Unit 02 L31 Neuroscience Approach

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- Neuroscience and Cognitive Science
  - The study of nervous system anatomy and physiology in human and other species.
  - Cognitive neuroscience studies the neural structure and processes underlying human cognitive function and emotion.
- Neuroscience Methods
  - Investigators study the effects of accidental or deliberate nervous system damage in the case of brain injuries. Two common methods used are:
    - The case study method looks at the effects of brain damage due to stroke, head trauma, or other injury in humans.
    - In lesion studies, an electrode is used to selectively destroy a specific brain area of an animal. The resulting behavioral deficits are then examined.
- Directions in the Nervous System
  - Dorsal (Top)
  - Ventral (Bottom)
  - Anterior (Front)
  - Posterior (Back)
  - Medical (Middle)
  - Lateral (Side)
- Major Cortical Features
  - Two cerebral hemispheres on each side, one on the left, the other on the right.
  - Corpus callous nerve fibres join the two hemispheres of the brain.
  - A gyrus is a fold of cortical tissue (sausage looking things, plural is gyri).
  - A fissure is a deep cleft or separation between gyri. The ones that are not so deep are the sulci (singular is sulcus).
- Hippocampus
  - The hippocampus is a major component of the brains of humans and other vertebrates. Humans and other mammals have two hippocampi, one in each side of the brain.
  - It plays important roles in the consolidation of information from short-term memory to long-term memory and spatial navigation.
  - Read the interesting case of H.M. from the online reading who lost both hippocampi.
- Neuroscience of problem solving
  - Patients with damage in frontal lobe suffer from executive dysfunction and have difficulty starting and stopping behaviors and in problem solving. The inability to stop an action once started is called psychological inertia.
  - They may also be impelled to engage in a behavior triggered by a

stimulus. This is called environmental dependency syndrome. Example: seeing a pen causes them to pick it up and start writing.

- The Split Brain
  - Information from one side of the environment or body is mapped onto the contra-lateral side.
  - In split brain patients, the corpus callosum is severed.
  - It is then possible to present information to only one side or the other and observe interesting results.
  - Watch the online video from the online reading materials.
- Other Interesting things
  - Visual agnosia is the inability to recognize a visual object.
  - Prosopagnosia is another type of agnosia in which patients have difficulty recognizing faces.
  - Hemi-spatial neglect is an inability to attend to any one side of the body and the environment.
- Brain Recording Techniques
  - The brain's electrical activity can be measured in a variety of ways.
    - In **Single-cell Recording** an electrode is inserted into or adjacent to a neuron.
    - In **Multiple-unit Recording**, a larger electrode is used to measure the activity of a group of neurons.
  - Modern day equipments apply various brain function measurement techniques such as imaging, electrical and magnetic signal measurement.