01 - 6 Consciousness

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CHAPTER 6 CONSCIOUSNESS © Lorel Ward Photolibrary/David Ridley/Images.com For more Cengage Learning textbooks, visit www.cengagebrain.co.uk

V eronica was sitting in a restaurant with her friend Gina, listening to Gina's recounting of a party she went to the night before. For a while, Veronica was interested in what Gina was saying, but as Gina went on and on about what a mutual acquaintance of theirs was wearing, Veronica lost interest, looked down at her watch, and then let her mind begin to drift. Suddenly, Gina said sharply, 'Veronica! You haven't heard a word I've said!' Indeed, Veronica had not heard what Gina had said, and when she looked down at her watch, she was stunned to see that ten minutes had passed. Sound like a familiar experience? If so, you are in good company. One survey of a random sample of adults found that more than 80 percent acknowledged they had had the experience of missing part of a conversation because their mind 'wandered' (Ross, 1997). Similarly, several people acknowledged not being sure whether they had done something or only thought about it (73% of the sample), remembering the past so vividly that they seemed to be reliving it (60%), not being sure if they remembered an event or it was just a dream (55%), and driving a car and realizing that they didn't remember part of the trip (48%). These experiences might be referred to as altered states of consciousness. To most psychologists, an altered state of consciousness exists whenever there is a change from an ordinary pattern of mental functioning to a state that seems different to the person experiencing the change. Although this definition is not very precise, it reflects the fact that states of consciousness are personal and therefore highly subjective. Altered states of consciousness can vary from ª ISTOCKPHOTO.COM/JAMES KNIGHTEN When we concentrate, we are unaware of background stimuli. This ability to select stimuli to focus on enables us to avoid information overload. For more Cengage Learning textbooks, visit www.cengagebrain.co.uk CHAPTER OUTLINE ASPECTS OF CONSCIOUSNESS Consciousness Preconscious memories The unconscious Automaticity and dissociation SLEEP AND DREAMS Stages of sleep Sleep theory Sleep disorders Dreams Theories of dreaming MEDITATION CUTTING EDGE RESEARCH: PICTURES OF CONSCIOUSNESS? HYPNOSIS Induction of hypnosis Hypnotic suggestions The hidden observer PSYCHOACTIVE DRUGS Depressants Illicit drugs Opiates Stimulants PSI PHENOMENA Experimental evidence The debate over the evidence Anecdotal Evidence SEEING BOTH SIDES: ARE PSI PHENOMENA REAL? 201

202 CHAPTER 6 CONSCIOUSNESS the distraction of a vivid daydream to the confusion and perceptual distortion caused by drug intoxication. In this chapter, we will look at some altered states of ASPECTS OF CONSCIOUSNESS Discussions about the nature of conscious experience and the functions of consciousness will appear throughout this book as we consider perception,

memory, language, problem solving, and other topics. At this point, a general theory of consciousness that provides a framework for considering these various topics would be helpful. Such an approach, however, is not feasible because there is no generally agreed-upon theory. Rather, there are almost as many theories of consciousness as there are individuals who have theorized about the topic. This state of affairs may be discouraging for some readers, particularly those whose prior exposure to science has been in areas where the facts are crystal clear and the theories are well established. Yet what can be more exciting or challenging than venturing into territory that is still uncharted? As important discoveries are being made – in neurophysiology, evolutionary biology, genetics, and various fields of psychology – many observers believe that an explanation of consciousness is tantalizingly close (Crick, 1994). In the absence of a general theory, our discussion of consciousness can do little more than introduce some terms and concepts that will provide a perspective on the topic as it surfaces in later chapters. What is consciousness? Philosophers such as Rene Descartes focused on the subjective experience of the mind ('I think therefore I am') in defining consciousness. The early psychologists defined psychology as 'the study of mind and consciousness'. Willhelm Wundt used the introspective method, along with controlled experiments, to study consciousness in the nineteenth century in Germany. As noted in Chapter 1, both introspection as a method for investigation and consciousness as a topic for investigation fell from favor with the rise of behaviorism in the early 1900s. John Watson and his followers believed that if psychology was to become a science, its data must be objective and measurable. Behavior could be publicly observed, and various responses could be objectively measured. In contrast, an individual's private experiences might be revealed through introspection but could not be directly observed by others or objectively measured. If psychology dealt with overt behavior, it would be dealing with public events rather than private events, which are observable only to the person experiencing them. Behaviorism did not require as radical a For more Cengage Learning textbooks, visit www.cengagebrain.co.uk consciousness that are experienced by everyone (sleep and dreams), as well as some that result from special circumstances (meditation, hypnosis, and the use of drugs). change as its pronouncements seemed to imply. The behaviorists themselves dealt with private events when their research required them to do so. They accepted verbal responses as a substitute for introspection when the participant's own experiences were studied. What participants said was objective, regardless of the underlying subjective condition. Still, many psychologists continued to believe that when people said they experienced a series of colored afterimages after staring at a bright light, they probably did see colors in succession. That is, their words were not the whole story. While behaviorists could deal with many phenomena in terms of verbal responses, their preoccupation with observable behavior caused them to neglect interesting psychological problems (such as dreaming, meditation, and hypnosis) because the subjective aspects made those topics irrelevant to them. By the 1960s, psychologists began to recognize that various aspects of consciousness are too pervasive and important to be neglected. This does not mean that psychology must again be defined exclusively as the study of consciousness; it means only that it cannot afford to neglect consciousness. Confining psychology to the study of observable behavior is too limiting. If we can theorize about the nature of consciousness, and that theory leads to testable predictions about behavior, then such theorizing is a valuable contribution to understanding how the mind works. Consciousness Many textbooks define consciousness as the individual's current awareness of external and internal stimuli – that is, of events in the environment and of body sensations, memories, and thoughts. This definition identifies only one aspect of consciousness and ignores the fact that we are also conscious when we try to solve a problem or deliberately select one course of action over others in response to

environmental circumstances and personal goals. We are conscious not only when we monitor our environment (internal and external) but also when we seek to control ourselves and our environment. In short, consciousness involves (1) monitoring ourselves and our environment so that percepts, memories, and thoughts are represented in awareness, and (2) controlling ourselves and our environment so that we are able to initiate and terminate behavioral and cognitive activities (Kihlstrom, 2007).

Monitoring Processing information from the environment is the main function of the body's sensory systems. It leads to awareness of what is going on in our surroundings as well as within our own bodies. However, we could not possibly attend to all of the stimuli that impinge on our senses without experiencing information overload. Our consciousness, therefore, focuses on some stimuli and ignores others. Often the information selected has to do with changes in our external or internal worlds. While concentrating on this paragraph, for example, you are probably unaware of numerous background stimuli. But should there be a change – the lights dim, the air begins to smell smoky, or the noise of the air conditioner ceases – you would suddenly be aware of such stimuli. Our attention is selective. Some events take precedence over others in gaining access to consciousness and in initiating action. Events that are important to survival usually have top priority. If we are hungry, it is difficult for us to concentrate on studying; if we experience a sudden pain, we push all other thoughts out of consciousness until we do something to make the pain go away. Controlling Another function of consciousness is to plan, initiate, and guide our actions. Whether the plan is simple and readily completed (such as meeting a friend for lunch) or complex and long-range (such as preparing for a career), our actions must be guided and arranged to coordinate with events around us. In planning, events that have not yet occurred can be represented in consciousness as future possibilities. We may envision alternative 'scenarios', make choices, and initiate the appropriate activities. Not all actions are guided by conscious decisions, nor are the solutions to all problems carried out at a conscious level. One of the tenets of modern psychology is that mental events involve both conscious and nonconscious processes and that many decisions and actions are conducted entirely outside of consciousness. The solution to a problem may occur out of the blue without our being aware that we have been thinking about it. And once we have the solution, we may be unable to offer an introspective account of how the solution was reached. Decision making and problem solving often occur at a nonconscious level, but this does not mean that all such behaviors occur without conscious reflection. Consciousness not only monitors ongoing behavior but plays a role in directing and controlling that behavior as well. Preconscious memories We cannot focus on everything that is going on around us at any given time, nor can we examine our entire store of knowledge and memories of past events. At any given moment, we can focus attention on only a few stimuli. We For more Cengage Learning textbooks, visit www.cengagebrain.co.uk ASPECTS OF CONSCIOUSNESS ignore, select, and reject all the time, so that the contents of consciousness are continually changing. Nevertheless, objects or events that are not the focus of attention can still have some influence on consciousness. For example, you may not be aware of hearing a clock strike the hour. But after a few strokes you become alert, and then you can go back and count the strokes that you did not know you heard. Another example of peripheral attention (or nonconscious monitoring) occurs when you are standing in a queue (Farthing, 1992). You are talking with a friend as you wait, ignoring other voices and general noise, when the sound of your own name in another conversation catches your attention. Clearly, you would not have detected your name in the other conversation if you had not, in some sense, been monitoring that conversation. You were not consciously aware of the other

conversation until a special signal drew your attention to it. A considerable body of research indicates that we register and evaluate stimuli that we do not consciously perceive (Bargh, 2007). These stimuli are said to influence us subconsciously, or to operate at a nonconscious level of awareness. Many memories and thoughts that are not part of your consciousness at this moment can be brought to consciousness when needed. At this moment, you may not be conscious of your vacation last summer, but the memories are accessible if you wish to retrieve them, and then they become part of your consciousness. The term preconscious memories is used to refer to memories that are accessible to consciousness. They include specific memories of personal events as well as the information accumulated over a lifetime, such as your knowledge of the meaning of words, the layout of the streets of a city, or the location of a particular country. They also include knowledge about learned skills like the procedures involved in driving a car or the sequence of steps in tying a shoelace. These procedures, once mastered, generally operate outside conscious awareness, but when our attention is called to them, we are capable of describing the steps involved. FROM CARTOONBANK.COM. ALL RIGHTS RESERVED. ª THE NEW YORKER COLLECTION 1979. DANA FRADON 'Good morning, beheaded – uhm I mean beloved'.

204 CHAPTER 6 CONSCIOUSNESS The unconscious One of the earliest theories of consciousness – and one that has been subject to considerable criticism over the years – is the psychoanalytic theory of Sigmund Freud. Freud and his followers believed that there is a portion of the mind, the unconscious, that contains some memories, impulses, and desires that are not accessible to consciousness. Freud believed that some emotionally painful memories and wishes are repressed – that is, diverted to the unconscious, where they may continue to influence our actions even though we are not aware of them. Repressed thoughts and impulses cannot enter our consciousness, but they can affect us in indirect or disguised ways – through dreams, irrational behaviors, mannerisms, and slips of the tongue. The term Freudian slip is commonly used to refer to unintentional remarks that are assumed to reveal hidden impulses. Saying, 'I'm sad you're better' when you intended to say, 'I'm glad you're better' is an example of such a slip. Freud believed that unconscious desires and impulses are the cause of most mental illnesses. He developed the method of psychoanalysis, which attempts to draw the repressed material back into consciousness and, in so doing, cure the individual (see Chapter 16). Most psychologists accept the idea that there are memories and mental processes that are inaccessible to introspection and accordingly may be described as unconscious. However, many would argue that Freud placed undue emphasis on the emotional aspects of the unconscious and not enough on other aspects. They would include in the unconscious a large array of mental processes that we depend on constantly in our everyday lives but to which we have no conscious access (Bargh, 2007). For example, during perception, the viewer may be aware of two objects in the environment but have no awareness of the mental calculations that she performed almost instantaneously to determine that one is closer or larger than the other (see Chapter 5). Although we have conscious access to the outcome of these mental processes – we are aware of the size and distance of the object – we have no conscious access to their operations. A study of the stereotypes people hold about the elderly in the US (for example, that they are slow and weak) provided a striking demonstration of how cues from the environment can influence our behavior without our conscious knowledge. Participants were first given a 'language test' in which they had to decipher a number of scrambled sentences. Some participants were given sentences that contained words such as forgetful, Florida, and bingo – words that the researchers believed would subconsciously evoke or 'prime' the elderly stereotype in their minds. Control participants saw sentences that did not contain these words. After the language test was

completed, each participant was thanked and allowed to leave. A research assistant – who did not know whether the participant was in the experimental group or the control group – surreptitiously measured how long it took the participant to walk down the 40-foot hallway to the exit. The researchers found that participants who had been primed For more Cengage Learning textbooks, visit www.cengagebrain.co.uk with the elderly stereotype words walked more slowly than control participants. (The word slow had not appeared in the sentences.) Interviews with the participants showed that they had no awareness of this influence on their behavior (Bargh, Chen, & Burrows, 1996). Automaticity and dissociation An important function of consciousness is control of our actions. However, some activities are practiced so often that they become habitual or automatic. Learning to drive a car requires intense concentration at first. We have to concentrate on coordinating the different actions (shifting gears, releasing the clutch, accelerating, steering, and so forth) and can scarcely think about anything else. However, once the movements become automatic, we can carry on a conversation or admire the scenery without being conscious of driving – unless a potential danger quickly draws our attention to the operation of the car. This habituation of responses that initially required conscious attention is termed automaticity. Skills like driving a car or riding a bike, once they are well learned, no longer require our attention. They become automatic and allow a relatively uncluttered consciousness to focus on other matters. Such automatic processes may have negative consequences on occasion – for example, when a driver cannot remember landmarks passed along the way. The more automatic an action becomes, the less it requires conscious control. Another example is the skilled pianist who carries on a conversation with a bystander while performing a familiar piece. The pianist is exercising control over two activities – playing and talking – but does not think about the music unless a wrong key is hit, alerting her attention to it and temporarily disrupting the conversation. You can undoubtedly think of other examples of welllearned, automatic activities that require little conscious control. One way of interpreting this is to say that the control is still there (we can focus on automatic processes if we want to) but has been dissociated from consciousness. The French psychiatrist Pierre Janet (1889) originated the concept of dissociation, in which under certain conditions some thoughts and actions become split off, or dissociated, from the rest of consciousness and function outside of awareness. Dissociation differs from Freud’s concept of repression because the dissociated memories and thoughts are accessible to consciousness. Repressed memories, in contrast, cannot be brought to consciousness. They have to be inferred from signs or symptoms such as slips of the tongue. When faced with a stressful situation, we may temporarily put it out of our minds in order to function effectively; when bored, we may lapse into reverie or daydreams. These are mild examples of dissociation that involve dissociating one part of consciousness from another. More extreme examples of dissociation are demonstrated by cases of dissociative identity disorder, or multiple personality, a rare psychological disorder.

INTERIM SUMMARY l A person’s perceptions, thoughts, and feelings at any given moment constitute that person’s consciousness. l An altered state of consciousness is said to exist when mental functioning seems changed or out of the ordinary to the person experiencing the state. Some altered states of consciousness, such as sleep and dreams, are experienced by everyone; others result from special circumstances, such as meditation, hypnosis, or drug use. l The functions of consciousness are (1) monitoring ourselves and our environment so that we are aware of what is happening within our bodies and in our surroundings and (2) controlling our actions so that they are coordinated with events in the outside world. Not all events that influence consciousness are at the center of our awareness at a given moment. Memories of personal events and accumulated

knowledge, which are accessible but are not currently part of a person’s consciousness, are called preconscious memories. Events that affect behavior, even though we are not aware of perceiving them, influence us subconsciously. l According to psychoanalytic theory, some emotionally painful memories and impulses are not available to consciousness because they have been repressed – that is, diverted to the unconscious. Unconscious thoughts and impulses influence our behavior even though they reach consciousness only in indirect ways – through dreams, irrational behavior, and slips of the tongue. l The notion of automaticity refers to the habituation of responses that initially required conscious attention, such as driving a car. CRITICAL THINKING QUESTIONS 1 Many amateur pianists memorize a piece for a recital by playing it over and over again until they can play it automatically, without paying attention to it. Unfortunately, they still often get stuck or forget parts of it during the actual recital. In contrast, some professional pianists deliberately memorize the music away from the piano, so that their ‘mind, not just their fingers’ knows the piece. What does this imply about automatic processes and the controlling function of consciousness? 2 Freud argued that certain desires or thoughts remain in the unconscious because making them conscious arouses anxiety in the individual. What might be some other reasons that certain desires or thoughts might remain out of conscious awareness to us? For more Cengage Learning textbooks, visit www.cengagebrain.co.uk SLEEP AND DREAMS SLEEP AND DREAMS We begin our discussion of consciousness with a state that seems to be its opposite: sleep. But although sleep might seem to have little in common with wakefulness, there are similarities between the two states. The phenomenon of dreaming indicates that we think while we sleep, although the type of thinking we do in dreams differs in various ways from the type we do while awake. We form memories while sleeping, as we know from the fact that we can remember dreams. Sleep is not entirely quiescent: Some people walk in their sleep. People who are asleep are not entirely insensitive to their environment: Parents are awakened by their baby’s cry. Nor is sleep entirely planless: Some people can decide to wake at a given time and do so. In this section we explore several facets of sleep and dreaming. Stages of sleep Some people are readily roused from sleep; others are hard to wake. Research begun in the 1930s (Loomis, Harvey, & Hobart, 1937) has produced sensitive techniques for measuring the depth of sleep and determining when dreams are occurring. This research uses devices that measure electrical changes on the scalp associated with spontaneous brain activity during sleep, as well as eye movements that occur during dreaming. The graphic recording of the electrical changes, or brain waves, is called an electroencephalogram, or EEG (see Figures 6.1 and 6.2). The EEG measures the rapidly fluctuating average electrical potential of thousands of neurons lying on the surface of the cortex under the electrode. It is a rather crude measure of cortical activity, but it has proved very useful in sleep research. Analysis of the patterns of brain waves suggests that there are five stages of sleep: four differing depths of sleep and a fifth stage, known as rapid eye movement (or REM) sleep. When a person closes his or her eyes and relaxes, the brain waves characteristically show a regular pattern of 8 to 12 hertz (cycles per second); these are known as alpha waves. As the individual drifts into Stage 1 sleep, the brain waves become less regular and are reduced in amplitude. Stage 2 is characterized by the appearance of spindles – short runs of rhythmical responses of 12 to 16 hertz – and an occasional sharp rise and fall in the amplitude of the whole EEG (referred to as a K-complex). The still deeper Stages 3 and 4 are characterized by slow waves (1 to 2 hertz), which are known as delta waves. Generally, it is hard to wake the sleeper during Stages 3 and 4, although he or she can be aroused by something personal, such as a familiar name or a child crying. A more impersonal disturbance, such as a loud sound, may be ignored.

206 CHAPTER 6 CONSCIOUSNESS 1 4 1 Electrodes on the scalp record the patterns of brain waves. Electrodes near the person's eyes record eye movement. Electrodes on the chin record tension and electrical activity in the muscles. A neutral electrode on the ear completes the circuit through amplifiers. Amplifiers produce graphical records of the various patterns. Figure 6.1 Arrangement of Electrodes for Recording the Electrophysiology of Sleep. This diagram shows the way electrodes are attached to the person’s head and face in a typical sleep experiment. Succession of sleep stages After an adult has been asleep for an hour or so, another change occurs. The EEG becomes very active (even more so than when the person is awake), but the person does not wake up. The electrodes placed near the person’s eyes detect rapid eye movements so pronounced that one can even watch the sleeper’s eyes move around beneath the closed eyelids. This highly active stage is known as REM sleep; the other four sleep stages are known as non-REM (or NREM) sleep. These various stages of sleep alternate throughout the night. Sleep begins with the NREM stages and has several sleep cycles, each containing some REM and some NREM sleep. Figure 6.3 illustrates a typical night’s sleep for a young adult. As you can see, the person goes from wakefulness into a deep sleep (Stage 4) very rapidly. After about 70 minutes, Stage 3 recurs briefly, immediately followed by the first REM period of the night. Notice that the deeper stages (3 and 4) occurred during the first part of the night, whereas most REM sleep occurred in the last part. This is the typical pattern: The deeper stages tend to disappear in the second half of the night as REM becomes more prominent. There are usually four or five distinct For more Cengage Learning textbooks, visit www.cengagebrain.co.uk REM periods over the course of an eight-hour night, with an occasional brief awakening as morning arrives. The pattern of the sleep cycles varies with age. Newborn infants, for instance, spend about half their sleeping time in REM sleep. This proportion drops to 20 percent to 25 percent of total sleep time by age 5 and remains fairly constant until old age, when it drops to 18 percent or less. Older people tend to experience less Stage 3 and 4 sleep (sometimes these stages disappear) and more frequent and longer nighttime awakenings. A natural kind of insomnia seems to set in as people grow older (Liu & Ancoli-Israel, 2006). REM and NREM compared During NREM sleep, eye movements are virtually absent, heart and breathing rates decrease markedly, the muscles are relaxed, and the brain’s metabolic rate decreases 25 to 30 percent compared with wakefulness. In contrast, during REM sleep, very rapid eye movements occur in bursts lasting 10 to 20 seconds, the heart rate increases, and the brain’s metabolic rate increases somewhat compared with wakefulness. Further, during REM sleep we are almost completely paralyzed – only the heart, diaphragm, eye muscles, and smooth muscles (such as the muscles of the intestines and blood vessels) are spared. To summarize, NREM sleep is characterized by a very relaxed body, whereas REM sleep is characterized by a brain that appears to be wide awake in a virtually paralyzed body. Physiological evidence indicates that in REM sleep the brain is largely isolated from its sensory and motor channels. Stimuli from other parts of the body are blocked from entering the brain, and there are no motor outputs. Nevertheless, the brain is still very active, spontaneously driven by the discharge of giant neurons that originate in the brain stem. These neurons extend into parts of the brain that control eye movements and motor activities. During REM sleep, the brain registers the fact that the neurons normally involved in walking and seeing are activated, even though the body itself is doing neither of these things (Stoerig, 2007). In addition, during REM sleep, the areas of the brain involved in the processing of emotional memories show significant increases in activation (Maquet, 2000). About 80 percent of sleepers who are awakened during REM sleep report having a dream, but when awakened during NREM sleep they report a dream only about 50 percent of the time (Stoerig, 2007). The dreams reported when a person is roused from REM sleep tend to be visually vivid with emotional and

illogical features. They represent the type of experience we typically associate with the word dream. The longer the period of REM sleep before arousal, the longer and more elaborate the reported dream. In contrast, NREM dreams are neither as visual nor as emotionally charged as REM dreams, and they are more directly related to what is happening in the

Awake Rem sleep Stage 1 Stage 2 Spindles Stage 3 Delta wave Stage 4 Figure 6.2 Electrophysiological Activity During Sleep. This figure represents EEG recordings during wakefulness and during the various stages of sleep. The Awake Stage (relaxed with eyes closed) is characterized by alpha waves (8–12 hertz). Stage 1 is basically a transition from wakefulness to the deeper stages of sleep. Stage 2 is defined by the presence of sleep spindles (brief bursts of 12–16 hertz waves) and K-complexes (a sharp rise and fall in the brainwave pattern). Stages 3 and 4 are marked by the presence of delta waves (1–2 hertz), and the only difference between these two stages is the amount of delta waves found. Stage 3 is scored when 20% to 50% of the record contains delta waves, and Stage 4 when the percentage of delta waves is 50% or more. Awake REM NREM Stages 2 4 7 5 3 1 Hours of sleep Figure 6.3 The Succession of Sleep Stages. This graph provides an example of the sequence and duration of sleep stages during a typical night. The individual went successively through Stages 1 to 4 during the first hour of sleep. He then moved back through Stage 3 to REM sleep. Thereafter, he cycled between NREM and REM periods, with two brief awakenings at about 31 2 and 6 hours of sleep. person’s waking life. As indicated by the types of dreams we report and the frequency of reporting a dream, mental activity is different in REM and NREM periods. For more Cengage Learning textbooks, visit www.cengagebrain.co.uk SLEEP AND DREAMS Sleep theory Why are we awake at certain times and asleep at others? Two leading sleep researchers, Dale Edgar and William Dement (1992), have proposed an opponent-process model of sleep and wakefulness. According to this model, the brain possesses two opponent processes that govern the tendency to fall asleep or remain awake. They are the homeostatic sleep drive and the clock-dependent alerting process. The homeostatic sleep drive is a physiological process that strives to obtain the amount of sleep required for a stable level of daytime alertness. It is active throughout the night, but it also operates during the daytime. Throughout the day, the need to sleep is continuously building. If we have slept too little the previous night, the tendency to fall asleep during the day will be significant. The clock-dependent alerting process is the process in the brain that arouses us at a particular time each day. It is controlled by the so-called biological clock, which consists of two tiny neural structures located in the center of the brain. This ‘clock’ controls a series of psychological and physiological changes, including rhythms of alertness, that are termed circadian rhythms because they occur approximately every 24 hours (the term comes from the Latin words circa, meaning ‘around’, and dies, ‘day’). The biological clock is affected by exposure to light: Daylight signals it to stop the secretion of melatonin, a hormone that induces sleep. The two opponent processes – homeostatic sleep drive and the clock-dependent alerting process – interact to produce our daily cycle of sleep and wakefulness. Whether we are asleep or awake at any given time depends on the relative strength of the two processes. During the day, the clock-dependent alerting process usually overcomes the drive for sleep, but during the evening our alertness decreases as the urge to sleep K-Complex

208 CHAPTER 6 CONSCIOUSNESS ª MONKEY BUSINESS IMAGES/DREAMSTIME.COM Sleep deprivation is a common cause of underperformance among students. becomes stronger. Late in the evening, the biological clock becomes inactive and we fall asleep. Sleep disorders About 90

percent of adults sleep six to nine hours per night, with the largest number sleeping seven-and-a-half to eight hours. Although some people sleep only six to seven hours, most of these people have measurable signs of sleepiness during the daytime, even if they do not realize it. It appears that most adults require eight to nine hours of sleep to be free from daytime sleepiness. A sleep disorder exists when inability to sleep well produces impaired daytime functioning or excessive sleepiness. In this section we look at some common types of sleep disorders. Deprivation Whether they are aware of it or not, most people occasionally or chronically deprive themselves of adequate sleep. Consider a few examples: l Thirty percent of high school and college students fall asleep in class at least once a week. l Thirty-one percent of all drivers have fallen asleep at the wheel at least once. l Fatigue is the primary factor that detrimentally affects the ability of pilots. l The nuclear accidents at Chernobyl and Three Mile Island occurred in the early morning hours, when night-shift workers were fatigued and missed, or were confused by, warning signals on their control panels (National Sleep Foundation in America Poll, 2006; Maas, 1998; Wolfson & Armitage, 2008). Gallup surveys have found that 56 percent of the adult U.S. population reports daytime drowsiness as a problem. According to a leading sleep researcher, many of these For more Cengage Learning textbooks, visit www.cengagebrain.co.uk individuals are ‘waking zombies’ carrying years of accumulated ‘sleep debt’. He points out that ‘a one-hour sleep loss every night for an entire week is equivalent to having pulled one all-nighter’ (Maas, 1998, p. 53). A common sign of sleep deprivation is inability to get through the day without a temporary loss in energy and alertness, usually occurring in mid-afternoon. Many people attribute this state to a heavy meal, a low dose of alcohol, or environmental conditions such as sitting in a warm room and listening to a dull lecture. But these factors do not cause sleepiness – they merely reveal the presence of sleep debt. With adequate sleep, a normal person is alert throughout the day, even when engaged in unstimulating, sedentary activities. Sleep researchers have demonstrated that alertness significantly increases when people who normally get eight hours of sleep get an additional two hours of sleep. Although most people can operate satisfactorily on eight hours of sleep, they are not at their best. Moreover, they lack a safety margin to make up for the times when they get less than that amount of sleep. The loss of as little as an hour of sleep increases the likelihood of inattentiveness, mistakes, illness, and accidents (Wolfson & Armitage, 2008). Even if you cannot arrange to get ten hours of sleep a night, you can avoid excessive sleep debt by getting eight or nine hours of restful sleep. Table 6.1 suggests techniques that can be used to ensure a good night’s sleep. Insomnia The term insomnia refers to complaints about a symptom, namely, dissatisfaction with the amount or quality of one’s sleep. Whether or not a person has insomnia is a largely subjective matter. Many people who complain of insomnia are found to have perfectly normal sleep when they are studied in a sleep laboratory, whereas others who do not complain of insomnia have detectable sleep disturbances (Carney, Berry, & Geyer, 2004). This does not mean that insomnia is not a real condition, only that subjective reports of sleeplessness do not always correlate well with more objective measures. A perplexing feature of insomnia is that people seem to overestimate the amount of sleep lost. One study that monitored the sleep of people who identified themselves as insomniacs found that only about half were actually awake as much as 30 minutes during the night (Carskadon, Mitler, & Dement, 1974). The problem may be that some people remember only time spent awake and think they have not slept because they have no memory of doing so. Narcolepsy and apnea Two relatively rare but severe sleep disorders are narcolepsy and apnea. A person with narcolepsy has recurring, irresistible attacks of drowsiness and may fall asleep at any time – while writing a letter, driving a car, or carrying

on a conversation. If a student falls asleep while a professor is lecturing, that may be perfectly normal, but a professor who falls asleep while lecturing may be suffering from narcolepsy. Such episodes can occur several times a day in severe cases and last from a few seconds to 30 minutes. Narcoleptics have difficulty keeping jobs because of their daytime sleepiness and are potentially dangerous if they are driving a car or operating machinery when an attack occurs. Approximately one in a thousand individuals suffers from debilitating narcolepsy, and the incidence of milder, unrecognized cases may be much higher. Essentially, narcolepsy is the intrusion of REM episodes into daytime hours. During attacks, victims go quickly into a REM state, so rapidly, in fact, that they may lose muscle control and collapse before they can lie down. Moreover, many report experiencing hallucinations during an attack as reality is replaced by vivid REM dreams. Narcolepsy runs in families, and there is evidence that a specific gene or combination of genes makes an individual susceptible to the disorder (Carney et al., 2004). Table 6.1 Advice for a good night's sleep There is considerable agreement among researchers and clinicians on how to avoid sleep problems. These recommendations are summarized in the table; some are based on actual research, and others are simply the best judgments of experts in the field. Regular sleep schedule Establish a regular schedule of going to bed and getting up. Set your alarm for a specific time every morning and get up at that time no matter how little you may have slept. Be consistent about naps. Take a nap every afternoon or not at all; when you take a nap only occasionally, you probably will not sleep well that night. Waking up late on weekends can also disrupt your sleep cycle. Alcohol and caffeine Having a stiff drink of alcohol before going to bed may put you to sleep, but it disturbs the sleep cycle and can cause you to wake up early the next day. In addition, stay away from caffeinated drinks like coffee or cola for several hours before bedtime. Caffeine works as a stimulant even on those people who claim they are not affected by it, and the body needs four to five hours to halve the amount of caffeine in the bloodstream at any one time. If you must drink something before bedtime, try milk; there is evidence to support the folklore that a glass of warm milk at bedtime induces sleep. Eating before bedtime Don't eat heavily before going to bed, since your digestive system will have to do several hours of work. If you must eat something before bedtime, have a light snack. Exercise Regular exercise will help you sleep better, but don't engage in a strenuous workout just before going to bed. Sleeping pills Be careful about using sleeping pills. All of the various kinds tend to disrupt the sleep cycle, and long-term use inevitably leads to insomnia. Even on nights before exams, avoid using a sleeping pill. One bad night of sleep tends not to affect performance the next day, but hangover from a sleeping pill may. Relax Avoid stressful thoughts before bedtime and engage in soothing activities that help you relax. Try to follow the same routine every night before going to bed; it might involve taking a warm bath or listening to soft music for a few minutes. Find a room temperature at which you are comfortable and maintain it throughout the night. When all fails If you are in bed and have trouble falling asleep, don't get up. Stay in bed and try to relax. But if that fails and you become tense, then get up for a brief time and do something restful that reduces anxiety. Doing push-ups or some other form of exercise to wear yourself out is not a good idea. In an experiment by noted sleep researcher William Dement, a narcoleptic dog suddenly falls asleep. About 1 in 1,000 humans suffers from this debilitating sleep disorder.

 In apnea, the individual stops breathing while asleep. There are two reasons for apnea attacks. One reason is that the brain fails to send a 'breathe' signal to the

diaphragm and other breathing muscles, thus causing breathing to stop. The other reason is that muscles at the top of the throat become too relaxed, allowing the windpipe to partially close and thereby forcing the breathing muscles to pull harder on incoming air, which causes the airway to completely collapse. During an apnea episode, the oxygen level of the blood drops dramatically, leading to the secretion of emergency hormones. This reaction causes the sleeper to awaken in order to begin breathing again. Most people have a few apnea episodes each night, but people with severe sleep problems may have several hundred episodes per night. With each one, they wake up to resume breathing, but these arousals are so brief that the person generally is unaware of them. The result is that people who suffer from apnea can spend 12 or more hours in bed each night and still be so sleepy the next day that they cannot function and may even fall asleep in the middle of a conversation (Vandeputte & de Weerd, 2003). Sleep apnea is common among older men. Sleeping pills, which make arousal more difficult, lengthen periods of apnea (during which the brain is deprived of oxygen) and may prove fatal. Dreams Dreaming is an altered state of consciousness in which picture stories are constructed based on memories and current concerns, emotions, fantasies and images. Investigators do not yet understand why people dream at all, much less why they dream what they do. However, modern methods of study have answered a great many questions about dreaming. Some of them are explored here. Does everyone dream? Although many people do not recall their dreams in the morning, evidence from studies of REM sleep suggests that nonrecallers often do as much dreaming as recallers. If you take people who swear that they have never dreamed, put them in a dream research laboratory, and wake them from REM sleep, they may recall dreams at rates comparable to those of other people. If someone says, ‘I never dream’, what they may mean is ‘I can’t recall my dreams’. Some evidence does suggest, however, that preschool children do not dream and that young children dream much less often than adults (Foulkes, 1999). In addition, adults with certain types of brain damage also do not appear to dream (Solms, 1997). Some people may indeed not dream. Researchers have proposed several hypotheses to account for differences in dream recall among people who For more Cengage Learning textbooks, visit www.cengagebrain.co.uk clearly do dream. One possibility is that nonrecallers simply have more difficulty than recallers in remembering their dreams. Another hypothesis suggests that some people wake up relatively easily in the midst of REM sleep and therefore recall more dreams than those who sleep more soundly. The most generally accepted model of dream recall supports the idea that what happens on awakening is the crucial factor. According to this hypothesis, unless a distraction-free waking period occurs shortly after dreaming, the memory of the dream is not consolidated – that is, the dream cannot be stored in memory (Cohen & Wolfe, 1973). Other researchers argue that a person’s motivation to recall dreams and interest in dreams is a good predictor of ability to recall dreams (see Schredl, 2007). If upon awakening we make an effort to remember what we were dreaming at the time, some of the dream content will be recalled at a later time. Otherwise, the dream will fade quickly. We may know that we have had a dream but will be unable to remember its content. If you are interested in remembering your dreams, keep a notebook and pencil beside your bed. Tell yourself that you want to wake up when you have a dream. When you do, immediately try to recall the details and write them down. As your dream recall improves, look for patterns. Underline anything that strikes you as odd and tell yourself that the next time something similar happens, you are going to recognize it as a sign that you are dreaming. (Of course, you will lose some sleep if you follow this regimen!) How long do dreams last? Some dreams seem almost instantaneous. The alarm clock rings, and we awaken to complex memories of a fire breaking out and fire engines arriving with their sirens blasting. Because the alarm is still ringing, we assume that the sound must have

produced the dream. Research ª ISTOCKPHOTO.COM/RYAN LANE We all like to have good dreams, but it is generally very difficult to control the content of our dreams.

suggests, however, that a ringing alarm clock or other sound merely reinstates a complete scene from earlier memories or dreams. This experience has its parallel during wakefulness, when a single cue may tap a rich memory. The length of a typical dream can be inferred from a REM study in which participants were awakened and asked to act out what they had been dreaming (Dement & Wolpert, 1958). The time it took them to pantomime the dream was almost the same as the length of the REM sleep period, suggesting that the incidents in dreams commonly last about as long as they would in real life. Do people know when they are dreaming? The answer to this question is 'sometimes yes'. People can be taught to recognize that they are dreaming, yet their awareness does not interfere with the spontaneous flow of the dream. For example, people have been trained to press a switch when they notice that they are dreaming (Salamy, 1970). Some people have lucid dreams, in which events seem so normal (lacking the bizarre and illogical character of most dreams) that the dreamers feel as if they are awake and conscious. Lucid dreamers report doing various 'experiments' within their dreams to determine whether they are awake or dreaming. They also report an occasional 'false awakening' within a dream. For example, one lucid dreamer discovered that he was dreaming and decided to call a taxicab as an indication of his control over events. When he reached into his pocket to see if he had some change to pay the driver, he thought that he woke up. He then found the coins scattered about the bed. At this point he really awoke and found himself lying in a different position and, of course, without any coins (Brown, 1936). Note, however, that relatively few people achieve lucidity with any regularity (LaBerge, 2007). Can people control the content of their dreams? Psychologists have demonstrated that some control of dream content is possible by changing people's environment or making suggestions to people in the presleep period and then analyzing the content of their dreams. In one study, researchers tested the effect of wearing red goggles for several hours before going to sleep. Although the researchers made no actual suggestion and the participants did not understand the purpose of the experiment, many participants reported that their visual dream worlds were tinted red (Roffwarg, Herman, BowerAnders, & Tauber, 1978). In a study of the effect of an overt predream suggestion, participants were asked to try to dream about a personality characteristic that they wished they had. Most of the participants had at least one dream in which the intended trait could be recognized (Cartwright, 1974). Despite these findings, most studies For more Cengage Learning textbooks, visit www.cengagebrain.co.uk SLEEP AND DREAMS find little evidence that dream content can actually be controlled (Domhoff, 1985). Dreams with disturbing content are usually referred to as nightmares. Occasional nightmares are fairly common, with about 85 percent of people reporting they had a nightmare in the last year (Levin & Nielsen, 2007). Between 8 and 25 percent of people have nightmares monthly, a figure that is very similar across cultures. Weekly nightmares are reported by 2 to 6 percent of people across cultures, and can constitute a mental health problem (Levin & Nielsen, 2007). Theories of dreaming One of the earliest theories of the function of dreams was suggested by Sigmund Freud. In The Interpretation of Dreams (1900), Freud proposed that dreams provide a 'royal road to a knowledge of the unconscious activities of the mind'. He believed that dreams are a disguised attempt at wish fulfillment. By this he meant that the dream touches on wishes, needs, or ideas that the individual finds unacceptable and have been repressed to the unconscious (for example, sexual longings for the parent of the opposite sex). These wishes and ideas are the latent content of the dream. Freud used the metaphor of a censor to explain the conversion of latent content into manifest content (the characters and events

that make up the actual narrative of the dream). In effect, Freud said, the censor protects the sleeper, enabling him or her to express repressed impulses symbolically while avoiding the guilt or anxiety that would occur if they were to appear consciously in undisguised form. According to Freud, the transformation of latent content into manifest content is done by ‘dream work’, whose function is to code and disguise material in the unconscious in such a way that it can reach consciousness. However, sometimes dream work fails, and the resulting anxiety awakens the dreamer. The dream essentially expresses the fulfillment of wishes or needs that are too painful or guilt-inducing to be acknowledged consciously (Freud, 1933). Subsequent research challenged several aspects of Freud’s theory. After surveying dozens of studies of dreaming, Fisher and Greenberg (1977, 1996) concluded there is good evidence that the content of dreams has psychological meaning, but there is none that supports Freud’s distinction between manifest and latent content. Although most psychologists would agree with Freud’s general conclusion that dreams focus on emotional concerns, they question the concept of ‘dream work’ and the idea that dreams represent wish fulfillment. Since Freud’s time, a variety of theories have been advanced to explain the role of sleep and dreams. Evans (1984), for example, views sleep, particularly REM sleep, as a period when the brain disengages from the external world and uses this ‘off-line’ time to sift through the

212 CHAPTER 6 CONSCIOUSNESS information that was input during the day and to incorporate it into memory (see also Crick & Mitchinson, 1983). We are not consciously aware of the processing that occurs during REM sleep. During dreaming, however, the brain comes back online for a brief time, and the conscious mind observes a small sample of the modification and reorganization of information that is taking place. The brain attempts to interpret this information the same way it would interpret stimuli coming from the outside world, giving rise to the kinds of pseudo-events that characterize dreams. According to Evans, dreams are nothing more than a small subset of the vast amount of information that is being scanned and sorted during REM sleep, a momentary glimpse by the conscious mind that we remember if we awaken. Evans believes that dreams can be useful in making inferences about the processing that occurs during REM sleep but that they represent an extremely small sample on which to base such inferences. Other researchers take different approaches. Hobson (1997), for example, notes that dreaming is characterized by formal visual imagery (akin to hallucination), inconstancy of time, place, and person (akin to disorientation), and inability to recall (akin to amnesia). Dreaming thus resembles delirium. It has also been suggested that dreams may have a problem-solving function (Cartwright, 1978, 1992, 1996), but this theory has been challenged on methodological grounds (Antrobus, 1993; Foulkes, 1993). Analysis of dreams shows that their emotional content varies widely and includes nightmares and terrors, social dreams with significant others that arouse happiness, dreams of loss of a loved one that engender intense sadness, and bizarre dreams that arouse confusion and strangeness (Businck & Kuiken, 1993; Kuiken & Sikora, 1996). Dream content may reflect personal conflicts, but dreams do not necessarily function to resolve those conflicts (Levin & Nielsen, 2007). Dreams often contain elements related to events of the previous day, but not full memories of episodes in the day (Nielsen & Stenstrom, 2005). Rather, fragments of events during the day may be included, such as a stranger in the dream who looks like the dreamer’s mother. In addition, there are more negative than positive emotions in dreams. Overall, dreams cannot be viewed as simple extensions of the previous day’s activities. Analyses of dreams have also found significant age, gender, and cross-cultural similarities and differences in their content, leading some theorists to propose that dreaming is a cognitive process (Antrobus, 1991; Domhoff, 1996; Foulkes, 1985).

An early researcher in this field pointed out that dreams seem to express conceptions and concerns (Hall, 1947, 1953). However, dreaming differs from waking thought in that it lacks intentionality and reflectiveness (Blagrove, 1992, 1996; Foulkes, 1985), and these theorists think that dreaming is unlikely to have a problem-solving function. Instead, it is a cognitive activity, as evidenced by For more Cengage Learning textbooks, visit www.cengagebrain.co.uk the continuity between dream content and waking thoughts and behavior. As Domhoff notes, 'The concerns people express in their dreams are the concerns they have in waking life. What they dream about is also what they think about or do when they are awake' (1996, p. 8). Parents dream of their children, aggressive dream content is more common among people under age 30 than in older people, and women are more often victims of aggression. These patterns support what Domhoff and others refer to as the 'continuity theory' of dreaming, in which dreaming is an imaginative process that reflects the individual's conceptions, concerns, and emotional preoccupations. INTERIM SUMMARY l Sleep, an altered state of consciousness, is of interest because of the rhythms evident in sleep schedules and in the depth of sleep. These rhythms are studied with the aid of the electroencephalogram (EEG). l Patterns of brain waves show four stages (depths) of sleep, plus a fifth stage characterized by rapid eye movements (REMs). These stages alternate throughout the night. Dreams occur more often during REM sleep than during the other four stages (NREM sleep). l The opponent-process model of sleep proposes that two opposing processes – the homeostatic sleep drive and the clock-dependent alerting process – interact to determine our tendency to fall asleep or remain awake. Whether we are asleep or awake at any given time depends on the relative forces exerted by the two processes. l There are a variety of sleep disorders, including sleep deprivation, insomnia, narcolepsy, and apnea. l Freud attributed psychological causes to dreams, distinguished between their manifest and latent content, and suggested that dreams are wishes in disguise. l Other theories see dreaming as a reflection of the information processing that the brain is doing while asleep. l Recently some theorists have concluded that dreaming is a cognitive process that reflects the individual's conceptions, concerns, and emotional preoccupations. CRITICAL THINKING QUESTIONS 1 How might dream theories explain instances when people appear to have dreamed of an event they were not expecting before it actually happens? 2 What personality characteristics do you think might be related to the tendency to remember your dreams?

MEDITATION Meditation refers to achieving an altered state of consciousness by performing certain rituals and exercises, such as controlling and regulating breathing, sharply restricting one's field of attention, eliminating external stimuli, assuming yogic body positions, and forming mental images of an event or symbol. The result is a pleasant, mildly altered subjective state in which the individual feels mentally and physically relaxed. After extensive practice, some individuals may have mystical experiences in which they lose self-awareness and gain a sense of being involved in a wider consciousness, however defined. The belief that such meditative techniques may cause a change in consciousness goes back to ancient times and is represented in every major world religion. Buddhists, Hindus, Sufi Muslims, Jews, and Christians all ª ISTOCKPHOTO.COM/BRENT HOLLAND The rituals of meditation include regulating breathing, restricting one's field of attention, eliminating external stimuli, and forming mental images of an event or symbol. Traditional forms of meditation follow the practices of yoga. For more Cengage Learning textbooks, visit www.cengagebrain.co.uk MEDITATION have literature describing rituals that induce meditative states. Traditional forms of meditation follow the practices of yoga, a system of thought based on the Hindu religion, or Zen, which is derived from Chinese and Japanese Buddhism. Two common meditation techniques are openingup meditation, in which the person clears his or her mind in

order to receive new experiences, and concentrative meditation, in which the benefits are obtained by actively attending to some object, word, or idea. The following is a typical description of opening-up meditation: This approach begins with the resolve to do nothing, to think nothing, to make no effort of one's own, to relax completely and let go of one's mind and body … stepping out of the stream of ever-changing ideas and feelings which your mind is in, watch the onrush of the stream. Refuse to be submerged in the current. Changing the metaphor … watch your ideas, feelings, and wishes fly across the firmament like a flock of birds. Let them fly freely. Just keep a watch. Don't let the birds carry you off into the clouds. (Chauduri, 1965, pp. 30–31) Here is a corresponding statement for concentrative meditation: The purpose of these sessions is to learn about concentration. Your aim is to concentrate on the blue vase. By concentration I do not mean analyzing the different parts of the vase, but rather, trying to see the vase as it exists in itself, without any connections to other things. Exclude all other thoughts or feelings or sounds or body sensations. (Deikman, 1963, p. 330) After a few sessions of concentrative meditation, people typically report a number of effects: an altered, more intense perception of the vase; some time shortening, particularly in retrospect; conflicting perceptions, as if the vase fills the visual field and does not fill it; decreasing effectiveness of external stimuli (less distraction and eventually less conscious registration); and an impression of the meditative state as pleasant and rewarding. In one experimental study of individuals who underwent an eight-week training in meditation practices, experimenters found that trainees (compared to a waitlist control group) reported reductions in anxiety and other negative affect, increases in activity in areas of the brain associated with positive affect, and enhanced immune system functioning (Davidson et al., 2003). Meditation training is increasingly being incorporated into interventions for people with stress-related disorders (see Chapter 14). Some researchers argue that the benefits of meditation come largely from relaxation of the body (Holmes, 1984). Indeed, one study in which

214 CHAPTER 6 CONSCIOUSNESS CUTTING EDGE RESEARCH Pictures of Consciousness? As neuroimaging techniques have become more sophisticated, researchers have been intrigued at the possibility that these techniques could shed light on the nature of consciousness, and what brain structures control various aspects of consciousness. Thus, magnetic resonance imagery, electroencephalograms, and positron emission tomography are all being used to image the brain of people in various forms of consciousness, including people sleeping, people in a coma, and people who have recently learned how to meditate. One group of researchers, however, is interested in the differences in brain structure and functioning between everyday people and those who are expert at achieving altered state of consciousness. Specifically, these researchers have been using neuroimaging techniques to understand the effects of long-time practice of meditation on brain functioning (see Lutz, Dunne, & Davidson, 2007). The participants in these studies have been experienced Buddhist meditators (with over 10,000 hour of cumulative meditation practice) and newly trained novice meditators. In one study (BrefczynskiLewis, Lutz, & Davidson, 2004), participants performed a focused attention meditation in which the mind is focused singularly and unwaveringly on an individual object (a white dot on the screen). Magnetic resonance imagery showed that both the experts and the novices showed increased activation in areas of the brain associated with attention during the meditation phase of the study, as compared to a rest phase. However, the experts showed even greater activity in these attention areas than the experts while meditating. In contrast, EEG readings were recorded for people practicing transcendental meditation found that most of the participants spent considerable portions of their meditation periods in physiological sleep (Younger, Adriance, & Berger, 1975). Other researchers suggest that

the psychological benefits of meditation may be due to learning to put aside repetitive and troubling thoughts (Teasdale et al., 2000). INTERIM SUMMARY l Meditation represents an effort to alter consciousness by following planned rituals or exercises such as those of yoga or Zen. l The result is a somewhat mystical state in which the individual is extremely relaxed and feels divorced from the outside world. For more Cengage Learning textbooks, visit www.cengagebrain.co.uk the novices showed greater activity than the experts in areas of the brain associated with detecting errors, possibly because they were having more difficulty maintaining their concentration and thus diverting their attention away from the white dot more often. In another study, these researchers had Buddhist practitioners and novices engage in a form of meditation in which they were to generate an unconditional feeling of lovingkindness and compassion. Neuroimaging showed that while in this state, both the experts and novices showed increased activity in areas of the brain associated with positive emotions and the planning of movements, but the experts showed greater activity in these areas than the novices. The researchers interpreted these data as suggesting that a conscious state of lovingkindness toward others involves both emotional processing and an inclination to act on these feelings. These studies raise intriguing questions about how practicing certain states of consciousness, as in mediation, can actually change the functioning of the brain. They also raise hope that training certain mental activities may help to generate new or altered activity in the brain, which could prove therapeutic for individuals with brain damage or deficiencies. Do these studies tell us anything, however, about the nature of consciousness? One impediment to understanding consciousness is the fact that we still must rely on individuals' selfreport to determine what is, or is not, going through their mind. Thus, although sophisticated neuroimaging techniques can give us pictures of the activity associated with consciousness, they can't give us a direct lens on consciousness itself. CRITICAL THINKING QUESTIONS 1 People who make a daily practice of meditating often say they are calmer and better able to respond to stress throughout the day as a result of meditating. If this is true, what might account for these effects? 2 There is some evidence that meditation can improve physical health. What might be the mechanisms for these effects, if true? HYPNOSIS Of all the altered states of consciousness discussed in this chapter, none has raised more questions than hypnosis. Once associated with the occult, hypnosis has become the subject of rigorous scientific investigation (see Kihlstrom, 2007). As in all fields of psychological investigation, uncertainties remain, but by now many facts have been

established. In this section we explore what is known about this controversial phenomenon. Induction of hypnosis In hypnosis, a willing and cooperative individual (the only kind that can be hypnotized under most circumstances) relinquishes some control over his or her behavior to the hypnotist and accepts some distortion of reality. The hypnotist uses a variety of methods to induce this condition. For example, the person may be asked to concentrate on a small target (such as a thumbtack on the wall) while gradually becoming relaxed. The hypnotist may suggest that the person is becoming sleepy because, like sleep, hypnosis is a relaxed state in which a person is out of touch with ordinary environmental demands. But sleep is only a metaphor. The person is told that he or she will not really go to sleep but will continue to listen to the hypnotist. The same state can be induced by methods other than relaxation. A hyperalert hypnotic trance is characterized by increased tension and alertness. For example, in one study, participants riding a stationary bicycle while receiving suggestions of strength and alertness were as responsive to hypnotic suggestions as relaxed participants (Banyai & Hilgard, 1976). This result denies the common equation of hypnosis with relaxation, but it is consistent with the trance-induction methods used by the

whirling dervishes of some Muslim religious orders. Modern hypnotists do not use authoritarian commands. The person enters the hypnotic state when the conditions are right; the hypnotist merely helps set the conditions. The following changes are characteristic of the hypnotized state: l Planfulness ceases. A deeply hypnotized individual does not like to initiate activity and would rather wait for the hypnotist to suggest something to do. l Attention becomes more selective than usual. A person who is told to listen only to the hypnotist's voice will ignore any other voices in the room. l Enriched fantasy is readily evoked. People may find themselves enjoying experiences at places that are distant in time and space. l Reality testing is reduced and reality distortion accepted. A person may uncritically accept hallucinated experiences (for example, conversing with an imagined person who is believed to be sitting in a nearby chair) and will not check to determine whether that person is real. l Suggestibility is increased. An individual must accept suggestions in order to be hypnotized at all, but whether suggestibility is increased under hypnosis is a matter of some dispute. Careful studies have found some increase in suggestibility following hypnotic induction, though less than is commonly supposed (Ruch, Morgan, & Hilgard, 1973). For more Cengage Learning textbooks, visit www.cengagebrain.co.uk HYPNOSIS © (AFTER HILGARD, 1965) Percent of cases 5 0 2 4 6 8 10 12 Hypnotic susceptibility score (based on 533 cases) Figure 6.4 Individual Differences in Hypnotizability. Participants were hypnotized, then given 12 different hypnotic suggestions. Their response to each suggestion was scored as present or absent, and the present responses were totaled for each participant to yield a score ranging from 0 (no responses) to 12 (responded to all). Most individuals fell in the middle ranges. l Posthypnotic amnesia is often present. When instructed to do so, an individual who is highly responsive to hypnotism will forget all or most of what took place during the hypnotic session. When a prearranged release signal is given, the memories are restored. Not all individuals are equally responsive to hypnosis, as Figure 6.4 indicates. Roughly 5 to 10 percent of the population cannot be hypnotized even by a skilled hypnotist, and the remainder show varying degrees of susceptibility. However, a person who is hypnotized on one occasion probably will be equally susceptible on another occasion (Kihlstrom, 2007). Hypnotic suggestions Suggestions given to a hypnotized individual can result in a variety of behaviors and experiences. The person's motor control may be affected, new memories may be lost or old ones re-experienced, and current perceptions may be radically altered. Control of movement Many hypnotized individuals respond to direct suggestion with involuntary movement. For example, if a person stands with arms outstretched and hands facing each other and the hypnotist suggests that the person's hands are attracted to each other, the hands will soon begin to move together, and the person will feel propelled by some external force. Direct suggestion can also inhibit movement. If a suggestible individual is told that an arm is stiff (like a bar of iron or an arm in a splint) and then is asked to bend the arm, it will not bend, or more effort than usual will be needed to make it bend. This response is less common than suggested movement.

 A posthypnotic response occurs when people who have been roused from hypnosis respond with movement to a prearranged signal by the hypnotist. Even if the suggestion has been forgotten, they will feel a compulsion to carry out the behavior. They may try to justify such behavior as rational, even though the urge to perform it is impulsive. For example, a young man searching for a rational explanation of why he opened a window when the hypnotist took off her glasses (the prearranged signal) remarked that the room felt a little stuffy. Posthypnotic amnesia At the suggestion of the hypnotist, events occurring during hypnosis may be 'forgotten' until a signal from the hypnotist enables the individual to recall them. This is called posthypnotic amnesia. People differ widely in their susceptibility to posthypnotic amnesia, as

Figure 6.5 shows. The items to be recalled in this study were ten actions that the participants performed while hypnotized. A few participants forgot none or only one or two items; most participants forgot four or five items. However, a sizable number of participants forgot all ten items. Many studies of posthypnotic amnesia have shown similar results. The group of participants with the higher recall is larger and presumably represents the average hypnotic responders; the participants who forgot all ten items have been described as ‘hypnotic virtuosos’. © (AFTER COOPER, 1979) 70 Number of cases 40 20 0 1 3 5 7 9 Number of items forgotten Figure 6.5 The Distribution of Posthypnotic Amnesia. Individuals performed 10 actions while hypnotized and were then given posthypnotic amnesia instructions. When asked what occurred during hypnosis, these individuals varied in the number of actions they failed to recall: The level of forgetting for a given individual ranged from 0 to 10 items. The experiment involved 491 people, and the graph plots the number of people at each level of forgetting. The plot shows a bimodal distribution for posthypnotic amnesia, with peaks at 4 and 10 items forgotten. For more Cengage Learning textbooks, visit www.cengagebrain.co.uk Differences in recall between the two groups do not appear to be related to differences in memory capacity: Once the amnesia is canceled at a prearranged signal from the hypnotist, highly amnesic participants remember as many items as those who are less amnesic. Some researchers have suggested that hypnosis temporarily interferes with the person’s ability to retrieve a particular item from memory but does not affect actual memory storage (Kihlstrom, 2007). Positive and negative hallucinations Some hypnotic experiences require a higher level of hypnotic talent than others. The vivid and convincing perceptual distortions of hallucinations, for instance, are relatively rare in hypnotized individuals. Two types of suggested hallucinations have been documented: positive hallucinations, in which the person sees an object or hears a voice that is not actually present; and negative hallucinations, in which the person does not perceive something that normally would be perceived. Many hallucinations have both positive and negative components. For example, in order to not see a person sitting in a chair (a negative hallucination), an individual must see the parts of the chair that would ordinarily be blocked from view (a positive hallucination). Hallucinations can also occur as a result of posthypnotic suggestion. For example, individuals may be told that upon being aroused from the hypnotic state they will find themselves holding a rabbit that wants to be petted and that the rabbit will ask, ‘What time is it?’ Seeing and petting the rabbit will seem natural to most people. But when they find themselves giving the correct time of day, they are surprised and try to provide an explanation for the behavior: ‘Did I hear someone ask the time? It’s funny, it seemed to be the rabbit asking, but rabbits can’t talk!’ Negative hallucinations can be used to control pain. In many cases, hypnosis eliminates pain even though the source of the pain – a severe burn or a bone fracture, for example – continues. The failure to perceive something (pain) that would normally be perceived qualifies this response as a negative hallucination. The pain reduction need not be complete for hypnosis to be useful in giving relief. Reducing pain by 20 percent can make the patient’s life tolerable. Experimental studies have shown that the amount of pain reduction is closely related to the degree of measured hypnotizability (Crasilneck & Hall, 1985; Hilgard & Hilgard, 1975). The hidden observer The concept of a hidden observer originated with Hilgard’s (1986) observation that in many hypnotized individuals, a part of the mind that is not within awareness seems to be watching the person’s experience as a whole. This finding has been described as follows:

ª H. ARNESON Previously when her hand was in the icewater, the woman felt no pain following suggestions of hypnotic anesthesia. By placing a hand on her shoulder, however, Dr. Hilgard tapped a ‘hidden observer’ that reported the pain that the subject had felt at some level. The

circumstances of Hilgard's discovery of a doubled train of thought in hypnosis were suitably dramatic. He was giving a classroom demonstration of hypnosis using an experienced subject who, as it happened, was blind. Hilgard induced deafness, telling him that he would be able to hear when a hand was put on his shoulder. Cut off from what was going on around him, he became bored and began to think of other things. Hilgard showed the class how unresponsive he was to noise or speech, but then the question arose as to whether he was as unresponsive as he seemed. In a quiet voice, Hilgard asked the subject whether, though he was hypnotically deaf, there might be 'some part of him' that could hear; if so, would he raise a forefinger? To the surprise of everyone – including the hypnotized subject – the finger rose. At this, the subject wanted to know what was going on. Hilgard put a hand on his shoulder so he could hear, promised to explain later, but in the meantime asked the subject what he remembered. What he remembered was that everything had become still, that he was bored and had begun thinking about a problem in statistics. Then he felt his forefinger rise, and he wanted to know why. For more Cengage Learning textbooks, visit www.cengagebrain.co.uk HYPNOSIS Hilgard then asked for a report from 'that part of you that listened to me before and made your finger rise', while instructing the hypnotized subject that he would not be able to hear what he himself said. It turned out that this second part of the subject's awareness had heard all that went on and was able to report it. Hilgard found a suitable metaphor to describe this detached witness – the hidden observer. (Hebb, 1982, p. 53) Thus, the hidden observer metaphor refers to a mental structure that monitors everything that happens, including events that the hypnotized individual is not consciously aware of perceiving. The presence of the hidden observer has been demonstrated in many experiments (Kirsch & Lynn, 1998). In studies of pain relief, for example, participants are able to describe how the pain feels, using automatic writing or speaking, at the same time that their conscious system accepts and responds to the hypnotist's suggestion of pain relief. Hilgard and his colleagues have compared this phenomenon to everyday experiences in which an individual divides attention between two tasks, such as driving a car and conversing at the same time or making a speech and simultaneously evaluating one's performance as an orator. Although hidden observer experiments have been replicated in many laboratories and clinics, they have been criticized on methodological grounds. Skeptics argue that implied demands for compliance may have produced the results (see, for example, Spanos, 1986; Spanos & Hewitt, 1980). In an experiment designed to determine the role of compliance, researchers have shown that the responses of the truly hypnotized can be distinguished from those of the merely compliant. They asked participants of proven low hypnotizability to simulate hypnosis while highly responsive participants behaved naturally. The experimenter did not know to which group each participant belonged. The simulators did conform to the implied demands in the way they were expected to, but their reports of the subjective experiences differed significantly from those of individuals who were actually hypnotized (Hilgard, Hilgard, MacDonald, Morgan, & Johnson, 1978; Zamansky & Bartis, 1985). Hypnosis as therapy Hypnosis is used to treat a number of physiological and psychological disorders (see reviews by Lynn, Kirsch, Barabasz, Cardena, & Patterson, 2000; Pinnell & Covino, 2000). In medicine, hypnosis has been used to reduce anxiety related to medical and dental procedures, asthma, gastrointestinal diseases, and the nausea associated with cancer treatment and used for general pain management. In treatment for psychological disorders, hypnosis has been used to help people overcome addictions. The most controversial use of hypnosis is in the treatment of emotional problems. Proponents of the therapeutic use of hypnosis suggest that it allows therapists to

218 CHAPTER 6 CONSCIOUSNESS uncover repressed memories that are behind psychological problems, but several researchers caution against the use of hypnosis in psychotherapy (see Kihlstrom, 2007). They argue that hypnosis amounts to no more than a therapist planting false memories in the minds of clients, including memories of horrendous abuse experiences that never happened. We discuss the rather substantial evidence for the claims of these opponents in Chapter 8. INTERIM SUMMARY l Hypnosis is a responsive state in which individuals focus their attention on the hypnotist and his or her suggestions. l Some people are more readily hypnotized than others, although most people show some susceptibility. l Characteristic hypnotic responses include enhanced or diminished control over movements, distortion of memory through posthypnotic amnesia, and positive and negative hallucinations. l Reduction of pain is one of the beneficial uses of hypnosis. CRITICAL THINKING QUESTIONS 1 Do you think you would be a good hypnotic subject or not? Why? 2 If it is true that hypnosis only plants false ideas in the minds of suggestible people, does this mean the phenomenon of hypnosis is not real? PSYCHOACTIVE DRUGS In addition to meditation and hypnosis, drugs can be used to alter a person's state of consciousness. Since ancient times, people have used drugs to stimulate or relax, to bring on sleep or prevent it, to enhance ordinary perceptions, or to produce hallucinations. The word drug can be used to refer to any substance (other than food) that chemically alters the functioning of an organism. The term psychoactive drugs refers to drugs that affect behavior, consciousness, and/or mood. These drugs include not only illegal 'street' drugs such as heroin and marijuana but also legal drugs such as tranquilizers and stimulants. Familiar, widely used drugs such as alcohol, nicotine, and caffeine are also included in this category. Whether a particular drug is legal or not does not reflect the risks and dangers associated with the drug. example, caffeine (coffee) is totally accepted in almost all cultures, and its use is unregulated; nicotine (tobacco) is minimally regulated in most cultures; alcohol is legal in most cultures but highly regulated in some; and marijuana is legal in some cultures but illegal in others. Yet it could be argued that of all these substances nicotine is the most harmful, because it is responsible for hundreds of thousands of deaths each year. We could well ask whether nicotine would even be made a legal drug if someone tried to introduce it today. Table 6.2 lists and classifies the psychoactive drugs that are most frequently used and abused. Drugs that are used to treat mental disorders (see Chapter 16) also affect mood and behavior and thus might be considered psychoactive. They are not included here, however, because they are seldom abused. By and large, their effects are not immediate and usually are not experienced as particularly pleasant. An exception is the minor tranquilizers, which may be prescribed to treat anxiety disorders and are sometimes abused. Caffeine and nicotine are also listed in the table. Although both substances are stimulants and can have negative effects on health, they do not significantly alter consciousness and hence are not discussed in this section. Much substance use by adolescents and young adults is experimental. Typically, young people try alcohol or marijuana and maybe even try heroin or cocaine a few times but do not use them chronically or continue to use them as they grow older. Some substances, however, have Table 6.2 Psychoactive drugs that are commonly used and abused Only a few examples of each class of drug are given. The generic name (for example, psilocybin) or the brand name (Xanax for alprazolam; Seconal for secobarbital) is used, depending on which is more familiar. Depressants (Sedatives) Stimulants Alcohol (ethanol) Amphetamines Barbiturates Benzedrine Nembutal Dexedrine Seconal Methedrine Minor tranquilzers Cocaine Miltown Nicotine Xanax Caffeine Valium Hallucinogens Inhalants LSD Paint thinner Mescaline Glue Psilocybin Opiates (Narcotics) PCP (Phencyclidine) Opium and its derivatives Cannabis Codeine Marijuana Heroin Hashish Morphine Methadone

such powerful reinforcing effects on the brain that many people who try these substances, even experimentally, find themselves craving more of the substance and have a difficult time resisting taking the substance. In addition, some people have a greater vulnerability to becoming 'hooked' psychologically or physically on substances, so even a little experimentation may be dangerous for them. The drugs listed in Table 6.2 are assumed to affect behavior and consciousness because they act on the brain in specific biochemical ways. With repeated use, an individual can become dependent on any of them. Drug dependence has three key characteristics: (1) tolerance – with continued use, the individual must take more and more of the drug to achieve the same effect; (2) withdrawal – if use of the drug is discontinued, the person experiences unpleasant physical and psychological reactions; and (3) compulsive use – the individual takes more of the drug than intended, tries to control his or her drug use but fails, and spends a great deal of time trying to obtain the drug. The degree to which tolerance develops and the severity of withdrawal symptoms vary from one drug to another. Tolerance for opiates, for example, develops fairly quickly, and heavy users can tolerate a dosage that would be lethal to a nonuser. In contrast, marijuana smokers seldom build up much tolerance. Withdrawal symptoms are common and easily observed following heavy and sustained use of alcohol, opiates, and sedatives. They are common, but less apparent, for stimulants, and nonexistent after repeated use of hallucinogens (American Psychiatric Association, 2000). Although tolerance and withdrawal are the primary characteristics of drug dependence, they are not necessary for a diagnosis. A person who shows a pattern of compulsive use without any signs of tolerance or withdrawal, as some marijuana users do, would still be considered drug dependent. Drug dependence is usually distinguished from drug misuse, continued use of a drug, despite serious consequences, by a person who is not dependent on it (that is, shows no symptoms of tolerance, withdrawal, or compulsive craving). For example, someone whose overindulgence in alcohol results in repeated accidents, absence from work, or marital problems (without signs of dependence) is said to misuse alcohol. In this section we look at several types of psychoactive drugs and the effects they may have on those who use them. Depressants Depressants are drugs that depress the central nervous system. They include tranquilizers, barbiturates (sleeping pills), inhalants (volatile solvents and aerosols), and ethyl alcohol. Of these, the most frequently used and abused is alcohol, and we will focus on it here. For more Cengage Learning textbooks, visit www.cengagebrain.co.uk PSYCHOACTIVE DRUGS ª BUBBLES PHOTOLIBRARY/ALAMY Alcohol is the depressant drug most often used. Alcohol and its effects People in most societies consume alcohol in some form. Alcohol can be produced by fermenting a wide variety of materials: grains such as rye, wheat, and corn; fruits such as grapes, apples, and plums; and vegetables such as potatoes. Through the process of distillation, the alcoholic content of a fermented beverage can be increased to obtain 'spirits' such as whiskey or rum. The alcohol used in beverages is called ethanol and consists of relatively small molecules that are easily and quickly absorbed into the body. Once a drink is swallowed, it enters the stomach and small intestine, where there is a heavy concentration of small blood vessels. These give the ethanol molecules ready access to the blood. Once they enter the bloodstream, they are rapidly carried throughout the body and to all of its organs. Although the alcohol is fairly evenly distributed through the whole body, its effects are likely to be felt most immediately in the brain because a substantial portion of the blood that the heart pumps at any given time goes to the brain and the fatty tissue in the brain absorbs alcohol very well.

of spirits) 1 3 5 7 9 11 54 2 4 6 8 10 12 Weight in kilograms 1 3 5 7 9 11 73 2 4 6 8 10 12 1 3 5 7 9 11 91 2 4 6 8 10 12 1 3 5 7 9 11 109 2 4 6 8 10 12 Be careful driving 0%–0.05% Driving impaired 0.05%–0.09% Do not drive 0.10% & UP BAC Figure 6.6 BAC and Alcohol Intake. Approximate values of blood-alcohol concentration as a function of alcohol consumption in a 2-hour period. For example, if you weigh 82 kilos and had four beers in two hours, your BAC would be between 0.05% and 0.09%, and your driving ability would be seriously impaired. Measuring the amount of alcohol in the air we exhale (as in a breathalyzer) gives a reliable index of the amount of alcohol in the blood. Consequently, it is easy to determine the relationship between blood alcohol concentration (BAC) and behavior. At concentrations of 0.03 percent to 0.05 percent in the blood (30 to 50 milligrams of alcohol per 100 milliliters of blood), alcohol produces lightheadedness, relaxation, and release of inhibitions. People say things that they might not ordinarily say and tend to become more sociable and expansive. Self-confidence may increase, but motor reactions begin to slow. In combination, these effects make it dangerous to drive after drinking. At a BAC of 0.10 percent, sensory and motor functions become noticeably impaired. Speech becomes slurred, and people have difficulty coordinating their movements. Some people become angry and aggressive; others grow silent and morose. At a level of 0.20 percent the drinker is seriously incapacitated, and a level above 0.40 percent may cause death. How much does a person have to drink to achieve these different blood alcohol concentrations? The relationship between BAC and alcohol intake is not a simple one. It depends on a person’s sex, body weight, and speed of consumption. Age, individual metabolism, and experience with drinking are also factors. Although the effects of alcohol intake on BAC vary a great deal, the average effects are shown in Figure 6.6. It is not true that beer or wine is 9 7 Consumption in liters 5 3 1 For more Cengage Learning textbooks, visit www.cengagebrain.co.uk less likely to make someone drunk than spirits. A small beer or glass of wine or a nip of whiskey have about the same alcohol content and about the same effect. Alcohol usage Many young adults view drinking as an integral part of social life. It promotes conviviality, eases tension, releases inhibitions, and generally adds to the fun. Nevertheless, social drinking can create problems in terms of lost work time, poor performance ‘the morning after’, and arguments or accidents while intoxicated. Clearly the most serious problem is accidents: unintentional alcohol-related injuries due to car accidents, drowning, burns, poisoning, and falls account for approximately 600,000 deaths per year internationally (WHO, 2005). In addition, more than half of all murderers and their victims are believed to be intoxicated with alcohol at the time of the murder, and people who commit suicide often do so when under the influence of alcohol. The consumption of alcohol varies greatly across nations and cultures (see Figure 6.7). One study of community members Africa Americas Eastern Mediterranean Europe Southeast Asia Western Pacific Figure 6.7 Consumption of Pure Alcohol in Various Regions of the World. Cultures vary greatly in their consumption of alcohol. (Southeast Asia includes India and neighboring countries. Western Pacific includes Australia, China, Japan, and the Pacific Rim Countries.) World Health Organization (2005)

in six different nations (Brazil, Canada, US, Mexico, Germany, and the Netherlands) found that as few as 43 percent (Mexico) to as many as 86 percent (the Netherlands) of adults had consumed at least 12 drinks in the last year (Vega et al., 2002). In Europe, it is estimated that there are 86.8 million people (99 per 1000) who have harmful levels of alcohol consumption (WHO, 2005). Heavy or prolonged drinking can lead to serious health problems. High blood pressure, stroke, ulcers, cancers of the mouth, throat, and stomach, cirrhosis of the liver, and depression are some of the conditions associated with regular use of substantial amounts of alcohol. Alcohol not only affects

the drinker; when pregnant women drink, the fetus is exposed to the alcohol and a number of negative effects can result. Pregnant women who drink heavily are twice as likely to suffer repeated miscarriages and to produce low-birth-weight babies. A condition called fetal alcohol syndrome is characterized by mental retardation and multiple deformities of the infant's face and mouth, caused by the mother's drinking during pregnancy. The amount of alcohol needed to produce this syndrome is unclear, but as little as a few ounces of alcohol a week is thought to be detrimental (Streissguth et al., 1999). Gender and age differences in alcohol disorders Across all nations, men are more likely than women to drink, and to have problems due to alcohol consumption (WHO, 2005). The gender gap in alcohol use is much greater among men and women who subscribe to traditional gender roles, which condone drinking for men but not for women (Huselid & Cooper, 1992). Binge-drinking may be especially damaging to health and safety. Binge-drinking is defined somewhat differently across cultures and studies, but a common definition is five or more drinks in one sitting for men, four or more for women (because it takes less alcohol for women to achieve a high BAC). Binge drinking on university campuses is common. One study of students at a large university in the United States found that 45 percent said they engage in binge drinking at least occasionally (Wahlberg, 1999). Lost study time, missed classes, injuries, unprotected sex, and trouble with police are some of the problems reported by students who engage in binge drinking. Internationally, there appears to be a pattern among young people toward binge-drinking and drinking to intoxication (WHO, 2005). Figure 6.8 shows patterns of binge-drinking for 18- to 24year-olds in various countries. Elderly people are less likely than others to misuse or be dependent on alcohol, probably for several reasons. First, with age, the liver metabolizes alcohol at a slower rate, and the lower percentage of body water increases the absorption of alcohol. As a result, older people can become intoxicated faster and experience the negative effects of alcohol more severely and quickly. Second, as people grow older, they may become more mature in their choices, including the choice about drinking alcohol to excess. Third, older people have grown up under stronger prohibitions against alcohol use and abuse and in a society with more stigma associated with alcoholism, leading them to curtail their use of alcohol more than younger people do. Finally, people who have used alcohol excessively for many years may die from alcohol-related diseases before they reach old age. Illicit drugs Illicit drugs are drugs that have significant psychological effects and that are legally restricted or prohibited in 5 15 25 Percent binge-drinking Brazil Uruguay Ecuador Guatemala Mexico Spain Hungary Croatia Russian Fed. Ukraine Kazakhstan Ghana Zimbabwe Chad Women Men Figure 6.8 Differences in binge-drinking among 18-24 year-olds by gender and across nations. Binge-drinking defined as five or more standard drinks in one sitting at least once per week. World Health Organization (2004) PSYCHOACTIVE DRUGS For more Cengage Learning textbooks, visit www.cengagebrain.co.uk

222 CHAPTER 6 CONSCIOUSNESS Heroin 4% Other opiates 2% Cocaine 6% Ecstacy 3% Amphetamines 16% Cannabis 69% Figure 6.9 Percent of illicit drug users reporting use of various drugs in the last year. Cannabis is the most frequently used illicit drug. World Health Organization (2008) many nations. Examples include opiates, such as heroin, stimulants, such as cocaine, hallucinogens, and cannabis. The United Nations estimates that over 185 million people worldwide are users of illicit drugs, with cannabis being the most frequently used drug (see Figure 6.9; WHO, 2008). Half of all drug seizures worldwide involve cannabis, and about 2.5 percent of the world population consume cannabis annually. Cannabis Cannabis is a psychoactive substance that creates a high feeling, cognitive and motor impairments, and sometimes hallucinations. The cannabis plant has been harvested since ancient times for its psychoactive effects. The dried

leaves and flowers are used to produce marijuana, and the solidified resin of the plant is called hashish. Marijuana and hashish are usually smoked but may also be taken orally, mixed with tea or food. The active ingredient in both substances is THC (tetrahydrocannabinol). Taken orally in small doses (5–10 milligrams), THC produces a mild high; larger doses (30–70 milligrams) produce severe and longer-lasting reactions that resemble those of hallucinogenic drugs. As with alcohol, the reaction often has two stages: a period of stimulation and euphoria, followed by a period of tranquility and sleep. When marijuana is smoked, THC is rapidly absorbed by the rich blood supply of the lungs. Blood from the lungs goes directly to the heart and then to the brain, causing a high within minutes. However, THC also accumulates in other organs, such as the liver, kidneys, spleen, and testes. The amount of THC reaching the body varies according to how the user smokes: A cigarette allows for the transfer of 10 to 20 percent of the THC in the marijuana, whereas a pipe allows about 40 to 50 percent to transfer. A water For more Cengage Learning textbooks, visit www.cengagebrain.co.uk pipe, or bong, traps the smoke until it is inhaled and therefore is a highly efficient means of transferring THC. Once in the brain, the THC binds to cannabinoid receptors, which are especially numerous in the hippocampus. Because the hippocampus is involved in the formation of new memories, it is not surprising that marijuana use inhibits memory formation (Kuhn, Swartzwelder, & Wilson, 1998). Regular users of marijuana report a number of sensory and perceptual changes: a general euphoria and sense of well-being, some distortions of space and time, and changes in social perception. Not all marijuana experiences are pleasant. Sixteen percent of regular users report anxiety, fearfulness, and confusion as a ‘usual occurrence’, and about one-third report that they occasionally experience such symptoms as acute panic, hallucinations, and unpleasant distortions in body image. Individuals who use marijuana regularly (daily or almost daily) often report both physical and mental lethargy, and about a third show mild forms of depression, anxiety, or irritability (American Psychiatric Association, 2000). Marijuana smoke contains even larger amounts of known carcinogens than tobacco (but marijuana users tend to smoke less than cigarette smokers, and their total intake of these substances is lower). Marijuana use interferes with performance on complex tasks. Motor coordination is significantly impaired by low to moderate doses, and reaction time for car braking and the ability to negotiate a twisting road course are adversely affected. These findings make it clear that driving under the influence of the drug is dangerous. The number of car accidents related to marijuana use is difficult to determine because, unlike alcohol, THC declines rapidly in the blood, quickly going to the fatty tissues and organs of the body. A blood analysis performed two hours after a heavy dose of marijuana may show no signs of THC, even though an observer would judge the person to be clearly impaired. The effects of marijuana may persist long after the subjective feelings of euphoria or sleepiness have passed. A study of aircraft pilots using a simulated flight-landing task found that performance was significantly impaired as much as 24 hours after smoking one marijuana cigarette containing 19 milligrams of THC – despite the fact that the pilots reported no awareness of any after-effects on their alertness or performance (Yesavage, Leier, Denari. & Hollister, 1985). These findings have led to concern about marijuana use by people whose jobs affect public safety. Marijuana has two clear effects on memory. First, it makes short-term memory more susceptible to interference. People under the influence of marijuana may lose the thread of a conversation or forget what they are saying in the middle of a sentence because of momentary distractions. Second, marijuana disrupts learning by interfering with the transfer of new information from short-term to long-term memory. These findings suggest

that it is not a good idea to study while under the influence of marijuana; later recall of the material will be poor. Opiates Opium and its derivatives, collectively known as opiates, are drugs that diminish physical sensation and the capacity to respond to stimuli by depressing the central nervous system. (These drugs are commonly called narcotics, but opiates is a more accurate term; the term narcotics is not well defined and covers a variety of illegal drugs.) Opiates are used in medical settings to reduce pain, but their ability to alter mood and reduce anxiety has led to widespread illegal consumption. Opium, which is the air-dried juice of the opium poppy, contains a number of chemical substances, including morphine and codeine. Codeine, a common ingredient in prescription painkillers and cough suppressants, is relatively mild in its effects (at least at low doses). Morphine and its derivative, heroin, are much more potent. Most illegal opiate use involves heroin because it is more concentrated and can be concealed and smuggled more easily than morphine. All opiate drugs bind to the same molecules in the brain, known as opiate receptors. The differences among these drugs depend on how quickly they reach the receptors and how much it takes to activate them – that is, their potency. The rate at which opiates enter the body depends on how they are taken. When opiates are smoked or injected, they reach peak levels in the brain within minutes. The faster this occurs, the greater the danger of death by overdose. Drugs that are ‘snorted’ are absorbed more slowly because they must pass through the mucous membranes of the nose to the blood vessels beneath. Heroin usage Heroin is an opiate that can be injected, smoked, or inhaled. At first it produces a sense of well-being. Experienced users report a special thrill, or ‘rush’, within a minute or two after an intravenous injection. Some describe this sensation as intensely pleasurable, similar to an orgasm. Young people who sniff heroin report that they forget everything that troubles them. Following this, the user feels ‘fixed’, or gratified, and has no awareness of hunger, pain, or sexual urges. The person may be alternately waking and drowsing while comfortably watching television or reading a book. Unlike a person who is intoxicated by alcohol, a heroin user can readily produce skilled responses to tests of agility and intelligence and seldom becomes aggressive or assaultive. The changes in consciousness produced by heroin are not very striking; there are no exciting visual experiences or feelings of being transported elsewhere. It is the change in mood – the feeling of euphoria and reduced anxiety – that prompts people to start using the drug. However, heroin is very addictive; even a brief period of usage can create physical dependence. After a person has been PSYCHOACTIVE DRUGS smoking or ‘sniffing’ (inhaling) heroin for a while, tolerance builds up, and this method no longer produces the desired effect. In an attempt to re-create the original high, the individual may progress to intravenous drug use and then to ‘mainlining’ (injecting into a vein). Once the user starts mainlining, stronger and stronger doses are required to produce the high, and the physical discomforts of withdrawal from the drug become intense (chills, sweating, stomach cramps, vomiting, headaches). Additional motivation to continue using the drug stems from the need to avoid physical pain and discomfort. The hazards of heroin use are many; the average age at death for frequent users is 40 (Hser, Anglin, & Powers, 1993). Death is caused by suffocation resulting from depression of the brain’s respiratory center. Death from an overdose is always a possibility because the concentration of street heroin fluctuates widely, and the user can never be sure of the potency of the powder in a newly purchased supply. Heroin use is generally associated with a serious deterioration of personal and social life. Because maintaining the habit is costly, the user often becomes involved in illegal activities to acquire money to purchase the drug. Additional dangers of heroin use include HIV, hepatitis C, and other infections associated with unsterile injections. Sharing needles used to inject drugs is an extremely easy way to be infected with HIV; blood from an infected person can be trapped in the needle or

syringe and injected directly into the bloodstream of the next person who uses the needle. Sharing of needles and syringes by people who inject drugs is a primary means by which HIV is spreading today. Opioid receptors In the 1970s, researchers made a major breakthrough in understanding opiate dependence with the discovery that opiates act on very specific neuroreceptor sites in the brain. Neurotransmitters travel across the synaptic junction between two neurons and bind to neuroreceptors, triggering activity in the receiving neuron (see Chapter2). The molecular shape of the opiates resembles that of a group of neurotransmitters called endorphins. Endorphins bind to opioid receptors, producing sensations of pleasure as well as reducing discomfort (Julien, 1992). Heroin and morphine relieve pain by binding to opioid receptors that are unfilled (see Figure 6.10). Repeated heroin use causes a drop in endorphin production; the body then needs more heroin to fill the unoccupied opioid receptors in order to reduce pain. The person experiences painful withdrawal symptoms when heroin is discontinued because many opioid receptors are left unfilled. In essence, the heroin has replaced the body's own natural opiates (Koob & Bloom, 1988). These findings have led to the development of drugs that operate by modulating the opioid receptors. These drugs are of two basic types: agonists and antagonists.

Agonists bind to the opioid receptors to produce a feeling of pleasure and thereby reduce the craving for opiates, but they cause less psychological and physiological impairment than the opiates. Antagonists also lock onto the opioid receptors but in a way that does not activate them; the drug serves to 'block' the receptors so that the opiates cannot gain access to them. Antagonists produce no feeling of pleasure and the craving is not satisfied (see Figure 6.10). Methadone is the best-known agonist drug used in treating heroin-dependent individuals. It is addictive in its own right, but it produces less psychological impairment than heroin and has few disruptive physical effects. When taken orally in low doses, it suppresses the craving for heroin and prevents withdrawal symptoms. Naltrexone, an antagonist drug, blocks the action of heroin because it has a greater affinity for the opioid receptors than does heroin itself. Naltrexone is often used in hospital emergency rooms to reverse the effects of a heroin overdose, but it has not proved generally effective as a treatment for heroin dependence. Interestingly, naltrexone does reduce the craving for alcohol. Alcohol causes the release of endorphins, and naltrexone, by blocking opioid receptors, reduces the pleasurable effects of alcohol and hence the desire for it. Stimulants In contrast to depressants and opiates, stimulants are drugs that increase alertness and general arousal. They increase the amount of monoamine neurotransmitters (norepinephrine, epinephrine, dopamine, and serotonin) in the synapse. The effects resemble what would happen if every one of the neurons that released a monoamine fired at once. The result is to arouse the body both physically, by increasing heart rate and blood pressure, and mentally, causing the person to become hyperalert. Amphetamines Amphetamines are powerful stimulants; they are sold under such trade names as Methedrine, Dexedrine, and Benzedrine and known colloquially as 'speed', 'uppers', and 'bennies'. The immediate effects of consuming such drugs are an increase in alertness and a decrease in feelings of fatigue and boredom. Strenuous activities that require endurance seem easier after taking amphetamines. As with other drugs, the ability of amphetamines to alter mood and increase self-confidence is the principal reason for their use. People also use them to stay awake. Low doses that are taken for limited periods to overcome fatigue (for example, when driving at night) seem to be relatively safe. However, as the stimulating effects of amphetamines wear off, there is a period when the user feels depressed, irritable, and fatigued and may be tempted to take more of the drug. Tolerance develops quickly, and the user needs increasingly larger doses to produce the desired effect. Because high doses can have

dangerous side effects – agitation, confusion, heart palpitations, and elevated blood pressure – medications containing amphetamines should be used with caution. When tolerance develops to the point at which oral doses are no longer effective, many users inject amphetamines into a vein. Large intravenous doses produce an immediate pleasant experience (a ‘flash’ or ‘rush’). This sensation is followed by irritability and discomfort, which can be overcome only by an additional injection. If this sequence is repeated every few hours over a period of days, it will end in a ‘crash’, a deep sleep followed by a period of lethargy and depression. The amphetamine abuser may seek relief from this discomfort by turning to alcohol or heroin. Long-term amphetamine use is accompanied by drastic deterioration of physical and mental health. The user, or ‘speed freak’, may develop symptoms that are indistinguishable from those of acute schizophrenia (see Chapter 15), including persecutory delusions (the false belief that people are persecuting you or out to get you) and visual or auditory hallucinations. The delusions may lead to unprovoked violence. For example, during an epidemic of amphetamine use in Japan in the early 1950s HEROIN METHADONE HEROIN HEROIN NALTREXONE Opioid receptor a) Neuron membrane b) c) Figure 6.10 Drug Abuse Medications. Methadone and naltrexone block the effects of heroine by binding to the same neuronal receptors that heroin binds to. CHAPTER 6 CONSCIOUSNESS For more Cengage Learning textbooks, visit www.cengagebrain.co.uk

(when amphetamines were sold without prescription and advertised for ‘elimination of drowsiness and repletion of the spirit’), 50 Percent of the murders that occurred in a two-month period were related to amphetamine abuse (Hemmi, 1969). Cocaine Like other stimulants, cocaine, or ‘coke’, a substance obtained from the dried leaves of the coca plant, increases energy and self-confidence; it makes the user feel witty and hyperalert. Early in the twentieth century, cocaine was widely used and easy to obtain. In fact, it was an ingredient in the original recipe of Coca-Cola. Its use then declined, but in the 1980s and 1990s its popularity increased, even though it is now illegal in most countries. Cocaine can be inhaled or ‘snorted’, or made into a solution and injected directly into a vein. It can also be converted into a flammable compound, ‘crack’, which is smoked. One of the earliest studies of the effects of cocaine was conducted by Freud (1885). In an account of his own use of cocaine, he was at first highly favorable to the drug and encouraged its use. However, he changed his Signal Neuron Pump Neurotransmitter Receptor Neuron a) A nerve impulse causes the release of

neurotransmitters that carry the signal across the

synapse to a receiving neuron. Some of the

neurotransmitters are then reabsorbed into the

originating neuron (reuptake process), while the

rest are broken up chemically and made inactive

(degradation process). These processes are

discussed in Chapter 2. Figure 6.11 Molecular Effects of Cocaine. For more Cengage Learning textbooks, visit www.cengagebrain.co.uk PSYCHOACTIVE DRUGS mind about the drug after using it to treat a friend, with disastrous results. The friend developed severe dependence on the drug,

demanded ever-larger dosages, and was debilitated until his eventual death. Despite earlier reports to the contrary, and as Freud soon discovered, cocaine is highly addictive. In fact, it has become more addictive and dangerous with the emergence of crack. Tolerance develops with repeated use, and withdrawal effects, although not as dramatic as those associated with opiates, do occur. The restless irritability that follows the euphoric high becomes, with repeated use, a feeling of depressed anguish. The down is as bad as the up was good and can be alleviated only by more cocaine (see Figure 6.11). Heavy cocaine users can experience the same abnormal symptoms as people who use amphetamines heavily. A common visual hallucination is flashes of light (‘snow lights’) or moving lights. Less common – but more disturbing – is the feeling that bugs (‘cocaine bugs’) are crawling under one’s skin. The hallucination may be so strong that the individual will use a knife to cut out the bugs. These experiences occur because cocaine is causing the sensory neurons to fire spontaneously. Signal Neuron Pump Cocaine Neurotransmitter Receptor Neuron b) Research findings indicate that cocaine blocks the

reuptake process for three neurotransmitters

(dopamine, serotonin, and norepinephrine) that are

involved in the regulation of mood.

226 CHAPTER 6 CONSCIOUSNESS Ecstasy Ecstasy has the stimulant effects of an amphetamine along with occasional properties that make people hallucinate. Users experience increased energy and restlessness, and feel their affection for others increases and their social inhibitions decrease. Ecstasy appears to lower levels of the neurotransmitter serotonin, which may result in its emotional effects. Even the short-term use of ecstasy can have long-term negative effects on thinking and health. Monkeys given ecstasy for just four days had brain damage lasting six to seven years (SAMHSA, 2002). Humans who use ecstasy do more poorly on tests measuring attention, memory, learning and general intelligence. In addition, long-term users of ecstasy are at risk for cardiac problems and liver failure, and show increased rates of anxiety, depression and paranoia. INTERIM SUMMARY l Psychoactive drugs have long been used to alter consciousness and mood. l Repeated use of any of these drugs can result in drug dependence, which is characterized by tolerance, withdrawal, and compulsive use. l Drug misuse refers to continued use of a drug, despite serious consequences, by a person who has not reached the stage of dependence. l Cannabis, such as marijuana and hashish, creates a high feeling, cognitive and motor impairments, and, in some people, hallucinations. l Depressant drugs, such as alcohol, tranquilizers, and inhalants, depress the central nervous system. The most commonly used depressant is alcohol. l Opiates, such as heroin and morphine, reduce perceptions of pain and induce euphoria, followed by a sense of drowsiness. Severe intoxication can lead to respiratory difficulties, unconsciousness, and coma. l Stimulants, such as amphetamines and cocaine, activate those parts of the brain that register reward or pleasure, and they produce euphoria, energy, and a sense of self-esteem. Withdrawal from stimulants can cause depression, restlessness, and dangerous physiological symptoms. l Ecstasy has some effects similar to stimulants, lowers inhibitions, and can create hallucinations. It has many negative effects on the brain and on general health. For more Cengage Learning textbooks, visit www.cengagebrain.co.uk CRITICAL THINKING QUESTIONS 1 Laws that criminalize some psychoactive drugs (marijuana, cocaine) but not others (alcohol, tobacco) do not seem well matched to the drugs’ actual dangers. If you were to redesign your country’s drug policies from

scratch, basing them only on current scientific knowledge, which drugs would you want to discourage most vigorously (or criminalize)? Which drugs would you worry about least? 2 It has been demonstrated that the ancient Asian medical practice of acupuncture, in which needles are inserted into the skin at different ‘acupuncture points’, stimulates the brain’s production of endorphins. How might this explain why acupuncture seems to help people overcome dependence on heroin? PSI PHENOMENA A discussion of consciousness would not be complete without considering some extraordinary claims about the mind that have long attracted widespread public attention. Of particular interest are questions about whether human beings (1) can acquire information in ways that do not involve stimulation of the known sense organs or (2) can influence physical events by purely mental means. These questions are the source of controversy over the existence of psi, anomalous processes of information and/or energy transfer that cannot currently be explained in terms of known biological or physical mechanisms. The phenomena of psi are the subject matter of parapsychology (‘beside’ or ‘beyond’ psychology) and include the following:

1. Extrasensory perception (ESP). Response to external stimuli without any known sensory contact.
2. Telepathy. Transference of thought from one person to another without the mediation of any known channel of sensory communication (for example, identifying a playing card that is merely being thought of by another person).
3. Clairvoyance. Perception of objects or events that do not provide a stimulus to the known senses (for example, identifying a concealed playing card whose identity is unknown to anyone).
4. Precognition. Perception of a future event that could not be anticipated through any known inferential process (for example, predicting that a particular number will come up on the next throw of a pair of dice).
5. Psychokinesis (PK). Mental influence over physical events without the intervention of any known physical

PERMISSION OF KING FEATURES SYNDICATE ª BILL YATES; REPRINTED WITH SPECIAL force (for example, willing that a particular number will come up on the next throw of a pair of dice). Experimental evidence Most parapsychologists consider themselves to be scientists who apply the usual rules of scientific inquiry to admittedly unusual phenomena. Yet the claims for psi are so extraordinary, and so similar to what are widely regarded as superstitions, that some scientists consider psi to be impossible and reject the legitimacy of parapsychological inquiry. Such a priori judgments are out of place in science. The real question is whether the empirical evidence is acceptable by scientific standards. Many psychologists who are not yet convinced that psi has been demonstrated are nonetheless open to the possibility that new evidence might emerge that would be more persuasive. For their part, many parapsychologists believe that several recent experimental procedures either provide that evidence already or hold the potential for doing so. We shall examine one of the most promising of these, the ganzfeld procedure. ª JEREMY WALKER/SPL/PHOTO RESEARCHERS The receiver (left) and the sender (right) in a ganzfeld experiment. For more Cengage Learning textbooks, visit www.cengagebrain.co.uk PSI PHENOMENA The ganzfeld procedure tests for telepathic communication between a participant who serves as the ‘receiver’ and another participant who serves as the ‘sender’. The receiver is sequestered in an acoustically isolated room and placed in a mild form of perceptual isolation: translucent pingpong ball halves are taped over the eyes, and headphones are placed over the ears; diffuse red light

illuminates the room, and white noise is played through the headphones. (White noise is a random mixture of sound frequencies similar to the hiss made by a radio tuned between stations.) This homogeneous visual and auditory environment is called the ganzfeld, a German word meaning ‘total field’. The sender sits in a separate acoustically isolated room, and a visual stimulus (picture, slide, or brief videotape sequence) is randomly selected from a large pool of similar stimuli to serve as the ‘target’ for the session. While the sender concentrates on the target, the receiver attempts to describe it by providing a continuous verbal report of his or her mental imagery and free associations. Upon completion of the session, the receiver is presented with four stimuli, one of which is the target, and asked to rate the COURTESY OF DR. CHARLES HONORTON

228 CHAPTER 6 CONSCIOUSNESS degree to which each matches the imagery and associations experienced during the ganzfeld session. A ‘direct hit’ is scored if the receiver assigns the highest rating to the target stimulus. More than 90 experiments have been conducted since this procedure was introduced in 1974; the typical experiment involves about 30 sessions in which a receiver attempts to identify the target transmitted by the sender. An overall analysis of 28 studies (with a total of 835 ganzfeld sessions conducted by investigators in 10 different laboratories) reveals that participants were able to select the correct target stimulus 38 percent of the time. Because a participant must select the target from four alternatives, we would expect a success rate of 25 percent if only chance were operating. Statistically, this result is highly significant. The probability that it could have arisen by chance is less than one in a billion (Bem & Honorton, 1994). The debate over the evidence In 1985 and 1986, the Journal of Parapsychology published an extended examination of the ganzfeld studies, focusing on a debate between Ray Hyman, a cognitive psychologist and critic of parapsychology, and Charles Honorton, a parapsychologist and major contributor to the ganzfeld database. They agree on the basic quantitative results but disagree on its interpretation (Honorton, 1985; Hyman, 1994, 1985; Hyman & Honorton, 1986). In what follows, we use their debate as a vehicle for examining the issues involved in evaluating claims of psi. The replication problem In scientific research, a phenomenon is not considered established until it has been observed repeatedly by several researchers. Accordingly, the most serious criticism of parapsychology is that it has failed to produce a single reliable demonstration of psi that can be replicated by other investigators. Even the same investigator testing the same individuals over time may obtain statistically significant results on one occasion but not on another. The ganzfeld procedure is no exception; fewer than half (43%) of the 28 studies analyzed in the debate yielded statistically significant results. The parapsychologists’ most effective response to this criticism actually comes from within psychology itself. Many statisticians and psychologists are dissatisfied with psychology’s focus on statistical significance as the sole measure of a study’s success. As an alternative, they are increasingly adopting meta-analysis, a statistical technique that treats the accumulated studies of a particular phenomenon as a single grand experiment and each study as a single observation. Any study that obtains positive results – even though it may not be statistically significant itself – contributes to the overall For more Cengage Learning textbooks, visit www.cengagebrain.co.uk strength and reliability of the phenomenon rather than simply being dismissed as a failure to replicate (Glass, McGaw, & Smith, 1981; Rosenthal, 1984). From this perspective, the ganzfeld studies provide impressive replicability: 23 of the 28 studies obtained positive results, an outcome whose probability of occurring by chance is less than one in a thousand. An additional 11 replications using computerized procedures yielded results consistent with the original set of 28 studies (Bem & Honorton, 1994). A more recent meta-analysis of 40 additional ganzfeld studies, conducted between 1987 and 1999, revealed that the ganzfeld

procedure continues to replicate (Bem, Palmer, & Broughton, 2001). At first glance, these more recent studies appeared to yield weaker results than did the earlier studies. Further analysis, however, showed that the 29 replications that had adhered to the standard procedure yielded results comparable to the previous studies, whereas the replications that had departed from the standard (for example, by using musical selections as targets) produced weaker results. Such a finding is neither bad nor unexpected. Many psi researchers now believe that the basic procedure is sufficiently well established to warrant extending it into unknown territory, even though this inevitably produces some unsuccessful experiments. When such replications are lumped into a meta-analysis with standard replications, weaker overall results are to be expected. This implies that future meta-analyses need to take this into account, lest the ganzfeld procedure become a victim of its own success. The ability of a particular experiment to replicate an effect also depends on how strong the effect is and how many observations are made. If an effect is weak, an experiment with too few participants or observations will fail to detect it at a statistically significant level – even though the effect actually exists. If the ganzfeld effect actually exists and has a true direct-hit rate of 38 percent, then statistically we should expect studies with 30 ganzfeld sessions (the average for the 28 studies discussed earlier) to obtain a statistically significant psi effect only about one-third of the time (Utts, 1986). In short, it is unrealistic to demand that any real effect be replicable at any time by any competent investigator. The replication issue is more complex than that, and meta-analysis is proving to be a valuable tool for dealing with some of those complexities. Inadequate controls The second major criticism of parapsychology is that many, if not most, of the experiments have inadequate controls and safeguards. Flawed procedures that would permit a participant to obtain the communicated information in normal sensory fashion, either inadvertently or through deliberate cheating, are particularly fatal. This is

called the problem of sensory leakage. Inadequate procedures for randomizing (randomly selecting) target stimuli are another common problem. Methodological inadequacies plague all sciences, but the history of parapsychology contains several instances of promising results that collapsed when the procedures were examined from a critical perspective (Akers, 1984). One common charge against parapsychology is that whereas preliminary, poorly controlled studies often obtain positive results, as soon as better controls and safeguards are introduced, the results disappear. Once a flaw is discovered in a completed experiment, there is no persuasive way of arguing that the flaw did not contribute to a positive outcome. The only remedy is to redo the experiment correctly. In a database of several studies, however, meta-analysis can evaluate the criticism empirically by checking to see if, in fact, the more poorly controlled studies obtained more positive results than the better controlled studies did. If there is a correlation between a procedural flaw and positive results across the studies, there is a problem. In the case of the ganzfeld database, both critic Hyman and parapsychologist Honorton agree that flaws of inadequate security and possible sensory leakage do not correlate with positive results. Hyman claimed to find a correlation between flaws of randomization and positive results, but both Honorton’s analysis and two additional analyses by nonparapsychologists dispute his conclusion (Harris & Rosenthal, 1988; Saunders, 1985). Moreover, the previously noted successful series of 11 computer-automated studies were specifically designed to control for flaws identified in the original database (Bem & Honorton, 1994). The file-drawer problem Suppose that each of 20 investigators independently decides to conduct a ganzfeld study. Even if there were no genuine ganzfeld effect, there is a reasonable probability that at least one of these investigators would obtain a statistically significant result by pure chance. That lucky investigator would then publish a report of the experiment, but

the other 19 investigators – all of whom obtained 'null' results – are likely to become discouraged, put their data in a file drawer, and move on to something more promising. As a result, the scientific community would learn about the one successful study but have no knowledge of the 19 null studies buried in file drawers. The database of known studies would thus be seriously biased toward positive studies, and any meta-analysis of that database would arrive at similarly biased conclusions. This is known as the file-drawer problem. The file-drawer problem is a tricky one because by definition it is impossible to know how many unknown studies are languishing in file drawers. Nevertheless, For more Cengage Learning textbooks, visit www.cengagebrain.co.uk PSI PHENOMENA parapsychologists offer two defenses against the charge that this problem constitutes a serious challenge to their findings. First, they point out that the Journal of Parapsychology actively solicits and publishes studies that report negative findings. Moreover, the community of parapsychologists is relatively small, and most investigators are aware of ongoing research in the field. When conducting meta-analysis, parapsychologists scout out unpublished negative studies at conventions and through their personal networks. But their major defense is statistical, and again metaanalysis provides an empirical approach to the problem. By knowing the overall statistical significance of the known database, it is possible to compute the number of studies with null results that would have to exist in file drawers to cancel out that significance. In the case of the ganzfeld database, there would have to be more than 400 unreported studies with null results – the equivalent of 12,000 ganzfeld sessions – to cancel out the statistical significance of the 28 studies analyzed in the debate (Honorton, 1985). It is generally agreed, therefore, that the overall significance of the ganzfeld studies cannot reasonably be explained by the file-drawer effect (Hyman & Honorton, 1986). Rather than continue their debate, Hyman and Honorton issued a joint communiqué in which they set forth their areas of agreement and disagreement and made a series of suggestions for the conduct of future ganzfeld studies (Hyman & Honorton, 1986). Their debate and the subsequent discussion provide a valuable model for evaluating disputed domains of scientific inquiry. Anecdotal evidence In the public's mind, the evidence for psi is primarily personal experiences and anecdotes. From a scientific standpoint, such evidence is unpersuasive because it suffers from the same problems that jeopardize the experimental evidence – nonreplicability, inadequate controls, and the file-drawer problem. The replication problem is acute because most such evidence consists of single occurrences. A woman announces a premonition that she will win the lottery that day – and she does. You dream about an unlikely event, which actually occurs a few days later. A 'psychic' correctly predicts the assassination of a public figure. Such incidents may be subjectively compelling, but there is no way to evaluate them because they are not repeatable. The problem of inadequate controls and safeguards is decisive because such incidents occur under unexpected and ambiguous conditions. There is thus no way of ruling out alternative interpretations such as coincidence (chance), faulty memories, and deliberate deception.

230 CHAPTER 6 CONSCIOUSNESS SEEING BOTH SIDES ARE PSI PHENOMENA REAL? I believe the evidence is strong enough to say yes. Daryl J. Bem, Cornell University If some of the experimental evidence for psi, discussed in the text, is as impressive as it seems, why hasn't it become part of established science? Why do many scientists continue to be skeptical? Most scientists believe that extraordinary claims require extraordinary evidence. A study reporting that students who study harder get higher grades will be believed even if the study was seriously flawed because the data fit well with our understanding of how the world works. But the claim that two people in a ganzfeld study communicate telepathically is more extraordinary; it violates most people's a priori beliefs about reality. We therefore rightly demand more and stronger evidence from psi researchers

because their claims, if true, would require us to radically revise our model of the world. In this way, science is justifiably conservative. Many open-minded psychologists are genuinely impressed by the ganzfeld studies, for example, but it is reasonable for them to ask for more evidence before committing themselves to the reality of psi. One of the features that makes psi extraordinary, almost by definition, is the absence of an explanation of how it works, a description of the physical and physiological processes that could explain how psi phenomena could occur. Indeed, some skeptics claim that they will remain unconvinced by any amount of evidence until this is provided. That is their prerogative, of course, but the history of science reveals that many if not most phenomena have usually been discovered empirically – and even used for practical purposes – long before explanations are available. For example, the use of aspirin to relieve pain dates back to antiquity but its mechanism of operation was not discovered until 1971 (Jeffreys, 2005). Many psi researchers believe that modern physics, especially quantum mechanics, is already providing clues to mechanisms that would explain how psi phenomena could occur (Radin, 2006). A survey of more than 1,000 professors in the United States and Canada revealed that academic psychologists are more skeptical of psi than their colleagues from other disciplines, including those in the biological and physical sciences (Wagner & Monnet, 1979). There are probably several reasons for this. First, they are more familiar with past instances of extraordinary claims that turned out to be based on flawed experimental procedures, faulty inference, or even on fraud and deception (Gardner, 1981; Randi, 1982). Second, psychologists know that popular accounts of psychological phenomena are frequently exaggerated or misreported. For more Cengage Learning textbooks, visit www.cengagebrain.co.uk For example, the genuine findings about asymmetries in the human brain have spawned a host of pop-psychology books and media reports containing unsubstantiated claims about leftbrained and right-brained individuals. Irresponsible reports about states of consciousness – including hypnosis and psi – appear daily in the media. Third, like most scholars, academic psychologists tend to be most familiar with their own areas of specialization. Because contemporary research on psi is not usually summarized in professional journals and handbooks, most psychologists are not aware of recent research. Finally, research in cognitive and social psychology has sensitized psychologists to the biases and shortcomings in our abilities to draw valid inferences from our everyday experiences (see Chapter 17). This makes them particularly skeptical of anecdotal reports of psi, where problems of nonrepeatability and inadequate controls, compromise our intuitive impressions. Because you have already met psi skeptic Ray Hyman in the debate over the ganzfeld studies and because he has prepared the other side of this discussion, it is pertinent to cite another set of studies he was asked to evaluate. These were studies of remote viewing, a form of clairvoyance in which a ‘viewer’ attempts to draw or describe a target location or a hidden photograph or object. The studies to be evaluated were sponsored by the United States government from 1973 until 1989 to see if remote viewing might be useful for intelligence applications. Hyman and Jessica Utts, a statistician, were asked to evaluate the program. Utts concluded that: Using the standards applied to any other area of science, it is concluded that psychic functioning has been well established. The statistical results of the studies examined are far beyond what is expected by chance. Arguments that these results could be due to methodological flaws in the experiments are soundly refuted. Utts’ full report, Hyman’s skeptical report, and a full description and history of the project are available at Professor Utts’ home page (http://www.ics.uci.edu/~jutts). The ganzfeld and remote viewing studies are but two bodies of data that psi researchers point to as evidence for psi. For accessible discussions of many others and discussions of theories of psi, see Dean Radin’s (2006) paperback Entangled Minds: Extrasensory Experiences in a Quantum Reality and Broderick’s (2007) paperback, Outside the Gates of Science.

I believe that the evidence is strong enough to conclude that psi phenomena are genuine.

The case for psi fails the scientific test Ray Hyman, University of Oregon Professor Daryl Bem asserts, ‘that the evidence is strong enough to conclude that psi phenomena are genuine’. Some of his fellow parapsychologists agree. Those who agree with Bem’s assertion base their claim on the results of several meta-analyses of parapsychological experiments. Many limitations of these metaanalyses seriously weaken the claim. However, I do not need to discuss these limitations here. Other parapsychologists have conducted re-evaluations of the meta-analyses and, ironically, these support a conclusion opposite to Bem’s. In the re-evaluations, the effect sizes from the studies in each meta-analysis were plotted against the date on which the study was conducted. In each case, the plot shows that, over time, the effect size in a given line of psi research begins above chance and gradually declines to zero. Bierman and Kennedy, both prominent parapsychologists, correctly conclude that this shows that the evidence for psi cannot be replicated and fails to meet conventional scientific standards of adequacy (Bierman, 2001; Kennedy, 2003). They are just two of several contemporary parapsychologists who disagree with their colleagues who claim that the case for psi has scientific support. Although parapsychologists disagree on the scientific status of their evidence, they all agree that psi exists. Parapsychologists call the tendency of the evidence for psi to erode over time the decline effect. Kennedy (2003) reviews several hypotheses that might explain this. An obvious explanation, favored by skeptics, is that psi does not exist. The decline effect, according to this hypothesis, results from the fact that initial experiments in any domain are not as carefully designed and controlled as later ones. The decline effect simply reveals that the initial successful findings were due to methodological flaws and errors. As investigators tighten the controls, errors are eliminated and outcomes become consistent with chance. In many meta-analyses, the individual studies are rated for quality of the methodology. Kennedy reports that the quality of experiments within a meta-analysis does improve over time. As methodology improves, the evidence for psi vanishes. Although these results strongly support the argument that those experiments that support the case for psi do so because of methodological flaws, Kennedy does not accept this hypothesis. Instead, he argues that the evasive nature of the evidence is due to an intelligent agency that deliberately prevents us from getting definitive evidence. Most parapsychologists prefer to explain the inconsistencies in their data and the decline effect in terms of quantum theory. For more Cengage Learning textbooks, visit www.cengagebrain.co.uk PSI PHENOMENA SEEING BOTH SIDES ARE PSI PHENOMENA REAL? They draw an analogy between the quirkiness of quantum effects and the inconsistencies in parapsychological data. This ignores the fact that physicists have been forced to accept quantum mechanics because of extremely precise, replicable experiments. Parapsychological data are notoriously imprecise and non-repeatable and, unlike quantum effects, so messy that they do not force any conclusions upon us. Those who now acknowledge that the evidence for psi fails the scientific test argue that this very fact is a unique property of psi. It is the very essence of psi that it is evasive, illusive, erratic, and scientifically unacceptable. However, the history of science shows that this claim is false. The scrapheap of science contains many examples of claims of anomalies that were eventually rejected because the evidence turned out to be inconsistent and not replicable. The evidence for these failed claims displays all the properties – decline effects, experimenter effects, elusiveness, inconsistencies – that parapsychologists today are claiming as a unique property of psi. Despite more than 125 years of trying to produce scientific evidence, the case for psi still fails to meet acceptable scientific standards. Throughout most of this period, parapsychologists openly sought acceptance for their claims from the scientific community, and at several times they openly claimed they had indeed

obtained scientific evidence to support their claims. In each instance, the same parapsychologists, or their successors, had to admit that the evidence could not be replicated. Today, more and more prominent parapsychologists are admitting that the evidence for psi does not meet scientific standards. However, these same parapsychologists do not want to relinquish their claim that psi is real. Indeed, they want to argue that the failure of scientific proof is a defining feature of psi. This is a peculiar argument. It seems to be a form of begging the question. The parapsychologists begin by assuming that psi is real. The scientific evidence fails to support this assumption. For some parapsychologists this is not evidence against their case, rather it is a failure of science! Even if the evidence had somehow consistently supported the existence of unexplained deviations from chance in parapsychological data, this would not be proof of some scientific anomaly or paranormal functioning. Alcock (2003) discusses several other problems that stand in the way of parapsychology achieving scientific legitimacy. An early cookbook, according to some writers, begins a recipe for hare soup with the advice: 'First catch your hare'. Despite more than a century of trying, parapsychologists have not caught their 'hare'. Indeed, they have provided no compelling reasons to believe that there are any 'hares' to be caught.

232 CHAPTER 6 CONSCIOUSNESS Finally, the file-drawer problem also occurs with anecdotal evidence. The lottery winner who announced ahead of time that she would win is prominently featured in the news. But the thousands of others with similar premonitions who did not win are never heard from; their 'evidence' remains in the file drawer. It is true that the probability of this woman's winning the lottery was very low. But the critical criterion in evaluating this case is not the probability that she would win but the probability that any one of the thousands who thought they would win would do so. That probability is much higher. Moreover, this woman has a personal file drawer that contains all the past instances in which she had similar premonitions but did not win. The same reasoning applies to precognitive dreams (dreams that anticipate an unlikely event, which actually occurs a few days later). We tend to forget our dreams unless and until an event happens to remind us of them. We thus have no way of evaluating how often we might have dreamed of similar unlikely events that did not occur. We fill our database with positive instances and unknowingly exclude the negative instances. Perhaps the fullest file drawers belong to the so-called psychics who make annual predictions in the tabloid newspapers. Nobody remembers the predictions that fail, but everybody remembers the occasional direct hits. In fact, these psychics are almost always wrong (Frazier, 1987; Tyler, 1977). For more Cengage Learning textbooks, visit www.cengagebrain.co.uk INTERIM SUMMARY l Psi is the idea that people can acquire information about the world in ways that do not involve stimulation of known sense organs or can influence physical events by purely mental means. l The phenomena of psi include extrasensory perception (ESP) in its various forms (telepathy, clairvoyance, precognition) and psychokinesis, movement of objects by the mind. l The ganzfeld procedure tests for telepathic communication between a participant who serves as the 'receiver' and another participant who serves as the 'sender'. l There is an ongoing debate over the replicability of psi phenomena and the methods used in studies attempting to demonstrate the phenomena. CRITICAL THINKING QUESTIONS 1 What 'extrasensory' experiences have you had personally? Can you think of alternative explanations for these experiences? 2 The file drawer problem is ubiquitous in science. Why do you think some researchers believe it's a special problem in research on psi phenomena?

CHAPTER SUMMARY A person's perceptions, thoughts, and feelings at any given moment constitute that person's consciousness. An altered state of consciousness is said to exist when mental

functioning seems changed or out of the ordinary to the person experiencing the state. Some altered states of consciousness, such as sleep and dreams, are experienced by everyone; others result from special circumstances such as meditation, hypnosis, or the use of drugs. The functions of consciousness are (a) monitoring ourselves and our environment so that we are aware of what is happening within our bodies and in our surroundings and (b) controlling our actions so that they are coordinated with events in the outside world. Not all events that influence consciousness are at the center of our awareness at a given moment. Memories of personal events and accumulated knowledge, which are accessible but not currently part of one's consciousness, are called preconscious memories. Events that affect behavior, even though we are not aware of perceiving them, influence us subconsciously. According to psychoanalytic theory, some emotionally painful memories and impulses are not available to consciousness because they have been repressed – that is, diverted to the unconscious. Unconscious thoughts and impulses influence our behavior even though they reach consciousness only in indirect ways – through dreams, irrational behavior, and slips of the tongue. The notion of automaticity refers to the habituation of responses that initially required conscious attention, such as driving a car. Sleep, an altered state of consciousness, is of interest because of the rhythms evident in sleep schedules and in the depth of sleep. These rhythms are studied with the aid of the electroencephalogram (EEG). Patterns of brain waves show four stages (depths) of sleep, plus a fifth stage characterized by rapid eye movements (REMs). These stages alternate throughout the night. Dreams occur more often during REM sleep than during the other four stages (NREM sleep). The opponent-process model of sleep proposes that two opposing processes – the homeostatic sleep drive and the clock-dependent alerting For more Cengage Learning textbooks, visit www.cengagebrain.co.uk CHAPTER SUMMARY process – interact to determine our tendency to fall asleep or remain awake. Whether we are asleep or awake at any given time depends on the relative forces exerted by the two processes. There are a variety of sleep disorders, including sleep deprivation, insomnia, narcolepsy, and apnea. Freud attributed psychological causes to dreams, distinguishing between their manifest and latent content and suggesting that dreams are wishes in disguise. Other theories see dreaming as a reflection of the information processing that the brain is doing while asleep. Recently some theorists have concluded that dreaming is a cognitive process that reflects the individual's conceptions, concerns, and emotional preoccupations. Meditation represents an effort to alter consciousness by following planned rituals or exercises such as those of yoga or Zen. The result is a somewhat mystical state in which the individual is extremely relaxed and feels divorced from the outside world. Hypnosis is a responsive state in which individuals focus their attention on the hypnotist and his or her suggestions. Some people are more readily hypnotized than others, although most people show some susceptibility. Characteristic hypnotic responses include enhanced or diminished control over movements, distortion of memory through posthypnotic amnesia, and positive and negative hallucinations. Reduction of pain is one of the beneficial uses of hypnosis. Psychoactive drugs have long been used to alter consciousness and mood. They include depressants, such as alcohol, tranquilizers, and inhalants; cannabis, such as marijuana and hashish; opiates, such as heroin and morphine; stimulants, such as amphetamines and cocaine; and ecstasy. There is considerable controversy over psi, the idea that people can acquire information about the world in ways that do not involve stimulation of known sense organs or can influence physical events by purely mental means. The phenomena of psi include extrasensory perception (ESP) in its various forms (telepathy, clairvoyance, precognition) and psychokinesis, movement of objects by the mind.

CORE CONCEPTS altered states of consciousness consciousness preconscious memories unconscious Freudian slip automaticity dissociation REM sleep non-REM sleep (or NREM) opponent-process model of sleep and wakefulness homeostatic sleep drive clock-dependent alerting process circadian rhythms melatonin sleep disorder insomnia narcolepsy apnea dreaming lucid dream meditation hypnosis posthypnotic response posthypnotic amnesia positive hallucinations negative hallucinations hidden observer psychoactive drugs drug dependence drug misuse depressants fetal alcohol syndrome illicit drugs cannabis marijuana hashish opiates heroin agonists antagonists methadone naltrexone stimulants amphetamines cocaine psi parapsychology ganzfeld procedure meta-analysis WEB RESOURCES http://www.atkinsonhilgard.com/ Take a quiz, try the activities and exercises, and explore web links. http://www.circadian.com/learning_center/ Are you sleepy all the time? Are you having trouble concentrating? Check out this circadian learning center and learn more about how circadian rhythms, your biological clock, and sleep habits affect you throughout the day. http://psyche.cs.monash.edu.au/index.html An interdisciplinary journal of research on consciousness. http://www.hypnos.co.uk/hypnomag/articles.htm A range of articles on the subject of hypnosis and hypnotherapy. CHAPTER 6 CONSCIOUSNESS For more Cengage Learning textbooks, visit www.cengagebrain.co.uk

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