

## Chapter 5 – Consciousness – Concept Map

### **The Nature of Consciousness**

- **Consciousness** refers to the subjective awareness of mental events. Consciousness serves at least two functions: monitoring the self and the environment and controlling thought and behaviour.
- **Attention** refers to the process of focusing conscious awareness, providing heightened sensitivity to a limited range of experience requiring more extensive information processing.
- A major component of the normal flow of consciousness is **daydreaming** – turning attention away from external stimuli to internal thoughts and imagined scenarios.

### **Perspectives on Consciousness**

- The **psychodynamic perspective**. Freud distinguished three types of mental activities: **conscious** processes, of which the person is currently subjectively aware; **preconscious** processes, which are not presently conscious but could be readily brought into consciousness; and the **unconscious** processes, which are dynamically kept from consciousness because they are threatening.
- The **cognitive perspective**. The **cognitive unconscious** focuses on information-processing mechanisms that operate outside of awareness, such as procedural knowledge and implicit memory.
- The **behavioural perspective**. Consciousness was considered analogous to a continuously moving video camera, surveying potentially significant perceptions, thoughts, emotions, goals and problem-solving strategies. The two functions of consciousness – monitor and control – allow people to initiate and terminate thought and behaviour in order to attain goals.
- The **evolutionary perspective**. Consciousness evolved as a mechanism for directing behaviour in adaptive ways, which was superimposed on more primitive psychological processes such as conditioning. The primary function of consciousness is to foster adaptation.

### **Sleeping and Dreaming**

- The sleep cycle is governed by **circadian rhythms**, cyclical biological 'clocks' that evolved around the daily cycles of light and dark.
- Sleep proceeds through a series of stages that can be assessed by EEG. The major distinction is between **rapid eye movement (REM)** and **non-REM (NREM) sleep**. Most dreaming occurs in REM sleep, in which the eyes dart around and the EEG takes on an active pattern resembling waking consciousness.
- Three theories on dreaming:
  - (1) Freud believed that dreams have meaning and distinguished between **the manifest content** (story line) and **the latent content** (underlying meaning) of the dream
  - (2) the cognitive perspective suggests that dreams are the outcome of cognitive processes and that their content reflects the concerns and metaphors people express in their waking cognition
  - (3) some theorists propose that dreams are biological phenomena with no meaning at all.

### **Altered States of Consciousness**

- **Altered states of consciousness**, in which the usual conscious ways of perceiving, thinking and feeling are modified or disrupted, are often brought about through meditation, hypnosis, ingestion of drugs and religious experiences.
- **Meditation** creates a deep state of tranquillity by altering the normal flow of conscious thoughts.
- **Hypnosis** is characterised by deep relaxation and suggestibility.
- The most common way people alter their state of consciousness is by ingesting **psychoactive substances** – such as alcohol and other depressants, stimulants, hallucinogens and marijuana – that operate on the nervous system to alter mental activity.

## Chapter 5 – Consciousness

- **States of consciousness** – qualitatively different patterns of subjective experience, including ways of experiencing both internal and external events.

### Chapter 5 – Consciousness – The Nature of Consciousness

- **Consciousness** is the subjective awareness of mental events.
- Two of the functions of consciousness are readily apparent: consciousness **monitors** the self and the environment, and it **regulates** thought and behaviour.
- Consciousness as a monitor is analogous to a continuously moving video camera, surveying potentially significant perceptions, thoughts, emotions, goals and problem-solving strategies. The regulatory or control function of consciousness allows people to initiate and terminate thought and behaviour in order to attain goals.
- Consciousness is often engaged when people choose between competing strategies for solving a problem.
- These two functions of consciousness – monitor and control – are intertwined, because consciousness monitors inner and outer experience to prevent and solve problems. For example, consciousness often ‘steps in’ when automatised processes (procedural knowledge) are not successful.
- Recent neuroimaging evidence suggests that the dorsolateral prefrontal cortex, which is involved in working memory and conscious decision making, is activated when people exercise conscious control. Researchers in one study demonstrated this using the Stroop task, in which participants are presented a word printed in colour and then have to name the colour quickly while ignoring the word. This task can be very difficult, particularly if the word itself is the name of a colour, because the participant has to name the colour of the ink and ignore the competing colour name — a task that requires considerable conscious attention.
- The researchers found that the Stroop task leads to activation of the dorsolateral prefrontal cortex, as participants ‘put their mind to’ the job of ignoring the words while naming the colour. Interestingly, a different part of the cortex, the anterior cingulate, becomes active only when the colour of the ink and the word conflict but not when the colour of the ink is congruent with the word. This suggests that the anterior cingulate is involved in consciously regulating conflicting cues and perhaps in inhibiting responses that are incorrect.
- From an evolutionary standpoint, consciousness probably evolved as a mechanism for directing behaviour in adaptive ways that was superimposed on more primitive psychological processes such as conditioning. Consciousness is often ‘grabbed’ by things that are unexpected, unusual, contradictory (as in the Stroop task), or contrary to expectations – precisely the things that could affect wellbeing or survival.

## **Consciousness and Attention**

### Attention

- **Attention** refers to the process of focusing conscious awareness, providing heightened sensitivity to a limited range of experience requiring more extensive information processing. Selection – of a particular object, a train of thought or a location in space where something important might be happening — is the essence of attention. Attention is generally guided by some combination of external stimulation, which naturally leads us to focus on relevant sensory information and activated goals, which lead us to attend to thoughts, feelings or stimuli relevant to obtaining these goals.

### *Filtering In and Filtering Out*

- Some psychologists have likened attention to a filtering process through which only more important information passes. For example, the phenomenon known as the **cocktail party phenomenon**, which also suggests that we implicitly process much more information than reaches consciousness.
- **Mind wandering** occurs when our conscious thoughts do not remain on topic and our brain processes additional, unrelated sensory information. People typically report having no awareness of what happened in the external environment when their mind wanders to another topic. Recent research indicates that mind wandering is a stable cognitive trait that can increase with stress, boredom, or sleepiness; it decreases with concentration, effort, successful and enjoyable tasks, or happiness.
- On the other hand, people also sometimes divert attention from information that may be relevant but emotionally upsetting, a process called **selective inattention**. This can be highly adaptive, as when students divert their attention from the anxiety of taking a test to the task itself. It can also be maladaptive, as when people ignore a darkening birthmark on their arm that could be malignant.
- Religious traditions have long recognised the benefits of utilising practices that help people stay attuned to the present moment and minimise diversion of attention. More recently, concepts like **mindfulness** – defined by as paying attention in a particular way: on purpose, in the present moment, and nonjudgmentally – have shown

beneficial therapeutic processes. Indeed, treatments based on mindfulness are now considered by some to be the 'third wave' of cognitive-behavioural therapies.

### *Components of Attention*

- Attention actually consists of at least three functions: orienting to sensory stimuli, controlling behaviour and the contents of consciousness and maintaining alertness. Different neural networks, relying on different neurotransmitter systems, appear to be involved in these three functions.
- **Orienting** involves turning sensory organs such as the eyes and ears towards a stimulus. It also involves spreading extra activation to the parts of the cortex that are processing information about the stimulus and probably inhibiting activation of others. When we attend to a stimulus, such as a mosquito buzzing around the room, the brain uses the same circuits it normally uses to process information that is not the focus of attention. For example, watching the mosquito activates the 'what' and 'where' visual pathways in the occipital, temporal and parietal lobes. What attention does is to enhance processing at those cortical locations. Orienting to stimuli activates neural circuits in the midbrain (such as the superior colliculi, which help control eye movements), thalamus (which directs attention to particular sensory systems) and parietal lobes (which direct attention to particular locations).
- A second function of attention is to **control the contents of consciousness**. Despite our subjective experience of consciously controlling what we attend to, the situation is more the other way around. To notice something consciously, unconscious attentional mechanisms have to alert us to its potential significance. Thus, paradoxically, consciousness is, to a large degree, regulated outside of consciousness, by unconscious attentional mechanisms that focus conscious awareness. Controlling the contents of consciousness and controlling voluntary behaviour involve areas of the frontal lobes and basal ganglia known to be involved in thought, movement and self-control.
- The third function of attention, **maintaining alertness**, is crucial in tasks ranging from focusing on test items in the face of anxiety, to staying alert for hours while watching a radar screen to detect seemingly small but potentially meaningful changes. A whole network of neurons from the reticular formation (involved in regulating states of alertness) through the frontal lobes appear to be involved in alertness.

### Divided Attention

- Trying to follow two such conversations is an example of **divided attention**, splitting attention between two complex tasks.
- One way researchers study divided attention is through **dichotic listening** tasks, in which participants are fitted with earphones, and different information is simultaneously presented to the left and right ears. Participants can be instructed to attend only to the information from one ear by repeating aloud what they hear in that ear, a procedure called **shadowing**.
- Participants can become so adept at shadowing that they are completely unable to recognise information in the unattended channel. Nevertheless, the information does appear to be processed to some degree, as demonstrated in research on **priming**, in which exposure to a stimulus (such as a word) affects performance on tasks involving related stimuli. For example, participants who hear 'England' (the prime) in the unattended channel in a dichotic listening study may have no recollection of having heard the name of any country. When compared to control participants who have not been similarly primed, however, they are more likely to say 'London' if asked to name a capital city and will more quickly fill in the missing letters when asked for the name of a city when presented with LO—.
- Divided attention can be seen in such every day but remarkably complex events as listening to a lecture while simultaneously taking notes. Psychologists have even trained participants to take dictation while reading. Sometimes people accomplish such feats by rapidly shifting attention back and forth between the two tasks. Much of the time, however, they solve attentional dilemmas by automatising one task or the other. **Automatisation** develops through practice, as actions previously performed with deliberate conscious effort are eventually processed automatically. While students listen to a lecture, their primary focus of consciousness is on the lecturer's current words, while a largely automatic process, perhaps drawing on some subset of attentional processes, allows note taking.
- One everyday task that should not be the subject of divided attention is that of driving. Found that increased mental workload caused by mobile phone usage resulted in decreased ability to detect peripheral stimulus. There is also a significant increase in reaction time when drivers operated a mobile phone. 46% of those surveyed had used their mobile phone without a hands-free set to make a call while driving. Additionally, 58% had sent a text message while driving. **Inattention blindness** refers to the failure to notice an unexpected stimulus occurring in one's visual field when focusing on another task, and is of particular interest to research on motor vehicle accidents. A recent study found that drivers were more likely to detect unexpected objects in their field of vision if the test object was

semantically congruent with the driving context. The research indicates that when we drive in situations familiar to us, the attentional processes we use to filter information change to reflect this familiarity.

### The Normal Flow of Consciousness

- A major component of the normal flow of consciousness is **daydreaming** – turning attention away from external stimuli to internal thoughts and imagined scenarios. Some daydreams are pleasurable fantasies, whereas others involve planning for future actions or conversations with significant others. In one large-scale study of daydreaming, all participants reported daydreaming daily. Another research team found that university students daydream about half the time they are conscious, if daydreaming includes thoughts about something other than what is currently happening in the person's environment, such as thinking about an upcoming date while sitting in the library. More recently, research into the daydreaming of 463 Australian psychology students found that younger students were inclined to have more task-unrelated images and thoughts, or daydreams, than older students. Of interest, and consistent with lecturer expectations, the more task-unrelated images and thoughts students had, the poorer they did in their course examinations.
- Psychologists study the normal flow of consciousness using **experience-sampling** techniques, in which participants report on the contents of consciousness at specified times. For example, after being instructed simply to report the contents of their consciousness, they may come into the laboratory and talk aloud, often while performing a task. Psychologists then code their verbal responses into categories, such as emotional tone, relevance to the task at hand and ways of solving the task.
- **Beeper studies** are an experience-sampling technique that has provided a more natural window to the flow of consciousness in everyday life. In these studies, participants carry pagers or personal digital assistants and report their experience when 'beeped' at various points during the day. In one study, researchers randomly selected 75 high school students within several categories, such as sex, grade and social class. For an entire week, they beeped the students at some point during every two-hour period. Participants then immediately filled out a brief form reporting what they were doing and with whom, what they were thinking and feeling, and how intensely they were feeling it. Some of the results were quite unexpected. For example, when participants were with their families, their negative thoughts outnumbered their positive thoughts by about 10 to 1. In a more recent study, university students were sorted according to intellect, and the scientists beeped them at random intervals (eight times a day, between noon and midnight) for seven days. The average intellect students reported 'wandering' not when they were bored, but rather when their minds were overtaxed by some unusually challenging task. Thus, such students' minds seemed to use 'escaping' as a coping mechanism

## Chapter 5 – Consciousness – Perspectives on Consciousness

### The Psychodynamic Unconscious

- Freud defined consciousness as one of three mental systems called the conscious, preconscious and unconscious. **Conscious mental processes** involve subjective awareness of stimuli, feelings or ideas (e.g., consciousness of the sentence you just read – if you were paying attention). **Preconscious mental processes** are not presently conscious but could be readily brought to consciousness if the need arose, such as the name of a city that is not currently in mind but could easily be retrieved. **Unconscious mental processes** are inaccessible to consciousness because they would be too anxiety provoking to acknowledge and thus have been repressed.
- Freud likened **repression** to a censor: the mind censor threatening thoughts from consciousness. Thus, a person may remember an abusive parent with love and admiration and have little access to unhappy memories because admitting the truth would be painful. Unconscious processes of this sort are dynamically unconscious – that is, kept unconscious for a reason. According to Freud, keeping mental contents out of awareness requires continuing psychological effort or energy, a postulate that has received empirical support in recent years. Other researchers have found that people can regulate their emotions outside of awareness by keeping distressing thoughts, feelings and memories out of consciousness. Freud recognised that many other psychological processes are descriptively unconscious – that is, not conscious even though they are not threatening, such as the processes by which readers are converting symbols on this page into words with psychological meaning.

### Subliminal Perception

- In the 1940s and 1950s researchers tested hypotheses derived from Freud's theory of consciousness. Studies of **subliminal perception** – perception of stimuli below the threshold of consciousness – used a device called a **tachistoscope**, which can flash images too quickly for conscious recognition but slowly enough to be registered outside awareness.

- Although experiments in subliminal perception went out of favour for almost 30 years, more recently both cognitive and psychodynamic researchers have breathed new life into subliminal research, demonstrating that subliminal presentation of stimuli can indeed influence thought and emotion. For instance, subliminal presentation of a happy or sad face directly prior to exposure to a novel visual stimulus (such as a Chinese character) affects the extent to which participants like it. Subliminal presentation of the face seems to 'tag' the stimulus with an emotional connotation. Other studies have shown that participants subliminally primed with a word (e.g., 'beach') will more quickly recognise words semantically related to it (e.g., 'sand'), even though they never consciously registered the prime.
- Psychologists have not been the only people interested in subliminal processing. In the 1950s, rumours flew that movie theatres were manipulating consumers by subliminally presenting messages 'eat popcorn' and 'buy Coke'. In the 1980s, parents expressed fears about subliminal messages in rock music, such as backward messages encouraging violence. Since then there have been countless examples of companies allegedly including subliminal messages in advertisements.

### Unconscious Emotion and Motivation

- With respect to motivation, research suggests a distinction between conscious and unconscious motivational systems. Numerous studies have shown that when people are not attending to their conscious goals and values, they tend to act on implicit motives. Other studies show that priming people with words associated with their motives (e.g., priming people with success, which is associated with the need for achievement) makes them more likely to act on these motives, even though they may be completely unaware that they have been primed.
- Emotional processes can also influence thought and behaviour without being conscious. This can be seen in research with patients with Korsakoff's disorder who have severe amnesia. In one study, Korsakoff's patients preferred a person described a week earlier as having positive traits over someone described more negatively, even though they had no recollection of having seen either one before. Similar findings emerge in subliminal priming studies of patients without neurological damage, using measures ranging from facial muscle movements indicating distress to brainwave activity assessed by EEG. These findings are of particular relevance to the psychodynamic hypothesis that individuals can respond emotionally to people or situations without knowing why.

### **The Cognitive Unconscious**

- The **cognitive unconscious** of cognitive research refers to information-processing mechanisms that operate outside of awareness (such as implicit memory) rather than information the person is motivated to keep from awareness. In other words, the cognitive unconscious includes what Freud called *descriptively* but not *dynamically* unconscious processes. Information-processing models often use the terms consciousness and working memory interchangeably. Most models now distinguish explicit (conscious) and implicit (unconscious) memory and cognition, such as conscious problem-solving strategies versus automatic, unconscious heuristics. Connectionist models further propose that information processing occurs simultaneously in multiple, relatively separate neural networks, most of which are unconscious. The brain synthesises a unitary conscious experience from the various activated unconscious networks, 'highlighting' those that best fit the data.

### The Functions of Conscious and Unconscious Processes

- Some cognitive theorists have examined the complementary functions, strengths and weaknesses of conscious and unconscious processes in everyday behaviour. Unconscious processes, notably skills and associative processes such as priming and classical conditioning, are extremely fast and efficient. Since they are usually based on considerable learning, they tend to lead to adaptive responses that make sense in the light of observed regularities in the environment (such as avoiding stimuli that would lead to pain or danger).
- Another strength of unconscious processes is that they can operate simultaneously. When solving a problem, for example, multiple networks can 'collect data' at the same time and come up with independent and 'well-researched' potential solutions. Consciousness, in contrast, has limited capacity. We can only form one 'scene' at a time in our conscious minds. We can switch rapidly back and forth between two views of a scene or among tasks that require attention, but ultimately, each will draw conscious cognitive resources from the other. On the other hand, conscious processes are more flexible than unconscious processes, and because consciousness is not limited to quasi-independent networks operating in parallel in their own small domains, consciousness can survey the landscape and consider the 'big picture'.
- One theory suggests that unconscious processes operating in parallel are like independent teams of 'experts', each offering its own advice on how to solve a problem or make a decision. A central role of consciousness is to redistribute activation among the tens, hundreds or thousands of networks active at any given time. When conscious



goals are active, they spread extra activation to networks associated with goal attainment. If a person is trying to make a decision or solve a problem, the networks activated below consciousness all vie for conscious access. Those that seem to provide the best potential solutions become represented in consciousness. Becoming conscious in turn spreads further activation to them and inhibits activation of less compelling alternatives.

## **Chapter 5 – Consciousness – Sleep and Dreaming**

- People sleep away roughly a third of their time on the Earth, about 25 years. A newborn infant typically sleeps about 70 percent of every 24 hours and typically results in 400–750 hours lost sleep for parents in the first year.
- Australians sleep an average of eight hours and one minute per day. We sleep about one to 1.5 hours less than we did 100 years ago.
- Anything less than five minutes to fall asleep at night means you are sleep deprived. Ideally, you should take between 10 and 15 minutes to fall asleep.
- From one-quarter to a third of all parents will experience babies who do not easily settle into a regular sleep routine. One of the best researched behavioural interventions to establish a regular sleep pattern in an infant is that of ‘controlled crying’. Controlled crying involves leaving an infant to cry for increasing periods of time after being resettled. However, this method has not been without controversy.
- Babies’ sleep and mothers’ wellbeing can be improved into toddlerhood by a brief infant sleep program, involving a Maternal and Child Health nurse helping the mother to learn ways to manage their infant’s sleep.

## **The Nature and Evolution of Sleep**

- Sleep evolved over 3 billion years ago in some organisms, and the mechanisms that govern the biological clock in humans are apparently over 500 million years old. Although not all animals show the characteristic EEG signs of sleep, nearly all animals show behavioural signs of sleeping: minimal movement, a stereotyped posture and a high degree of stimulation needed to arouse them. They differ, however, in how much they sleep.
- Most people between 6.5 and 8.5 hours a night. As people get older, they tend to require less sleep. The number of hours people sleep is related to mortality rates, although the reasons for this are unclear. People who report sleeping for unusually long or unusually short durations are prone to die earlier than people whose reported sleep is closer to average. Researchers suggest that lack of sleep doubles the risk of death, but so can too much sleep. They found that those who had cut their sleeping to 5 hours faced a 1.7 fold increased risk in mortality from all causes, and twice the increased risk of death from a cardiovascular problem in particular. Interestingly, the researchers also found that too much sleep also increased mortality. Those individuals who showed an increase in sleep duration to 8 hours or more a night were more than twice as likely to die as those who had not changed their habit; however, cause of death was predominantly from non-cardiovascular diseases. The researchers suggest that consistently sleeping around seven hours per night is optimal for health and a sustained reduction (or increase) may predispose individuals to ill-health. Chronic sleep deprivation is related to high levels of psychological distress and early intervention programs are needed to prevent these problems from persisting.
- Researchers have documented rare cases of people who require minimal sleep with no adverse consequences, such as a 70-year-old English nurse who was observed to sleep only one hour every night.

## **Circadian Rhythms**

- A **circadian rhythm** is a cyclical biological process that evolved around the daily cycles of light and dark. Expectant mothers can attest to the fact that circadian rhythms begin before birth. Foetuses begin showing rhythms of sleep and activity by the sixth month in utero.
- Rhythms akin to sleep–wake cycles may exist in daytime as well as in sleep. Research supports the distinction between ‘day people’ and ‘night people’, finding that people peak in their alertness and arousal at different times of the day. The ‘natural alarm clock’ which enables some people to wake up more or less when they want to is caused by a burst of the stress hormone **adrenocorticotropin**. Researchers say this reflects an unconscious anticipation of the stress of waking up.
- Human circadian rhythms are controlled largely by the **hypothalamus** but are influenced by light and dark. A special neural tract that projects from the retina to the hypothalamus responds only to relatively intense light, such as sunlight. During periods of darkness, the **pineal gland** in the middle of the brain produces a hormone called **melatonin**; melatonin levels gradually diminish during daylight hours. Melatonin influences not only sleep but also sexual arousal. Thus, during the winter months, when the number of daylight hours diminishes, so, too, does sexual arousal.

## Sleep Deprivation

- No-one knows precisely what functions sleep serves. Some researchers emphasise its role in conserving energy, because sleep turns down the body's 'thermostat' at night. Others emphasise a restorative function, in which sleep freshens both body and mind; still others point to a potential role in consolidating memories learned during the day.
- People have known of the ill effects of extreme sleep deprivation for at least 2000 years. In Roman times and during the Middle Ages, sleep deprivation was used as a form of torture. Long-term sleep deprivation reduces the functioning of the immune system and makes the body more vulnerable to diseases ranging from common colds to cancer. Lack of sleep has been pinpointed as a key factor in road accidents in Australia and New Zealand. Found that a significant proportion of those involved in accidents reported feeling drowsy before the crash, had regularly slept less than six hours a night or suffered from a disorder that affected their sleep.
- Sleep thus appears essential to physical and emotional wellness. When your body works well, you sleep well. No matter what age you are, limited sleep can affect every aspect of your lifestyle. Estimated that over 1.2 million Australians experience sleep disorders. On average, Australians feel sleepy for approximately five months of the year. More than 70% of those surveyed feel their ability to get to sleep is affected by the level of work/school or everyday stresses and that they sleep better when relaxed. Poor sleep is detrimental to performance at work – 44% of employees surveyed said they were likely to be in a bad mood at work as a result of poor sleep.
- Many Australians feel stressed and 'time poor', perhaps reflecting the fact that we work some of the longest hours in the developed world. The average Australian works around 1855 hours annually, compared to an international average of 1643 hours. In August 2002, around 1.7 million Australians worked 50 hours or more per week, twice as many as in 1982. Suggested that feeling tired and run down is a warning sign that work is interfering with home life. Today's '24 hour society', complete with the all-hours availability of the internet, has been viewed by many as disrupting sleeping patterns across the world. Adolescents and young adults are at risk of poor academic performance, mood swings and increased car crashes as a result of excessive sleepiness. Additionally, a survey of Australian university students showed that the most common sleep complaints were difficulty falling asleep (18%), early morning awakening (13%), general sleep difficulties (12%) and difficulty staying asleep (9%).
- Research suggests that sleep deprivation is associated with impaired immune and motor function and psychological problems such as memory and attention deficits. Most teenagers commence the week with a sleep deficit that continues to grow as the week progresses. They make up for the sleep lost on a Saturday night, but then find it difficult to wake up on Monday morning because they typically go to bed late on a Sunday night, wanting the weekend to last as long as possible. This sleep deficit then continues throughout the week.
- The time required to fall asleep drops substantially after even a single sleepless night. Researchers have recently discovered that a neurotransmitter substance (actually a modulatory neurotransmitter, which regulates the activity of other neurotransmitters) in the thalamus and in structures deep within the cerebrum increases with each additional hour an animal is awake. This neurotransmitter, called **adenosine**, plays an inhibitory role in the brain, shutting down the systems that normally lead to arousal and hence fostering sleep when an animal has been awake too long.
- **Insomnia**, or inability to sleep, affects virtually everyone at some point, but for some people it is a chronic problem. Reports suggest that up to one in three Australians suffer from insomnia at some stage, making it the second most common medical complaint, with almost one half of older adults experiencing symptoms of insomnia on a few nights each week. Despite this, few people seek help from their doctor. Insomnia costs the Australian community over half a billion dollars each year in direct medical costs, and as much as 10 times that amount in indirect costs, such as lost productivity or days off work. For both the community and the sufferer, it is an issue that should not be ignored.
- Alarming statistics show that almost 10% of Australians are turning to sleeping tablets to help them cope, a third of which admit to taking them every night. This is a major public health issue, because over time, sleep deprivation can lead to an inability to deal with stress, ill health, irritability, and feeling distracted and unfocused. Additionally, sleeping tablets are problematic because they do not often address the cause of the sleeping problem. Thus, although sleeping pills are sometimes appropriate and may offer temporary relief, they should always be taken with caution. Sleeping pills can lead to more, rather than less, trouble sleeping, as the person becomes dependent on them or the brain develops a tolerance, requiring higher doses to achieve the same effect.

## Stages of Sleep

- Sleep proceeds through a series of stages. To study these stages, researchers use EEG, attaching electrodes to participants' heads to assess electrical activity in the brain. In general, as people move from a waking state through deeper stages of sleep, their brainwaves become slower and more rhythmic, decreasing from over 14 cycles per second (cps) in the waking state to as little as 0.5 cps in deep sleep. (The number of cycles per second is a gross measure of rate of neural firing and hence of mental activity.)

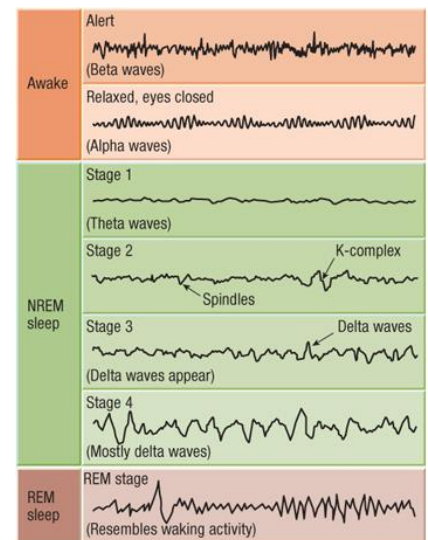
### Early Stages of Sleep

- Normal waking brain activity has an irregular pattern with a high mental activity level, evidenced in a large number of cycles per second (known as **beta waves**). As people close their eyes and relax, **alpha waves** (8 to 12 cps) emerge, signalling a slowing of mental activity and a transition into sleep.

- **Stage 1** sleep is brief (only a few minutes), marked by the appearance of slower **theta waves** (3 to 7 cps). Physiological changes accompany this shift from drowsiness into sleep as eye movements slow, muscles relax and blood pressure drops, bringing the body into a calm, quiet state.

- **Stage 2** sleep is marked by an EEG pattern of slightly larger waves interrupted by bursts of low-amplitude activity (called **sleep spindles**) and slow, high-amplitude waves called **K-complexes**. During stage 2, sleep deepens, as alpha activity disappears.

- **Stage 3** sleep is marked by large, slow, rhythmic **delta waves** (less than 1 cps). When delta waves comprise more than 50% of recorded brain activity, the person has entered **stage 4** sleep. Together, stages 3 and 4 constitute what is called **delta sleep**, a deep sleep characterised by relaxed muscles, decreased rate of respiration and slightly lower body temperature. People aroused from delta sleep are groggy and disoriented. During delta sleep, muscles apparently rest and rejuvenate, since people deprived of it frequently complain of muscle aches and tension.



### Rapid Eye Movement Sleep

- Delta sleep is followed by a kind of sleep that is qualitatively different from the preceding stages. Stage 4 sleep is interrupted, and the sleep stages occur in reverse order, through stages 3 and 2. But instead of entering stage 1, suddenly the eyes begin to dart around as if the sleeper were watching a play. At this point, the person enters **rapid eye movement (REM) sleep**, a qualitatively different stage of sleep that is named for the darting eye movements that characterise it. Because REM sleep is so different, stages 1 to 4 are often collectively called simply **non-REM (or NREM) sleep**.

- In REM sleep, autonomic activity increases. Pulse and blood pressure quicken, respiration becomes faster and irregular, and both males and females evidence signs of sexual arousal that may last for several minutes. At the same time, muscle movement is largely 'turned off'. In fact, those who have REM sleep behaviour disorder physically enact behaviours from their dreams while they are sleeping, potentially putting themselves and their bed partners at risk of harm. The EEG during REM sleep resembles the irregular, faster pattern of waking life, suggesting that, although the body is not moving, the brain is quite active. The function of REM sleep is not clear, but if a person is repeatedly awakened from it, the brain will return to it with increasing persistence.

- The mental activity that occurs during REM sleep is dreaming. Roughly 80% of the time when people are awakened from REM sleep, they report dream activity. Although many people believe they do not dream, the evidence suggests that everyone dreams several times a night, even though they may not remember dreaming. Dreaming also occurs during NREM sleep, but less frequently, and the dreams often consist of a simple experience, such as 'I dreamed I smelled fish'.

- PET studies find that a network of neurons, beginning at the pons and extending through the thalamus and amygdala, are active during REM sleep. Visual association areas in the occipital and temporal lobes, which are active when people form mental images and identify objects, are also activated during REM sleep, but the primary visual cortex is not. At the same time, areas of the prefrontal cortex involved in consciousness and attention are inactive or inhibited.

- These findings are particularly interesting in light of the fact that watching an event in normal waking consciousness (as opposed to 'watching' a dream) involves both primary visual cortex and prefrontal attentional mechanisms. Together, these findings suggest that dreaming involves a neurologically distinct kind of consciousness that does not rely on normal waking attentional mechanisms. These findings may also explain why dreams are often highly emotional – because the amygdala is very active – and why dreamers can uncritically accept bizarre story lines – because the frontal circuits involved in critical thinking and social judgement are shut off during dreaming.

- An interesting question is how the dreams of a blind person 'look' compared to those of a sighted person. Research has suggested that if blindness is congenital or develops before around the age of five, visual imagery does not occupy dreams – or, in the case of the latter group, seldom occupies dreams. Instead, blind people experience auditory dreams that may be accompanied by bodily sensations and representations from the other senses. What does appear to be similar between the dreams of the sighted and non-sighted is that they each contain representations both of the dreamer and of the topographical world.



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## A Psychodynamic View

- Freud believed that dreams, like all mental events, have meaning but must be deciphered by someone skilled in dream interpretation. As communications spoken in the language of the unconscious, which is irrational and wishful, dreams are often vague, illogical or bizarre and thus require translation into the language of rational waking consciousness. For example, in dreams two people are often condensed into one, or thoughts about one person are displaced onto someone else (that is, attributed to the wrong person).

- According to Freud, unconscious processes are **associative processes**. Thus, ideas are connected by their relationship to one another along networks of association, not by logic. During sleep, a person is not using conscious, rational processes to create or monitor the story, so one thought or image can easily be activated in place of another. Because associative thinking replaces logical thought, Freud saw dreams as 'the insanity of the night'. For example, a man who was angry at his father had a dream of murdering his father's best friend, presumably because anger and murder were associatively linked, as were his father and his father's friend.

- Freud distinguished between the **manifest content**, the story line of the dream, and the **latent content**, the dream's underlying meaning. To uncover the latent content of a dream, the dreamer **free-associates** to each part of the dream (that is, simply says aloud whatever thoughts come to mind about it), while the dream analyst tries to trace the networks of association.

- Freud proposed that the underlying meaning of every dream is an **unconscious wish**, typically a forbidden sexual or aggressive desire. He suggested that people often rapidly forget their dreams upon awakening because dreams contain anxiety-provoking thoughts that are repressed during normal waking consciousness. The empirical data do not support the hypothesis that dream content is generally associated with sexual and aggressive wishes. Most contemporary psychodynamic psychologists believe, instead, that the latent content of a dream can be a wish, a fear or anything else that is emotionally pressing. Probably the most central aspect of the psychodynamic approach today is its view of dreaming as associative thought laden with emotional concerns. This form of thought requires interpretation because the story line has not been constructed using the rational thought processes characteristic of conscious mental activity.

- A cognitive perspective suggests that dreams are **cognitive constructions** that reflect the concerns and metaphors people express in their waking thought. In other words, dreams are simply a form of thought. At times, they may even serve a problem-solving function, presenting dreamers with potential solutions to problems they faced during the day.

- Dreams rely on the same metaphors people use in everyday thinking. However, conscious monitoring is deactivated during dreaming, so metaphoric thinking is relatively unconstrained, leading to images or events that may seem bizarre to the conscious mind. Dreams also show cognitive development. Children's dreams lack the sophistication of adult dreams.

- One cognitive view that shares many points with Freud's theory was proposed by dream researcher David Foulkes. Like many contemporary psychodynamic psychologists, Foulkes disagrees that the latent meaning of every dream is an unconscious wish. He proposes instead that dreams simply express current concerns of one sort or another, in a language with its own peculiar grammar. The manifest content is constructed from the latent content through **rules of transformation** – that is, rules for putting a thought or concern into the 'language' of dreaming.

- Decoding dream language thus requires a knowledge of those rules of transformation, just as a transformational grammar allows linguists to transform the surface structure of a sentence into its deep structure, or meaning. In everyday language, the sentence 'The boy threw the ball' can be transformed into 'The ball was thrown by the boy'. In dream language, the thought 'I am worried about my upcoming exam' can be translated into a dream about falling off a cliff.

### *Dreams and Current Concerns*

- Empirical research supports the view that dreams are related to current concerns, whether wishes, fears or preoccupations of other sorts. A study of the dreams of Israeli medical students five weeks into the Gulf War, when Israel was under threat of missile attacks, found that over half the dream reports dealt with themes of war or attack. Other research finds that the extent to which people's dreams express wishes for intimacy correlates with their desires for intimacy by day. Similarly, people who report high wellbeing during waking hours also report fewer nightmares. An Australian study, which compared people who reported frequent nightmares with a control group, came up with similar findings. The study indicated that those people who experienced numerous nightmares were more likely to suffer from anxiety, paranoia and depression. The study also found that feelings of stress increased the number and intensity of nightmares.

- Gender and cross-cultural differences also support the view that dreams express concerns similar to those that people experience in their waking consciousness. Just as males tend to be more aggressive than females by day, their dreams show a greater ratio of aggressive to friendly interactions than women's dreams. Similarly, the Netherlands and Switzerland are two of the least violent technologically developed societies, whereas the US is the most violent. Incidents involving physical aggression are about 20% more prevalent in the dreams of males and females in the US than among their Dutch and Swiss counterparts.

### A Biological View

- Some dream researchers argue that dreams are **biological phenomena** with no meaning at all. According to one such theory, dreams reflect cortical interpretations of random neural signals initiated in the midbrain during REM sleep. These signals are relayed through the thalamus to the visual and association cortexes, which try to understand this information in their usual way – namely, by using existing knowledge structures (schemas) to process the information. Because the initial signals are essentially random, however, the interpretations proposed by the cortex rarely make logical sense.

- Many dream researchers, however, criticise this view, arguing that the presence of dreams during NREM sleep challenges this explanation of dreaming. Further, the lack of evidence linking specific patterns of midbrain activation with specific patterns of dream content suggests that a biological interpretation is at least incomplete.

- More recently, biologically oriented researchers have offered another view that emphasises the role of sleep and dreaming in learning and memory. If they are right, the next time you are tempted to stay up all night to prepare for a big exam, think again. Sleep appears to be involved in the consolidation of memory. Memories for newly learned material are stronger after eight hours of sleep than after eight hours of wakefulness. Researchers are just beginning to track down the mechanisms, but the data suggest that during sleep the cortex and hippocampus work together to consolidate newly learned material – that is, to solidify it so it 'sticks'. According to this view, during NREM sleep, the hippocampus 'replays' what it has 'learned' during the day and activates relevant parts of the cortex to consolidate the memory. During REM sleep, activity appears to flow in the other direction – from the cortex to the hippocampus – erasing old memories from the hippocampus that are now fully consolidated in the cortex.

### Integrating the Alternative Models

- Are these three models of dreaming really incompatible? The psychodynamic and cognitive views converge on the notion that dreams express current ideas and concerns in a highly symbolic language that requires decoding. They differ over the extent to which those concerns involve motives and emotions, although dreams probably express motives (wishes and fears) as well as ideas. Many motives have cognitive components, such as representations of wished-for or feared states. Thus, a fear of failing an examination includes a representation of the feared scenario and its possible consequences. What applies to cognition, then, probably applies to many aspects of motivation as well, so dreams are as likely to express motives as beliefs.

- Even the biological view of dreams as cortical interpretations of random midbrain events is not necessarily incompatible with either the psychodynamic or the cognitive view. The interpretive processes that occur at the cortical level involve the same structures of meaning – schemas, associational networks and emotional processes – posited by Freud and Foulkes. Hence, even random activation of these structures would produce dreams that reveal something about the organisation of thoughts and feelings in the person's mind, particularly those that have

received chronic or recent activation. Further, neurons activated during the day should be more readily triggered at night, leading to likely similarities of content in daytime and night-time thoughts. The memory consolidation theory is even more congruent with psychodynamic and cognitive theories, because what matters during the day is what is likely to be replayed and consolidated by night.

## **Chapter 5 – Consciousness – Altered States of Consciousness**

- In **altered states of consciousness**, the usual conscious ways of perceiving, thinking, and feeling are modified or disrupted. Altered states are often culturally patterned and occur through meditation, hypnosis, ingestion of drugs and religious experiences.

### **Meditation**

- In **meditation**, the meditator develops a deep state of tranquillity by altering the normal flow of conscious thoughts. Many religions and belief systems, such as Buddhism, believe that meditation leads to a deepened understanding of reality. By focusing attention on a simple stimulus or by concentrating on stimuli that are usually in the background of awareness (such as one's breathing), meditation shuts down the normal flow of self-conscious inner dialogue. With the usual goal-directed flow of consciousness disrupted, the procedures that normally direct conscious attention are 'de-automatised' or disrupted.
- Meditation can produce a state of serenity that is reflected in altered brainwave activity. Some forms of meditation facilitate the alpha waves characteristic of the relaxed state of falling into sleep. Others produce beta activity, and still others even produce theta waves, which are rarely observed except in participants who are fully asleep. As a result, some experienced meditators can perform remarkable feats, such as meditating for hours in the bitter cold.
- Mindfulness meditation involves directing attention to the contents of one's moment-to-moment experience, without judgement and without reaction. **Mindfulness** is a state of focused awareness whereby an individual calls upon all senses to shift focus from external stimuli to internal awareness and develop the mental, emotional, physical and social competencies needed to successfully handle life's challenges. Mindfulness involves a heightened awareness of thoughts, feelings and behaviours. Mindfulness training involves:
  - learning how to focus attention to inner and outer experience
  - learning to tolerate any emotional discomfort you experience in response to this focused attention
  - purposefully responding to yourself and others in a kind and compassionate way.
- It has proven effective in helping patients suffering from severe pain. For example, in mindfulness meditation, the patients focus on the various sensations in their mind without judgement; thus, they do not react to any pain they might be experiencing.

### **Hypnosis**

- **Hypnosis** is characterised by deep relaxation and suggestibility (proneness to follow the suggestions of the hypnotist). The participant is likely to experience a number of changes in consciousness, including an altered sense of time, self, volition (voluntary control over actions) and perception of the external world. For instance, a participant directed to raise her arm may have no sense of initiating the action but feel instead as if the arm has a mind of its own.
- Entertainers such as Grant Boddington in New Zealand and Martin St. James in Australia make a living through stage shows where they hypnotise people from the crowd and ask them to comply with humorous suggestions. Many sceptics go along to these shows believing they can never be hypnotised — only to find themselves up on stage becoming part of the night's entertainment. These 'hypnotists' are not psychologists. They use hypnosis to entertain and to make a living. However, there is a more serious side to hypnosis. Psychologists undergo comprehensive training to gain qualifications in hypnosis and use these skills to assist people with a variety of problems in living. For example, hypnosis is commonly used to assist people to stop smoking and to lose weight. In Australia, clinical hypnotherapists can become registered members of the Australian National Hypnotherapy Register (ANHR) when they complete extensive education in hypnotherapy and associated disciplines and comply with a strict Code of Conduct and continuing professional education requirements.
- Not everyone can be hypnotised. People differ in **hypnotic susceptibility**, the capacity to enter into deep hypnotic states. People who are highly hypnotisable tend to be able to form vivid visual images and to become readily absorbed in fantasy, daydreams, movies and the like.

### **Hypnotic Effects**

- Hypnosis can produce an array of unusual effects, although, researchers disagree on the extent to which many of these effects are either genuine or unique to hypnosis. For example, if told they are about to smell a beautiful

flower, participants will smile peacefully rather than reflexively turn their heads when ammonia is placed under their noses. Under hypnosis, people can experience amnesia or its opposite, hyperamnesia, the recall of forgotten memories. A hypnotist can induce age regression, in which hypnotic participants feel as if they are reliving an earlier experience. Under hypnosis, one participant spoke a language he did not consciously remember but was spoken in his home when he was a very young child.

- Hypnosis has clear and well-documented therapeutic effects. Hypnotised participants often demonstrate hypnotic analgesia, an apparent lack of pain despite pain-inducing stimulation. Some hypnotic participants have undergone surgery without anaesthesia and shown no signs of conscious pain. Hypnosis can, in fact, be useful in minimising the experience of pain in many situations, ranging from the dentist's chair to the treatment of burn injuries. A recent Australian study showed that hypnosis can also be used for effective pain relief during labour and childbirth. Controlled scientific studies have even shown that hypnotised participants can rid themselves of warts and stop blood from flowing profusely from lacerated skin.

### The Hidden Observer

- Ernest Hilgard experimented extensively with hypnotic phenomena and told the story of a striking event that led him down a productive path of scientific research. In a class demonstration of hypnosis, he hypnotised a student to become deaf, telling him he could hear nothing until Hilgard touched his right shoulder. Hilgard then banged together large wooden blocks near the participant's ears and even fired off a starter pistol, to which the participant did not respond.

- A student in the room wondered whether 'some part' of the participant could still hear him, so Hilgard, confident this was not the case, told the participant, 'Perhaps there is some part of you that is hearing my voice. If there is, I should like the index finger of your right hand to rise'. To the surprise of both instructor and students, the finger rose. The hypnotised student then asked Hilgard to restore his hearing and tell him what had just happened, explaining, 'I felt my finger rise in a way that was not a spontaneous twitch, so you must have done something to make it rise, and I want to know what you did'.

- Hilgard then instructed the student, 'When I place my hand on your arm ... I can be in touch with that part of you that listened to me before and made your finger rise ... But this hypnotised part of you, to whom I am now talking, will not know what you are saying'. The hidden observer – the part of the student's consciousness that raised the finger – then fully described what had happened, including hearing the slamming wooden blocks. When Hilgard lifted his hand and again asked what had happened in the last few minutes, the participant had no idea.

- Hilgard's discovery of the hidden observer led him to conduct some fascinating experiments on hypnotic analgesia. In the basic design, the participant places her hand and forearm in ice water and reports the degree of pain produced, from 0 (no pain) to 10 (pain so severe that she wants to pull out her hand). In a normal waking state, the person usually hits 10 in less than a minute. When given a suggestion for hypnotic analgesia, participants often report no pain and would keep their arm in the water indefinitely if allowed. However, when given the suggestion for the hidden observer to rate the pain using the same 0 to 10 scale, participants report steadily increasing pain.

### Hypnosis and Memory

- Some advocates of hypnosis have claimed that hypnosis can restore forgotten memories. In the late 1970s, a busload of children and their driver were kidnapped at gunpoint. Later, under hypnosis, the driver relived the experience from beginning to end and was able to recall the kidnappers' licence plate number with enough clarity to lead to their apprehension.

- One researcher found that participants under hypnosis could even recall events that occurred under anaesthesia. While a surgeon was removing a small lump from the lower lip of a patient, the doctor made the comment, 'Good gracious ... it may be a cancer!' For the next three weeks, the patient was inexplicably depressed. The investigator then hypnotised the woman and induced hypnotic regression to the day of the operation. She remembered the exclamation 'Good gracious' and then, crying profusely, recalled, 'He is saying this may be malignant'. The researcher subsequently demonstrated the capacity for recall of similar events experimentally with a sample of dental patients. Since then, a number of memory researchers have demonstrated both implicit and explicit memory for events occurring during anaesthesia, such as later recognition of word lists presented while surgery patients were completely unconscious).

- Despite such examples, many psychologists have expressed concern about the use of hypnosis to retrieve memories of crime scenes or experiences from childhood such as sexual abuse. Others have questioned the scientific validity of hypnosis as an aid to memory enhancement for legal purposes. One of the major problems is that people under hypnosis are highly suggestible, and a subtle inflection or leading question can lead hypnotised eyewitnesses to report more than they actually know. Hypnosis may also lower the threshold for feeling confident enough to



report a memory. This can increase the capacity to recall actual memories, such as the licence plate of the school bus kidnappers described above, but it can also increase the tendency to mistake beliefs, hypotheses, fantasies or suggestions for true memories. Controversy continues over the conditions under which hypnosis leads to genuine or distorted memories and is likely to do so for some time.

### Is Hypnosis Real?

- Hypnosis has drawn considerable scepticism since it first received scientific attention in the nineteenth century, in part because of a history of charlatans using stage hypnosis mixed with liberal doses of deception (such as planting participants). Research over many decades has demonstrated that social pressure can lead people to perform peculiar, deviant or destructive behaviour, even in a normal state of consciousness. Several researchers have produced evidence to suggest that hypnotic participants are simply playing the role they believe they are expected to play.
- Other critics contend that aspects of hypnotic suggestion that are not unique to hypnosis, such as heavy reliance on imagery, actually account for hypnotic effects. For example, people instructed to use vivid visual images can often accomplish the same feats as hypnotised participants, such as eliminating warts.
- Data supporting the validity of hypnosis, however, come from studies in which participants are given posthypnotic suggestions – commands to perform a behaviour on demand once they are out of the hypnotic trance. In a study designed to test the hypothesis that hypnotised participants are simply playing roles (and that they are not really in an altered state), the investigators compared the behaviour of participants instructed to act as if they were hypnotised with the behaviour of truly hypnotised participants. When both groups of participants were distracted from assigned tasks and thus diverted from thinking about what they were supposed to do, hypnotised participants were three times as likely to carry out the posthypnotic suggestion as simulators.
- Neuroscientific data also provide evidence for the validity of hypnosis as an altered state. Not only do studies find distinct EEG patterns in hypnotised participants, but also recent neuroimaging studies support the distinctness of hypnotic states. In one study, researchers suggested to hypnotised participants that they should see colour images in black and white. Remarkably, their brain scans showed decreased activation in a part of the cortex that processes colour (at the borders of the occipital and temporal lobes), compared with activation while viewing colour images without the suggestion. When the researchers made the same suggestion to the same individuals without hypnosis, they showed no reduction in the colour area of the cortex. These findings suggest that hypnosis can, in fact, dramatically influence basic components of perceptual experience that psychologists have generally assumed to be independent of people's intentions.
- Other strong evidence comes from studies in which hypnotic participants have endured painful medical procedures, including surgery, without anaesthesia. Although some sceptics argue that these patients may be 'faking it', it is difficult to imagine undergoing an operation without anaesthesia simply to please an experimenter.
- The most appropriate conclusion is probably that hypnosis is, in fact, an altered state of consciousness, at least in highly hypnotisable people. However, some or many of its effects can be produced under other conditions, such as use of imagery, relaxation or social pressure.

### **Drug-Induced States of Consciousness**

- The most common way people alter their state of consciousness (other than by going to sleep, of course) is by ingesting **psychoactive substances** – drugs that operate on the nervous system to alter mental activity. In the West, people use many psychoactive substances, ranging from caffeine in coffee and nicotine in tobacco, to medications that relieve depression or anxiety, to drugs that seriously impair functioning, such as cocaine and heroin. Some psychoactive drugs resemble the molecular structure of naturally occurring neurotransmitters and thus have similar effects at synapses. Others alter the normal processes of synthesis, release, reuptake or breakdown of neurotransmitters and consequently affect the rate of neural firing in various regions of the brain.
- The action of psychoactive substances cannot, however, be reduced entirely to their chemical properties. Their impact also depends on cultural beliefs and expectations. Native Americans who use peyote (a potent consciousness-altering drug) in religious rituals typically experience visions congruent with their religious beliefs, as well as feelings of reverence or religious awe and relief from physical ailments. In contrast, Anglo-Americans using the same drug often experience frightening visions, extreme mood states and a breakdown in normal social inhibitions. Similarly, the drug kava (drawn from the root of the kava plant) is a traditional drink widely used in Polynesian societies in the Pacific Ocean, from New Guinea to the Hawaiian Islands. While the substance has psychoactive properties, its consumption is usually part of a ritual that is an important component of those societies' culture and belief systems.

- In Australia, there are approximately 20 species of 'magic mushrooms' that have hallucinogenic properties. Fresh or dried magic mushrooms are usually taken orally, and may be eaten raw or added to a variety of foods including pasta, stews or teas. The effects produced by these substances can differ greatly among individual users, ranging from elation to terror.
- The major types of psychoactive substances in widespread use include alcohol and other depressants, stimulants, hallucinogens and marijuana.

### Alcohol and Other Depressants

- **Depressants** are substances that depress, or slow down, the nervous system. Common depressants are barbiturates and benzodiazepines. **Barbiturates** ('downers') provide a sedative or calming effect and in higher doses can be used as sleeping pills. **Benzodiazepines**, or anti-anxiety agents, serve as tranquillisers; common examples are Valium and Xanax. Depressants can produce both psychological and physical dependence.
- **Heroin** is also a depressant that slows down the activity of the central nervous system. Immediate effects of its use can range from an intense pleasure and a strong feeling of wellbeing to feeling confused, drowsiness, reduced coordination, nausea and vomiting. Long-term effects include dependence, depression and cognitive impairment. People who are physically dependent on heroin usually develop tolerance to the drug, making it necessary to take more and more to get the desired effects. Eventually, a dose plateau is reached, at which no amount of the drug is sufficient. When this level is achieved, the person may continue to use heroin, but largely for the purpose of delaying withdrawal symptoms. In 2010, 1.4 percent of Australians aged 14 years and older had used heroin in their lifetime.
- Contrary to what many people who rely on **alcohol** to elevate their mood believe, alcohol is a depressant. Researchers are still tracking down the precise neural mechanisms by which alcohol slows down central nervous system activity, but like other sedatives, alcohol appears to enhance the activity of the neurotransmitter GABA (gamma-aminobutyric acid). Because GABA inhibits norepinephrine, which is involved in anxiety reactions, alcohol can reduce anxiety. Alcohol also enhances the activity of dopamine and endorphins, which provide pleasurable feelings that reinforce behaviour. Thus, alcohol derives its powerful effects from its capacity both to diminish unpleasant feelings and heighten pleasurable ones.
- Cross-culturally, alcohol is the most widely used psychoactive substance. In moderate doses alcohol can enhance wellbeing and even have positive health consequences, but the social costs of abuse of alcohol and other substances are staggering. In an Australian study of 16- to 17-year-olds, 70% of participants said they drank alcohol, 17% of drinkers reported alcohol-related violence (accidents or injuries) and 15% reported problems related to sex under the influence of alcohol in the previous 12 months. Revealed that alcohol and drugs were the second most important issue, behind the environment, among young people. Drugs and alcohol were highlighted as an important issue by both younger and older respondents in the survey. A higher proportion of younger respondents, however, considered alcohol and drug use to be a serious issue, and more young male respondents than young female respondents were concerned about drug and alcohol use. More than 80.5% of the Australian population aged over 14 years consumed alcohol in the 12 months prior to the survey. While the percentage of people drinking daily declined between 2007 and 2010, one in five Australians are still drinking at a level that puts them at risk of harm over their lifespan. The survey also showed that most Australians are 17 years old when they experience their first full serve of alcohol. In the US, approximately one in seven people abuse alcohol, and another one in 20 misuse other psychoactive substances. The number of people killed in alcohol-related accidents in the US every year surpasses the total number killed in the entire Vietnam War. A Swedish study found that reported alcohol consumption in 1973 predicted mortality rates in a large sample followed up over the next 20 years.

### Alcohol and Expectations

- As with psychoactive substances in general, expectations about alcohol's effects, shaped by culture and personal experience, can sometimes have as much impact on behaviour as the drug's direct effects on the nervous system. This appears to be true cross-culturally.
- Several studies have sought to distinguish the causal roles of two independent variables: whether participants are drinking alcohol and whether they think they are drinking alcohol. The researchers place participants in one of four groups. In one, participants drink an alcoholic beverage and are told they are drinking alcohol; in another, they drink alcohol but are told they are not. In the other two groups, participants drink a non-alcoholic beverage and are either informed or misinformed about what they are drinking.
- The results of these investigations can help 'distill' the relative contributions of biology and beliefs to the effects of alcoholic consumption. For example, male participants who think they are drinking alcohol report greater sexual arousal and less guilt when exposed to sexually arousing stimuli, whether or not they have actually been drinking alcohol. This is even more likely to occur if they have strong beliefs about the impact of alcohol on arousal. More

generally, people are more likely to behave in ways that are deviant, dangerous or antisocial if they can attribute their behaviour to alcohol.

### *Consequences of Alcohol Use and Abuse*

- Alcohol abuse is involved in many violent crimes, including assault, rape, spouse abuse and murder, but precisely how alcohol contributes to aggression is not entirely clear. One theory suggests that it disengages normal inhibitions. A related theory suggests that alcohol facilitates aggression by derailing other psychological processes that normally decrease the likelihood of aggression, such as the ability to assess risks accurately. A third theory suggests that violence-prone individuals drink so that they can have an excuse for aggression, particularly since they tend to believe that alcohol makes them aggressive. All three processes can operate together. An angry, violent person may drink in part to dull his conscience and to provide himself with an excuse for his actions.
- Long-term ingestion of alcohol produces physical changes in the brain that can seriously affect cognitive functioning, sometimes to the point of dementia (confusion and disorientation) or Korsakoff's syndrome. Alcohol-induced Wernicke's encephalopathy, a precursor to Korsakoff's syndrome, is caused by a deficiency of thiamine in the body of a person who abuses alcohol. Along with alcoholic polyneuropathy (nerve damage due to excessive drinking), Wernicke's encephalopathy can be treated with varying degrees of effectiveness by giving patients vitamin B. Imaging techniques such as CAT scans reveal that roughly half of alcoholics show cerebral atrophy, and many show subcortical damage as well. Some of the behavioural changes associated with these physiological changes appear to be reversible, however, if the person stops drinking.
- Research, both in Australia and overseas, has demonstrated a high level of alcohol use and misuse by criminal offenders before they are imprisoned. Surveys of prisoners have shown that many drink greater amounts of alcohol than the rest of the population, with between 32% and 50% of offenders classified as alcohol dependent.
- Alcohol consumption increases the number of homicides. Additionally, the research highlighted the crucial role situational and environmental factors play in precipitating alcohol-related homicide. A key finding was that alcohol is equally likely to be implicated in intimate-partner homicides as it is in all other homicides. However, homicides involving women killing male intimate partners were far more likely to involve alcohol consumption by victim or offender or both, and the overwhelming majority of Indigenous Australian intimate-partner homicides were alcohol related.

### Stimulants

- **Stimulants** are drugs that increase alertness, energy and autonomic reactivity (such as heart rate and blood pressure). These drugs range from commonly used substances such as nicotine and caffeine to more potent ones such as amphetamines and cocaine.
- **Nicotine** increases heart rate and blood pressure while often decreasing emotional reactivity. Thus, cigarette smokers often report that smoking increases their arousal and alertness while also providing a soothing effect. The reason is that nicotine has receptors in both branches of the autonomic nervous system – sympathetic (which increases arousal) and parasympathetic (which reduces it). When one of these branches is active, nicotine tends to produce stronger effects in the other – thus both arousing the slothful and soothing the stressed. Over the long term, however, smoking can cause cancer, heart disease and other life-threatening conditions.
- The average age at which Australian smokers took up tobacco smoking was 16. It was estimated that while approximately 2.8 million Australians aged 14 years or older were daily smokers, there was a large decrease in the proportion of people in their early 20s to mid 40s who smoked daily. The short-term effects produced by tobacco smoking include a rise in blood pressure and heart rate; brain and central nervous system activity which is stimulated then reduced; dizziness, nausea, and watery eyes; and weakened appetite, taste, and smell. Long-term effects of tobacco smoking include shortness of breath; persistent coughing; increased risk of heart disease, stroke, colds, and chronic bronchitis; and emphysema.
- Smoking during pregnancy can affect the unborn child. Babies are more likely to miscarry, to be of low birth weight, to be premature, and to be stillborn. Passive smoking occurs when one breathes in the tobacco smoke of others. Passive smoking has been shown to contribute to lung damage, and has been linked to cancer and heart disease. Children exposed to passive smoke are especially susceptible, having more respiratory and ear infections, and suffering from higher levels of these infections, as well as more severe asthma.
- **Caffeine** is found in coffee, tea, chocolate, soft drinks and some non-prescription drugs (such as aspirin products, decongestants and sleep suppressants). Whereas moderate amounts of caffeine can help a person stay awake, high doses can produce symptoms indistinguishable from anxiety disorders, such as 'the jitters' or even panic.
- **Amphetamines** lead to hyperarousal and a feeling of 'speeding', where everything seems to move quickly. The molecular structure of amphetamines is similar to that of the neurotransmitters dopamine and norepinephrine.

Stimulation of norepinephrine receptors appears to produce alertness, while stimulation of dopamine receptors produces euphoria and increased motor activity. Amphetamines can induce psychosis in vulnerable individuals, death by overdose or ill health in chronic users, who essentially circumvent the normal signals sent by the brain to protect the body from fatigue and overuse.

- In one national survey, more than 9% of Australians aged 14 and over indicated they had used amphetamines at some stage in their lifetime, and 3% had used amphetamines in the past 12 months. There is an increase in the number of young recreational drug users smoking crystal methamphetamine. Also an increase in use of methamphetamine, which occurred around the same time as the heroin shortage in Australia in 2000–01. People aged 20–29 years were more likely than those in the other age groups to have used methamphetamine. The vast majority of secondary school students had never used amphetamines. By the age of 17, a small percentage of students reported having had some experience with amphetamines.

- Various Australian studies have shown that drivers of heavy vehicles have a higher rate of amphetamine use and impairment. Drivers reportedly use 'speed' and other stimulants to keep themselves awake on long trips. This trend is extremely worrying from a road traffic safety point of view. Using stimulants increases the risk of greater fatigue and tiredness when their effects wear off, thus increasing the possibility of falling asleep at the wheel and causing an accident. Indeed, long driving hours and excessive fatigue have been identified as factors in many heavy vehicle accidents.

- **Cocaine** causes hyperarousal, leading to a 'rush' that can last a few minutes to several hours. Cocaine is one of the most potent pleasure-inducing substances, as well as one of the most addictive, ever discovered. Like other stimulants, it appears to increase the activity of norepinephrine and dopamine. Chronic use depletes these neurotransmitters and can cause chronic depression similar to the crash that occurs when the initial high is over.

- Cocaine produces diminished judgement and an inflated sense of one's own abilities. Regular use can also produce paranoia.

- A study found that two-thirds of the assailants in domestic violence cases had consumed both cocaine and alcohol on the day they beat their spouse or children. In Australia, in 1998, illicit drug use caused more than 1000 deaths and about 7% of all hospital admissions. Cocaine accounted for 10% of these deaths related to illicit drugs. A study of 200 cocaine users in Sydney found that 42% reported adverse psychological events associated with the use of the drug. The most common symptoms reported were paranoia, anxiety and panic.

- In Australia, cocaine is most commonly available as cocaine hydrochloride, a white powder, although it can be found as an alkaloid form for smoking or in the form of small crystals known as 'crack'. Cocaine is a stimulant, increasing the speed of central nervous system activity. The effects of cocaine include increased body temperature and heart rate, reduced appetite and heightened levels of energy and alertness. Although cocaine can cause euphoria and increased confidence, it may cause anxiety and panic. In larger doses or if used repeatedly over hours, cocaine can lead to extreme agitation, panic, paranoia, hallucinations, dizziness, trembling, nausea and heart attack. Concentration and coordination may deteriorate. Unlike use of most other drugs surveyed, recent cocaine use increased from 1.6 percent in 2007 to 2.1 percent in 2010. In 2010, 7.3% of Australians aged 14 years or older had used cocaine and almost 390,000 had used it in the previous 12 months. The highest levels of recent cocaine use were seen in the 20–29 years age group.

## Hallucinogens

- Hallucinogens derive their name from **hallucinations** – sensations and perceptions that occur in the absence of external stimulation. **Hallucinogens** alter sensory data to produce bizarre or unusual perceptions. While under the influence of hallucinogens, people may experience time as speeding up or slowing down or sense colours bursting from the sky, walls moving or ants crawling under their skin.

- Humans have used hallucinogens for thousands of years, but their impact and cultural meaning differ dramatically. In many cultures, people use hallucinogens largely during cultural rituals such as when Australian Aboriginal boys ingest hallucinogenic plants during ceremonies initiating them into manhood. In these settings, the meaning of the hallucinations is established by the elders, who consider the drugs essential for bringing the young into the community of adults.

- Hallucinogenic drug use in Europe and North America dramatically increased in the 1960s with the discovery of the synthetic hallucinogen **lysergic acid diethylamide (LSD)**. By the late 1970s, concern over the abuse of LSD and other drugs, such as **PCP ('angel dust')** and **hallucinogenic mushrooms ('magic mushrooms')**, intensified, and with good scientific reason. Chronic use of LSD is associated with psychotic symptoms, depression, paranoia, lack of motivation and changes in brain physiology. Some chronic users repeatedly experience strange visual phenomena, such as seeing trails of light or images as they move their hands. Even when they are not experiencing these symptoms, their EEGs show a pattern of abnormal firing of neurons in visual pathways of the brain. The long-term effects of even



occasional use of LSD are not entirely clear, although tragic events have occurred with LSD use, such as people walking out of windows and falling to their deaths.

- 8.8% of the Australian population reported using hallucinogens at some time, with 1.4% having used them in the previous 12 months. Popular forms of the drug in Australia are 'tabs' – pieces of blotting paper soaked in the drug and taken orally – and one of the 20 varieties of 'magic mushrooms' found in the country. Users reported a variety of reactions to taking hallucinogens, ranging from elation to terror.

- **Ecstasy** is now a popular hallucinogenic stimulant. Among Australians aged 14 years or older, recent use of ecstasy (3%) was second only to **marijuana** (10.3%) of all illicit drugs surveyed. About 550,000 people had used ecstasy in the previous 12 months. Males aged 20–29 years were more likely than others to use ecstasy. Most recent ecstasy users also consumed alcohol at the same time they used ecstasy. Its use is mainly associated with the dance culture and so it is often perceived as a 'party' drug. However, ecstasy interferes with the concentration and action of serotonin in our brains, resulting in a change of mood, repression of libido and appetite, mental stimulation and increased body temperature. Many of the side effects users encounter with ecstasy are similar to those found with the use of amphetamines and cocaine. They include an increased heart rate and blood pressure, nausea, blurred vision, faintness, chills and sweating. Psychological problems such as confusion, depression, insomnia, severe anxiety, paranoia and psychotic episodes can also occur.

- Concluded that ecstasy users are aware of the potential harm associated with ecstasy use and actively employ strategies to attempt to minimise this. Although ecstasy is not physically or psychologically addictive, the long-term effects of ecstasy use are largely unknown and require further investigation.

### Marijuana

- **Marijuana** continues to be among the most widely used recreational drugs across all age groups in Australia. In 2011 34.3% of people had used marijuana/cannabis in their lifetime. Cannabis was most commonly consumed within private homes and most commonly obtained through friends or acquaintances. Cannabis was also the most commonly used illicit substance among secondary school students, with 18% of all secondary school students aged between 12 and 17 years reporting the use of cannabis at some time in their life.

- Marijuana produces a state of being high, or 'stoned', during which the individual may feel euphoric, giddy, uninhibited or contemplative. During a marijuana high, judgement is moderately impaired, problem solving becomes less focused and efficient, and attention is more difficult to direct; some people report paranoia or panic symptoms.

- For decades, people have speculated about the detrimental effects of marijuana, but few credible scientific studies have documented negative effects from occasional recreational use. In fact, the most definitive study in this area, a longitudinal follow-up of young adults observed since early childhood, actually found occasional marijuana users and experimenters to be healthier psychologically than either abusers or abstainers. Other research finds that marijuana abuse, but not occasional use, is a risk factor for use of harder drugs.

- Nevertheless, marijuana, like harder drugs, artificially manipulates dopamine reward circuits in the brain and can produce unwanted consequences. For example, residual effects on attention, working memory and motor abilities can make users unaware of subtle impairment at work, at school or at the wheel. Chronic or heavy use, particularly beyond adolescence, is a symptom of psychological disturbance and can contribute to deficits in social and occupational functioning. In New Zealand, studies have found that cannabis use among teenage girls is associated with increased levels of health problems, and that cannabis dependence is associated with increased rates of psychotic symptoms in young people, even when pre-existing symptoms and other background factors are taken into account. As with other drugs, smoking during pregnancy may have risks for the developing foetus.

- In summary, like alcohol, the extent to which marijuana has negative psychological consequences probably depends on whether or not it is abused.

### **Disorders of Consciousness**

- Disorders of consciousness are usually caused by severe brain injury and, in the past, many patients have been regarded as clinically unresponsive after a brain injury. These patients are generally classified into two groups: those with **unresponsive wakefulness syndrome** ([UWS]; previously known as the 'vegetative state'); and those who are in the **minimally conscious state** (MCS). Both groups, particularly the former, have limited or no ability to express their wishes, and thus rely on others to meet their basic needs. However, recent findings from functional imaging studies suggest that the emotional, language and pain networks of those in the MCS group may be more preserved than once thought. In fact, neurophysiological studies and functional imaging advances have allowed new ways to assess awareness. Indeed, researchers have discovered that some patients who have previously been regarded as unresponsive actually have an identifiable level of awareness. This raises several ethical and social issues that need consideration to ensure people of MCS are properly cared for. **Religious experiences** are subjective experiences of

being in contact with the divine or spiritual. They range from relatively ordinary experiences, such as listening passively to a sermon, to altered states of consciousness in which a person feels at one with nature or the supernatural. Experiences people consider spiritual occur in a wide variety of settings and may or may not involve organised religion. In most societies, however, dramatic religious experiences occur in the context of ritualised religious practices. For example, in a possession trance, the person who is 'possessed' believes another person or a supernatural being enters his soul. The altered state typically occurs through drumming, singing, dancing and crowd participation. Many born-again Christian churches include possession trances as part of their regular religious practices.

## Chapter 5 – Consciousness – Interim Summaries

- **Consciousness** refers to the subjective awareness of mental events. **States of consciousness** are qualitatively different patterns of subjective experience, including ways of experiencing both internal and external events. Consciousness plays at least two functions: monitoring the self and the environment and controlling thought and behaviour. Consciousness probably evolved as a mechanism for directing behaviour in adaptive ways that was superimposed on more primitive psychological processes that continue to function without conscious awareness.
- **Attention** refers to the process of focusing conscious awareness, providing heightened sensitivity to a limited range of experience requiring more extensive information processing. Attention consists of at least three functions: orienting to sensory stimuli, controlling behaviour and the contents of consciousness and maintaining alertness. **Divided attention**, which often involves automatising one or more tasks or rapidly shifting attention between them, refers to the capacity to split attention or cognitive resources between two or more tasks.
- Prominent in the normal flow of conscious experience are **daydreams**, in which the person turns attention away from external stimuli to internal thoughts and imagined scenarios, often for pleasure or for problem solving. Psychologists learn about the normal flow of consciousness through **experience-sampling** techniques, such as **beeper studies**, in which participants carry pagers or personal digital assistants and report on aspects of consciousness when they are paged at random intervals.
- Freud distinguished three types of mental activities: **conscious** processes, of which the person is currently subjectively aware; **preconscious** processes, which are not presently conscious but could be readily brought to consciousness; and **unconscious** processes, which are dynamically kept from consciousness because they are threatening. Studies of **subliminal perception** have shown that perception of stimuli below the threshold of consciousness can indeed have an impact on conscious thought and behaviour. Recent research also supports the psychodynamic hypothesis that emotional and motivational processes can occur outside of awareness. Researchers from a cognitive perspective have been studying the **cognitive unconscious**, which focuses on information-processing mechanisms that operate outside of awareness, such as procedural knowledge and implicit memory. Implicit processes tend to be rapid and to operate simultaneously. Conscious processes are slower and less efficient for tasks that require instant responses but are useful for 'shining a spotlight' on problems that require more careful consideration.
- An integrated view suggests that consciousness is a specialised processing function that monitors and controls current states for the purpose of maximising adaptation. Consciousness thus highlights or inhibits information based on its relevance to adaptation and its emotional consequences. Consciousness involves a network of neurons distributed throughout the brain. Damage to hindbrain structures, particularly the reticular formation, can lead to a complete loss of consciousness. The neural networks that 'shine a spotlight' on perceptions, thoughts, emotions or goals at any moment appear to involve the prefrontal cortex, the thalamus and midbrain regions of the reticular formation.
- People spend roughly one-third of their lives asleep. The sleep cycle is governed by **circadian rhythms**, cyclical biological 'clocks' that evolved around the daily cycles of light and dark. The functions of sleep are not yet known, although sleep appears to be involved in restoration and maintenance of bodily processes such as homeostasis, immune functioning and consolidation of memory.
- Sleep proceeds through a series of stages that can be assessed by EEG. The major distinction is between **rapid eye movement (REM)** and **non-REM (NREM)** sleep. Most dreaming occurs in REM sleep, in which the eyes dart around and the EEG takes on an active pattern resembling waking consciousness.
- Freud viewed dreams as a window to the language of unconscious associative thoughts, feelings and wishes. He distinguished the **latent content**, or underlying meaning, from the **manifest content**, or story line. Although Freud believed that the latent content of every dream is an unconscious sexual or aggressive wish that has been repressed, empirical data do not support this view. Most psycho-dynamic theorists instead believe that the latent content can be a wish, a fear or anything else that is emotionally pressing. The cognitive perspective suggests that dreams are the outcome of cognitive processes and that their content reflects the concerns and metaphors people express in their waking cognition. One biological view of dreaming proposes that dreams reflect cortical interpretations of random neural signals arising from the midbrain during REM sleep. Another points to the role of sleep and dreaming in memory consolidation, as the hippocampus and cortex work together to consolidate memories and then 'wipe the slate clean' in the hippocampus. These three perspectives are probably not incompatible.
- **Altered states of consciousness**, in which the usual conscious ways of perceiving, thinking and feeling are modified or disrupted, are often brought about through meditation, hypnosis, ingestion of drugs and religious experiences.

**Meditation** creates a deep state of tranquillity by altering the normal flow of conscious thoughts. **Hypnosis** is an altered state characterised by deep relaxation and suggestibility.

- The most common way people alter their state of consciousness is by ingesting **psychoactive substances**, drugs that operate on the nervous system to alter mental activity. Drugs have their effects not only physiologically but also through cultural beliefs and expectations. **Depressants** such as alcohol slow down, or depress, the nervous system. **Stimulants**, such as amphetamines and cocaine, increase alertness, energy and autonomic reactivity. **Hallucinogens** such as LSD produce **hallucinations**, sensations and perceptions that occur without external sensory stimulation. Marijuana is a controversial drug that produces a 'high' that may include a mixture of pleasurable feelings and a sense of calm or panic and paranoia.



## Chapter 5 – Consciousness – Summary

### 1. The functions of consciousness

- **Consciousness** refers to the subjective awareness of percepts, thoughts, feelings and behaviour. It performs two functions: monitoring the self and environment and controlling thought and behaviour. **Attention** is the process of focusing awareness, providing heightened sensitivity to a limited range experience requiring more extensive information processing. **Divided attention** means splitting attention between two or more stimuli or tasks.
- Psychologists study the flow of consciousness through **experience-sampling** techniques, such as **beeper studies**. Even such a private experience as consciousness is in part shaped by cultural practices and beliefs, which influence aspects of subjective awareness, such as the experience of time and the focus on internal psychological states.

### 2. Perspectives on consciousness

- Freud distinguished among conscious, preconscious and unconscious process. **Conscious mental processes** are at the centre of subjective awareness. **Preconscious mental processes** are not presently conscious but could be readily brought to consciousness. Dynamically unconscious processes – or the system of mental processes Freud called the **unconscious** – are thoughts, feelings and memories that are inaccessible to consciousness. They are inaccessible because they have been kept from awareness because they are threatening. Research over several decades has demonstrated that subliminal presentation of stimuli can influence conscious thought and behaviour. Emotional and motivational processes can also be unconscious or implicit.
- The **cognitive unconscious** refers to information-processing mechanisms that occur outside of awareness, notably unconscious procedures or skills and preconscious associational processes such as those that occur in priming experiments. Cognitive theorists have argued that consciousness is a mechanism for flexibility bringing together quasi-independent processing modules that normally operate in relative isolation and for solving problems that automatic processes cannot optimally solve.
- Hindbrain and midbrain structures, notably the reticular formation, play a key role in regulating states of wakefulness and arousal. Like most psychological functions, consciousness appears to be distributed across a number of neural pathways, involving a circuit running from the reticular formation through the thalamus, from the thalamus to the cortex (particularly the prefrontal cortex), and back down to the thalamus and midbrain regions of the reticular formation.

### 3. Sleep and dreaming

- The sleep-wake cycle is a **circadian rhythm**, a cyclical biological process that evolved around the daily cycles of light and dark. Sleep proceeds through a series of stages that cycle throughout the night. Most dreaming occurs during REM sleep, named for the bursts of darting eye movements.
- Freud distinguished between the **manifest content**, or story line, and the **latent content**, or underlying meaning, of dreams. Freud believed the latent content is always an unconscious wish, although most contemporary psychodynamic psychologists believe that wishes, fears and current concerns can underlie dreams. Cognitive theorists suggest that dreams express thoughts and current concerns in a distinct language with its own rules of transformation. Some biological theorists contend that dreams have no meaning; in this view, dreams are cortical interpretations of random neural impulses generated in the midbrain. Others focus on the role of sleep and dreaming in memory consolidation. These three approaches to dreaming are not necessarily incompatible.

### 4. Altered state of consciousness

- In **altered states of consciousness**, the usual conscious way of perceiving, thinking and feeling are changed. **Meditation** is an altered state in which the person narrows consciousness to a single thought or expands consciousness to focus on stimuli that are usually at the periphery of awareness. **Hypnosis**, characterised by deep relaxation and suggestibility, appears to be an altered state, but many hypnotic phenomena can be produced under other conditions. In altered states that occur during **religious experiences**, the persons feels a sense of oneness with nature, others or the supernatural and experiences a breakdown in the normal boundaries between self and non-self.
- **Psychoactive substances** are drugs that operate on the nervous system to alter patterns of perception, thought, feeling and behaviour. **Depressants**, the most widely used of which is alcohol, slow down the nervous system. **Stimulants** (such as nicotine, caffeine, amphetamines and cocaine) increase alertness, energy and autonomic reactivity. **Hallucinogens** create **hallucinations**, in which sensations and perceptions occur in the absence of any external stimulation. Marijuana leads to a state of being high – euphoric, giddy, uninhibited or contemplative. **Psychoactive substances** alter consciousness biologically, by facilitating or inhibiting neural transmission at the synapse, and psychologically, through expectations shaped by cultural beliefs.