MEMORY
A Simplified Memory Model

External events → Sensory input → Sensory memory → Attention to important or novel information → Encoding → Short-term memory → Encoding → Long-term memory → Retrieving
Memory

- Sensory Memory
  - the immediate, initial recording of sensory information in the memory system
Storage: Retaining Information

- Iconic Memory
  - a momentary sensory memory of visual stimuli
  - a photographic or picture image memory lasting no more than a few tenths of a second

- Echoic Memory
  - momentary sensory memory of auditory stimuli
Memory

- **Short-Term Memory**
  - activated memory that holds a few items briefly, limited capacity.
  - look up a phone number, then quickly dial before the information is forgotten

- **Working Memory**
  - Concerned with immediate conscious perceptual and linguistic processing.
  - Important for reasoning and decision making
  - focuses more on the processing of briefly stored information
Memory

- Long-Term Memory
  - the relatively permanent and limitless storehouse of the memory system

Types:
- Explicit – we have awareness about these
- Implicit – these are automatic processes
Storage: Long-Term Memory Subsystems

Types of long-term memories

Explicit (declarative) With conscious recall
- Facts-general knowledge (“semantic memory”)
- Personally experienced events (“episodic memory”)

Implicit (nondeclarative) Without conscious recall
- Skills-motor and cognitive
- Dispositions-classical and operant conditioning effects
Memory consists of learning, retaining, and remembering what has been previously learned. Here learning is called memorizing.
The processes of memory are:

I-Memorizing

It is a sort of controlled learning of certain materials with the purpose of retaining them.
Memory Span

- Is the number of certain items that can be correctly reproduced or reported immediately after their first presentation; visual or auditory, e.g., list of numbers (Digit Span). The digit span consists of presenting numbers in a gradually increasing order done verbally and the subject is required to repeat them in the same order, i.e., in a forward manner or in a reversed order, i.e., backwards. Children of 4-6 years have a span of 4 digits, while adults have a span of 6-8. The digit span increases with age and practice. It is included in most intelligence tests because memory is one of the important components of intelligence. The immediate memory span (6-8 digits) is taken notice of in telephone and automobile number.
Economy in memorizing

The factors that help in economizing the time and effort of memorizing and favor efficient learning are

1) Prevention of distraction, whether external or internal.
2) Identification of the essential principles and main points of the subject.
3) Observation of the relations between the parts of the subject and between it and other subjects.
4) Understanding and digestion of the meaning of the subject to be learned.

5) Recitation to oneself economizes the time and fixes the lesson for a long time in memory and is superior to passive re-reading.

6) Spaced repetition requires fewer trials than massed repetition.

7) Study by the whole method makes memorizing usually faster than by the part method.
II-Retention

- It is the persisting after-effect of any learnt material. Learning produces modification of the structure of the brain called memory trace. Retention decreases with the passage of time between learning and remembering. The loss is more rapid at first, then it becomes slower in the retention interval.
Forgetting

• It is the negative aspect of retention. It is gradual loss of the retained material. Forgetting is maximal in the first few hours after memorizing. The rate of forgetting varies with the individual differences, the degree of leaning, the time spent in learning, the way of learning and the type of material learnt.
Causes of Forgetting

1) **Interference theory**: New learning may disrupt memory traces and we forget because recently learnt material interferes with what we are trying to remember. Lack of interference is said to be the cause of slower forgetting during sleep than during waking hours.

2) **Repression theory**: Repression makes us forget what we are not interested and what we do not want to remember, as it may be associated with a painful memory.
3) **Disuse atrophy**: Memory traces become weaker and atrophied with the passage of time if they are not used, exactly as the muscle which strophys if it is not used for a long time.
It consists of three processes recall, recognition and relearning

1. **Recall**: Is remembering something that is not present, e.g., recalling of names and images. Hallucinations are vivid images without an external stimulus. They occur in dreams and in some forms of mental disorders. Interference with recall occurs even when retention is adequate. Such as the examination anxiety or from a strong tendency to recall some other incorrect response.
2) **Recognition**: It is remembering of something present to the individual’s senses, e.g., when you are shown parts to identify in the oral anatomy examination they are remembered by recognition, in contrast to remembering by recall in written examinations. Although recognition is simpler than recall, errors may result from failure to distinguish between two similar objects.
3) **Relearning** You may recall or recognize almost nothing of previously learned lesson; however, you still find it very easy to relearn this particular lesson. This means that there are traces retained of studied material which cannot be remembered by the usual methods but facilitates its learning again.
Physiology of memory

There are three regions of the brain which are mainly concerned in the function of memory

1) The temporal lobe.
2) The mamillary bodies and the region around the third ventricle periventricular gray matter.
3) The limbic system: This system includes the amygdala, hippocampus, hippocampal gyrus, cingulate gyrus and parts of the diencephalon.
Structures of the Brain That Play a Role in Memory

- Basal forebrain
- Mediodorsal nucleus
- Prefrontal cortex
- Amygdala
- Rhinal cortex (not visible, on medial surface of temporal lobe)
- Hippocampus
- Inferotemporal cortex
- Cerebellum
Major Components of the Hippocampus

- Dentate gyrus
- CA1 Subfield
- CA2 Subfield
- CA3 Subfield
- CA4 Subfield

Pyramidal cell layer

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Disorders of memory

1) **Hypermnesia**: This is abnormally pronounced memory which registers and remembers minute details of life events. It occurs normally in some individuals and in some mental disorders, e.g., hypomania and paranoia.
2) **Amnesia**: This is loss of memory:

A. **Amnesia for recent events**: This usually occurs in elderly individuals suffering from senile and atherosclerotic dementia (i.e. irreversible intellectual deterioration).

B. **Amnesia for remote events**: This occurs in normal forgetting and in advanced cases of dementia together with amnesia for recent events.

C. **Circumscribed amnesia**: This is amnesia limited to a certain period in which a traumatic experience has happened, e.g., head trauma or a psychological stress has occurred, e.g., in hysterical amnesia.
3) **Paramnesia**: It is a qualitative disturbance of memory.

A. **Confabulation or Fabrication**: This is inventing new memories to compensate for the loss of memory for recent events.

B. **Falsification**: This is adding false details to what has actually occurred.

C. **Deja vu phenomenon**: This is sense of familiarity with subjects or places that have not been seen before.