UNIT 5  MEMORY AND FORGETTING

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5.0  OBJECTIVES

After going through this Unit, you should be able to:
● state memory process;
● describe short term memory and differentiate with long term memory;
● list causes of forgetting; and
● illustrate methods of improving memory.

5.1  INTRODUCTION

In the previous unit you have learnt about how we learn. Any learning is effective when we can remember it for a long duration. In this unit you would learn about how we remember things and what makes us, target.

You would realized learning emphasizes that one must also remember the information learned or skill learned. Imagine if you were unable to retain or remember all that you have earlier learned. Even animals have some system by which they remember. Memory plays a very important role in our learning and psychological growth. Through memory of our past experiences, we handle new situation it helps us in our relearning, problem solving and thinking. In clinical work also memory functions are of great importance, which shall be discussed in the later section of the unit.

5.2  MEMORY PROCESS

Memory process can be divided into stages for the purpose of understanding (Fig. 5.1). Memory starts with the sensory input or stimulus from the environments. The input is through sensory channels vision, hearing or touch and is held briefly (seconds) in a sensory register. Information is passed through sensory register to short term memory store where it is held for 20-30 seconds. Some part of the information from STM is further processed as rehearsal buffer,
that is information is repeated, and in some way linked with other information already stored in memory. From the rehearsal buffer processed information is passed on to long term memory store (LTM) where it is organised in categories and stored for years. Information not so processed is forgotten. This process can be compared with your day to day experiences. To learn new technical words, or names, you have to rehearse several times.

Memory is viewed by cognitive theorist as an attempt to isolate some of the processes that act between the input of the stimulus and the response output. Memory is divided into three stages — encoding, storage, and retrieval. Encoding means transforming the sensory input into a form that can be processed by the memory system. The encoded information is transferred to storage. Retrieval involves in locating the memorized information when needed.

This could be compared with your experience of attending as particular class. Your hear lecture and make notes that is you encode the lecture, then the notes are stored in some file using date or topic name. When later this information is required you retrieve by searching that particular file by its topic name.

**Check Your Progress 1**

State process of memory.

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5.3 TYPES OF MEMORY

Recall of information is most often required in daily activities and especially in educational performances. We also recognize the material, or persons or places by acknowledging that. Familiar material can be learned more rapidly than the unfamiliar material. Short term memory and long term memory can be differentiated by their levels of processing. Some detail of these memories are as following:

5.3.1 Short Term Memory

You have just seen that information from sensory register is passed on to short term memory. In this sub-section we shall deal with short term memory in more detail. Information is held, in STM store up to about 30 seconds, but the length can very depending upon many factors. Short term memory has very limited storage capacity, six to seven items can be stored at one time. With new stimulus input, the original items get erased or fade away. The storage capacity can be increased by chunking i.e. combining several items. Unfamiliar items fade out faster than familiar items. Items can be recalled at will while the information is in short term memory store.

Coding for short term memory involves speech sounds, visual images and words. Generally visual stimul is translated into sounds, for example, if a card of unfamiliar letters if flashed for
half a second and after 15 second you are asked to repeat it, chances are that you would reproduce the sound resembling that letter.

Some experiments have also demonstrated that the material presented in the beginning of the text and at the end are recalled relatively well than those appearing in the middle. This is called serial position effect. When recall is better in the beginning of the text which contributes to serial position effect then it is known as primary effect. While if the recall is better of the last part of the text then it is called recency effect.

Rehearsal

Rehearsal means repeating items of information, silently or aloud and it helps to keep these items of information in the centre of attention. Experiments have shown that rehearsal could be maintenance rehearsal wherein information in just repeated as it is. This is not very helpful in remembering for a longer duration. Elaborative rehearsal organizes the material and gives meaning while rehearsing. ‘This is an active process of transferring material from short term memory to long term memory.

The amount of rehearsal given to items is important in the transfer of information from short term to long term memory, the more an item is rehearsed, the more likely it is to become part of long term memory. In elaborative rehearsal, people use strategies that give meaning and organization to the material so that it can be fitted in with existing organized long term memories.

5.3.2 Long Term Memory

Long term memory seems to be very complex as it stores many different aspects of our experiences. The storage capacity has no known limits and one can remember information for days, months, years. It records the salient features of sensory inputs and files these according to various memory categories. It also creates an auditory representation of the input and it also records how to reproduce the information when required.

Long term memory contains two different categories of information:

- **Semantic Memory**
  - Contains meaning of words and concepts, rules of using these in language. Semantic memory is not easily forgotten as the information is stored in highly organized way in logical hierarchies, from general to specific ones. Such organization makes it possible for us to make logical inferences from the information stored in semantic memory.

- **Episodic Memory**
  - Contains personal experiences of long term memories. It is a record of what has happened to us, our remembrances of past things. Episodic memory seems to be organized with respect to when certain events happened in our lives. The episodes do not have to have a logical organization. It is less organized, episodic memory seems more susceptible to being forgotten than does semantic memory.

Long term memory is highly organized. Information is categorized in number of ways. One of the evidence of organization is seen in **tip of the Tongue phenomenon**. You all would have experienced while trying to retrieve a person’s name you cannot quite remember it but the name is at your tongue. If we look at this tip-of-the-tongue (TOT) phenomenon in greater detail, we find evidence for the organization of long-term memory.

In an important experiment, Brown & McNeill (1966) found that the search through the memory store in the TOT state is not random. If the name we are looking for is Shalu, we may come up with Shalini or Shobha, but not Meena. In the experiment, when the subjects were in the TOT state, on hearing the definition but not able to hit the “target” word, they tended to retrieve words from their long term memories that (i) sounded like the target word, (ii) started with the same letter as the target word, (iii) contained the same number of syllables as the target word,
and/or (iv) had a meaning similar to that of the target word. The TOT phenomenon indicates that information is organized in long-term memory.

**Check Your Progress 2**

Describe short term memory and differentiate with long term memory.

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### 5.4 CAUSES OF FORGETTING

Forgetting is failure to retrieve information from long term memory store. Much of the information is lost but enough remains, so that we have sketchy record of our lives. Sometimes what we think is forgotten in real sense is not forgotten because it was never encoded and stored in the first place. Many students complain that they do not remember the contents after attending the class or forget after reading the text. This happens due to lack of attention, some information does not reach short term memory from the sensory register or due to inadequate encoding and rehearsal, the information may not have been transferred from short term to long term memory. Information was not stored in long term memory because rehearsal was not sufficiently elaborate.

Many times we forget as memory does not match events which had occurred. This happens due to the constructive processes i.e. during encoding, the to-be-remembered information, especially if it is a complex life event or something you have read, is modified. Certain details are accentuated, the material may be simplified, or it may be changed in many other ways so that what is encoded and stored is far from a literal copy of the input. Constructive processes of encoding distorts which stored in the memory and distortions are remembered. We remember the gist, or meaning of what we have read or heard, but not the actual words themselves. Inferences constructed at the time the information was encoded for storage is remembered, or portions of encoded informations are remembered.

Besides the faulty memory processes, some of the other common factors of forgetting are as following:

#### 5.4.1 Interference

According to this explanation, what we do in the interval between learning and recall, determines the course of forgetting. Experimental studies have shown that learning new things interferes with memory of what is learned earlier and prior learning interferes with memory of things learned later.

i) **Retroactive Inhibition**

This is a technical name for new learning that may interfere with material previously learned. This has been demonstrated in experiments as following:

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<th>Groups</th>
<th>Activity</th>
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<tbody>
<tr>
<td></td>
<td>I</td>
</tr>
<tr>
<td>Experimental</td>
<td>Learn A</td>
</tr>
<tr>
<td>Control</td>
<td>Learn A</td>
</tr>
</tbody>
</table>

As an example you may learn one chapter of physiology in activity I, then learn one chapter of Anatomy in activity II, then try to recall what you had learned in physiology. The amount of information you forget would be due to interference caused by learning anatomy. Compared to
this, if you learn a chapter from physiology, rest for sometimes, then recall physiology you would find that your recall is better than that of the previous chapter.

ii) **Proactive Inhibition**

When prior learning interferes with the learning and recall of new material, it is called proactive inhibition. To demonstrate this type of interference experiment is designed as following:

<table>
<thead>
<tr>
<th>Groups</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental</td>
<td>Learn A</td>
</tr>
<tr>
<td>Control</td>
<td>Rest or unrelated</td>
</tr>
</tbody>
</table>

Supposing you learn English, then French and recall French, you would find that study of English interferes with your recall of French. Here what you that learned earlier, interferes with the subsequent memory.

Even though lots of experiments have been conducted, yet the process of interference is not very clear, one idea is that the interferences disrupts the various kinds of associations between stimuli and responses formed during. Another idea is that interference has its greatest effect on the memory of retrieval cues. You have seen in the earlier section that memory depends on retrieval cues, so if interference results in problems with the use of these cues, forgetting will result.

In both types of interference it has been found that the effect of interference is less with meaningful material and after attaining some mastery in the subject. In initial period of your course you should try to allot different study times to similar subject.

### 5.4.2 Encoding, Organization and Retrieval Problems

If the stored information is not encoded well or organized at the time it was learned, it is forgotten. **Retrieval cues** are also important in memory, as we may not be able to recall ‘a’ information in one situation but may spontaneously remember in the other situation. Retrieval is facilitated by organisation of the stored material and the presence of retrieval cues that can guide our search through long term memory for stored informations. In absence of proper retrieval cues, the sought for items stored in long-term memory are not be found. Many times you would have experienced that you cannot recall something while actively searching for it, but after giving up that search while doing something else, you recall that object. The new activity in which you engaged, or the new context gives another set of reminders, which helps to retrieve that information. **It is a good idea to give up and do something else in order to generate new retrieval cues.**

### 5.4.3 Motivated Forgetting

Emotional factors also play an important role in forgetting. If we encode information while in one **emotional state** and try to recall it while in another, our recall suffers. Many lapses of memory in daily life illustrate motivated forgetting. We may forget the names of people we do not like. **Repression** theory holds that we forget because the retrieval of memories would be painful or unacceptable in some way to the person. Freud, in his book “The Psychopathology of Everyday Life” had illustrated many examples of repression in forgetting. Repression includes retrieval failure for the associations of the threatening, anxiety-provoking information.

Anxiety or guilt producing material are more often forgotten than pleasant experiences. Supposing in a particular class you were scolded by the teacher, chances of forgetting what happened in that class would be higher. Psychologist, have also found that some persons can not forget unpleasant experiences easily, they have related this phenomenon with personality. Some stored information is so threatening and anxiety arousing that its retrieval is possible only under special circumstances like hypnosis, free associations.

Zeigarnik, a Russian psychologist demonstrated through experiments that **incompleted tasks** are remembered longer than the completed tasks. This is sometimes called “**Zeigarnik effect**”,

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“ego-oriented” persons remember more of completed tasks as incompletely completed tasks generate more anxiety. On the other hand “task-oriented” persons remember more the incomplete tasks, as for them the incomplete task is more painful while completed tasks are not so. All these findings are related to the “tension theory” of Kurt Levin.

5.4.4 Amnesia—Forgetting during Sickness

Amnesia refers to loss of memory due to disease. Amnesia is a general “disease of memory. The person may forget his past experiences or may have impaired ability to encode, store and to retrieve, thus forming of new memory is difficult. Amnesia is a profound memory deficit due to either the loss of what has been stored or to the inability to form new memories. Amnesias are classified as two types:

i) Biological Amnesias

Forgetting could be due to any of the following reasons — diseases of the brain like senile dementia, Korsakoff syndrome, concussion from blows on head, brain damage, brain infections, tumor, stroke, temporary disturbances in the blood supply or effect of high dose of alcohol and drug abuse.

Senile dementia is characterized by deficits in many intellectual abilities like memory, attention, judgement, and abstract thought, that can occur in aged people. Personality changes like excessive dependence and irritability, are common. Delusional thoughts which have no basis in reality and general disorientation not knowing where one is in time or place can also occur. The person has trouble remembering events, that happened after the onset of the disease. Thus the person with this disorder has trouble learning and cannot recall well what happened last month, yesterday, or even a few hours ago. Senile dementia is usually the result of a reduction in blood flow to the brain. Most of the patients with this disorder have brain arteriosclerosis, narrowing of the small arteries of the brain due to fat accumulation in them. Arteriosclerosis deprives brain cells of adequate supplies of oxygen and nutrients so that some cells die and others malfunction.

Transient Global Amnesia are profound memory problem with no loss of consciousness. It comes on suddenly without any obvious cause, and it typically lasts for only a few hours or days before memory becomes normal again. Fortunately, most people who experience such amnesia have it only once. This type of amnesia is called global because much of what has already been stored in memory is forgotten and because even though the person is conscious and can go about the routine business of daily life, no new memories are formed while the attack is in progress.

Alcohol and drug abuse also cause amnesia, a person may have amnesia for the events occurring while under the influence of alcohol because encoding and storage processes have been disrupted by the effects of the alcohol on the brain. Heavy drinking over a period of years however, can result through vitamin-B deficits and other chemical imbalances, in irreversible brain damage and a pattern of symptoms known as the Korsakoff syndrome. Anterograde amnesia the inability to form new memories is one of the prominent symptoms of this syndrome.

ii) Psychological Amnesias

These types of amnesias occur due to psychiatric diseases where the person his identity also. These may not be permanent loss.

Childhood amnesia is due to the differences in the ways young children and older people encode and store information. As adults, much of our memory is encoded verbally and tied into networks, or schemata, that are based on language. But the young child without language encodes memories in a non-verbal form, perhaps storing information as images or feelings. Early childhood memories are thus said to be stored in forms no longer available to us as verbal adults, our language dominated memories, do not have retrieval cues appropriate for gaining access to the image and feeling memories of early childhood. Perhaps the memory machine is just not able to store long term memories until its maturation is essentially finished. Language ability and memory develop together because both depend on brain maturation.

You all experience that dreams are forgotten on waking up. Dream amnesia may actually have a biological basis. The dreaming brain seems to be in a special state different from that of the waking brain.
People with **defensive amnesia** may forget their names, where they have come from who their spouses are, and many other important details of their past lives. It is called defensive because this type of amnesia is usually considered to be a way of protecting oneself from the guilt or anxiety that can result from intense, intolerable life situations and conflicts. Defensive amnesia is thus an extreme of repression.

**Normal aging** has its problems too, but the typical forgetfulness of old age is hardly severe enough to be called amnesia. In normal aging, the memory problem, centers largely on the storage of relatively recent events; it is anterograde in nature. But, in marked contrast to senile demantias patients, normal old people are able to compensate for their mile memory problems. They try to do less and thus put a smaller burden on their information-processing systems, they provide themselves with reminder cues, perhaps by writing down what is to be remembered, and they organize their lives into routines so that fewer new things need to be remembered. In other words, normal old people adopt adaptive memory strategies.

**Check Your Progress 3**

List causes of forgetting.

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### 5.5 METHODS TO IMPROVE MEMORY

**Mnemonics**

With training, practice and motivation memory can be improved. There are variety of mnemonics or memory tricks to remember things better. People with super memories sometimes use mnemonics, and we can also learn to do so. One of it is to associate link whatever you want to recall with something already established in your memory bank e.g. colours of rainbow are associated with name “Roy G. BIV” i.e. Red, Orange, Yellow, Green, Blue, Indigo and Violet.

**Method of Loci**

The Method of Loci says that you visualize a scene and fit the items to be remembered in that scene. The scene can be a street, a building with rooms, the layout of a college campus, a kitchen, or just about anything that can be visualized clearly and contains a number of discrete items in specific locations to serve as memory pegs. Supposing you want to remember for examination classical conditioning, which you have read in the previous unit. Then start by imagining a dog, experimental room, food, bell and any person as an experimenter. Rehearse this image over and over until it is well established in your mind. After you have formed your image, associate the events like stimulus substitution, extinction with this. The trick is to make associations with as many concepts as needed.

**Rhyming**

Like the method of loci, number and letterpeg systems is to establish, main idea in your long term memory, a well organized set of images to which the to-be-remembered items can be linked. In number systems, you form an image with each number. For instance a rhyming system can be used for the numbers I through 10. For letter systems you can establish mnemonic pegs by forming strong distinctive images of words that start with the sounds of the letter of the alphabet.

**Make a Story**

You can make a story and in that you can fit the facts, like you read in elaborative rehearsal. The important thing for good memory is your motivation and ability to organize the material. One strategy in remembering things well is to organize, or arrange, the input so that it fits into
existing long term memory categories, is grouped in some logical manner, or is arranged in some other way that makes sense. The organizational encoding may be inherent in the input itself or it may be supplied by individuals as they learn and remember new things.

**Chunking**

This mnemonic technique illustrates systematic ways of encoding information. If you want to remember a long list of digits, e.g. 19891609065 you can break the numbers into chunks, the first four digits could remembered as the year you passed your school or associate with any significant thing that happened in that year. Next four digits could also be taken as date e.g. for some one’s birthday. The next 3 digits are the last digits of IGNOU address codes. Like this chunks can be associated with some important thing for lasting memory.

Here are some tips to help you to improve your memory:

1. **Plan your study content** and make a **time schedule** to cover that content. Stick to this schedule firmly.

2. As you have seen rehearsal is important to transfer information into long term memory and **elaborative rehearsal** is more effective than **maintenance rehearsal**. So make notes of important points as all the details of information cannot be remembered. Revise these notes. You can use imagery to visualize the material you are learning and give auditory stimulation by **reading aloud**. For example while studying nervous system, visualize the structure of nervous system with minutes details and also read loudly. **Multi channel stimulation** would improve your memory.

3. Try to **organize** your material with **retrieval cues** or reminders make a map of contents in your mind.

4. Give a **feedback** to yourself by testing your memory. Revise areas where you could not remember.

5. **Review** before examination. Try to overlearn but do not ‘get anxious as you have seen high anxiety level would interfere with your remembering.

6. Give some **short rest pauses** between your study time. It would help to consolidate the material you are learning.

**Check Your Progress 4**

Illustrate methods of improving memory.

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5.6 **LET US SUM UP**

Memory as ability to remember is a very important process for our learning. The memory process is divided into three main stages encoding, storage and retrieval. There are two types of memory — short term memory, wherein information is stored for maximum 30 seconds and has limited capacity. In long term memory store, information is organized in semantic memory or in episodic memory. There are four main causes of forgetting: (i) interference due to similar material (ii) faulty encoding storage and retrieval. If the sensory registration or input of inform is faulty then memory will not be established. Similarly each of these stages are important for good memory. (iii) motivated forgetting and (iv) amnesias which could be due to diseases of the brain or psychological. Memory could be improved with good planning, organisation, review and feedback.
5.7 **KEY WORDS**

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Amnesia</td>
<td>Any loss of memory</td>
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<tr>
<td>Anterograde amnesia</td>
<td>The inability to encode and store new information in memory</td>
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<tr>
<td>Attention</td>
<td>Processes that select certain inputs for inclusion in the focus of experience</td>
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<tr>
<td>Chunking</td>
<td>An encoding process in which items of information regrouped together in short term memory increases the capacity of short term memory</td>
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<tr>
<td>Concept</td>
<td>A symbolic construction that represents some common and general feature or features of objects or events</td>
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<tr>
<td>Defence mechanism</td>
<td>Unconscious strategies used to avoid anxiety</td>
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<tr>
<td>Defensive amnesia</td>
<td>Forgetting which protects oneself from the guilt and anxiety</td>
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<tr>
<td>Elaborative rehearsal</td>
<td>Process of giving material organisation and meaning as it is being rehearsed; an active rehearsal process</td>
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<tr>
<td>Episodic memory</td>
<td>Reminiscences memory of specific things that happened to a person</td>
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<tr>
<td>Forgetting</td>
<td>Apparent loss of information that has been stored in long term memory</td>
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<tr>
<td>Images</td>
<td>Partial or altered representations of sensory experience</td>
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<tr>
<td>Long term memory</td>
<td>The relatively permanent memory store of information which is categorized in various ways and can be drawn upon as needed</td>
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<tr>
<td>Mnemonics</td>
<td>(pronounced “nemoniks”) Techniques for improving memory</td>
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<tr>
<td>Projection</td>
<td>A defence mechanism in which conflict is dealt with by ascribing one’s own anxiety provoking motives to someone else, blaming others</td>
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<tr>
<td>Recall</td>
<td>A way of measuring retention</td>
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<tr>
<td>Recognition</td>
<td>A method of measuring retention whereby a person is required to identify a correct response</td>
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<tr>
<td>Rehearsal Buffer</td>
<td>Information that is undergoing rehearsal and consequently being continuously referred and restored in short term memory. The process facilitates the short term recall of information and its transfer to long term memory</td>
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<tr>
<td>Repression</td>
<td>An unconscious process characterised by the selective forgetting of the material that is anxiety provoking or threatening.</td>
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<tr>
<td>Retrieval</td>
<td>The process of withdrawing information for long term or the short term memory</td>
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<tr>
<td>Retroactive inhibition</td>
<td>The interfering effect that new learning may have on something already learnt</td>
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<tr>
<td>Semantic</td>
<td>Aspect of language related to meaning</td>
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<tr>
<td>Sensory register</td>
<td>The storage of information for a brief time in a sensory channel</td>
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5.8 ANSWERS TO CHECK YOUR PROGRESS

Check Your Progress 1
Refer to Section 5.2.

Check Your Progress 2
Read carefully Section 5.3.

Check Your Progress 3
Refer to Section 5.4.

Check Your Progress 4
Refer to Section 5.5.