Chapter 8: Memory
A. A Simple Model of Human Memory
   1. Sensations come in the sensory memory
   2. If information is attended to it goes to short term memory, and if it is rehearsed, it goes into long term memory

I. Overview of Memory
A. This chapter deals with memory (obviously) which is the cognitive process of encoding, storing, and retrieving information
B. Encoding-active process of putting stimulus information into a form that can be used by our memory system
C. Storage-process of maintaining information in memory
D. Retrieval-includes the active processes of locating and using information stored in memory
E. Sensory memory-memory in which representations of the physical features of a stimulus are stored for a very brief time
F. Short-term memory-an immediate memory for stimuli have just been perceived
G. One could rehearse short term memory until it was part of long-term memory in which information is represented on a permanent or near permanent basis
   1. Long term memory has no limits unlike short term memory

II. Sensory Memory
A. Information we have just perceived remains in sensory memory just long enough to be transferred to short-term memory. The capacity for sensory memory is very large
B. Iconic Memory-a form of sensory memory that briefly holds a visual representation of a scene that has just been perceived; also known as visible persistence
   1. Sperling did an experiment in which he flashed letters upon a screen for very short periods of time and had subjects repeat the letters
   2. However most of the subjects said they had the impression that knew all the letters and then it faded away
   From his experiments he concluded that the image of the visual stimulus fades quickly from iconic memory.
C. Echoic Memory-a form of sensory memory for sounds that have just been perceived
   1. Sound is made up of individual noises
   2. When we hear a word, we need to listen to all of the sounds before we can understand it. Echoic memory stores
      the auditory information until we can put the sounds together to identify it as a word. At this point, the word
      enters a short term memory
   3. Echoic memory holds a representation of the initial sounds until the entire word has been heard

III. Short Term or Working Memory
A. Encoding of Information in the Short Term: Interaction with Long-Term Memory
   1. Short term memory is more than a simple way station between perception and long–term memory. Information
      can enter short term memory from two directions: sensory or long-term memory
   2. Take the example in which we multiply 7 by 19. When we are asked to do this the information enters our short
      term memory but we retrieve other information like how to multiply from our long term memory
   3. The fact that short term memory can store new information and retrieve old information has led many cognitive
      psychologists to term short term memory as working memory
      a. Working memory involves storage, retrieval, and rehearsal mechanism
      b. Referred to the “workbench of consciousness”
   4. Elaborative rehearsal-information is given meaning and related it to other information in long term memory.
      This represents the transition of short term to long term memory
B. Primacy and Recency Effects
   1. Primacy effect-the tendency to remember initial information
   2. Recency effect-the tendency to recall later information
   3. The reason the primacy effect occurs is because words in the beginning of the list have a tendency to rehearsed
      more than words in other parts of the list
   4. The reason the recency effect occurs is because the words at the end of the list are still available in the short
      term memory
C. The Limits of Working Memory
1. According to an experiment conducted by John Brown and Lloyd and Margaret Peterson, stimuli remain in working memory for less than 20 seconds unless they are rehearsed.
2. When an unexpected disruptor is initiated, short term memory decreases to about 2 seconds.
3. We can only remember up to about 7 pieces of information in our short term memory; then how is it that we can carry on tasks that require more use of short term memory?
   a. **Chunking** - a process by which information is simplified by rules, which make it easily remembered once the rules are learned.
   b. Using the chunking technique, we are actually able to memorize 7 chunks of information.

**D. Varieties of Working Memory**
1. Short term memory can use a variety of sensory information: visual, auditory, somatosensory, gustatory, and olfactory.
2. **Phonological Working Memory** - short-term memory for verbal information
   a. Much of the information that we receive is encoded verbally.
   b. Evidence suggests that short term storage of words occurs in the **phonological short term memory**.
   c. **Subvocal Articulation** - an unvoiced speech utterance.
   d. **Conduction aphasia** - a disorder caused by damage to the left parietal lobe. People with this disorder can talk and can comprehend what other are saying, but they are very poor at repeating precisely what they hear. When they attempt to repeat words that other people say, they often get the meaning correct but use different words. It is caused by damage to Broca’s area (production of speech) or Wernicke’s area (understanding speech) in the brain.
3. **Visual Working Memory**
   a. Contains visual information obtained from the immediate environment by means of the sense organs or retrieved from long-term memory.
   b. We are able to imagine visual scenes in our head (like when we read).

**E. Loss of Information from Short-Term Memory**
1. Rehearsal activity of phonological short term memory prevents decay.

**IV. Learning and Encoding in Long-Term Memory**

**A. The Consolidation Hypothesis**
1. **Consolidation** - process by which information in short term memory is transferred to long term memory.
   a. There is a structural change within the brain that causes long term memory to be kept.
   b. If you injure your brain, you have trouble remembering memories.
   c. **Anterograde amnesia** - inability to make new memories.
   d. **Retrograde amnesia** - inability to remember memories (relatively recent information is forgotten).
2. **Levels of Processing Approach**
   a. **Maintenance Rehearsal** - rote memorization of information; repeating a given item over and over again.
      i. **Shallow Processing** - analysis of the superficial characteristics of a stimulus such as size or shape. It involves the surface characteristics of stimuli.
      ii. Maintenance rehearsal is not an efficient method of keeping something in long term memory.
   b. **Elaborative Rehearsal** - processing information on the meaningful level, such as forming associations, attending to the meaning of the material, thinking about it, and so on.
      i. **Deep Processing** - analysis of complex characteristics of a stimulus, such as its meaning or its relation to other stimuli.
      ii. Deep processing generally leads to better retention than surface processing does.
3. **Knowledge, Encoding, and Learning**
   a. Encoding deals with getting material into our memory. By encoding properly we are less likely to forget the material that we want to remember.
   b. **Effortful processing** - practicing or rehearsing information through either deep or shallow processing.
   c. **Automatic processing** - forming memories of events or experiences with little or no effort.
   d. **Encoding specificity** - the principle that how we encode information determines our ability to retrieve it later.

**B. Improving Long-Term Memory through Mnemonics**
1. **Mnemonic systems** - a special technique or strategy consciously used in an attempt to improve memory.
a. Mnemonic systems make information more elaborate. The additional information makes the material easier to recall

2. **Method of Loci** - a mnemonic system in which items to be remembered are mentally associated with specific physical locations or landmarks
   a. By associating items in specific locations one is better able to recall the information (figure 8.7)

3. **Peg–word method** - a mnemonic system in which items to be remembered are associated with a set of mental pegs already in memory
   a. Using rhymes to memorize is an example of the peg-word method

4. Narrative Stories and Songs
   a. Another useful method of memorization is to place information in a narrative or items linked together in a story
   b. By putting information in song, it will also help us with memorization. This is why companies place their slogans in song to help us remember

V. **Organization of Long Term Memory**

A. Episodic and Semantic Memory
   1. **Episodic Memory** - record of our life experiences
      a. Tied to particular contexts
   2. **Semantic Memory** - conceptual information, data facts, and other information to include vocabulary

B. Explicit and Implicit Memory
   1. **Explicit memory** - memories that can be described verbally, and of which we are consciously aware (these include facts and knowledge like the name of the states in the United States)
   2. **Implicit memory** - consist of memories that cannot be described verbally; and are not available to consciousness (these include skills or habits like riding a bike)

C. Biological Basis of Long Term Memory
   1. Story of H.M.
      a. A guy had to have surgery which causes mild retrograde amnesia and severe anterograde amnesia
         i. He would not be able to remember things that happened to him very recently (within minutes)
         ii. The reason that this occurs is that the process of consolidation has been disturbed
         iii. The hippocampus is an integral part in consolidation in the temporal lobe
   2. The Roles of the Hippocampus and Basal Ganglia
      a. The hippocampus receives information from all association areas of the cerebral cortex and sends information back to them
      b. Most psychologists agree that the hippocampus plays an important role in the consolidation of memories. However once consolidation is complete, the hippocampus is no longer needed
      c. The basal ganglia consolidate nondeclarative (implicit) memories

VI. **Remembering, Recollecting, and Forgetting**

A. How Long does Memory Last?
   1. The rate of forgetting information is greatest in the first few years after it is learned and decreases slowly afterwards
   2. Remembering and Recollecting
      a. **The tip-of-the-tongue phenomenon** - an occasional problem with retrieval of information that we are sure we know but cannot immediately remember
      b. **Retrieval cues** - contextual variable, including physical or verbal stimuli, that improve the ability to recall information from memory

VII. **Forgetting and Inference**

A. The reason that many people may forget something they knew so well is because it was too long may due to the fact of interference meaning that some memories will interfere with the retrieval of others
   1. **Retroactive interference** - occurs when recently learned information disrupts the ability to remember older information
   2. **Proactive Interference** - occurs when previously learned information disrupts the ability to remember newer information
a. Understanding Apple products interfered with learning Windows

B. Reconstruction: Remembering as a Creative Process

1. The Role of Schemas
   a. **Schema** - a mental framework or body of knowledge that organizes and synthesizes information about a person, place, or thing
   b. One example of this is when a person is told a story and later on required to repeat the story, the person will “remember” it differently and tell it in a little more coherent and sensible fashion

2. Eyewitness Testimony
   a. In court, the way that a lawyer might phrase a certain question may lead to others reconstructing a situation slightly differently in their head. For example, if a lawyer asks if two cars smashed into each other the witness would think that the car had gone faster than it actually was in the situation
   b. Our brain organizes and integrates information on what we already known and when we recall the memory later, it may not be the same as the original

3. Flashbulb Memories
   a. Some memories are so traumatic and emotional that people know exactly how the original event played out. These memories are known as **flashbulb memories**