to take time out from the honeymoon to see a doctor about her itching ears. So I'm not sure how Freud can help us here.

In any case, it didn't take much delving into the psychological literature to learn that Freud's dream theories have been thoroughly discredited. Subsequent research has failed to support them, and as Peter D. Kramer puts it in "Freud: Inventor of the Modern Mind" (Atlas, 2006), today it would be hard to find "defenders of the view that dreams are minutely and complexly constructed to hide and yet retain evidence of unacceptable beliefs and feelings."

Jungians would see my dream as compensating for aspects of my personality that are shortchanged in conscious life. But I don't get very far when I try to connect the wearing of a nose plate to some neglected side of me (the inner slacker-dude?). And it turns out that Jung on dreams doesn't hold much water now, either. G. William Domhoff, a psychology professor at the University of California at Santa Cruz, notes in "The Scientific Study of Dreams" (American Psychological Association, 2003) that Jung's compensation idea "seems to be contradicted by every relevant systematic study since the beginning of modern-day dream research in the late 19th century, when psychologists who wrote down their own dreams found considerable continuity between dream content and waking cognition."

So away with the repressed urges and surreal symbols. Today few psychologists believe that dreams talk to us in codes of any kind, and the action in dream research is empirical rather than broadly theoretical.

The change began in 1953, when a University of Chicago grad student discovered that, periodically during the night, sleepers' eyes dart back and forth beneath their eyelids (the phenomenon that became known as rapid eye movement, or REM) and that these episodes coincide with surges of brain activity. Sure enough, subjects who were awakened during REM reported a high incidence of dreaming. (It has since been learned that people dream during non-REM sleep, too, though less vividly.) The finding led to a theory known as activation synthesis, in which random signals emitted by the more primitive parts of the brain gain a certain amount of shape and coherence when processed by the higher brain.

But the notion that dreaming originates as mere static seems to fly in the face of many dreamers' experiences. For one thing, what about dreams that feature elements from our daily lives? Take the narrator of Robert Frost's poem "After Apple-Picking," who declares, "I could tell/What form my dreaming was about to take/Magnified apples appear and disappear . . ." Reading these lines, don't we nod in recognition? Dream researchers call this phenomenon "incorporation": Our dreaming mind rehashes something we've recently done or had happen to us, asking, in effect, "How do you like them apples?"

But Mark Mahowald, director of the Minnesota Regional Sleep Disorders Center at the Hennepin County Medical Center in Minneapolis, regards incorporations as flukes. "My main reason for skepticism," he said, "is that I don't think dreaming has a function. It doesn't seem to give humans any evolutionary advantage. It's just an epiphenomenon, a byproduct of sleep." He notes that fetuses evidently dream in utero -- hence all that kicking -- but you can't think of them as working out something in their undeveloped psyches (try having an Oedipal complex in the womb!) or as coping with their pasts.

Also on Mahowald's side are findings that, unlike sleep deprivation, which can have serious physical and psychological effects, failure to dream for extended periods seems to cause no problems at all.

Given that everybody produces zillions of dreams over a lifetime, Mahowald considers it unremarkable that occasionally one strikes a relevant note. Such dreams might be compared to waking coincidences (thinking of a relative who an hour later calls us on the phone, running into an old classmate on vacation in Pago Pago, etc.). Just as we make a big deal out of these interactions while ignoring the countless times when life rolls along in its aimless way, so we tend to remember the few dreams that touch on something in our waking lives while forgetting about the great many that don't.

But might it be that dreams help us take our psychic temperature -- that, for example, a nightmare is a kind of inner doctor's order to reduce the tension we're living with? Here again, Mahowald is dubious. "Experiments have shown that the incidence of nightmares is no greater after subjects watched a scary movie than after they watched a bland one," he said. "And starving or thirsty people rarely report dreaming of eating or sleeping. Nor do people suffering from sleep apnea dream of suffocating."

But other researchers, who concentrate on what sleepers report after being awakened in the laboratory, can point to a 1978 experiment in which subjects who wore red goggles for several days reported a high incidence of red-tinted objects in their dreams. And Tore Nielsen, a dream researcher at the University of Montreal, said in an e-mail that he believes dreams "regularly incorporate clips and fragments from recent and not-so-recent experience." In a 2004 study, Nielsen and several co-authors interpreted data suggesting that incorporation often lags a few days behind the underlying incidents. The authors hypothesize that this delay might indicate a process of "working through" problems, and

that dreaming "facilitates adaptation to the stresses and emotional difficulties of interpersonal relationships."

The notion that dreams flow from random inner noise also seems to be undermined by the phenomenon of recurrent dreams. It's not easy to imagine our higher brain getting stuck like a needle on an old LP and repeatedly twisting amorphous signals into the same story line. (For me the record number of appearances is held by a scenario in which I've completely forgotten about a college course I signed up for, it's the day before the final exam, and, boy, am I in trouble!) Mahowald cheerfully acknowledged that this is "something I have no answer for," so recurrent dreaming looks like a fertile topic for research.

There are also the intriguing cases of a dream as the source of a scientific discovery or work of art. Two of the most famous date from the 19th century.

Friedrich August von Kekule, a professor of chemistry at the University of Ghent in Belgium, had been trying to determine the molecular structure of benzene. One day in 1865, he fell asleep in front of a fire and, as he'd done before, dreamed of atoms coming together in various combinations. This time new, snakelike shapes appeared and, according to Kekule, "One of the snakes had seized hold of its own tail and the form whirled mockingly before my eyes." On awakening, he suspected that the atoms of benzene and similar compounds didn't line up in rows as he'd thought, but in rings, a discovery that was to have profound implications for organic chemistry.

Something similar happened to Robert Louis Stevenson before he wrote "The Strange Case of Dr. Jekyll and Mr. Hyde." Stevenson later explained that for some time he'd wanted to tell a story about a man with an alter ego but couldn't come up with the right plot. Then one night a powerful vignette appeared to him in a dream: "Hyde, pursued for some crime, took the powder and underwent the change in the presence of his pursuers."

Domhoff argues in his book that such cases are rare. "When all is said and done . . . only occasional anecdotal evidence supports the idea that dreaming itself provides any solutions to problems. This anecdotal evidence is not impressive when it is seen in the context of the small percentage of dreams that are recalled and the even smaller percentage of recalled dreams that might be construed as having a solution to a problem."

But the key phrase in that formulation may be "dreaming itself." The most interesting features of both examples are, first, how closely related the dreams were to the sleepers' waking preoccupations and, second, how much conscious effort it took for the dreams to bear fruit. In advance of his eureka! dream, Kekule had spent hours studying and thinking about benzene. Nor did the dream hand him the compound's structure on a platter; all he saw was an analogue, the tail-biting snake, which he had to interpret, adapt to a chemical context, and confirm experimentally.

Similarly, the sleeping Stevenson didn't conjure up a ready-made story; he had to expand and build that flickering scene into a novel. He dashed off a draft in three days, only to have his wife read it and tell him it was no good. He threw that one away, wrote another version, and spent the next six weeks polishing it. In each case, the dream yielded rich ore, but the conscious mind played blacksmith, rolling up its sleeves and hammering the raw stuff into something useful. Both Kekule and Stevenson were blessed not only with a fertile unconscious that could supply striking images but also with a disciplined waking mind that could revise and perfect them.

What this suggests is that we may be asking the wrong questions about our dreams. Forget the notion that they are sending us cryptic signals about a secret self that we aren't privy to; concentrate instead on what our alert self can make of them. A dream might be just plain loopy (my nose-medallion number, for example), in which case we can have a laugh and move on. But it might provide a new angle for looking at something we've been immersed in, professionally or personally. This probably doesn't happen often, but neither does winning the lottery (though the beauty of dreaming is that there's no admission charge). In this analysis, it makes no more sense to ask for the meaning of a dream than it does to ask for the meaning of a waking thought. The answer in each case is: Why, that's up to you.

November 2, 1999

New Clues to Why We Dream

By ERICA GOODE

3

To Sigmund Freud, whose classic book, "The Interpretation of Dreams," arrived in the bookstores of Vienna 100 years ago this month, dreams were filled with latent meaning, their bizarre imagery and peculiar narratives concealing deep-seated, instinctual motives and desires.

Modern neuroscientists, however, have cast the products of nightly repose in a different light. Laboratory studies in the 1960's and 70's linked dreams not to hidden urges but to the firing of neurons and oscillation of chemicals in the most primitive part of the brain during the arousal of "rapid eye movement," or REM sleep.

Dreaming, in this conception, was random and chaotic, the mind's attempt to take account of the brain's revved-up physiology. Higher brain centers -- the crucibles of thoughts, emotions and memories -- were merely passive responders, making "the best of a bad job in producing even partially coherent dream imagery from the relatively noisy signals sent up from the brainstem," as Dr. Allan Hobson and Dr. Robert McCarley of Harvard, authors of the "activation-synthesis" model of dreaming, put it in a 1977 paper.

Freud, in other words, could not have been more wrong. Or so it seemed.

But in recent years, new work has forced scientists to rethink their understanding of dreaming and the brain, granting a more active role to parts of the brain involved with feeling, memory and vision.

The new findings neither validate the particulars of Freudian theory nor prove that dream interpretation is, as Freud asserted, "the royal road to a knowledge of the unconscious activities of the mind."

And some scientists, Dr. Hobson among them, see little in the new work to bolster Freud's case.

But neither are the results inconsistent with psychoanalytic thinking. And they have been eagerly pounced upon by many psychoanalysts, who say that they offer a biological foundation for at least some of what the Viennese doctor deduced from treating neurotic patients a century ago.

"Twenty years ago," said Dr. Mark Solms, lecturer in neurosurgery at St. Bartholomew's Hospital in London, who is both a neuropsychologist and a psychoanalyst, "Freudian dream theory seemed absolutely untenable. Today, what we know about the brain mechanisms of dreaming is far more compatible with what Freud inferred."

Some of the new insights into dreaming have come from the development of neuroimaging techniques that allow investigators to observe the living brain. In one series of studies, for example, Dr. Allen R. Braun of the National Institutes of Health and his colleagues used PET scanning to measure blood flow, an indicator of brain activation, during REM and non-REM stages of sleep.

During REM sleep, Dr. Braun and his colleagues found, the brainstem and other regions involved in regulating arousal were highly active, as predicted by earlier laboratory studies. But areas of the brain responsible for more complex mental functions also showed great bursts of activity. These included structures in the "limbic system" involved with emotion, motivation and memory formation, and visual and auditory areas of the forebrain involved in processing sensory information.

The brain centers that went "off line" during REM sleep were equally striking. Cortical regions responsible for the most sophisticated mental processes, like planning, abstraction, logical thinking and the contextual flow of memories, showed decreased activity, as did the primary visual cortex, in charge of receiving visual input from the outside world. Imaging studies by other researchers have yielded similar results.

What the findings add up to is a map of the dreaming brain that conforms nicely to the subjective experience of dreaming: the presence of florid images, intense emotions and gobs of memory; the absence of orderly sequence, time sense, self-awareness and other hallmarks of waking consciousness.

In some ways, Dr. Braun said in an interview, the map is also "consistent with psychoanalytic theory." The fact that the emotional system in REM is "wildly active," at the same time that brain regions responsible for rational thought appear to be shut down, for instance, might be seen as the "ego" relaxing its control during sleep, allowing the "unconscious" free reign.. And the activation of regions associated with motivations and appetites, though broader and more amorphous than the sexual and aggressive instincts Freud thought underlay dream images, still leaves open the possibility that dreams are driven by basic drives.

Yet the inconsistencies between the brain scans and Freudian thinking are, Dr. Braun said, just as significant, if not more so. Freud argued that the unconscious desires underlying dreams were censored and disguised. But in the PET study the parts of the brain essential for the generation of symbols were inactive during REM. This finding fits more comfortably with the "activation-synthesis" theory, which requires no cloaking of meaning, and which Dr. Hobson and Dr. McCarley have revised to account for the new findings.

In an interview, Dr. Hobson said that he saw no need to call upon psychoanalysis to understand the role of emotions in dreaming.

Anxiety, anger, elation -- emotions that commonly emerge in dreams -- are interwoven with survival, Dr. Hobson pointed out. "And anxiety is not a symptom," he said. "It's not something you're experiencing because you don't want to recognize some cognitive truth about yourself. It's because anxiety is damned important."

Other recent studies address a more fundamental question, one that also bears on the question of how plausible Freud's theory remains: "Where do dreams originate?"

In the activation-synthesis model put forward by Dr. Hobson and Dr. McCarley, dreaming is, for all intents and purposes, equated with REM sleep, which occurs with predictable regularity at 90-minute intervals in a typical night's slumber.

In fact, decades of studies in the sleep lab have shown that REM is the stage of sleep when dreaming is most likely to occur.

Human subjects awakened during REM report dreaming 80 to 95 percent of the time, in comparison to about 10 percent of the time when awakened during other sleep stages.

Because studies had demonstrated that REM sleep is turned on by the shifting of neurotransmitter chemicals in an area of the brainstem called the pons, it was logical to think, the Harvard researchers reasoned, that the REM "on" mechanism initiated dreaming, as well.

But if the vivid scenes of the night are set off by the preprogrammed flip of a chemical switch, what room does that leave for the stirring of unconscious desires, the replaying of childhood traumas, the acting out of psychological conflict -- in short, for all the dream material that therapists and their patients routinely interpret?

Beginning in the 1960's, some scientists, notably Dr. David Foulkes, then at the University of Chicago, took issue with notion of a one-to-one correspondence between dreaming and REM sleep. Dr. Foulkes and other researchers demonstrated that at some points during non-REM sleep, subjects reported dreams that, rated by judges unaware of what stage the dreams occurred in, were indistinguishable from REM dreams.

"I think the evidence shows that REM sleep is not necessary or sufficient for dreaming," said Dr. Gerald Vogel, director of the Sleep Research Laboratory at Emory University School of Medicine.

Uncoupling of REM and dreaming would mean that dreams could be instigated in other parts of the brain, said Dr. Solms, the lecturer in neurosurgery, even in the parts of the forebrain intimately tied to urges, impulses and appetites.

Dr. Solms said that during his training as a neuropsychologist in the early 1980's, he studied Dr. Hobson's model and assumed that Freud must be "100 percent wrong." But after beginning to practice, he saw two patients with injuries in areas of the forebrain. Both said that they had stopped dreaming after their injuries, a peculiar thing if dreams were in fact driven by the brainstem.

Intrigued, Dr. Solms began to investigate more systematically. In 1997, he published a report of dreaming cessation in 45 patients with intact brainstems but lesions in the forebrain. He has collected an additional 65 cases from the medical literature, and discovered hundreds of other accounts of patients who underwent frontal lobotomies -- at one time a popular treatment for psychosis -- and experienced a loss of dreaming.

At the same time, Dr. Solms studied 26 cases in the literature of patients with lesions in the pons area of the brainstem -- the home of the REM sleep generator. REM was no longer present in these patients, and some were comatose as a result of their injuries. Still, he said, in only one was there a report that dreams ceased, also problematic if dreams were driven by brainstem activity during REM.

His findings, he said, changed his thoughts about dreaming.: "It was a gradual process of realizing that there was something horribly wrong with the original theory."

In its place, Dr. Solms, who debates Dr. Hobson in a forthcoming issue of the interdisciplinary journal *Neuropsychanalysis*, proposes that dreams can be set off by various types of brain activation. REM activity in the brainstem is the most common trigger. But increased activity during other sleep phases -- the periods immediately before awakening in the morning or just after falling asleep at night, for example -- could also provide this stimulation.

Such a system, Dr. Solms contends, would be more compatible with a psychological approach to dreams, including Freud's assertion that every dream is spawned by a deep-seated wish, or more accurately, in light of current knowledge, by emotions and appetites, conscious or unconscious. "My proposal is this: Dreaming can occur as a result of anything that arouses the sleeper," Dr. Solms writes in the journal, but only when the stimulus in question "excites the motivational systems of the forebrain and thereby initiates a goal-directed intention."

The new studies, said Dr. William Domhoff, research professor in psychology at the University of California at Santa Cruz, "relegitimize dreaming as a psychological process by showing that it is necessary to have higher brain capability."

Though Dr. Solms and Dr. Hobson still disagree, in some ways the new research has brought their respective assessments of the dreaming brain closer together.

Dr. Solms, for example, concedes that there is as yet no evidence to support Freud's assertion that unconscious motives are disguised and censored, to prevent their intrusion into consciousness. This is the part of Freudian dream theory that, at the moment, seems weakest, he said.

Dr. Hobson, for his part, said that he never claimed dreams were meaningless: he has filled 109 volumes with his own dreams over the years, hardly the act of someone who dismisses dreaming as unimportant. "Dreams are transparently meaningful," Dr. Hobson said, "chock full of emotional salience."

He is not opposed to the idea of unconscious mental process, but questions whether "there are parts of my unconscious mind that are inaccessible to me and that are critically important in understanding my behavior."

Perhaps, he suggested, the emotions in dreams, and in particular anxiety, serve as rehearsals of basic, evolutionarily determined survival mechanisms. "One theory emerging here is that REM sleep enables you to run all the crucial programs for behavior two hours a night," he said. "How much time does a pianist practice each day?"

Dr. Hobson rejects, however, the notion that the forebrain can act entirely on its own in inciting a dream. And he doubts that the appearance of vivid dreams in non-REM sleep means anything other than that sleep and waking form a continuum, with some REM processes stretching into other parts of the cycle.

Most of all, he bristles at the idea that advancing the understanding of dreaming means resurrecting Freud. "My problem with psychoanalysis is historical," he said. "I was trained in an era when it was unquestioned. I thought it was a scientific theory and I found out little by little that it was a speculative hypothesis."

Still, for both sides, it is perhaps time to put Freud aside, suggested Dr. Braun of the National Institutes of Health, who served as commentator in the journal's Solms-Hobson debate.

"Stepping back a short distance," Dr. Braun wrote, "this is what I see: Hobson, a consummate biological psychiatrist, now argues against reductionism and passionately advocates the study of subjective conscious experience. Solms, a psychoanalyst, is attempting to recast dynamic psychology in neurochemical terms."

"It sounds to me like these gentlemen are approaching common ground," Dr. Braun wrote. "Perhaps it is simply the ghost of Freud that is getting in the way."

July 3, 2007

Winding Through 'Big Dreams' Are the Threads of Our Lives

By REBECCA CATHCART

I was in the fluorescent pallor of a windowless office, staring at the dense grid of an unfilled spreadsheet, when my mother called to say my father had died.

It wasn't a surprise. He had been given a diagnosis of terminal cancer the year before. But it was a jolt to my system — one switch, pulled down with a thump, the power fading and the conveyor belt coming to a stop.

My memories from that week are a jumble of misfiled pieces. But at the end of the second week, I had a dream that remains crisp and vivid in my mind.

I sat up in bed and saw my father across the room. His figure was full and healthy and framed by the yellow light that glowed in the stairwell outside my door. He was grinning, green eyes on me, and listening to sounds from the dining room below, the clinking of plates and the voices of my extended family laughing and sharing memories of him. He raised his dark eyebrows and laughed with them.

"Back to life" or "visitation" dreams, as they are known among dream specialists and psychologists, are vivid and memorable dreams of the dead. They are a particularly potent form of what Carl Jung called "big dreams," the emotionally vibrant ones we remember for the rest of our lives.

Big dreams are once again on the minds of psychologists as part of a larger trend toward studying dreams as meaningful representations of our concerns and emotions. "Big dreams are transformative," Roger Knudson, director of the Ph.D. program in clinical psychology at Miami University of Ohio, said in a telephone interview. The dreaming imagination does not just harvest images from remembered experience, he said. It has a "poetic creativity" that connects the dots and "deforms the given," turning scattered memories and emotions into vivid, experiential vignettes that can help us to reflect on our lives.

Grief itself is transformative. It is a process of disassembly. The bereaved must let go of the selves they were, as well as the loved ones they have lost. The dreams we have while grieving are an important part of that process.

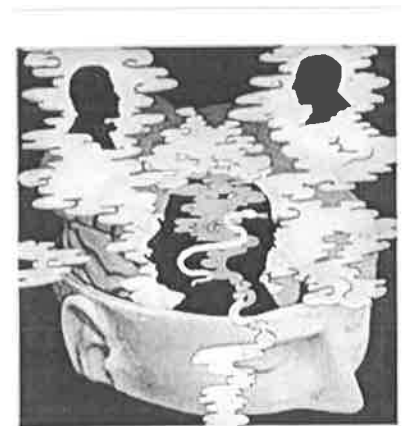
"Our dreams have to do with how we internalize the people we love," said Pamela McCarthy, director of counseling services at Smith College. "You learn to look within for the loved one and the particular function that person played in your life, such as caretaking or guidance in the case of a parent. This becomes part of a function that you can provide for yourself."

Cultural narratives in regions like Vietnam and North and South America assign special importance to such dreams and consider them actual encounters with the spirits of lost loved ones.

"This notion is so widely shared by traditions all across the globe that some scholars have gone so far as to argue that religion itself actually originated in dream experience," Kelly Bulkeley, past president of the Association for



Jonathan Rosen



Jonathan Rosen

the Study of Dreams, wrote in his book "Transforming Dreams: Learning Spiritual Lessons From the Dreams You Never Forget" (2000).

Current dream study has its epic narrative in the life and dreams of the pseudonymous Ed, a widower who recorded 22 years of dreams about Mary, his deceased wife. Ed made his journal available to G. William Domhoff, a psychology professor at the University of California, Santa Cruz, a leading dream theorist.

Dr. Domhoff and Adam Schneider, his research assistant, categorized the 143 dreams and cross-referenced them with Ed's waking reflections on his wife, their marriage and her death from ovarian cancer on June 15, 1980. In a path-breaking study in 2004, Dr. Domhoff asserted that Ed's dreams could not be the nonsensical noise of a restless brain stem. They represented the currents of loss, love and confusion in Ed's waking life.

Ed and Mary's love began on a seaside boardwalk in 1947. They wed a year later, when Ed was 25 and Mary 22. In his more comforting dreams, Mary appears young and radiant as she did that day, with dark hair and bewitching eyes.

In Ed's dreams, his companionship with Mary and her withdrawal during an arduous illness are recurrent themes. Sometimes, his mind weaves these threads together to poignant effect, as when Ed finds himself standing across the street from where Mary sits in a car, unable to cross over.

Other times, they form jumbled, comic events. Ed and Mary are lost in a city. They see Jerry Seinfeld and ask him for directions. Soon, Ed realizes that Mary has left with Mr. Seinfeld. He broods behind a building and begins to sink in quicksand.

Almost 20 years after Mary's death, Ed dreams he is walking down a hallway in their old apartment. It leads to Mary's hospital room, where she lies, gaunt and still. Her head, according to Ed's journal, is "hanging over the top edge of the bed." Her hair is sparse, as it was after chemotherapy. "I sit on the bed," he writes, "and cradle her in my arms."

Such composite images and sudden scene changes, Dr. Domhoff conceded, may be the brain's effort to make sense of random neuron fire. But they are more likely to be symbolic of Ed's emotional struggle. Dreams, Dr. Domhoff wrote, are the "embodiment of thoughts" from our waking lives.

Deirdre Barrett, assistant professor of psychology at the Harvard Medical School and editor in chief of the journal *Dreaming*, wrote the first significant study on dreams of the dead. She collected dream reports from two sample groups totaling 245 people at the University of North Carolina, Chapel Hill, and found 77 such dreams. Her findings were published in the 1992 issue of *Omega: The Journal of Death and Dying*.

The type and intensity of these dreams, Dr. Barrett wrote, corresponded to phases of her subjects' waking grief. She arranged the dreams in four categories based not only on common content, but also on concurrent stages of grieving.

The most common was "back to life" dreams, which made up 39 percent of the dreams of the dead in Dr. Barrett's sample. In such dreams, subjects were surprised or frightened by the appearance of a deceased loved one. Dr. Barrett theorized that these early dreams corresponded to the confusion and denial of early stages of grief.

Dr. Domhoff is not willing to link dreams so closely to stages of waking grief. But, he said in an e-mail message, Ed's dreams did dissipate in intensity and frequency over time.

Dreams that occur during rapid eye movement, or REM, cycles are the most memorable and emotionally powerful, said John Antrobus, a retired professor of psychology and sleep research at the City College of New York who founded the sleep laboratory there in 1965. The dreams have power because brain activity during REM is most similar to that of a waking state. The emotional responses to REM dream content, therefore, are most like the responses during waking cognition.

In REM, the amygdala, the lima-bean-size gland at the base of the skull responsible for emotions, and the hippocampus, the tissue curled up under the temples that enables memory, are active. The two organs, along with areas in the frontal and prefrontal lobes near the forehead that enable attention and coordination, work simultaneously in producing dreams.

"You have an image of a lost loved one, and along come all kinds of emotions you've tied up with them," Dr. Antrobus said. "Their image comes up, and all parts of the brain associated with the loss get activated, as well in REM sleep, because they're part of our survival system."

In a study last year, Dr. Antrobus and City College graduate students linked the body's circadian cycle and the singular level of brain activity in REM to the high emotionality of REM dreams.

Core body temperature rises gradually from its nadir in the middle of the night during slow-wave sleep, the least active brain state. As morning nears, subcortical brain activity tied to the circadian cycle increases. When these cycles coincide in the last and longest REM phase, the study found, the mind produces its most dramatic dreams.

"The brain is waking up," Dr. Antrobus said in an interview. "It starts waking up long before you are fully awake."

Dreams during this active period are more likely to be highly memorable, vivid, and experiential, what Dr. Antrobus calls "superdreams."

"That's what people talk about," he said. "That's what they're usually remembering. That's what these 'big dreams' are."

He added that the four or five phases of REM in a normal night's sleep might include similar dream content. Just as the image of a lost loved one stimulates parts of the brain associated with loss, the content of dreams early in the sleep cycle could set the tone for that night's dream experiences. Our memories upon waking, therefore, may be our recollection of a night's cumulative dream content.

Apart from an effort to understand the physiology behind the content of dreams, what do we do with big dreams? If we ignore them, said Dr. Knudson of Miami University of Ohio, "we discount our most valuable resource in understanding ourselves."

America is not a country with a ritualistic approach to grief. Many employers offer as few as three days off after a family member's death. Dreams of the dead keep alive our connections to lost loved ones.

"Big dreams, those dreams that stop you dead in your tracks, are for precisely that purpose," said Dr. Knudson, whose father died three years ago. "They pull us out of our headlong rush forward. They yank us back down from our schedule books and our jobs."

He continued, "I don't want to get over my father. That's not to say that I want to suffer on a daily basis or that I don't want to understand that he is dead. But I look forward to dreams in which my father will come again. What does it mean to 'get over' it? I think that is crazy."

Name: _____ Date: _____

Title: _____		
Main Ideas/Categories	Explanation/Details	Thoughts and Reactions
Ex:	Ex:	Ex:
1.		
2.		
3.		

Summary, Reflection, Analysis

Name: _____

Date: _____

Title:

Explanation/Details

Thoughts and Reactions

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Summary, Reflection, Analysis

Name: _____ Date: _____

Title: _____		
Main Ideas/Categories	Explanation/Details	Thoughts and Reactions
Ex:	Ex:	Ex:
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Summary, Reflection, Analysis

Name: _____ Date: _____

Title: _____		
Main Ideas/Categories	Explanation/Details	Thoughts and Reactions
Ex:	Ex:	Ex:
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Summary, Reflection, Analysis

60 Minutes: Science of Sleep

Pay attention closely to the films because (at times) there are questions that come in rapid succession ... SO DON'T SLEEP DURING THE FILM BECAUSE YOU'LL MISS KEY INFO!

1. What did the sleep studies with rats show about the importance of sleep?

The answers to questions B and C come right after each other so pay attention:

2. What did Professor Walker find about student performance on memory tests after not sleeping for the night?

3. On a more revolutionary note, what specifically did Walker find about memory performance after a good night's sleep?

4. In the "chronic partial sleep deprivation" study where subjects were kept awake until 4 am and then awakened at 8 am (for a 5 nights in a row), what effects did the experimenters note right away?

- How does each consecutive night of "partial sleep" affect the subjects' performance and emotions?

5. What do studies show about the effectiveness of strategies to combat "micro-sleep" (such as singing, rolling the window down, etc.) while driving?

6. Identify the major catastrophes that Professor Dinges believes were caused, at least in part, by a lack of sleep:

7. What does Professor Dinges say about "chronically sleepless" peoples' ability to adapt to their consistently abbreviated sleep (i.e. how well have people really "*learned to live without sleep?*")

8. What did Professor Walker find going on inside sleep-deprived college students' brains (particularly their amygdalas) while he showed them horrific images?

- What impact does this have on rational thinking?

9. How many hours per night do human need?

- How many hours of sleep Americans now getting?

10. Explain the relationship found between lack of sleep and obesity (make sure to explain the role of the hormone *leptin*).

11. Besides obesity, what other health issues have been linked to short sleep times?

12. What is the prevailing attitude about sleep in America?

13. When the research subject (Jonathan) is sleeping in the room, what is the purpose of the doctor in the other room who is monitoring his sleep (that is, what specifically is she trying to prevent?)

14. As we get older, what happens to the amount of deep sleep we get? (How significantly does this amount change as we get older?)

15. What major effects do we see with Jonathan after only 4 nights of this treatment?

16. What is the difference in the mating behavior of fruit flies between when a male fruit fly has enough sleep or is sleep deprived?

17. Why don't the scientists believe that research should focus on how we can function better while sleeping less?

Inception Film Guide

Director Christopher Nolan said in an interview: "What *Inception* deals with is a science fiction concept in which...you and I are able to experience the same dream at the same time. Once you remove the privacy, you've created an infinite number of alternate universes in which people can meaningfully interact – with validity, with weight, with dramatic consequences."

Yes, it's a great idea for a movie. And far from being only a science fiction concept, interactive or social dreaming is a real phenomenon in our lives that may go on every night. Shared/mutual dreaming is a practice that can be learned.

Synchronous or concurrent dreams are those in which two or more dreamers have very similar dream experiences at the same time. This is more a coincidence than it is a shared dream.

The most commonly reported mutual dreams are known as ***meshing dreams***. They happen when you share certain dream elements with someone else. For instance, you and your partner may both watch *LOST* on TV and then dream about being stranded on a deserted island. Understandably, your shared waking experience leads to similar dreams

The less likely experiences are called ***meeting dreams***. This is the true meaning of mutual dreaming, where two or more people meet up and communicate in the dream world. As yet there is no firm evidence for the existence of such shared dreams, although it is arguably a difficult concept to prove.

The film presents an interesting (far more science-fiction than actual science) depiction of what can happen in our dreams. Nonetheless, I want you to try to keep track of how "dream stealing" actually occurs.

Describe the techniques used to steal dreams (that is, describe the "science" behind dream stealing) ...

Describe the complications that can arise when you are in someone else's dream ...

What techniques are used to address the complications ...

How did you like the general plot of the film in relation to lucid dreaming? If you could dream like this, what would you do?

The Benefits of Lucid Dreaming

Researchers Decipher Clues From Those With Greater Awareness, Control of Behavior in Dreams

Anthony Bloxham was standing in the garden of his house when he wondered if he was dreaming.

To figure it out, he looked at his hands. Experts in a phenomenon known as lucid dreaming, where sleeping people are aware that they're in a dream, say dreamers should look for reality checks, or details that look different in dreams than in real life. Indeed, Mr. Bloxham's hand was glowing yellow, so he realized he was asleep.

Some lucid dreamers are able to control elements of their dreams once they realize they're dreaming. They do what's impossible or unlikely in real life, like fly or meet famous people. Mr. Bloxham, 21, a recent university graduate from Mansfield, England, who stumbled onto the concept on the Internet and thought it sounded like fun, recalls the feeling of swimming through the air—though he hasn't flown, as he's wanted to.

Others use the technique to solve problems, spur creativity, overcome nightmares or practice a physical skill, says Daniel Erlacher, a professor at the University of Bern's Institute for Sport Science, who has conducted surveys of lucid dreamers.

Researchers are studying people like Mr. Bloxham to understand if lucid dreaming can improve dreamers' abilities when they're awake.

Psychologists at the University of Lincoln in England found in a June study that people with frequent lucid dreams are better at cognitive tasks that involve insight, like problem-solving. Other researchers have shown that people who dream of practicing a routine can improve their abilities in that activity in real life. Early evidence also suggests that lucid dreaming may help improve depressive symptoms and mental health in general, perhaps by giving people a greater sense of self-control.

Many of the studies are small, however, and it isn't always clear whether lucid dreaming is responsible for the improvements or simply linked to them, experts say. People vary tremendously in how often they remember their dreams, as well as their degree of awareness and control while dreaming.

Most people aren't aware when they're dreaming, which tends to occur in a stage known as rapid-eye movement, or REM, sleep. Yet even with the body in a very deep sleep, the mind is very active.

Having awareness during the dream state, and the added ability to control the dream, as portrayed in the movie "Inception," isn't a regular occurrence for most people. Surveys suggest that about half of us will have at least one experience in our lifetimes. About 20% or more have routine lucid dreaming experiences, according to studies conducted by Dr. Erlacher and his team in Switzerland.

Lucid dreaming comes more easily to some people, but experts say it can be learned. The low number of people able to lucid dream at will, particularly in a sleep lab, is one of the main challenges with conducting research on the phenomenon. Another obstacle is figuring out when people are actually lucid dreaming, since it isn't clear whether people's recollections upon waking are accurate.



The plot of the 2010 film "Inception" involves the idea of lucid dreaming. ©Warner Bros/Everett Collection

Patrick Bourke and Hannah Shaw are researchers from the University of Lincoln, and lucid dreamers themselves. They set out to investigate in their recent study whether frequent lucid dreamers had different ways of thinking while awake, compared with non-frequent lucid dreamers. They hypothesized that awareness while dreaming may be related to those "aha!" moments often necessary in problem-solving. The study was published in *Dreaming*, a journal of the American Psychological Association, in June.

In the lab, 20 people who say they haven't had the experience of being aware that they're dreaming, 28 occasional lucid dreamers and 20 frequent lucid dreamers completed a problem-solving task. They were given three words and had to figure out a word to go with each. For instance, stone pairs up with the trio of age, mile and sand.

The frequent lucid dreamers were significantly better at solving these puzzles than the non-dreamers. The occasional dreamers fell in the middle but weren't statistically different from either of the other two groups.

Why frequent dreamers showed improved performance wasn't clear from the study. The authors speculated that the ability to make more remote associations and question unusual details could be more finely honed in the lucid group. The authors don't know if the lucid dreamers differed from the other groups in terms of intelligence or other cognitive skills.

Other studies looking at different cognitive tasks also suggest that lucid dreamers perform better than non-lucid dreamers.

The University of Bern's Dr. Erlacher has been curious about the effect of mental practice during dreaming on physical skills. Research in his field has demonstrated that imagining successfully hitting a ball or making a basket can help athletes perform better during competition.

In one small study, published in the journal *Sport Psychologist* in 2010, he and his colleagues asked lucid dreamers to toss coins into coffee cups 20 times before bed and then dream about themselves practicing that night. In the morning, when asked to toss coins yet again, the lucid dreamers who successfully practiced while dreaming were more accurate, compared with lucid dreamers who failed to practice and a control group of non-lucid dreamers.

Dr. Erlacher is trying to replicate the findings using dart-throwing while participants are in the sleep lab.

The ability to successfully induce lucid dreaming has been extensively studied and there are a number of tips in books and on the Internet purporting to describe how to induce a lucid dream. Some research suggests that playing videogames may be linked with lucid dreaming ability, and several companies offer headband-like devices that claim to help induce lucid dreaming.

It isn't easy to teach this practice, say researchers who try to induce lucid dreaming in the lab.

But in May, Ursula Voss, a psychology professor at Frankfurt University in Germany, and her team published a study in a top journal, *Nature Neuroscience*, demonstrating that they were able to induce lucid dreaming in people who had never or rarely had the experience before. They used mild electrical stimulation, thought to be the first time a group has reliably induced the experience in a lab. The electric current that induced lucid dreaming, which couldn't be felt by the sleeper, used a frequency of wave known as gamma. Gamma activity has been related to abstract thinking and decision-making, as well as with lucid dreaming, according to Dr. Voss. The stimulation induced awareness of the dream state but lucid dreaming also increased gamma activity. She and her group are planning to study clinical applications for lucid dreaming, such as for the treatment of psychiatric disorders.

Some people are so interested in lucid dreaming that they practice for months or longer. Mr. Bloxham, who participated in the University of Lincoln study, has tried several techniques over the past seven years to improve his ability.

Sometimes he wakes up crying because the dreams are so vivid and emotional, he says. He's also tried to use lucid dreaming to give himself a creativity boost by thinking about a particular problem before bed every night, writing down his dreams and looking for solutions from those dreams.

His goal is to build his own dream planet one day.

Source: <http://online.wsj.com/articles/the-benefits-of-lucid-dreaming-1407772779>

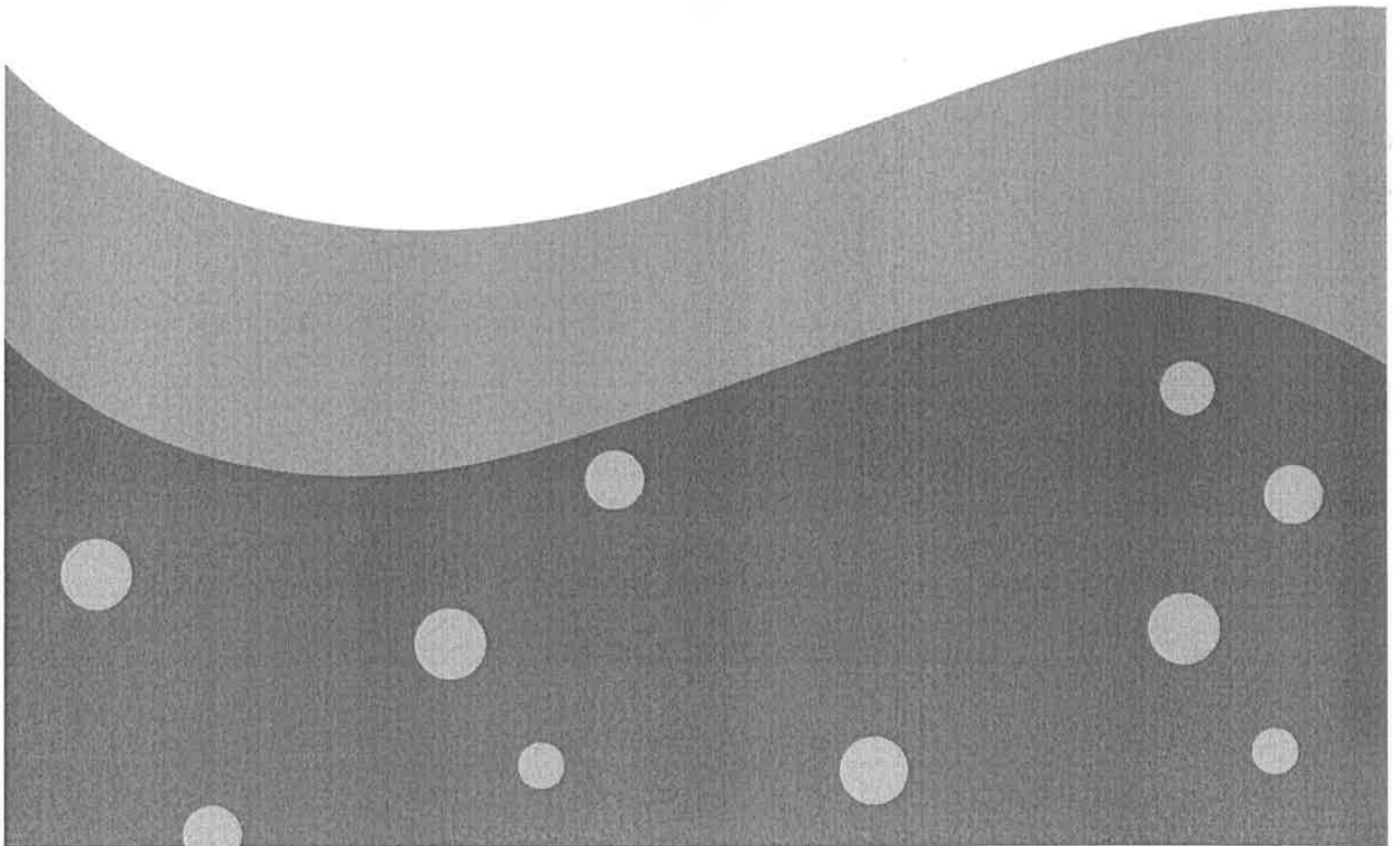
Article Questions

1. Define *lucid dreaming*.
2. How do people use lucid dreams to better their lives or society?
3. Based on the studies discussed, what seems to be the primary advantage held by people who are lucid dreamers?
4. Is it easy to induce lucid dreams?

What are some potentially pseudoscientific methods claiming to produce lucid dreams?

What has worked in studies to produce them?

Sleep and Dream Journal



Date:

Sleep	Your Records
What time did you start to get groggy?	
What time did you go to sleep?	
Did you wake up during the night at all? If so, when and why?	
What time did you wake up? How? (alarm, naturally, disturbance, etc.)	
How did you feel during the day? How did your level of sleep affect your day? Discuss mood, hunger, illness, daytime tiredness, concentration, etc.	
Did you get enough sleep? If not, how could you change this?	

Dreams	Your Records
Did you dream at all last night?	Yes <input type="radio"/> No <input type="radio"/>
How do you think your sleeping habits/times affected whether or not you dreamed?	
If so, what about? Provide as much detail as you can?	
Draw an image that depicts your most vivid memory of the dream?	
Did this dream have some significance to you? Was it about something that recently happened or completely random?	

Date:

Sleep	Your Records
What time did you start to get groggy?	
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What time did you wake up? How? (alarm, naturally, disturbance, etc.)	
How did you feel during the day? How did your level of sleep affect your day? Discuss mood, hunger, illness, daytime tiredness, concentration, etc.	
Did you get enough sleep? If not, how could you change this?	

Dreams	Your Records
Did you dream at all last night?	Yes <input type="radio"/> No <input type="radio"/>
How do you think your sleeping habits/times affected whether or not you dreamed?	
If so, what about? Provide as much detail as you can?	
Draw an image that depicts your most vivid memory of the dream?	
Did this dream have some significance to you? Was it about something that recently happened or completely random?	

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McMurray/Tarshish

Sleep and Dream Journal Reflection

Directions: Use these questions below to reflect and analyze on your sleep and dream journal. Use the headings to organize your reflection. You must have **FOUR** sections clearly labeled with the following headings "Sleep Hygiene," "Impact of Sleep," "Dream Analysis," "Future Sleep Plan."

Sleep Hygiene

Summarize your sleep habits (bed and wake times/routines, quality of sleep, location, naps, waking up in the middle of the night, etc.)? Identify and analyze the trends or patterns you've noticed from observing 10 nights of sleep (ex. I noticed that when I stay up past midnight I have a really hard time getting out of bed and hit a wall around 7th period)? Are you consistent with these patterns? What is your sleep space like (Bed or couch? Traditional mattress or waterbed? Music, tv, or silence in the backdrop? Share a room, etc.)?

Impact of Sleep

Is there a correlation between the amount of sleep you get and your daily energy level? What about your mood and temperament? Ability to concentrate or focus? Ability to think quickly? How does sleep affect your memory?

Dream Analysis

Based on dream analysis theory (Freudian, information processing, physiological, activation-synthesis), how would you explain the content of some of your dreams (feel free to choose two)? Use examples of dreams from the 10-day monitoring period and if you didn't have any, draw on one from your past as a basis for this question.

Future Sleep Plan

Using the articles, text readings, and video notes from this unit, construct a **research-based** plan to improve your sleep hygiene. It should address: sleep and wake times, quality of sleep, sleep cycles, need for napping, daytime effects of lack of sleep, increasing dream space, sleep deprivation or disorders. You must use **TWO sources** to support your plan. Cite the sources in text with author's last name and page number or title for films [ex. (Davis, 4) or (*60 Minutes: The Science of Sleep*)].

Potential Sources: Reading packet, 60 Minutes: Science of Sleep Video, 90 Minute Solution-Ultradian Rhythms, Two Articles on Sleep Hygiene, Four Articles on Dreams, Lecture notes

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