7. Human Memory
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I. Encoding: Getting Information Into Memory
  A. The Role of Attention
  - attention is defined as "focusing awareness on a narrowed range of stimuli or events."
  - this permits the individual to only manage a small range of data which he/she may encode in memory
  - regarding whether other information is immediately discarded or processed and then done away with, both
    appear to occur as one would notice his/her name in a nearby conversation even without paying attention to
    it; other research shows that in other cases, information is screened out before processing
  B. Levels of Processing
  - researchers have proposed multiple levels of processing which account for increasingly stronger memory codes
  - structural encoding is "relatively shallow" and concentrates on the physical structure of the stimuli
  - phonemic encoding focuses on the sound of the stimuli and is a deeper level of processing
  - semantic encoding is the strongest and longest-lasting memory code and is formed by analysis of the meaning
    of a stimuli
  - research also shows that depth of processing does not correlate with longer time taken to encode
  C. Enriching Encoding
    1. Elaboration
    - defined as "linking a stimulus to other information at the time of encoding"
    - studies have proved that this enhances one's ability to remember significantly
    2. Visual Imagery
    - defined as "the creation of visual images to represent the words to be remembered"
    - research has also proved that words with easy correlating images are easier to remember due to imagery
    - the dual coding theory "holds that memory is enhanced by forming semantic and visual codes since either
      can lead to recall"
    3. Self-Referent Encoding
    - defined as "deciding how or whether information is personally relevant"
    - studies have proved its effectiveness by comparing ability to recall words that easily relate to people and to
      those which do not
II. Storage: Maintaining Information in Memory
  A. Sensory Memory
  - defined as information preserved in its original sensory form for a brief time, usually a fraction of a second
  - while visual sensory memory only lasts for about 1/4 seconds, auditory memory tends to be better
  B. Short-Term Memory (STM)
  - defined as "a limited-capacity store that can maintain unrehearsed information for up to about 20 seconds"
  - this time period can be extended by rehearsal - "the process of repetitively verbalizing or thinking about the
    information."
  - incorrect recollections are likely to sound similarly to the original stimuli, but are rarely confused for
    appearance (ex: P can be confused for E but not R)
  - STM durability is about 20 seconds; capacity is 7 plus or minus 2 pieces of information; this can be improved
    by chunking - "a chunk is a group of familiar stimuli stored as a single unit" (ex: grouping F,B, and I to FBI)
  - the newer "Working Memory" theory proposes multiple aspects to STM: (1) the rehearsal loop - essentially
    the previous model of STM, (2) a visuospatial sketchpad - "permits people to temporarily hold and manipulate
    visual images", (3) an executive control system - "handles the limited amount of information that people can
    juggle at one time as they engage in reasoning and decision making."; this model accounts for evidence that
    the STM handle's a greater variety of functions and depends on more complex processes
  C. Long-Term Memory (LTM)
  - defined as "an unlimited capacity store that can hold information over lengthy periods of time"
  - researchers have not yet managed to confirm whether long term memories are permanent; some claim that
    EEG of the temporal lobe and hypnosis can recover forgotten memories, but others argue that these are not
    memories but dreams or hallucinations
  - information is transferred to LTM by repetition; the serial position effect "occurs when subjects show better
    recall for items at the beginning and end of a list than for items in the middle."; the primacy effect (greater
    ability to recall the beginning) is due to greater repetition; the recency effect (greater ability to recall the end of
    a list) is due to the recency of the stimuli and the data is readily infallible in the STM
    1. Organization in LTM
    - Clustering and Conceptual Hierarchies: clustering is "the tendency to remember similar or related items in a

group"; a conceptual hierarchy is "a multilevel classification system based on common properties among items."

- Semantic Networks: "a semantic network consists of nodes representing concepts, joined together by pathways that link related concepts"; this helps to prove why thinking of a word makes closely related words easier to remember; referred to as spreading activation - as one recalls a word, related words are also recalled
- Schemas and Scripts: defined as "an organized cluster of knowledge about a particular object or event abstracted from previous experience with the object or event."; a schema "organizes what people know about common activities"; this explains why subjects of an experiment would mistakenly recall seeing an object in a room which did not exist as their schema dictates that such a room normally possesses the feature

III. Retrieval: Getting Information Out of Memory

A. Using Cues to Aid Retrieval
- retrieval cues appear to aid retrieval by narrowing the search, or they may trigger a series of associations that lead to the missing word

B. Reinstating the Context of an Event
- recalling the setting or context in which an event took place often will assist an individual to recall the event

C. Associating Mood and Retrieval
- individuals at times will recall information more effectively when in the same mood as the individual was in at the time of encoding; this tends to work with memories of internal mental processes rather than external events; a newer theory is the mood congruence effect which "occurs when memory is better for information that is consistent with one's ongoing mood" (ex: an individual will recall pleasant memories in a happy mood)

D. Reconstructing Memories
- people tend to reconstruct memories to fit their predetermined schema of the event;
- studies on the "misinformation effect" has shown that reconstructive distortions show up frequently in testimonies; the effect requires somewhat misleading information

E. Source Monitoring
- a source monitoring error is defined as attributing a memory derived from one source to another
- cryptomnesia describes accidental plagiarisms in which a person attributes an idea to him/herself inappropriately
- reality monitoring is a type of source monitoring in which an individual must reason as to whether an event truly occurred or was merely contemplated by the subject

IV. Forgetting: When Memory Lapses

A. How Quickly We Forget: Ebbinghaus's Forgetting Curve
- Herman Ebbinghaus studied his own abilities to remember to develop a forgetting curve that shows that most forgetting occurs within the early hours after learning

B. Measures of Forgetting
- three methods are used to measure retention (and thereby forgetting as well): (1) recall - requires subjects to reproduce information on their own without cues, (2) recognition - requires subjects to select previously learned information from an array of options, and (3) a relearning measure - requires subjects to memorize information a second time to determine how much time or effort is saved by having learned it before

C. Why We Forget

1. Ineffective Encoding
- also known as pseudo forgetting because the subject has never actually learned the fact initially
- the subject has likely encoded the information phonemically or structurally which allows for easy forgetting

2. Decay
- "Decay theory proposes that forgetting occurs because memory traces fade with time."
- it is already known that decay applies to sensory and short term memory, but this is unclear with LTM
- decay theory does not apply well however because the principle cause of forgetting is not time but rather the amount , complexity, and type of information that subjects have had to assimilate during the retention interval

3. Interference
- "Interference theory proposes that people forget information because of competition from other material"
- "Retroactive interference occurs when new information impairs the retention of previously learned information"
- "Proactive interference occurs when previously learned information interferes with the retention of new information"

4. Retrieval Failure

- individuals will often remember information that was out of reach earlier; this is likely due to ineffective cues; an effective cue emphasizes the same aspect of the information as was used in coding it to memory
- "The encoding specificity principle states that the value of a retrieval cue depends on how well it corresponds to the memory code."
- "Transfer-appropriate processing occurs when the initial processing information is similar to the type of processing required by the subsequent measure of retention
5. Motivated Forgetting
- Freud described a weakly proved phenomenon he termed as repression - "keeping distressing thoughts and feelings buried in the unconscious"
  D. Repressed Memories Controversy
V. In Search of the Memory trace: The Physiology of Memory
  A. The Biochemistry of Memory
  - some research shows that alterations in synaptic transmission at specific sites record memories
  - studies of sea slugs show that specific forms of learning result in an increase or decrease in the release of neurotransmitters
  - administering certain hormones at certain quantities after learning can affect retention both positively and negatively
  - interference with protein synthesis in rats has severely damaged their LTM
  - Alzheimer's disease appears to be partly a result of inadequate synthesis of acetylcholine
  B. The Neural Circuitry of Memory#
  - recent studies suggest that it may be possible to find pathways for a specific memory
  C. The Anatomy of Memory
  - cases of severe memory loss provide clues about the physiological bases of memory
  - the two types of amnesia are retrograde ("a person loses memories for events that occurred prior to the onset") and anterograde ("a person loses memories for events that occur after the onset")
  - a specific case of memory loss is that of H.M. who lost his hippocampus during surgery for severe epileptic seizures; in his case, he recalls only the most recent 20 seconds in short term memory and anything he learned until 1953; this does not attribute memory to only the hippocampus but does credit it with the consolidation (gradual conversion of the information to durable memory) of memories
  - modern understanding is that memories are likely consolidated in the subcortical structures in the limbic system but stored in various areas of the cortex
VI. Are There Multiple Memory Systems?
  A. Implicit Versus Explicit Memory
  - although victims of amnesia cannot consciously recall information that was recently learned, they do appear to have encoded the information as they are able to extract the data indirectly while not remembering even being presented the original information
  - this is explained by dividing memory into implicit memory (retention is exhibited on a task that does not require intentional remembering) and explicit memory (involves intentional recollection of previous experiences)
  B. Declarative Versus Procedural Memory
  - many theorists have suggested that multiple memory systems may exist
  - the first division for this is the declarative memory system (which handles factual information) and the procedural memory system (which handles memory for actions, skills, and operations)
  - this theory is supported by cases of amnesia in which patients lose the ability to recollect and create data memories, but can easily recall and learn procedural tasks
  C. Semantic Versus Episodic Memory
  - another division in memory has also been hypothesized which splits declarative memory into episodic memory (consisting of chronological recollections of personal experiences) and semantic memory (made up of facts unrelated to the time of encoding)
  D. Prospective Versus Retrospective Memory
  - prospective memory regards actions which one will perform in the future
  - retrospective memory handles recollections of past actions taken by the individual
  - habitual tasks and event based tasks are easier to remember as one has been repeated enough to remain in memory and the other possesses a cue for remembering
VII. Putting It in Perspective#