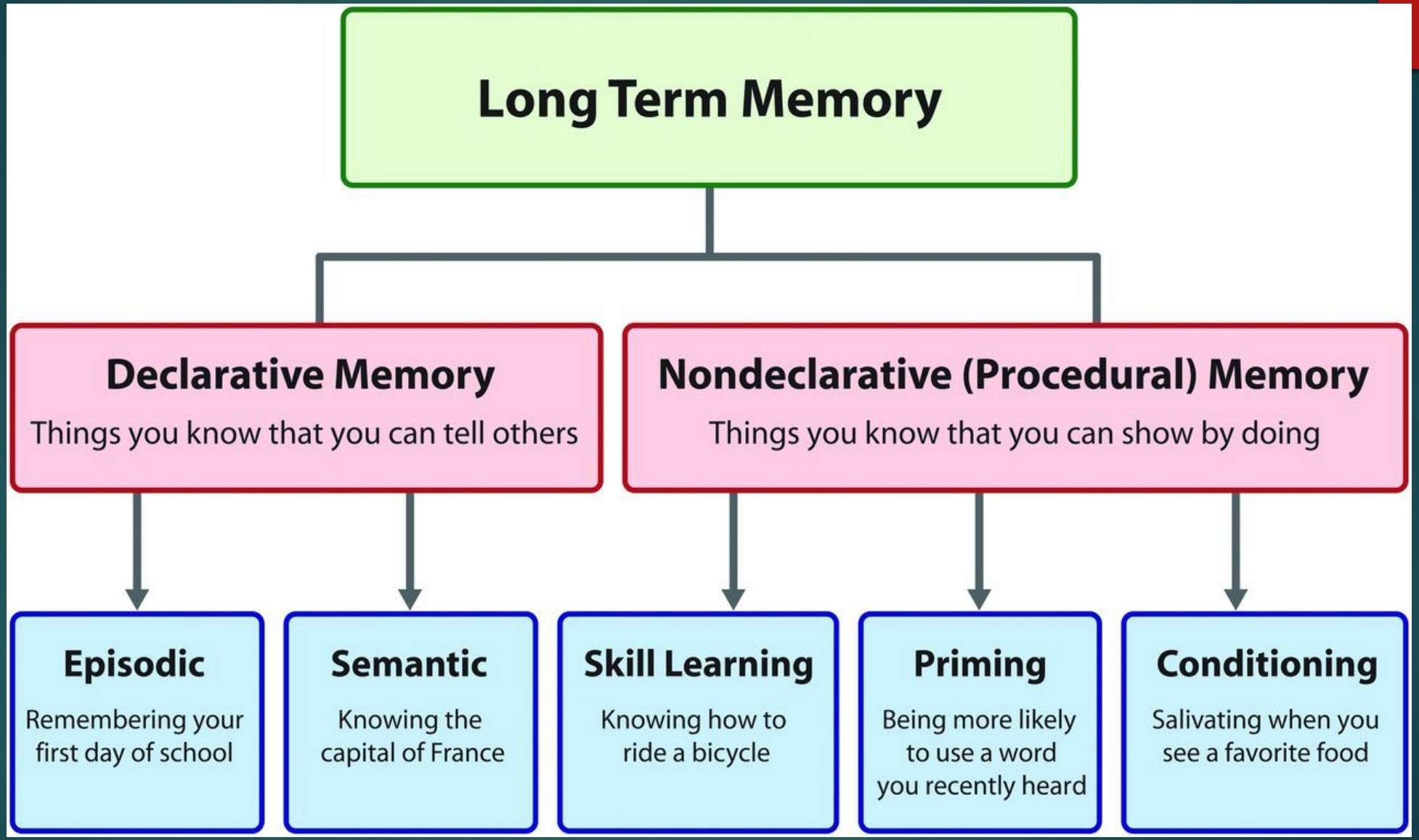
Memory & Brain


Long Term Memory
Declarative Memory
Things you know that you can tell others
Nondeclarative (Procedural) Memory
Things you know that you can show by doing
Episodic
Remembering your first day of school
Semantic
Knowing the capital of France
Skill Learning
Knowing how to ride a bicycle
Priming
Being more likely to use a word you recently heard
Conditioning
Salivating when you see a favorite food

DECLARATIVE MEMORY

- This system is the system of memory that is perhaps the most familiar. It is the memory system that has a **conscious component** and it includes the memories of **facts and events**. (Explicit Memory)
- For e.g. A fact like " Paris is the capital of France"

NON- DECLARATIVE MEMORY

Another name is **Implicit Memory**.

It includes the types of memory systems that do not have a conscious component but are nevertheless extremely important.

They include the memories for **skills and habits** (e.g. riding a bicycle, driving a car, playing golf or tennis or a piano); a phenomena called **priming**, simple forms of associative learning (e.g. classical conditioning) and simply forms of non- associative learning such as **habituation** and **sensitization**.

PRIMING

- Priming is the implicit memory effect in which exposure to a stimulus influences response to a later stimulus.
- An example of this is introducing the color blue to a person in order to help him/her recognize "sky" as a word. This is because sky and blue is a word that psychologists consider to be closely related.
- For example, the word NURSE is recognized more quickly following the word DOCTOR than following the word BREAD

HABITUATION

- Habituation is a decrease in response to a stimulus after repeated presentations. For example, a new sound in your environment, such as a new ringtone, may initially draw your attention or even become distracting. Over time, as you become accustomed to this sound, you pay less attention to the noise and your response to the sound will diminish. This diminished response is habituation.

SENSITIZATION

- Sensitization, in psychology, refers to a non-associative learning process through which repeated exposure to a stimulus results in the progressive amplification (increasing strength) of the reaction to the stimulus. The organism is becoming more sensitive to the stimulus as time progresses.
- A dog normally loves to ride in the car, but after a few trips to the veterinarian the dog makes the association that the car that takes it to see the vet is responsible for hurting him. For this reason, a dog might start to resist riding in the car.

Memory

- We like to think that memory is similar to taking a photograph and placing that photograph into filing cabinet drawer to be withdrawn later (recalled) as the memory exactly the way it was placed there originally (stored).
- But memory is more like taking a picture and tearing it up into small pieces and putting the pieces in different drawers.
- The memory is then recalled by reconstructing the memory from the individual fragments of the memory.

LOCALIZATION OF MEMORY

- 1. **Imaging**- FMRI or PET allows one to see areas of the brain that are active during specific brain tasks.
- If a subject is placed in an FMRI scanner and given a memory test, one can determine what areas of the brain are active and that of activity presumably is related to where in the brain the memory is stored and processed.
- OBJECT LOCATION TEST- Hippocampus is involved in object location test.

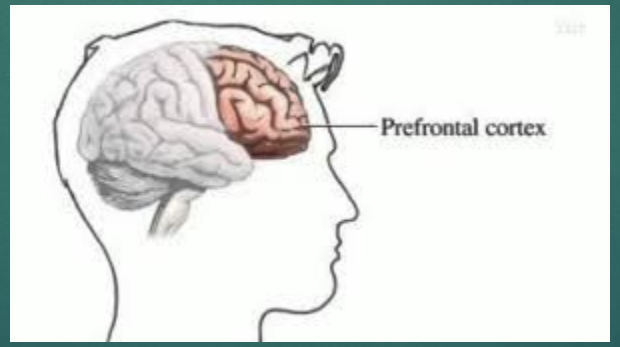
LOCALIZATION OF MEMORY

- 2) **Brain Lesion**- in this experimental procedure, small parts of the brains of mice and rats are surgically removed or chemically inactivated and the animals are systematically examined to determine whether the lesion affected any memory system.

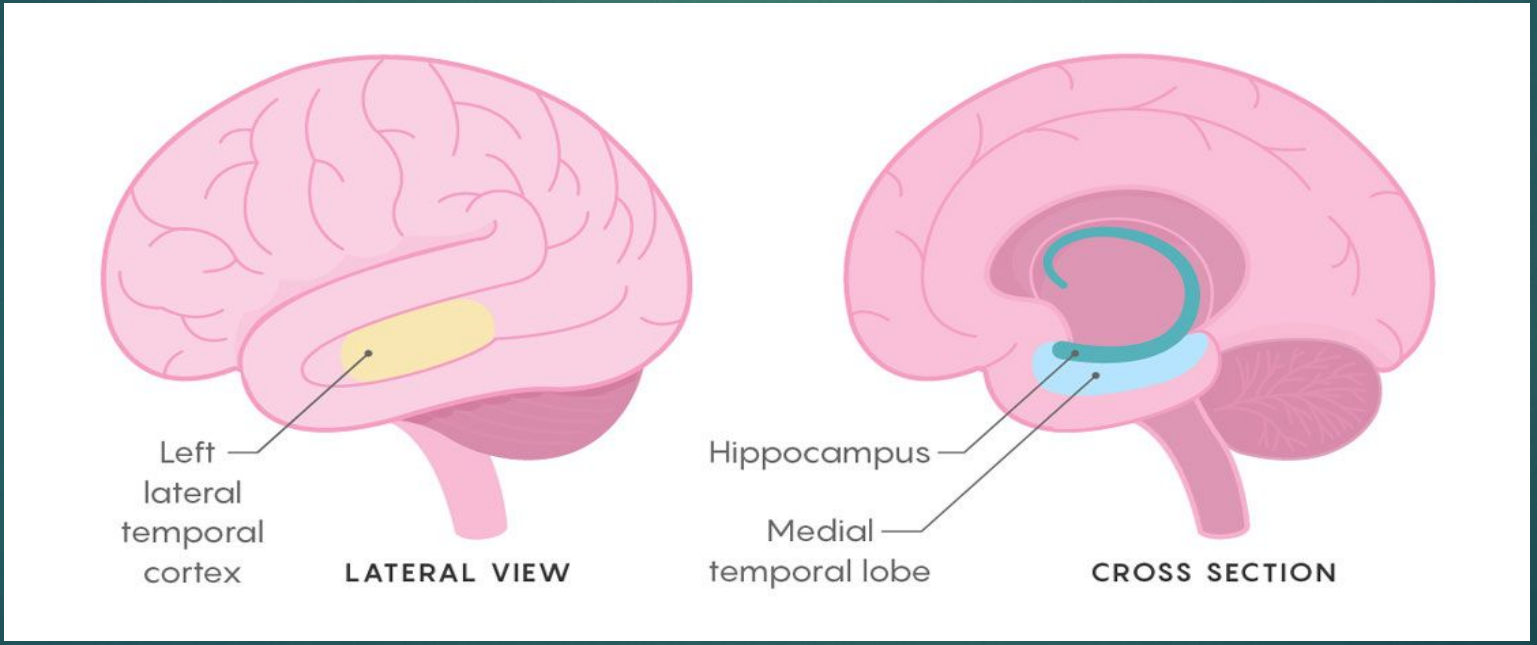
LOCALIZATION OF MEMORY

- 3) **Brain Disease & Injury**- Here scientists take advantage of individuals who have had unfortunate brain injuries, for e.g. through stroke or through a brain tumor in a specific area of the brain. If one finds a memory deficit in the patient, it is likely that the region of the brain that was injured is involved in that memory.

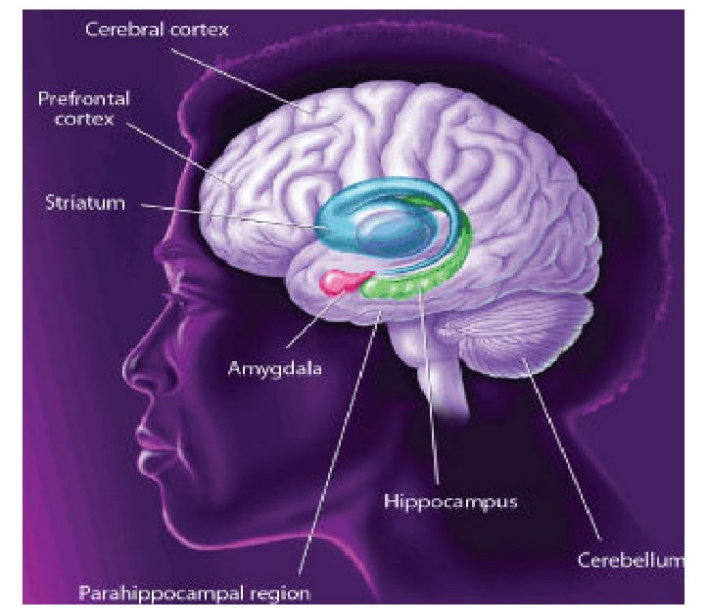
- The studies on HM clearly indicated that whereas the hippocampus is critical for the formation of new memories, it is not where the old memories are stored.
- It is now known that those **old memories** are stored in other parts of the brain, such as in the **frontal cortex**.



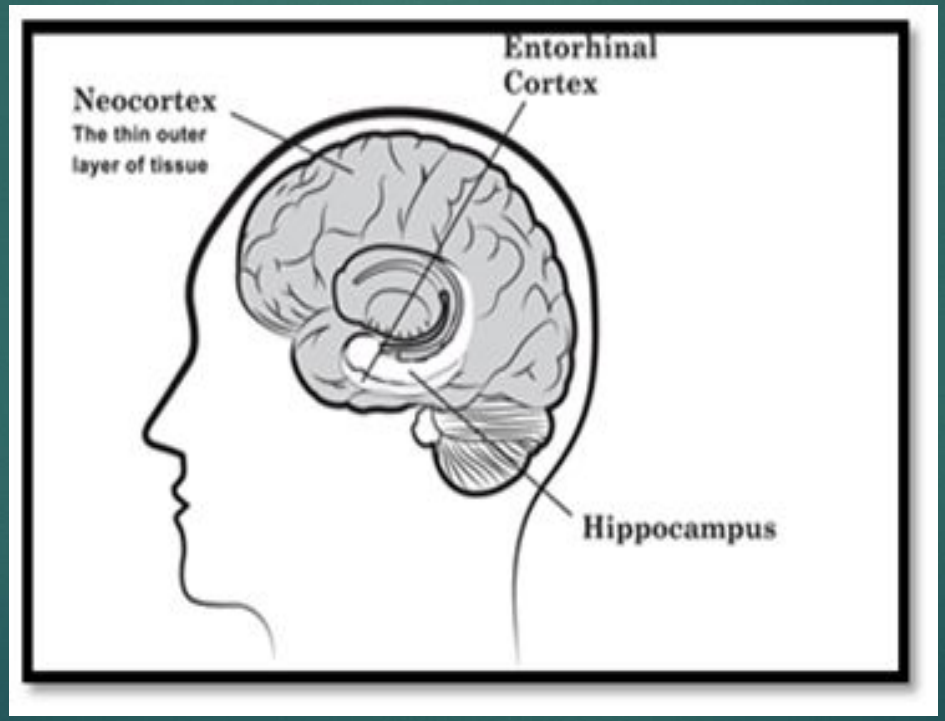
- The **medial temporal lobe** and structure like the **hippocampus** are involved with memories for **facts and events**.



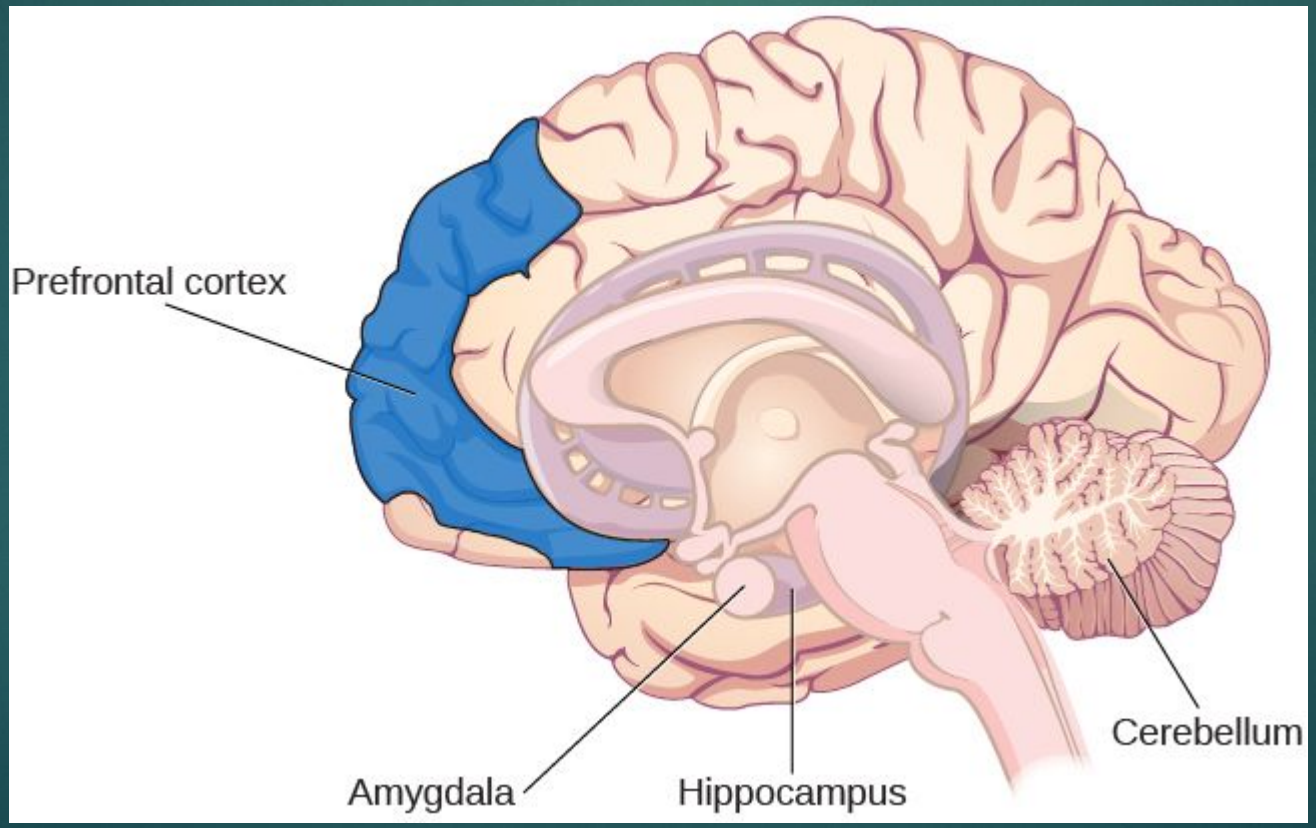
- The **striatum** is involved with memories for **skills and habits**.



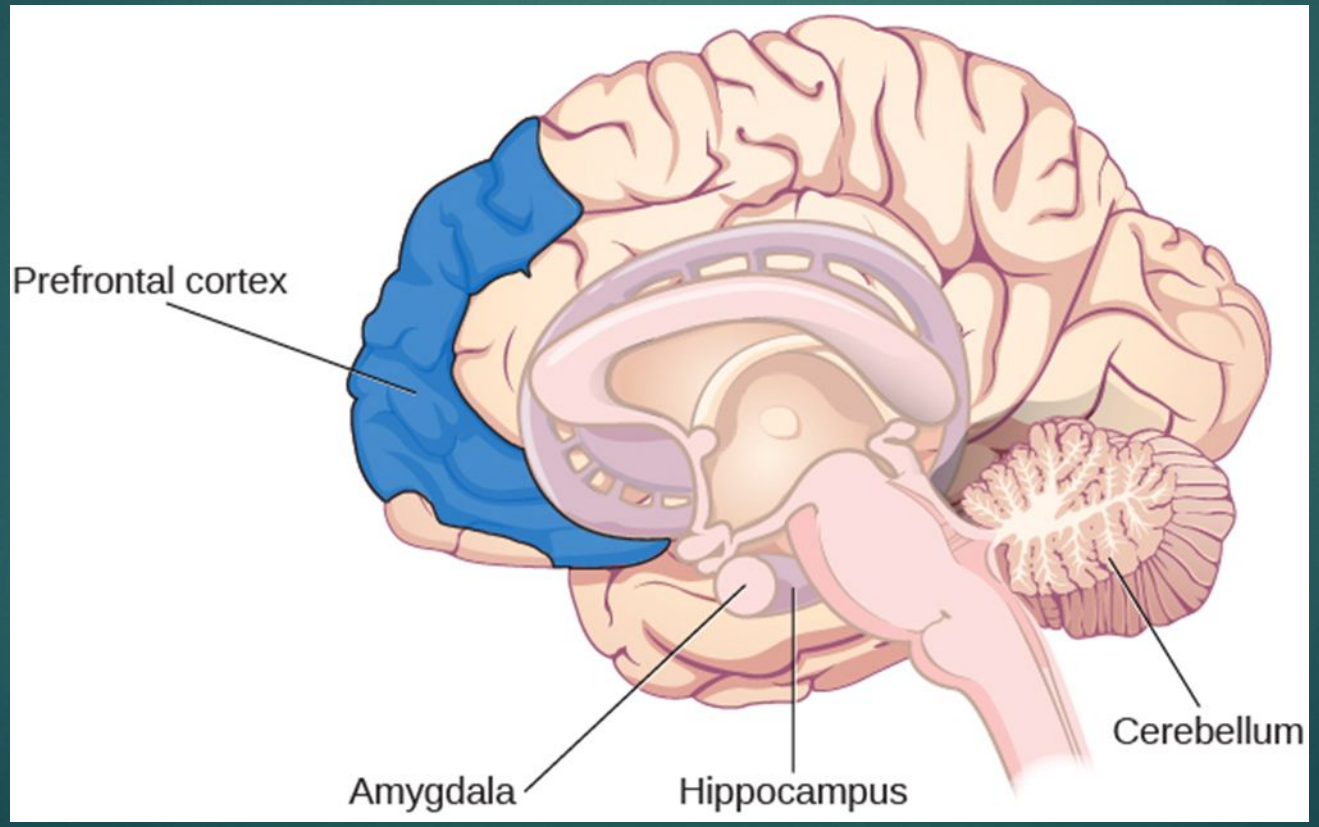
- The neo- cortex is involved with priming.



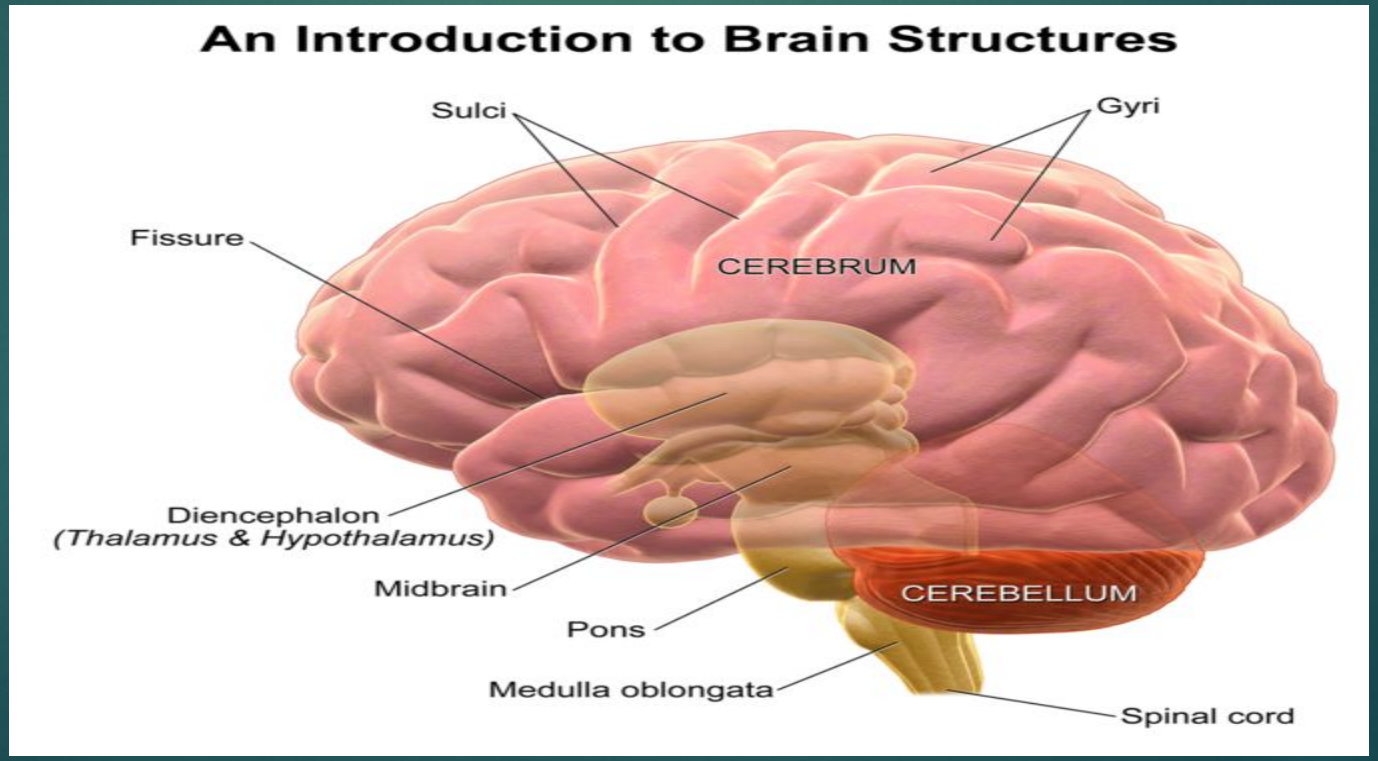
- The **amygdala** is involved with **emotional memories**.



- The **cerebellum** with simple forms of **associative learning**.



- **Lower brain regions** and the **spinal cord** contains even **simpler forms of learning**.



MEMORY DISORDER

- Memory disorders can range from mild to severe, but they all result from some kind of neurological damage to the structures of the brain, thus hindering the storage, retention and recollection of memories.
- Memory disorders can be progressive, like Alzheimer's or Huntington's disease, or immediate, like those resulting from a traumatic head injury. Most disorders are exacerbated by the effects of ageing, which remains the single greatest risk factor for neurodegenerative diseases in general.

Agnosia

- is the inability to recognize certain objects, persons or sounds. **It is typically caused by damage to the brain.**
- it is the inability to process sensory information. often there is a loss of ability to recognize objects, persons, sounds, shapes or smells while the specific sense is not defective nor is there any significant memory loss it is usually associated with brain injury or neurological illness, particularly after damage to the occipitotemporal border, which is part of the ventral stream.

Amnesia

- Amnesia is an abnormal mental state in which memory and learning are affected out of all proportion to other cognitive functions in an otherwise alert and responsive patient.
- **There are two forms of amnesia: Anterograde amnesia and retrograde amnesia, that show hippocampal or medial temporal lobe damage.**
- Anterograde amnesics show difficulty in the learning and retention of information encountered after brain damage. Retrograde Amnesics generally have memories spared about personal experiences or context independent semantic information.

Reasons for Amnesia

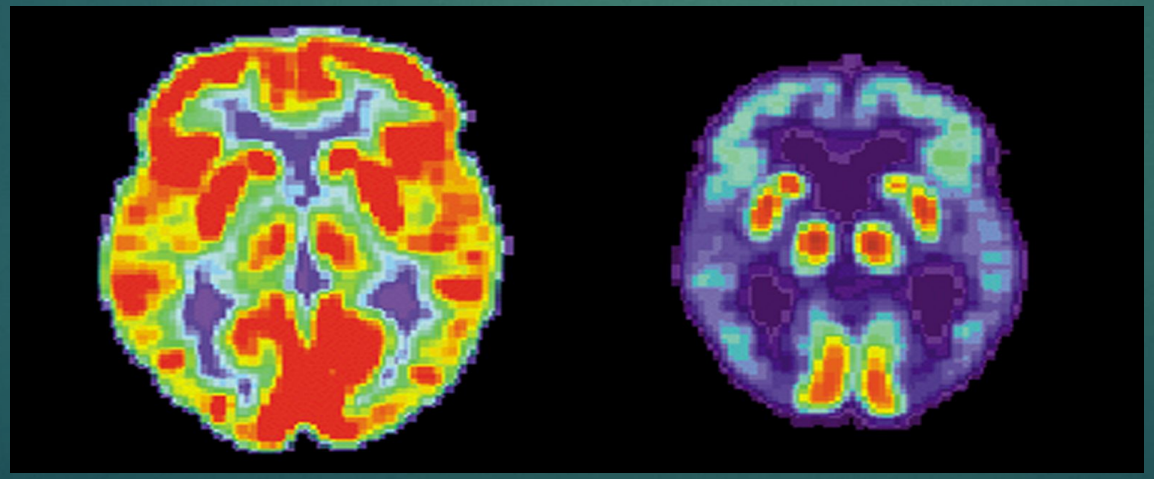
- **ORGANIC**
- **PSYCHOGENIC**

ORGANIC

- Alzheimer disease
- Korsakoff disorder (Pure Memory disorder)
- Herpes Simplex Encephalitis (HSE)
- Temporal Lobe Surgery (H.M. case)
- Post ECT Amnesia

Alzheimer's disease

- **Alzheimer's disease (AD) is a progressive, degenerative and fatal brain disease, in which cell to cell connections in the brain are lost**.
- Globally approximately 1–5% of the population is affected by Alzheimer's disease.



Famous Case of HENRY MOLASON (HM)

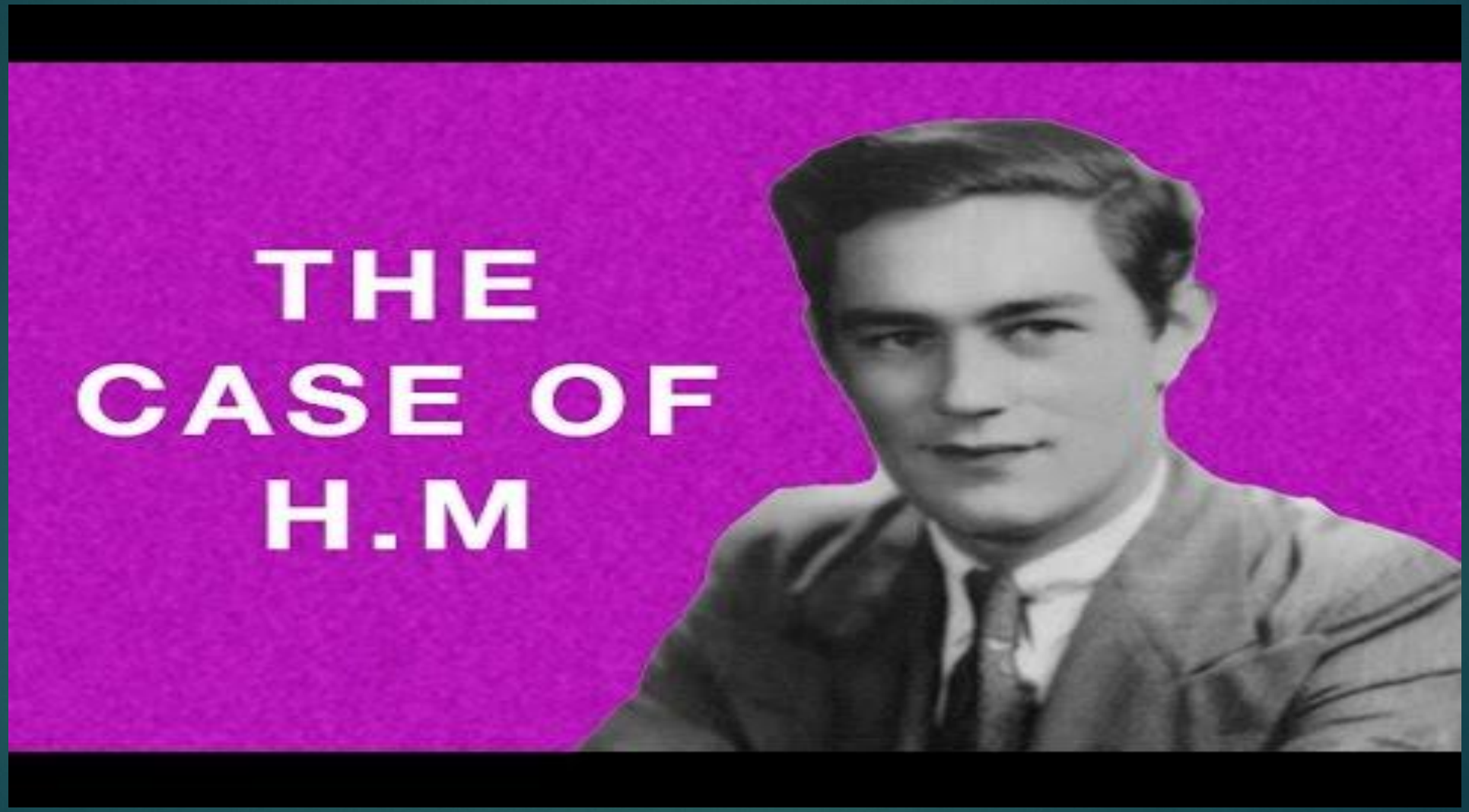
Every Day Is Alone

Patient H. M. has a relatively pure amnesia. His intellectual ability and his immediate verbal memory appear to be normal. He can repeat seven numbers forward and five numbers backward, and he can carry on conversations, rephrase sentences, and perform mental arithmetic. He is unable to remember events that occurred during several years preceding his brain surgery, but he can recall older memories very well. He showed no personality change after the operation, and he appears to be generally polite and good-natured.

However, since the operation, H. M. has been unable to learn anything new. He cannot identify by name people he has met since the operation (performed in 1953, when he was twenty-seven years old). His family moved to a new house after his operation, and he never learned how to get around in the new neighborhood. (He now lives in a nursing home, where he can be cared for.) He is aware of his disorder and often says something like this:

> Every day is alone in itself, whatever enjoyment I've had, and whatever sorrow I've had. . . . Right now, I'm wondering. Have I done or said anything amiss? You see, at this moment everything looks clear to me, but what happened just before? That's what worries me. It's like waking from a dream; I just don't remember. (Milner, 1970, p. 37)

H. M. is capable of remembering a small amount of verbal information as long as he is not distracted; constant rehearsal can keep information in his immediate memory for a long time. However, rehearsal does not appear to have any long-term effects; if he is distracted for a moment, he will completely forget whatever he had been rehearsing. He works very well at repetitive tasks. Indeed, because he so quickly forgets what previously happened, he does not easily become bored. He can endlessly reread the same magazine or laugh at the same jokes, finding them fresh and new each time. His time is typically spent solving crossword puzzles and watching television.


THE
CASE OF
H.M

Korsakoff's Syndrme

Korsakoff's Syndrome is a disorder that primarily affects the memory system in the brain, it usually results from a deficiency of thiamine (Vitamin B1), which may be caused by alcohol abuse. dietary deficiencies, prolonged vomiting, eating disorders.

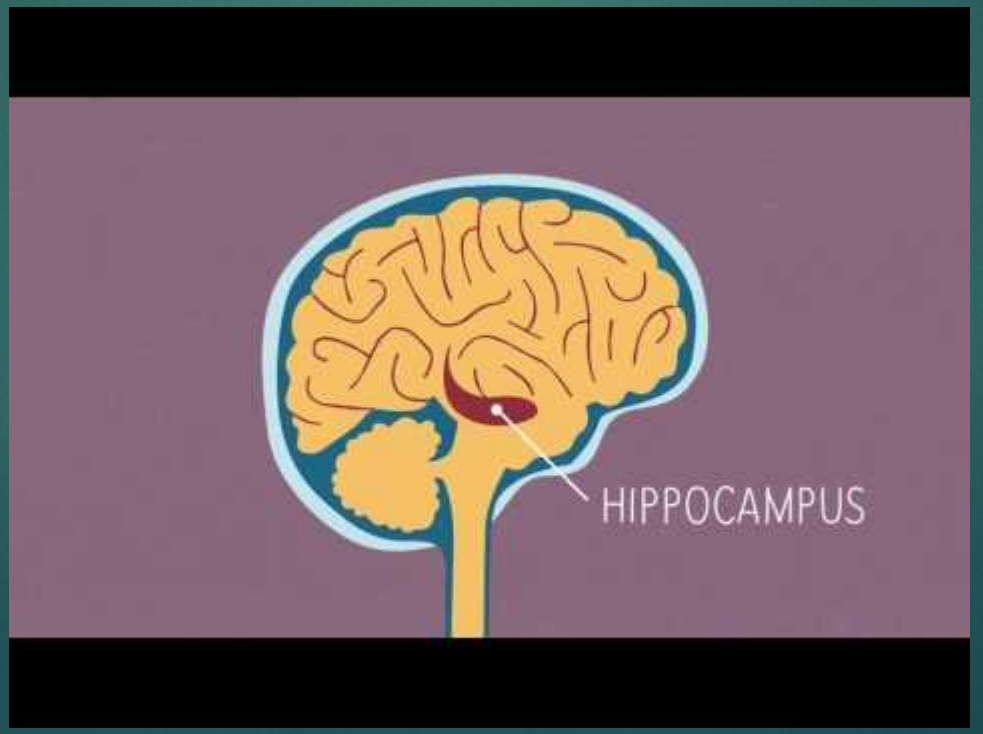
prolonged alcohol use can cause amnesia. damage in Hypothalamus and Thalamus. LTM is stored in thalamus and hypothalamus.

The case of N.A.

http://dementia.hiim.hr/HM_RB_NA.pdf

Dementia

- Dementia refers to a large class of disorders characterized by the progressive deterioration of thinking ability and memory as the brain becomes damaged.



Hyperthymestic syndrome

Hyperthymesia is a condition that leads people to be able to remember an abnormally large number of their life experiences in vivid detail.

Patients with this condition are able to recall events from every day of their lives.

This condition is very rare with only a few confirmed cases.

An MRI study conducted on AJ provides a plausible argument as to the neurological foundation of her superior memory. both the temporal lobe and the caudate nucleus are found to be enlarged. the hippocampus, located in the medial temporal lobe, is involved in the encoding of declarative memory (memory for facts and events), while the temporal cortex is involved in the storage of such memory. the caudate nucleus is primarily associated with procedural memory, in particular habit formation and is therefore intrinsically linked to obsessive- compulsive disorder.

Parkinson's disease

- Parkinson's disease (PD) is a neurodegenerative disease. PD and aging share a lot of the same neuropathology and behavioral features.
- The most common symptoms include: tremors, slowness, stiffness, impaired balance, rigidity of the muscles, and fatigue.

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