Sleeping patterns also vary greatly among individuals, and even among different cultures (in terms of napping, for example).

Two theories of sleep, the repair and the adaptive theories, attempt to explain why sleep occurs. In the repair theory, sleep serves a biological need, replenishing key areas of the brain or body which are depleted during the day. The adaptive theory suggests that sleep as a function evolved over time because it prevented early humans from wasting energy and exposing themselves to nocturnal predators, thus aiding in survival. REM sleep in particular has been thought to serve special functions. Research subjects whose REM sleep was interrupted made up for the loss by spending extra time in the REM stage on successive nights. It has also been suggested that REM sleep aids the activity of neurons that use the **neurotransmitter** norepinephrine, thus maintaining waking alertness. Persons deprived of REM sleep have shown poorer retention of skills learned during the day, leading to the hypothesis that REM sleep helps in assimilating daytime learning experiences.

As with many other physiological processes, sleep is linked to a 24-hour circadian rhythm and affected by signals such as light and dark. The effects of disrupting the sleep-wake cycle can be seen in jet lag, which is characterized by fatigue, irritability, lack of alertness, and sleeping problems. A person affected by jet lag feels like sleeping at the wrong times of day. It has been found that the body maintains a circadian sleep-wake rhythm even in the absence of external cues like lightness and darkness, although research subjects deprived of such cues eventually adopt a 25-hour "day." The "internal clock" that maintains this pattern is a section of the brain called the supra chiasmatic nucleus (SCN), located in the **hypothalamus**.

Various disorders interfere with sleep. The most common is insomnia, the inability to fall asleep or stay asleep. Nearly one-third of all Americans are affected by some degree of insomnia. Often associated with mental distress, insomnia is treated with medication, **psychotherapy**, relaxation techniques, or a combination of these methods. The medications most commonly prescribed are benzodiazepines (Valium, Halcyon, Restoril) and barbiturates. While they alleviate insomnia in the short run, these drugs interfere with **normal** sleep patterns, and can lead to increased tolerance and dependence. Researchers and clinicians have had success treating insomnia with the hormone melatonin, a naturally occurring substance related to sleep onset and secreted by the pineal gland. Melatonin supplements first became available in American health food stores in 1993 and have become increasingly popular as a sleep aid, although their use has caused some controversy in medical circles.

Narcolepsy, a disorder characterized by sudden and uncontrollable occurrences of sleep, afflicts 100,000 people in the United States. This condition is genetically linked, and may be curable in the future. Individuals affected by narcolepsy abruptly enter REM sleep states during the daytime, collapsing and remaining immobile for a period of time after awakening. Napping and stimulants have both been used to treat this condition. Another disorder associated with sleep is sudden infant death syndrome (SIDS), in which a healthy baby stops breathing during sleep, fails to awaken, and suffocates. While the exact cause of SIDS is unknown, researchers are attempting to identify and save at-risk infants by studying the relationship between the disorder and sleeping patterns. In sleep apnea, a person repeatedly stops breathing while asleep but awakes each time. The disrupted sleep that results from these multiple awakenings leaves the sleeper fatigued and sleepy during the daytime. **Night terrors** are non-REM dream experiences from which the sleeper never fully awakes and which he or she does not recall upon awakening. This condition mostly occurs in children and can be treated with **hypnosis** or medication in severe cases.

See also Sleep Disorders.

Sleep disorders

Chronic disturbances in the quantity or quality of sleep that interfere with a person's ability to function normally.

An estimated 15 percent of Americans have chronic **sleep** problems, while about 10 percent have occasional trouble sleeping. Sleep disorders are listed among the clinical syndromes in Axis I of the American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders. They may be either primary (unrelated to any other disorder, medical or psychological) or secondary (the result of physical illness, psychological disorders such as **depression**, drug or alcohol use, **stress**, or lifestyle factors, such as jet lag).

The Association for Sleep Disorders Centers has divided sleep problems into four categories. The first and most common is insomnia (Disorders of Initiating and Maintaining Sleep). In insomnia, sleep loss is so severe that it interferes with daytime functioning and well-being. Three types of insomnia have been identified (although a single person can have more than one): sleep-onset insomnia (difficulty falling asleep); sleep-

A patient suffering from acute sleep apnea is hooked up to monitors in preparation for a night's sleep at a Stanford University sleep lab. *(Photo by Russell D. Curtis. National Audubon Society Collection/ Photo Researchers, Inc. Reproduced by permission.)*

maintenance insomnia (difficulty staying asleep); and terminal insomnia (waking early and not being able to go back to sleep). While insomnia can occur at any stage of life, it becomes increasingly common as people get older.

Some cases of insomnia are thought to be caused by abnormalities in the part of the **brain** that controls sleeping and waking. However, insomnia commonly has a wide variety of non-neurological causes, including stress, physical **pain**, irregular hours, and psychological disorders. Temporary acute insomnia related to a major event or crisis can turn chronic if a person becomes overly anxious about sleep itself and is unable to return to his or her **normal** sleep pattern. Called learned or behavioral insomnia, this problem troubles about 15 percent of people who seek professional help. In about 30 percent of cases, an underlying psychological disorder—often depression—is responsible for insomnia. Disorders that can cause insomnia include anxiety disorders (such as post-traumatic stress disorder), **obsessive-compulsive disorder**, and **schizophrenia**. Normal sleep may be disrupted by a variety of substances, including caffeine, nicotine, alcohol, appetite suppressants, and prescription medications such as steroids, thyroid medications, and certain antihypertensive drugs.

Many people take medications for insomnia, ranging from over-the-counter preparations (which are basically antihistamines) to prescription drugs including barbiturates and benzodiazepines. The American Sleep Disorders Association recommends benzodiazepines (a class of drugs that includes Valium and Restoril) over barbiturates and other sedatives, although only for limited use to treat temporary insomnia or as a supplement to **psychotherapy** and other treatments for chronic insomnia. Benzodiazepines can lead to tolerance and addiction, and withdrawal can actually worsen insomnia. People who take sleeping pills for two weeks or more and then quit are likely to experience a rebound effect that can disrupt their sleep for a period of up to several weeks.

A variety of behavioral treatments are available for insomnia which, when practiced consistently, can be as effective as medication without side effects or withdrawal symptoms. Different types of relaxation therapy, including progressive muscle relaxation, **hypnosis**, meditation, and **biofeedback**, can be taught through special classes,

audiotapes, or individual sessions. **Cognitive therapy** focuses on deflecting anxiety-producing thoughts and behaviors at bedtime. Stimulus control therapy is based on the idea that people with learned insomnia have become conditioned to associate their beds with wakefulness. Persons involved in this type of therapy are not allowed to remain in bed at night if they can not fall asleep; they are instructed to go to another room and engage in a nonstressful activity until they become sleepy. In the morning, they must arise at a set hour no matter how much or little sleep they have had the night before. Finally, sleep restriction therapy consists of limiting one's hours in bed to the average number of hours one has generally been sleeping and then gradually increasing them.

The second category of sleep disorder is hypersomnia, or Disorders of Excessive Somnolence. People affected by any type of hypersomnia report abnormal degrees of sleepiness, either at night or in the daytime. While the most common causes are sleep apnea and **narcolepsy**, hypersomnia may also be caused by physical illness, medications, withdrawal from stimulants, or other psychological disorders. Sleep apnea consists of disrupted breathing which wakens a person repeatedly during the night. Though unaware of the problem while it is occurring, people with sleep apnea are unable to get a good night's sleep and feel tired and sleepy during the day. The condition is generally caused either by a physical obstruction of the upper airway or an impairment of the brain's respiration control centers. Common treatment methods include weight loss (**obesity** is a risk factor for the condition), refraining from sleeping on one's back, and medications that reduce **rapid eye movement (REM)** sleep. A technique called continuous positive airway pressure (CPAP) pushes air into the sleeper's throat all night through a small mask, preventing the airway from collapsing. In addition, a surgical procedure is available that modifies the upper airway to allow for freer breathing.

The other main type of hypersomnia is narcolepsy—sudden attacks of REM sleep during waking hours. Many narcoleptics experience additional symptoms including cataplexy (a sudden loss of muscle tone while in a conscious state), **hallucinations** and other unusual perceptual phenomena, and sleep paralysis, an inability to move for several minutes upon awakening. Between 200,000 and 500,000 Americans are affected by narcolepsy, which is caused by a physiological brain dysfunction that can be inherited or develop after trauma to the brain from disease or injury. Treatments include stimulants to combat daytime sleepiness, tricyclic **antidepressants** to suppress REM sleep, and other medications to control cataplexy.

Disorders of the Sleep-Wake Schedule—the third type of sleep disturbance—are also called circadian rhythm disorders because they interfere with the 24-hour biological clock that regulates many bodily processes. People with these disorders have trouble adhering to the sleep-wake schedule required by their job or **environment**, often due to shift work or jet lag. However, some persons suffer from delayed or advanced sleep onset problems with no external aggravating factor. Exposure to bright lights and chronotherapy, a technique for resetting one's biological clock, have been effective in the treatment of some circadian rhythm disorders.

Parasomnias, the final category of sleep disorder, involve unusual phenomena—nightmares, sleep terrors, and sleepwalking—that occur during sleep or during the period between sleeping and waking. Nightmare and sleep terror disorders are similar in that both occur mainly in children and involve frightening nighttime awakenings (in the case of sleep terrors, the person is awakened from non-REM sleep by feelings of agitation that can last for up to 10 minutes). Both are often outgrown but may be treated with psychotherapy, low-dose benzodiazepines, and, in the case of nightmare disorder, relaxation training. Sleepwalking occurs during the deep non-REM sleep of stages three and four and is also most common in children, who tend to outgrow it after the age of 12. It is also more common among males than females. The greatest danger posed by sleepwalking is injury through falls or other mishaps.

Other features of parasomnias include bruxism (teeth grinding) and enuresis (bedwetting). Both are often stress-related, although enuresis may also be caused by genitourinary disorders, neurological disturbances, or toilet training problems. Bruxism may be relieved through relaxation techniques or the use of a custom-made oral device that discourages grinding or at least prevents tooth damage. Enuresis often responds to the medication imipramine (Tofranil) and various **behavior modification** techniques. A parasomnia only identified within the past decade is REM sleep behavior disorder. Those affected by this condition—usually middle-aged or older men—engage in vigorous and bizarre physical activities during REM sleep in response to **dreams**, which are generally of a violent, intense nature. As their actions may injure themselves or their sleeping partners, this disorder, thought to be neurological in nature, has been treated with hypnosis and medications including clonazepam and carbamazepine.

Further Reading

Hales, Dianne R. *The Complete Book of Sleep: How Your Nights Affect Your Days.* Reading, MA: Addison-Wesley Longman, 1981.

Lamberg, Lynne. *The American Medical Association Guide to Better Sleep.* New York: Random House, 1984.