

Consciousness

- Consciousness can mean something akin to awareness or wakefulness
 - Coined by Zeman (2005)
- Wakefulness is a mental state and can be differentiated from other states like sleep, coma, death
 - Consciousness if described as wakefulness comes in degrees
 - Dependent on if one is wide awake, sleepy, etc.
 - Glasgow Coma Scale (1974) helps judge this by providing three criteria for judging one's degree of wakefulness
- Aside from responsivity, one who is awake also has conscious experiences
 - Called **qualia**
 - What it is to be you at a given moment in time
 - Difficult to describe verbally to others
 - Cannot be accounted for with a classical cognitive science framework
 - **Zombie** - A construct made out of biological materials, i.e. carbon based cells that looked and acted as a human would
 - Is it possible for such a thing to be able to pass the Turing test (Demonstrates wakefulness, intelligence), but doesn't have qualia?
- Aside from wakefulness and qualia, consciousness applies to the individual in the way of self-consciousness, and has multiple senses
 - Ability to be embarrassed
 - Self-detection - Aware of what is happening to one's own body
 - Self-monitoring - Aware of self-detection in the past and into the future
 - Self-recognition - Ability to recognize one's body as being a part of the person one identifies themselves as
 - Awareness of perspective - Ability to acknowledge that different people have different viewpoints and opinions on how they see the world
 - Self-knowledge - Knowledge of oneself as being the center of their own narrative
- These senses seem simple to model, as it only requires knowledge of oneself. As such, it appears trivial to create a simulation that would take into account the appropriate representations
 - However, a given set of different experiences may often belong to the same individual
 - May be cases where the link between qualia and the self fails
 - Ex: Alien hand
- We do not know the extent to which qualia is necessary for a proper self-consciousness
 - Self-consciousness may be learned or constructed as is the case with emotions from qualia
 - If this is true, then a simulation may not be able to be defined as being self-conscious despite having proper knowledge of itself

The Mind-Body Problem

- Posed by Rene Descartes who was interested in figuring out what the mind was
- A possibility ruled out was the simple fact that the mind was part of the body
 - Every other part of the body possesses physical properties, but the mind appears not to have such properties
 - Except for duration - both mind and body only exist for a limited amount of time
- Despite this separation between mind and body, it can be strongly felt that the two are deeply intertwined
 - If your mind decides on an action, your body acts on it
 - If your body feels a sensation, i.e. pain, your mind reacts accordingly
- The problem, therefore is: If your mind isn't a part of the body, how are they so strongly linked together?
 - Involves consciousness in a special way, as the whole problem involves the difficulty in relating the external view of the mind with the inner view of the mind as a set of experiences
- Decartes solution was known as **substance dualism**
 - The body is composed of one kind of substance (matter), and the mind another (unnamed)
 - The connection and interaction between body and mind occurs at the pineal gland in the brain
 - Not widely accepted solution today
 - Interaction between physical and non-physical (body and brain) seems to violate the principle of conservation of energy

Functionalism

- View of consciousness most inline with classical Cognitive Science
- Accounts for consciousness at the computational level i.e. what consciousness actually does
 - In particular, self-consciousness
 - Consciousness involves detecting what is currently happening to oneself, relating it to a self-image and utilizing the resulting information to determine our next actions
 - Johnson-Laird (1984) proposed that consciousness is simply the OS of a human being
 - Computer OS represents and monitors a computer's state, controls its access to resources and regulates its interactions
- Functionalism allows for **multiple realization** - same states can be realized on more than one computer
 - In a similar fashion, consciousness can work on seemly very different beings
- Difficulties
 - Correctly modelling self conscious states with the right software may not account for qualia

Property Dualism

- Difficulty of functionalism is that it's hard to see how mental representations and procedures would yield experiences
- Instead, we could start with qualia, rather than leaving it as an afterthought
 - Proposed by David Chalmers (1996)
- To provide credence to his argument, he proposed the fading qualia argument
 - Take a person - who is obviously conscious at the moment
 - Take an android duplicate with a neural network that perfectly replicates the function and placement of every neuron in your brain
 - Intuition would say that the android is not conscious
 - Replace the person's neurons with the android's nodes one by one
 - Eventually, the person would cease to experience or their experiences may fade away
 - Former is not believable, simply swapping one neuron shouldn't have such a drastic effect (As a result of graceful degradation)
 - The latter should definitely be noticeable by the person, but from the very premise from the argument, the person's behaviour should remain unchanged from when they were fully conscious
 - Proven by contradiction - qualia can't fade
 - We end up with a contradiction where both arguments are not plausible
 - Chalmers claims we must give up and admit the the android is indeed conscious
 - To account for functionalism's issue with qualia, Chalmers states that qualia is emergent, springing from material bodies that are organized and functioning in the appropriate manner
 - Material bodies have a mental and physical component
 - Physical consists of the usual (mass, shape, etc)
 - Mental properties are properties possessed in addition to the physical properties
 - When a material body is configured such that its physical components cause it to have conscious behaviour, its mental properties in turn cause it to have conscious experiences.
 - Advantages: Preserves qualia while remaining consistent with functionalism
 - Difficulties:
 - Appears to be unfalsifiable, mental properties are distinct from physical and thus are unmeasurable - aka unscientific
 - Appears to admit multiple realizability, similar to functionalism by definition, as his belief that mental properties emerge when a thing is sufficiently complex enough goes against our intuition

Identity Materialism

- Attempts to tackle consciousness with neuroscience
- Identity Materialism states that mental states are simply different brain states
- Solves the issue of zombies

- We note that if materialism is true then if one was duplicated in every physical sense, they must also be conscious
 - B/c two beings are unable to have identical brain states yet different mental states (Kirk 1999)
 - One argument might be to say that simply having a given brain state doesn't explain qualia - what it feels like to be in that state
 - This argument could be defined as being in a state of confusion
 - In reality, brain state and conscious mental state are the same concept
 - Confusion also explains why the zombie concept appears so appealing
 - Brain state is used to describe events from an outside perspective, whereas mental state is used to describe events from a personal viewpoint, but in reality both are identical concepts
- Problems
 - Opposite of multiple realization - if we define consciousness to be anything with human brain states, we refute the fact that any other organism can be conscious
 - **homocentrism**

Science - Overview

- Out of the properties of consciousness discussed previously, qualia is the main factor creating a metaphysical problem
- Cognitive Science's attempt to understand consciousness falls under either the **functionalist** or **materialist** viewpoint
 - With much overlap between the two categories

Wakefulness

- First scientific research into consciousness was in the form of **EEGs**
 - EEG studies showed that neural activity patterns depended on a person's conscious state (asleep, coma, awake, etc)
- **Lesion studies**
 - Showed that specific brain regions have special roles in the sleep/wake cycles
- There are also chemical rhythms in the brain that correspond to these cycles
 - Brain has stores of glycogen (sugar that neurons use for energy)
 - As glycogen levels go down, adenosine levels increase (glycogen naturally suppresses adenosine production)
 - Adenosine is related to the feeling of drowsiness
- Summary: The patterns of resource usage in the brain is important when discussing consciousness

Neural Correlates of Consciousness

- Neuroscience avoids the problem of qualia altogether
 - Most scientists do not believe themselves ready to tackle this issue
 - Crick and Koch (1990) proposed a way to address this problem
 - Called Neural Correlates of Consciousness (NCCs)
 - Aims to identify the neural activities that occur with people's conscious experiences and attempts to find a correlation between them
- Notes the interaction between the localization and pattern of brain activity while conscious
 - Consciousness is associated with certain areas of the brain (Ex: Thalamus) depending on the activity at hand
- Crick and Koch's search to find the NCC is lead by the question of why one is conscious
 - To produce the best possible interpretation of what is visible
 - To make the interpretation available to areas of the brain that are responsible for voluntary action
 - Claim that the need for well-considered action is identified as the **survival value of consciousness** to conscious organisms
 - Such that they are better equipped to act appropriately in a given situation compared to something that is not conscious
 - Emphasized the importance of **short-term memory** and **attention**
 - Short-term memory is usually the memory that we are conscious of
 - Properties seem to agree with introspections about conscious experience, that is, visual experience is fluid - it changes as one's perspective changes
 - Attention determines what is the focus of one's visual view
 - Crick and Koch suggested that it was because of competition amongst collations of neurons present in the visual cortex
 - Different groups of neurons represent different interpretations of what is being seen, with each group trying to suppress the other whilst activating the neurons in its own group
 - NCCs exist in the visual associative cortex and the motor cortex
- In terms of patterns, there is an emphasize on recurrent feedback, believed that short term memory involved neurons in loops
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