Consciousness

- Consciousness is the subjective experience of the world and the mind. Experience is defined not only as 'being awake' but also during a vivid (lucid) dream (WA4).

- Phenomenology: how the world is structured to the conscious person, with their present understanding of mind and behavior.

- Remember that term for the long essay on Midterm 2; it is necessary for integrating the possibilities of Limitless with Lucid Dreaming (WA4).

- This leads to phenomenological assessment, a real tool for diagnosticians (DSM-V). Most people have come to trust each other in describing their inner lives, reaching the general assumption that other human minds are like their own.

- This takes us to the problem of other minds: the fundamental difficulty we have in perceiving the consciousness of others.

- Figure 5.1 (Dimensions of Mind Perception). When participants judged the mental capacities of 13 targets, two dimensions of mind perception were discovered: experience and agency.

- Experience: eg. the ability to feel pain or pleasure

- Agency: eg. the ability to plan or exert self-control.

- In the discipline of psychology, several solutions were proposed: renounce all supposed mental phenomenon; behaviorism; consciousness study based on neuroscience; this class takes the latter approach.
The Nature of Consciousness

- first, the timing of conscious will (Fig 5.3) in the Libet experiment, the patient was asked to move their fingers at will while watching a dot move around the face of a clock to mark the moment at which the action was consciously willed. EEG sensors timed the onset of brain activation; EMG sensors timed muscle movement. EEG precedes EMG.

- **Intentionality**: the quality of being directed toward an object. Consciousness is limited, and it fills in details rather than analyzing everything.

- **Unity**: the ability to integrate all the body's senses into one coherent whole. Remember this for Web Article Four, as unity is mediated by the 40 Hertz component.

- **Selectivity**: the capacity to include some subjects but not others. An example is inattentional blindness.

- Dichotic listening: a task in which people wearing headphones hear different messages presented to each ear. They are asked to 'shadow' one of the messages by repeating it aloud. Consciousness filters out non-important information. Note that participant's noticed a gender change in the voice, or if their name was spoken.

- Selectivity is not only a pattern of waking consciousness; people are more sensitive to their own names even during sleep.

- **Transience**: the mind wanders incessantly. This 'stream of consciousness' may flow partly because of the limited capacity of the conscious mind. When new information is selected, some of what is currently 'loaded' must disappear. A good example is the Necker Cube. It has the property of reversible perspective. The stream of consciousness flows even when the target is a constant object.
Consciousness: Experience vs Agency

- How does the capacity for experience differ from the capacity for agency?
  - Experience: pleasure, pain, hunger, consciousness, anger & fear.
  - Agency: self-control, planning, memory, thought.

- For behaviourists, the radical solution was to eliminate consciousness from psychology.
- The astonishing richness of mental life, however, cannot be ignored.

- This leads to the mind-body problem. How is mind related to brain and body? The modern conclusion is that the 'mind is what the brain does'.

- Every thought, perception, or feeling is associated with a particular pattern of neuronal activation, and these patterns are dynamic. Remember that perfect cup of hot chocolate?

- The brain's activities appear to precede the activities of the conscious mind. (Libet, 1985).

- Figure 5.3 (The Timing of Conscious Will). The participant was asked to move fingers at will while watching a dot move around the face of a clock to mark the moment at which the action was consciously willed. EEG sensors timed the onset of brain activation and EMG sensors timed the muscle movement. EEG preceded EMG, but the reported timing of consciously willing the finger to move follows the brain activity. Willing is 'sandwiched' in between EEG and EMG.

- So, not only aren't we sure where consciousness is, but also when it is.
Levels of Consciousness

- **Minimal Consciousness**: a low-level kind of sensory awareness and responsiveness that occurs when the mind inputs sensations and may output behaviour. In the case of humans, we can safely assume that there is something it feels like to be them, at least when awake.

- **Full Consciousness**: you know and are able to report your mental state. Since neither babies nor animals can report their mental state through language, this was the 'deal-breaker' for behaviourism.

- **Self-Consciousness**: a distinct level of consciousness in which the person's attention is drawn to the self as an object. This leads to the question: "What is a self?"

  Self-consciousness brings with it a tendency to evaluate yourself and notice your shortcomings. People go out of their way to avoid mirrors when they have done something they are ashamed of.

  Because it makes us more self-critical, the perceived mirror image can also make us briefly more helpful, more cooperative, and less aggressive.

- The 'Self-In-The-Mirror' experiment (Gallup, 1977) Humans, chimpanzees, orangutans, even elephants pass, gorillas do not.

- Infants below the age of 18 months also do not recognize themselves. (Lewis & Brooks-Gunn, 1979)
Outside of Consciousness?

- **Ironic process of mental control**: ironic errors occur because the mental process that monitors errors can itself produce them. It is, however, not present in consciousness.

- The **ironic monitor** is a process of the mind that works outside of consciousness making us sensitive to all the things that we do not want to think, feel or do so that we can notice and consciously take steps to regain control of these things should they come to mind.

- This process unfortunately increases the person's sensitivity to the very thought that is unwanted. These functions are needed for effective mental control—they help in banishing a thought from consciousness—but they can sometimes yield the very failure they seem designed to overcome.

- This leads us to the modern neuroscience conclusion that most mental processes occur outside of consciousness. We group these together, and call them the unconscious mind.

- Memorize the page 'Disorders of Consciousness' for the next exam. Make sure you know the difference between a Vegetative State and Locked-In Syndrome.

- **Coma**: eyes closed; do not respond to their name or touch.

- **Vegetative State** alternate between eyes-open and eyes closed; may move limbs, but none of these behaviours can be reproduced reliably by external stimulation.

- **Locked-in Syndrome**: fully aware, but cannot consciously move any voluntary muscles; they can however blink their eyes.

- The Real World: Anyone For Tennis? will be second page of Memory Items in Midterm Two.
Conscious Contents & Daydreaming

- **Experience-sampling technique**: Ecological Momentary Assessment: one recent study collected data from over 900 working women by asking them to reflect on the events of the past day and record how they felt while engaging in each activity (Kahneman et. al. 2004). See Table 5.2 (How Was Your Day?) Positive affect (emotion) was highest during intimate relations (spouse, children).

- **Skin Conductance Level (SCL)** (Nikula, Klinger & Larson-Gutman, 1993). SCL would rise spontaneously, emotional moments that corresponded with a current concern popping into mind. Table 5.1 (What Is On Your Mind?)

- **Daydreaming**: (Mason et. al. 2007) During a fMRI study, when participants were not busy with their cognitive tasks, they still showed a widespread pattern of activation in many areas now known as the **default network**. These patterns are active while thinking about social life, self, past and future—all the usual haunts of the daydreaming mind. Daydreaming can be seen as a survival process based on 'what if' as contrasted to 'what is'.

- **Ruminating thoughts**, or problem-solving attempts that never seem to succeed can come to dominate consciousness. This may result in **mental control**, the attempt to change conscious states of mind.

- This can lead to **thought suppression**, the conscious avoidance of a thought. Wegner et. al. 1987 asked people not to think of a white bear for 5 minutes while they recorded all their thoughts. What occurred was the rebound effect of thought suppression, the tendency of a thought to return to consciousness with greater frequency following thought suppression. The thought returned in a more robust way. Fig. 5.7
Freudian Unconscious

- The actual process of thinking is not conscious at all, only its preparation, its materials, and its end result are consciously perceived. (Jaynes, 1976)
- Answers to easy questions seem to pop into our heads automatically, and often does not even allow you to be aware of the steps.
- To understand these processes, we need first to compare the Freud's Unconscious with the modern cognitive and neuroscientific views. Kahneman, 2011 suggests a **dual-process** model, often called **implicit and explicit learning**.

- Freud described a **dynamic unconscious**, an active system encompassing a lifetime of hidden memories, our deepest instincts and desires, and our inner struggle to control these forces.
- According to Freud, this unconscious is a force to be held in check by **repression**, a mental process that removes unacceptable thoughts and memories from consciousness and keeps them in the unconscious.
- Freud looked for evidence of the unconscious in speech errors and lapses of consciousness, commonly called Freudian slips. Motley & Baars, 1979, revealed that slips of speech can indeed be prompted by a person's pressing concerns. Participants in the **experimental group** were told they might receive electric shocks while quickly reading through a series of word pairs. This group more often slipped in pronouncing these pairs, even blurring out the word “shock”. Question: what did the control group do?
Cognitive Unconscious

Anyone can offer a reasonable compelling explanation for an event after it has occurred, but the work of science is to offer testable hypotheses that are evaluated based on reliable evidence. This leads to the definition of the cognitive unconscious: all the mental processes that give rise to a person's thoughts, choices, emotions and behaviour are not necessarily experience by the person.

One indication is subliminal perception: thought or behaviour that is influenced by stimuli that a person cannot consciously perceive. Bargh et. al. 1996 had undergraduate students complete a survey that called for them to make sentences with various words. They were not informed that these words are commonly associated with aging. Participants were then clocked as they left the room and walked down the hall. Compared to a control group, they walked more slowly.

Assigning godlike power to the unconscious is downright dumb. The unconscious processes that underlie the perception of subliminal visual stimuli do not seem to be able to understand the combined meaning of the paired words, although they can understand single words.

The Roomate Choosing Experiment (Dijksterhuis, 2004): Unconscious minds seem to be better able than conscious minds to sort out complex information and arrive at the best choice. Fig 5.8

Can fMRI be used to detect signs of consciousness in brain-damaged patients. 39-year old Scott Routley was considered to be in a vegetative state for 12 years. When asked to imagine swinging a tennis racquet at a ball, brain imaging results showed that the areas of his brain that were activated during this task were the same as for the control group.
Dreams are the most commonly experienced **altered state of consciousness**, a form of experience the departs significantly from the normal subjective experience of the world and the mind. Changes in thinking, disturbances in the sense of time, feelings of loss of control, changes in emotional expression, alterations in body image and 'sense of self', perceptual distortions and changes in meaning or significance of everyday experiences.

Sleep contains many signs and states: **hypnic jerk** (a sudden quiver or sensation of dropping). After this, time and experience seem to stop, and there seems to be no 'you' to have experiences. Then there are dreams, interspersed with short and shorter periods of unconsciousness. Finally, glimmerings of waking consciousness return again as you enter postsleep consciousness, known as the **hypnopompic** state.

Circadian rhythm: we have a 24-hour cycle built into us, but if allowed to live in 'time-free environment' we naturally move to a 25.1-hour cycle (Aschoff, 1965). This evidence has led some scientists to question if homo sapiens are native to this Earth, or if we have alien DNA in us. For some intriguing answers, google: “alien DNA Kazakhstan”

Memorize Fig. 5.9 Sleep stages: EEG Patterns During Stages of Sleep.

REM (Rapid Eye Movement) discovered by Aserinsky & Kleitman, 1953. The pulse quickens, blood pressure rises, and sexual arousal. Big body muscles are paralyzed; only eye muscles move rapidly from side to side.

Dreams may occur in other sleep stages, but they are less vivid and emotional.

Delta wave sleep is radically different from REM; there is a general synchronization of neural firing. Fig 5.10 Stages of Sleep During the Night will be on the next exam.
Sleep Disorders

- **Insomnia** = difficulty on falling asleep or staying asleep. The desire to sleep initiates the **ironic process of mental control**, a heightened sensitivity to signs of sleeplessness, which interferes with sleep.

- Even in short-term use, sedatives can interfere with the sleep cycle. Although they promote sleep, they can reduce the proportion of time spent in REM and **slow-wave delta** sleep. Sleep quality deteriorates, resulting in grogginess and irritation during the day. Suddenly stopping the use of sedatives can produce even worse insomnia.

- **Sleep Apnea** is a disorder in which the person stops breathing during brief periods while asleep. It occurs most often in middle-aged overweight men. Therapies that involve weight loss, drugs, surgery or sleep masks that push air into the nasal passage may solve the problem.

- **Somnambulism** is most common in children between the ages of 4 to 8, with 15 to 40% of children experiencing one episode. It usually happens during **slow-wave delta** sleep.

- **Narcolepsy** is a disorder in which sudden sleep attacks occur in the middle of waking activities. It involves the intrusion of REM in the waking state.

- **Sleep paralysis** is the experience of waking up, but being unable to move, usually when awakening from REM sleep, but before muscle control returns. It can be accompanied by **hynopompic illusions** and may the source of alien abduction experiences.

- **Night terrors** are abrupt awakenings with panic and intense emotional arousal, mostly in children and 2% of adults. Occurring in non-REM sleep, early in the sleep cycle, without dream content.
Stickgold, 2000 found that when people learning a difficult perceptual task are kept up all night after they had finished practicing, their learning of the task was wiped out. Even two nights of catch-up sleep did not help. Sleep following learning is essential for memory consolidation.

Rechtschaffen et. al. 1983 found that when rats are deprived of sleep, their bodily systems break down and they die normally in 21 days.

REM sleep deprivation (Ellman et. al. 1991) increases memory problems and excessive aggression. REM rebound (more REM) occurs the next night.

Theta sleep deprivation has more physical effects, such as fatigue, and hypersensitivity to muscle and bone pain. (Lentz et al. 1999)

Why sleep? Herbivores that travel in herds need the least sleep, predators the most, big-brained primates in the middle. Since sleep leaves one open to predation—a costly evolutionary choice—then it must have other biological purposes that gain a Darwinian advantage.
Hobson, 1988 the five major characteristics of dreams: intense emotion, illogical thought, fully-formed sensation (note the absence of smell or taste), uncritical acceptance, difficulty in remembering the dream.

Domhoff, 2007: Dreams are normally mundane; current conscious concerns pop up; a dream may incorporate sensations experienced during sleep. Dreams that reflect the day's experiences tend to single out sensory experiences or objects from waking life, essentially snapshots.

Nightmares as the result of trauma. When police officers experience 'critical incidents' of conflict and danger, they tend to have more nightmares in general. (Neylan et al. 2002).

Dream theories: Freud theorized that dreams have a manifest content—a dream's apparent topic or superficial meaning—and a latent content, the dream's true underlying meaning. The problem with this approach is that there are an infinite number of potential interpretations.

Return of suppressed thoughts: (Wegner, Wenzlaff & Kozak, 2004) asked volunteers to think of a personal acquaintance and then to spend 5 minutes before going to bed writing down whatever came to mind. Some participants (experimental) were asked to suppress the thoughts of that person as they wrote, others (control) asked freely to write about anything. The experimental group more often dreamed of the person they had named.

Reticular Activation Synthesis Model (Hobson, 1977) dreams are produced when the brain attempts to make sense of random neural activity during sleep. Keep this in mind when studying Web Article Four.
Memorize Fig 5.12 Brain Activation and Deactivation During REM Sleep for the next exam. FMRI suggests that brain areas responsible for fear or emotion (amygdala pathway) work overtime in dreams.

Visual experience is heightened, even overloaded, but there are fewer auditory sensations, and even fewer tactile sensations, and almost no smells or tastes. The picture show is the imagination of actual events. The occipital perception lobe is not activated; instead the occipital visual association area is.

In REM the prefrontal cortex show relatively less arousal than during waking. Prefrontal areas are associated with planning and executing actions. Dreams often seem unplanned and rambling. Compare the text to Web Article Four. Focus on the role of the dLPFC.

During REM, the motor cortex is activated, but spinal neurons running through the brain stem inhibit the expression of motor activation.

The text's section drug addiction (Artificial Inspiration) will be omitted for this course.
Hypnosis (Greek for under knowledge) is a social interaction in which one person (the hypnotist) makes suggestions that lead to a change in another person's (the subject's) subjective experience of the world.

To induce hypnosis, the subject will ask to sit quietly and focus on some item (the swinging pocket watch) and then make suggestions about what effects hypnosis will have. Not everyone is equally hypnotizable.

Susceptibility varies greatly; one of the best indicators is a person's own judgment. People with vivid imaginations, or easily drawn into a movie, are somewhat more prone to be candidates for hypnosis.

Posthypnotic Amnesia: the failure to retrieve memories following hypnotic suggestions to forget. Only memories that were lost under hypnosis can be retrieved with hypnosis. See the Paul Ingram case.

Hypnotic Analgesia: measurable physical and behavioural changes in the body after hypnotic treatment. (Stern et al. 1977)

Hypnosis and the activity of the anterior cingulate cortex. During hypnosis, the scientists found, a region of the brain called the dorsal anterior cingulate cortex became less active. Studies have found that that region helps people stay vigilant about their external environment. (Ploghaus, 2003)