COGNITIVE NEUROSCIENCE [Charles Gordon (1900)]

- It combines the research techniques of cognitive psychology with various methods for assessing the structure and function of the brain

- In the last few years, researchers have discovered which structures in the brain are activated when people perform a variety of cognitive task.

- Furthermore, psychologists now use neuroscience techniques to explore the kind of cognitive processes we use in our interactions with other people this new discipline is called. **social cognitive neuroscience.**

Methods and techniques of Neuroscience

1) Brain lesions

The term Brain lesions

- refers to the destruction of tissue in the brain, often by strokes, tumors or accidents.

The study of brain lesions has definitely helped us understand the organisation of the brain. However, the results are often difficult to interpret.

2) Brain - Imaging Techniques.

These are categorized into 2 : ① Structural
② Functional.

a) Structural it identifies anatomic regions (CAT, XRAY, MRI)

b) functional it demonstrates the physiology and metabolism of the region of interest (PET, fMRI, EEG, ERP)

I CAT(CT) SCAN (God frey Hounsfield)

One of the earliest such - brain - imaging techniques, developed in 1970's was x-ray computed tomography - also called x-ray CT, computerized axial tomography or CAT scan - a technique in which a highly focused beam of x-rays is passed through the body from many different angles. Differing densities of body organs deflects the x-Rays differently, allowing visualization of the organ

II MRI (Raymond Damadian)

- Although an important diagonastic tool in neuropsychology, CAT scans are used less often than a newer brain imaging technique magnetic resonance imaging or MRI.

- Like CAT scans, MRI provides information about neuroanatomy.

- Unlike CAT scans however, MRI requires no exposure to radiation and often permits clearer pictures

III PET

- A functional brain-imaging technique that also dates back to the 1970's is called Positron Emission Tomography or PET

- This technique involves injecting a radioactively labeled compound

- PET scans measures the blood flow to different regions of the brain, allowing an electronic reconstruction of a picture of a brain that shows which area are more active at a

particular time.

— Another technique to measure cerebral blood flow is known as single-photon emission computed tomography or SPECT for short

— The basic technique is similar to a PET scan, but it does not require some of the expensive equipment a PET scan does; thus it is sometimes known as a poor person's PET.

IV fMRI [Seiji Ogawa]

— A newer technique offers a way out of these difficulties

— Functional maganetic Resonance imaging or fMRI relies on the fact that blood has ~~magnetic~~ magnetic properties. As blood is carried from the heart, it is maximally magnetic.

— As it passes through capillaries, it becomes less magnetic.

— Brain regions that shows activity show a change in the ratio of oxygenated to deoxygenated blood.

- Such fMRI scans use existing MRI equipment but provide clinicians and investigators with a non-invasive, non-radioactive means of assessing blood flow to various brain regions.

- These techniques for studying the way the brain functions make possible new connections and new questions in cognitive psychology.

* Exocrine System - ~~In it~~ it includes a series of glands all over your body

- These glands secrete substances that help your organs function, including sweat, breast milk, mucus and oil

- Endocrine System it consists of glands which ~~release~~ releases chemicals called hormones directly into the bloodstream

- The major part of endocrine system is Pituitary glands (master glands) it is closely connected to a imp. region of brain that plays a role in emotions

It is really 2 glands in one:-

posterior pituitary
it releases hormones that regulate reabsorbtion of water by the kidneys and in female, the production and release of milk.

anterior pituitary
It releases hormones that regulate the activity of other endocrine glands - eg. release of hormone ACTH - it stimulates the outer layer of adrenal cortex - causing it to secrete cortisone - it affects cells in many parts of the body.

adrenal glands
it sit on the top of the kidneys.
in response to autonomic nervous system, the adrenal glands release epinephrine and norepinephrine.
This hormone help the body handle emergencies - increasing heart rate, blood pressure and sugar in the blood.

Left hemisphere — Right hemisphere

both have 4 lobes
Frontal lobe - high cognition
Parietal lob - sensory motors
Occipital lobe - vision
Temporal lobe - auditory.

Methods of studying brain

1. Method of ablation
2. Method of stimulation
3. Method of anatomy
4. Chemical Method
5. Electrical recording Method. (EEG, MEG, MCI)
6. Scanning Method (CAT, MRI, PET SQUID)

I EEG - Electroencephalography [Hansburger 1924]

- It is used to detect different states of consciousness metal electrodes are positioned all ones the scalp.

- The waveform records changes in predictable ways when the person being recorded is awake and alert, drowsy asleep or in coma.

- EEG's provide the clinicians or researcher with a continuous measure to brain activity.

[Cohen 1972]

- A newer technique Mon Magnetoencephalography or MEG. measures changes in magnetic fields generated by electrical activities of neurons. It has been called the "magnetic equivalent" of EEG. MEG gives a more precise localization of brain region activity than does EEG.

II ERP [Pauline and Hallowell Davis recorded 1st ERP]

- A newer technique called, event-related potential or ERP, measures an arc of the brain's response to a specific event

- Participants in an ERP study have electrodes attached to their scalp and are then presented with various external stimuli, such as sights and sounds.

- The recording measures brain activity from the time before the stimulus is presented until some time afterwards

- The brain waves recorded also have predictable parts or components.

- That is the shape of the waveform can vary depending on whether or not the participant expects the stimuli to occur, or is

attending to the location in which the stimulus appears and whether the stimulus is physically different from other recent stimuli.

[J. Zimmermann.]

II SQUID recently developed imaging device is called superconducting quantum interference device.

— It produces images based on its ability to detect tiny changes in magnetic fields in the brain

— When neurons fire, they create an electrical current.

— Electric currents in turn, give rise to magenetic fields that the SQUID interpretes as neural activity

— Researches have used SQUIDs to map various brain functions, including construction a representation of the hearing part of the brain.