UNIT-II MEMORY (cc-5)

**STUDY MATERIAl FOR M.A (IInd semester)**

NAMRATA
ASSISTANT PROFESSOR
MAGADH MAHILACOLLEGE
PATNA UNIVERSITY

Types of Memory :

 There is four type of memoryse;
1.Sensory memory.
2.short term memory.
3.working memory
4.long term memory

- Sensory memory, short-term memory, and long-term memory differ from each other, in term of duration, capacity, and function. Sensory memory has a large capacity for information, but it has a brief duration.
- The short-term memory and long-term memory have limited and unlimited capacity respectively. While the duration of sensory memory ranges up to 1 seconds, the duration of the short-term memory is about 20-30 seconds. The information can be stored in long-term memory indefinitely.
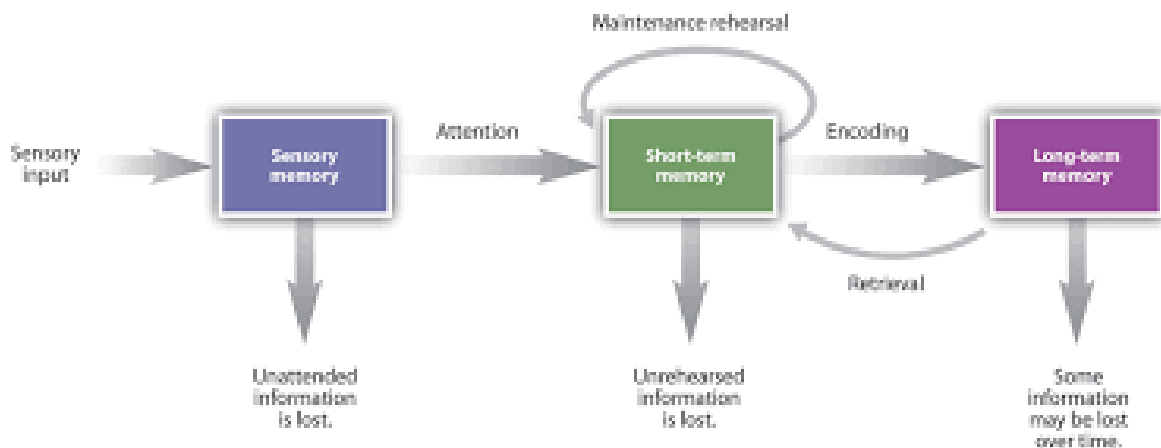
1.SENSORY MEMORY

sensory memory' refers to the first stage of memory that holds on the incoming sensory/perceptual information. Before the information enters the short-term memory store, the data is acquired by our senses.

- Sensory memory allows individuals to retain impressions of sensory information after the original stimulus has ceased.

- Sensory memory is not involved in higher cognitive functions like short- and long-term memory.

- It is not consciously controlled. The role of sensory memory is to provide a detailed representation of our entire sensory experience for which relevant pieces of information are extracted by short-term memory and processed by working memory.
- Sensory memory is a very brief (less than 1 seconds). Some compare sensory memory to a quick snapshot of what you just experienced that quickly disappears.
- It is sometimes called a fleeting memory, gets consolidated as short-term memory, only if we choose to remember the event. This memory is replaced constantly. For example, when watching a motion picture, one do not observe the gaps between frames, as each frame is held in the sensory register until the arrival of the next frame.
- It is the first stage of memory and exact copy of the information gathered through the senses is stored for a brief time. Our senses are working constantly, which is why we focus on a limited amount of information that we consider as relevant. The sensory memory has a large capacity. It is believed that it includes systems that are associated with each sense. In the encoding process, a substantial amount of information is gathered through the sense of sight and hearing.
- Act as a buffer memory
- The element of attention is extremely important in case of sensory memory. Out of all the sensory inputs, only the information that we pay attention to gets transferred to the short-term memory. The rest of the information is discarded or forgotten.

Types of sensory memory are

- Iconic memory (Visual sensory input from the eyes)
- Echoic memory (Auditory sensory input)
- Haptic memory (Tactile sensory input)
- Gustatory memory (Input related to the sense of taste)

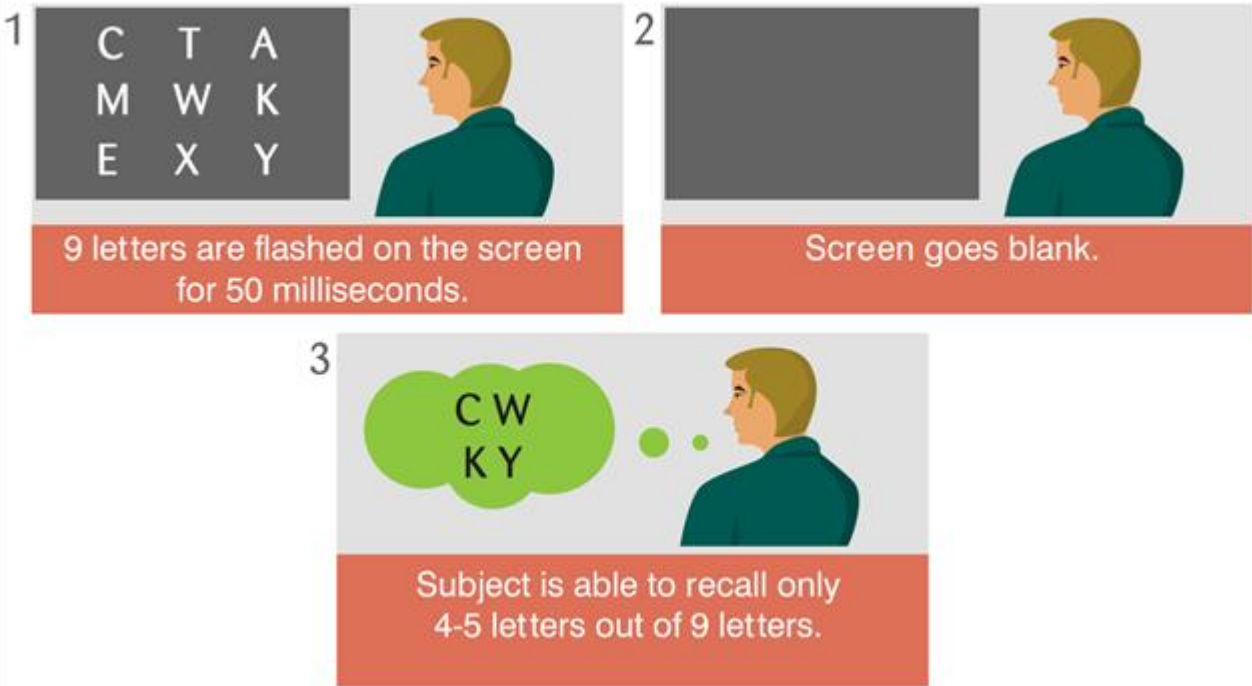- Olfactory memory (Input related to the sense of smell)

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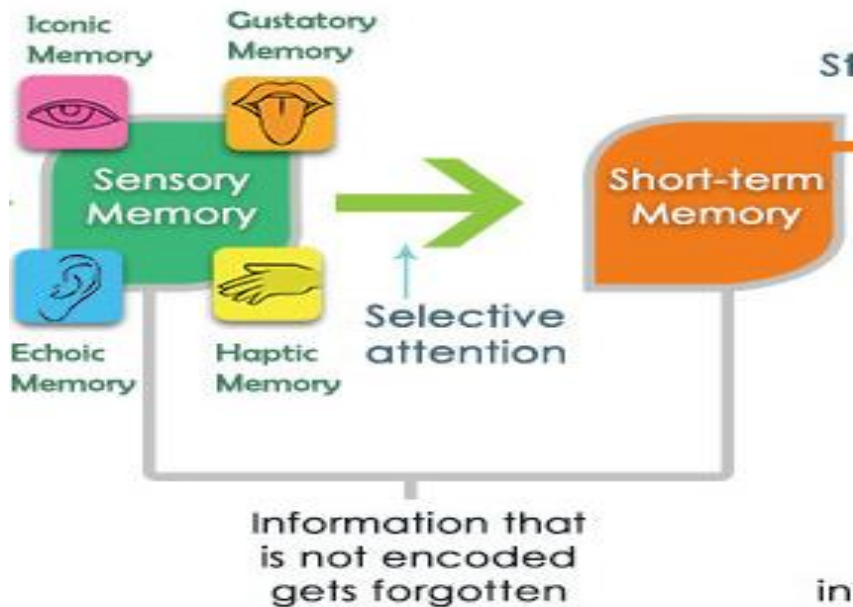
Iconic Memory vs. Echoic Memory

The terms 'iconic memory' and 'echoic memory' were coined by Ulric Neisser in 1967. Iconic memory is the sensory memory for vision, whereas echoic memory is the memory for audition (hearing). The term 'iconic' is derived from the word 'icon', and refers to a fleeting mental image that is formed after receiving the sensory input from the eyes. Lightning flash or sparkler trails are examples of iconic memory. Even when we blink, the visual inputs are held in the iconic memory, which is why there's no realization of the fact that our eyes were completely closed.

On the other hand, the term 'echoic' is derived from the word 'echo', and refers to the continuation of the sound or the sensory input from the auditory system. For instance, if you are engrossed in reading a book when someone says something to you, you might ask the person to repeat what he/she said. However, you might be immediately able to remember what that person had said, as the words would have been briefly stored in the echoic memory.

The major difference between iconic memory and echoic memory is regarding the duration and capacity. Echoic memory lasts up to 3-4 seconds in comparison to the iconic memory, which lasts up to one second. However, iconic memory preserves 8-9 items, in comparison to 4-5 items in case of echoic memory.
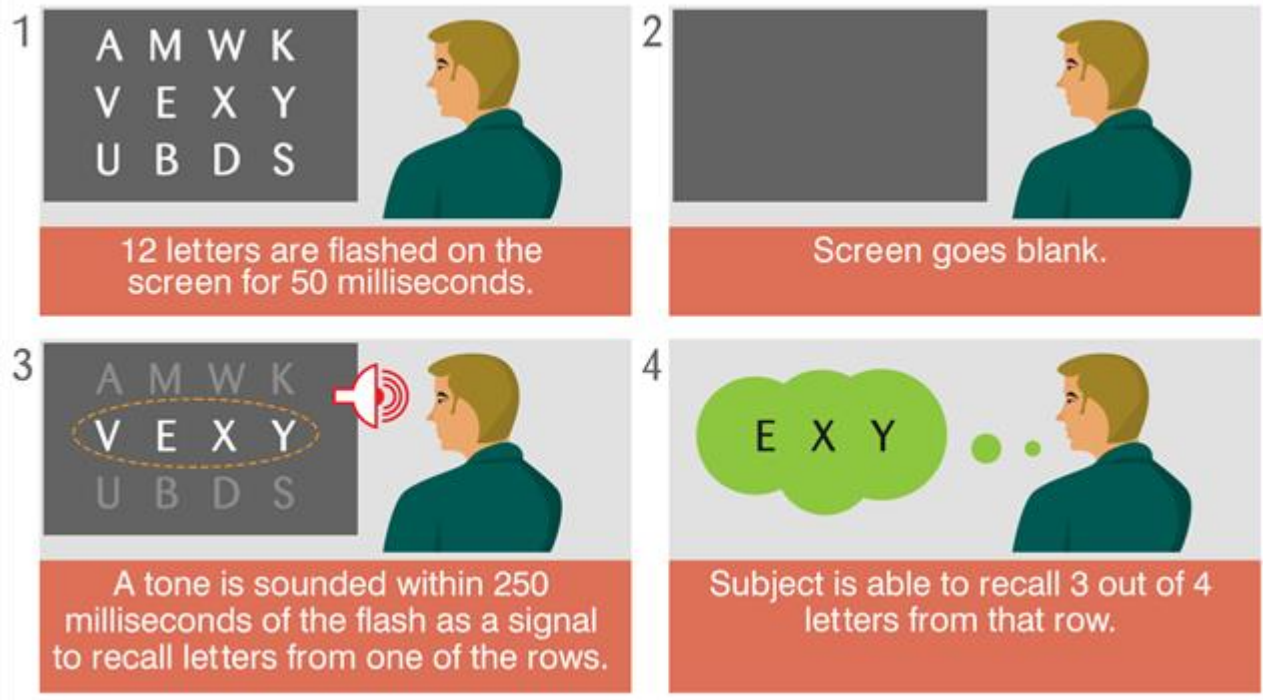
George Sperling's Experiment:Bipartite model of memory

1 — C T A / M W K / E X Y — 9 letters are flashed on the screen for 50 milliseconds.

2 — Screen goes blank.

3 — C W / K Y — Subject is able to recall only 4-5 letters out of 9 letters.

It was in the 1960s that the existence of iconic memory was proven with the help of a series of experiments conducted by an American psychologist named George Sperling. In the experiment, the subjects were asked to recall a set of 9 letters (three letters each in three rows). The letters were projected on to a screen for a brief period (one-twentieth of a second) with the help of a tachistoscope.

It was observed that when used whole report method most participants were able to recall four or five letters . According to Sperling, the participants were unable to recall all the letters even when all of them had been registered, as the memory had faded too quickly.

Another Experiment

1. A M W K / V E X Y / U B D S — 12 letters are flashed on the screen for 50 milliseconds.

2. Screen goes blank.

3. A M W K / V E X Y / U B D S — A tone is sounded within 250 milliseconds of the flash as a signal to recall letters from one of the rows.

4. E X Y — Subject is able to recall 3 out of 4 letters from that row.

In another experiment, a set of twelve letters were projected on to the screen, but a tone was sounded right after the letters were flashed. The subjects were given the instructions to recite only the letters in the top, middle, and bottom row on hearing the high, medium, and low tone respectively. It was observed that the participants had no difficulty in recalling the letters in the row indicated by the tone. On an average, most subjects were able to recall 3 out of 4 letters in the row. This proved that all the twelve letters had been registered in the visual sensory store. It also reveal that for short interval following exposure observers have a muh better memory than whole report procedure.

2.SHORT-TERM MEMORY

- Short-term memory is also known as *working memory*. It holds only a few items (research shows a range of 7 +/- 2 items) and only lasts for about 20-30 seconds. However, items can be moved from short-term memory to long-term memory via processes like *rehearsal*. An example of rehearsal is when someone gives you a phone number verbally and you say it to yourself repeatedly until you can write it down. If someone interrupts your rehearsal by asking a question, you can easily forget the number, since it is only being held in your short-term memory.
- It is very fragil.
- It is aiso galled AVL storage(Acoustic, verbal, linguistic)
- STM could be enhanced through

- Rehearsal- Repetition of an item in short-term memory in order to store it in long-term memory.
- Repeating
- Rote learningor brute learning
- Chunking(miller1956):FCINCBINASASBI,(FCI,NCBI,NASA,SBI)
- **To measure the size of STM two technique were used**:
    1. **SERIAL POSITION CURVE METHOD**:serial position curve can be defined as a "U-shaped relationship between a word's position in a list and its probability of recall." This occurs due to a phenomenon known as *Serial Position Effect*. The serial position effect consists of two phenomena viz. primacy effect and recency effect.
    o **Primacy effect** refers to the better recall of items from the beginning of list (first three or four items), whereas
    o **Recency effect** refers to the better recall of items from the end of the list (last three or four items) than middle items of the

    2.**Memory Span Method**:miller in his experiment said that ts capacity is 7+/-9 in research paper "the magical number seven,plusand minus Two". We can store 5-9 item at a time called **magical number.**

    o Can be enhanced through chunking and rehearsal.

DURATION OF STM: Psychologist have used 2 technique to determine durationof STM.

1.DISTRACTOR TECHNIQUE: Peterson and Peterson in 1959 done a experiment in which subjects had to recall meaningless three-consonant syllables, e.g. BGH, CLS).

The trigrams were presented one at a time and had to be recalled   after intervals of 3, 6, 9, 12, 15 or 18 seconds.

To prevent rehearsal participants were asked to count backwards in threes a specified random number 854,851 in descending order until they saw a red light appear. This is known as the brown peterson technique.

 Result shows that there was a rapid increase in forgetting as the time delay increased.

- After 3 seconds 80% of the trigrams were recalled correctly.
- After 6 seconds this fell to 50%.
- After 18 seconds less than 10% of the trigrams were recalled correctly.

Conclusion:

Short-term memory has a limited duration (of about 18 seconds) when rehearsal is prevented. It is thought that this information is lost from short-term memory from trace decay.

The results of the study also show the short-term memory is different from long-term memory in terms of duration.

If a person is not able to rehearse information it will not transfer to their long-term memory store.

Critical Evaluation:

This experiment lacks mundane realism and external validity as they used very artificial stimuli (i.e., people do not try to recall trigrams in real life).

They also only considered short-term memory duration for one type of stimuli. They did not provide information about other types of stimuli such as pictures and melodies.

2.PROBE TECHNIQUE:

CODING IN STM: The three types of information—visual, auditory or acoustic or phonological, and semantic can be coded into short-term memory without the individual's awareness.

REHEARSAL IN STM:

Is the subvocal repetition of the information to be encoded using phonological or articulatory loop.

- Information can be retained through Rehearsal(Atkinson &shiffrin)
- 2 type of rehearsal-**(craik & watkins1973)**
  - ✓ Maintenance Rehearsal(role rehearsal)
  - ✓ Elobrative Rehearsal

RETRIEVAL FROM STM:

Sternberg in his study found that inf of STM is retrieved in systematic manner and searched in a serial order thus more the information in STM longer will the reaction time in process of retrieval.

For each additional member reaction is about 250millisecond more.

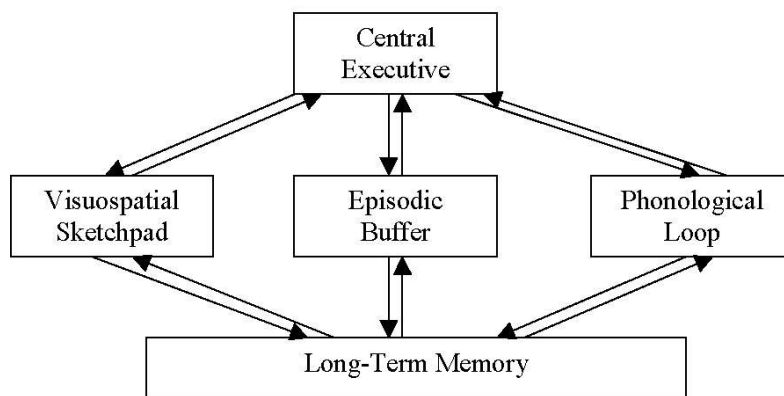- ## FORGETTING IN STM: Can be due to

1.Decay Mechanism

2.Interference mechanism;

- ✓ Proactive interference

- ✓ Retroactive interference

3.Displacement mechanism

WORKING MEMORY Propunded by Alan Baddley in 2003

- Working memory has limited capacity part of the human [memory](#) system that combines the temporary storage and manipulation of information in the service of cognition. Working memory differs from short-term memory (STM) in that it assumes both the storage and manipulation of information, and in the emphasis on its functional role in complex cognition.
- When S.T.M get organised from there the work of working memory srarts where various thinking process starts
- **Baddeley's Model of Working Memory**

```
                    ┌──────────────┐
                    │   Central    │
                    │  Executive   │
                    └──────────────┘
┌──────────────┐    ┌──────────────┐    ┌──────────────┐
│ Visuospatial │    │   Episodic   │    │ Phonological │
│  Sketchpad   │    │    Buffer    │    │     Loop     │
└──────────────┘    └──────────────┘    └──────────────┘
                    ┌──────────────┐
                    │ Long-Term Memory │
                    └──────────────┘
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Working memory, previously referred to as short-term memory, refers to the memory that one is currently processing. This memory lasts for less than a minute and is limited in capacity. In an attempt to better understand working memory, Alan Baddeley developed the working memory approach. According to this approach, working memory is a system with several different parts that control the information being processed. This led to the development of Allan Baddeley's Model of Working Memory. This model assumes that each component has a limited capacity and is relatively, not entirely, independent of the others. Baddeley's original model contained three components, the

phonological loop, the visuo-spatial sketchpad, and the central executive. However, the current model also contains the episodic buffer.

The phonological loop processes sounds and is responsible for speech based information. This includes sounds that are processed in one's mind. For example, the phonological loop is used in learning new vocabulary, problem-solving, math problems, and remembering instructions. In all these tasks, sounds are being processed through the phonological loop. The two components of the phonological loop are the phonological store and the articulatory control process. The phonological store holds the information for 1.5-2 seconds. The articulatory control process refreshes the information in the phonological store. It also converts written material into phonological code so that it can be registered by the phonological store
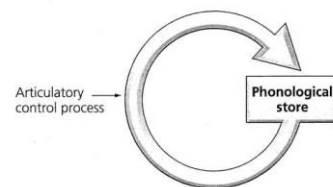
The visuo-spatial sketchpad is responsible for processing visual and spatial information. It can be fed either directly, through perception, or indirectly, through a visual image. The visuo-spatial sketchpad allows people to store images of objects and their locations. The sketchpad is also used in navigation. When a person goes from one location to another, it is the visuo-spatial sketchpad that is stimulated. It is also activated in various activities such as puzzles, mazes, and games. There are two components to the sketchpad. The visual cache stores information pertaining to color and visual form. The inner scribe rehearses information from the visual cache and transfers information from the visual cache to the central executive. The inner scribe also deals with spatial and movement information, and is involved in the planning and execution of body movements.

The central executive incorporates information from the phonological loop, the visuo-spatial sketchpad, the episodic buffer, and from long-term memory. The complexity of the central executive is not yet fully known. Some of the major functions involved with the central executive are the switching of retrieval plans, time sharing in multitasking, selective attention, suppressing irrelevant information, daydreaming, and temporary activation of long-term memory. These are not all of the functions of the

central executive, and it is important to realize that it is not fully clear what the central executive is capable of.

   The episodic buffer was not a part of Baddley's original model. It was added to the model 25 years later. It is seen as a place to temporarily integrate information gathered from the phonological loop, visuo-spatial sketchpad, and long-term memory. The episodic buffer is controlled by the central executive, yet it transfers information into and out of the long term store. The addition of the episodic buffer allowed a clearer connection to be made between working memory and long-term memory.

3.LONG-TERM MEMORY

- William james called it secondry memory
- Long-term memories hold for 30 seconds to periods of time longer long-term memory encompasses everything from what we learned in first grade to our old addresses to what we wore to work yesterday. Long-term memory has an incredibly vast storage capacity, and some memories can last from the time they are created until we die.
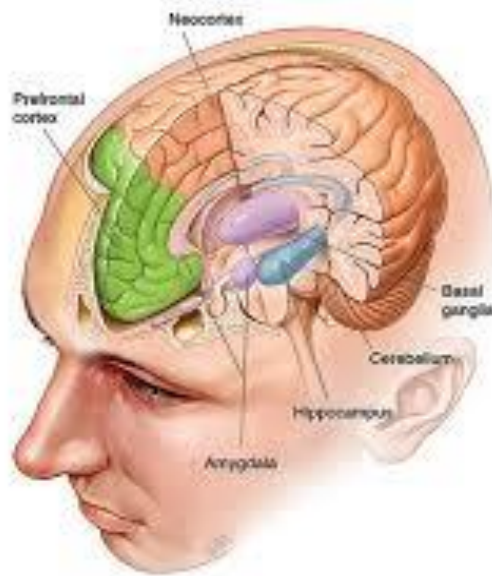

There are many types of long-term memory.

- **Explicit or declarative memory**) requires conscious recall; it consists of information that is consciously stored or retrieved. Explicit memory can be further subdivided into *semantic* **memory** (facts taken out of context, such as "Paris is the capital of France") **and** *episodic* **memory** (personal experiences, such as "When I was in Paris, I saw the *Mona Lisa*").
- **HIPPOCAMPUS,ENTORHINAL CORTEX AND PERIRHINALCORTEX** is the ares essential for learning new information to consolidate that information from STM to LTM.

Procedural/Implicit Memory: propounded by schatchter(19870. These memories are not based on consciously storing and retrieving information, but on implicit learning. Often this type of memory is employed in learning new motor skills. An example of implicit learning is learning to ride a bike: you do not need to consciously remember how to ride a bike, you simply do. This is because of implicit memory. One of related incident related to it is PRIMING-having seen or heard a stimulus once may facilitate our recognizing it oo later occasion even we are not aware that it is happening.

- It is registered in cerebellum
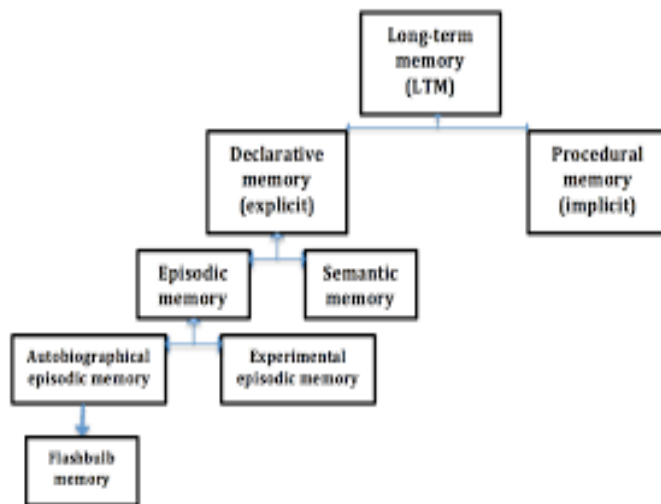
Tulving had proposed two type of declarative memory
Episodic memory
It refer to any events that can be reported from a persons life.
This covers information such as any times, places involved – for example, when you went to the zoo with a friend last week. It is a type of 'declarative' memory, i.e. it can
be *explicitly* inspected and recalled consciously. Episodic memory can be split further
into autobiographical episodic memory (memories of specific episodes of one's life)

and experimental episodic memory (where learning a fact [a semantic memory] has been associated with memory of the specific life episode when it was learned.

- Hippocampus only stores information forshort tme after which memory is consolidated to neocortex

- **Autobiographical memory** refers to memory of personal events. This type of memory is highly valued by patients and caregivers, as it contains knowledge about the self and personal identity and personal experiences.
- Emotions, the "facts" that describe you and make you unique, the facts of your life, and the experiences you have had, are all contained in separate domains, and processed differently.
- Your memory for emotions can help you modify your moods.
- Autobiographical memory contains the information you have about yourself. It includes several domains:self-description (the source of a large part of your sense of identity), containing information such as:

  o whether or not you like ice-cream
  o what your favorite color is
  o what you think about a political party

- emotional memory, which not only contains our memories of emotional experiences, but also helps us control our moods. By dwelling on appropriate memories, we can sustain a mood. By recalling memories that involve a contrasting emotion, we can change a mood.
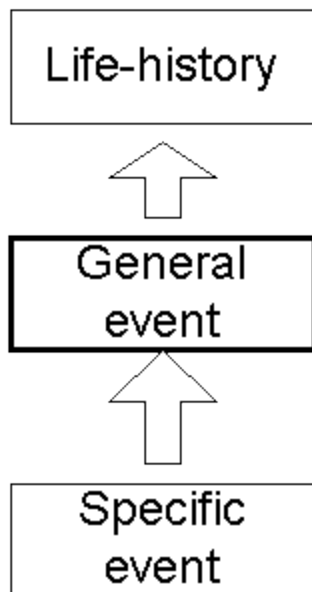- event memory
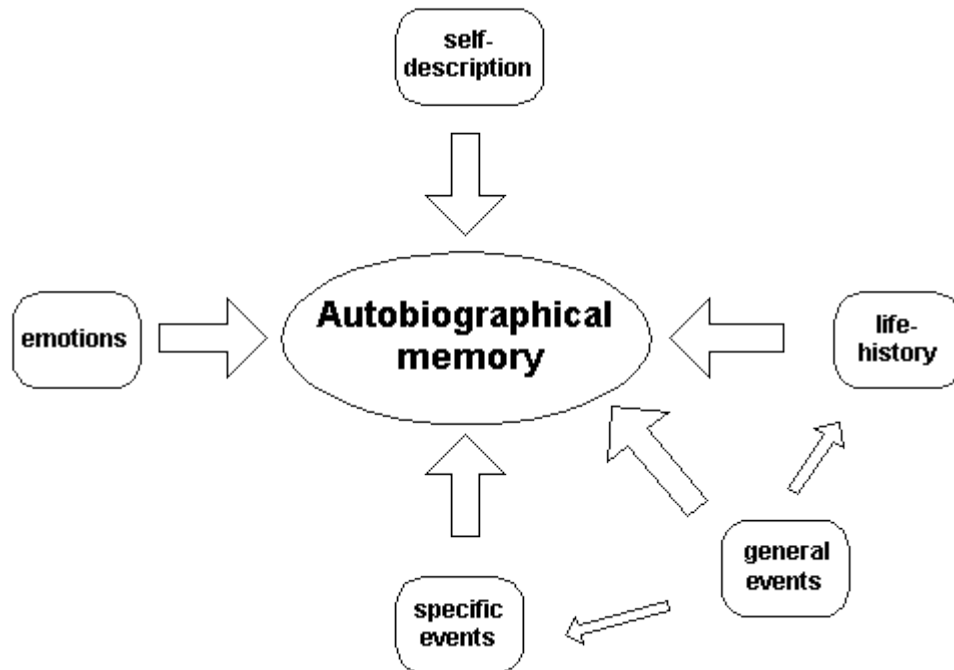
Your memory for events

This is the largest component of autobiographical memory, containing three separate but related domains:

- memory for specific events that have happened to you
- memory for general events, which tells you the broad sequence of actions in events such as going to a restaurant or going to the dentist
- a potted summary of your life, which enables you to answer such questions as, "Where did you go to school?", "Where were you working last year?".

These may be thought of as being connected hierarchically:

Life-history

↑

General event

↑

Specific event

Recalling specific events

Event memory is usually entered via the general-event level, although the information we are searching for is usually at the specific-event level. Thus, if you're trying to retrieve the memory of going to see the movie *Titanic*, you will probably start by accessing the general event "going to the pictures"

Specific events over time become merged into a general event - all the occasions you've been to the dentist, for example, have blurred into a generic "script", which encapsulates the key experiences and actions that are typical of the going-to-the-dentist event. After the specific event has become consolidated into the script, only distinctive events are likely to be specifically remembered. That is, events when something unusual/interesting/humorous happened.

The power of these scripts is such that people often "remember" details of a specific event that never happened, merely because they are typical of the script for that event.

Our memory for events reflects what we *expect* to happen.

It is perhaps because of this that unexpected events and new events (first-time experiences) are better remembered. If you don't have an existing script for the event, or if the event is atypical enough not to easily fit an existing script, then you can't mould the experience to your expectations.

The more distinctive an event - the more the event breaks with your script for that type of event - the better your memory for that particular event will be. (Failures to remember trivial events, such as where you've put something, or whether you've done something, are reflections of the fact that we pay little attention to routine actions that are, as it were, already scripted).

To remember an event therefore, you should look for distinctive details.

Flashbulb memories are more detailed autobiographical memory that are stored permanently in LTM when they are first learned, often because they were of emotional or historical importance in that person's life (e.g. a birth or a death).It is exceptionally vivid (emotionally arousing). It is highly resistat to forget ,possibly due to the strong emotion that are typically associated with them .however number of studies have demonstrated that it is not too correct ,despite apparently being experienced with vividness and confidance.

SEMANTIC MEMORY:

Like episodic , semantic is also atype of declarative memory. However ,the conscious recall here is of fact that have meaning as oppose to the recall of past life events associated with episodic memory. For instance, recalling that you listen to music using your ears does not require knowing when or where you first learned the fact

A memory system that stores abstract knowledge about the world , meaning of words, properties of object, typical event of everyday life.

Temporal lobe may be responsible

- ## RETRIVAL FROM LTM:

Brown1976 states 2 process of retrieval-Recall and Recognition

4 WAYS IN WHICH INFORMATION CAN BE ACCESSED

- **Recall:** This type of memory retrieval involves being able to access the information without being cued. Answering a question on a fill-in-the-blank test is a good example of recall.

    - ✓ Free recall- when no clues are given to assist retrival.
    - ✓ Serial recall-when item are recalled in particular order .2 effect can be seen:
        - o Primacy effect
        - o Recency effect

    - ✓ Cued recall- when some some cue re given

- **Recollection:** This type of memory retrieval involves reconstructing memory, often utilizing logical structures, partial memories, narratives or clues. For example, writing an answer on an essay exam often involves remembering bits of information and then restructuring the remaining information based on these partial memories.
- **Recognition:** This type of memory retrieval involves identifying information after experiencing it again. For example, taking a

multiple-choice quiz requires that you recognize the correct answer out of a group of available answers.

Relearning: This type of memory retrieval involves relearning information that has been previously learned. This often makes it easier to remember and retrieve information in the future and can improve the strength of memories.

Retrieval can be effected by:

When the stored information is bring ot in consciousness is Retrieval.

1 when the material in LTM is not organized

2.Retrieval Cues:these type of cues are present in environment like CONTEXT – DEPENDANT RETRIEVAL CUE –place, smell,sound,picture.

- ✓ STATE- DEPENDANT RETRIEVAL CUE- related to internal state
- • According to ENCODING SPECIFICITY PRINCIPAL of tulving and Thomson 1971 information are better retrieved in that situation in which it had encoded.

The temporary failure to retrieve information from memory is called TIP-OF –TONGUE-PHENOMENON

THANKYOU....