Lecture 19:
Memory Processes

III. COMMITTING INFO INTO LTS
    A. Encoding

- The metaphors all speak to three fundamental aspects of memory:
  - **Encoding** (getting information into the memory system)
  - **Storage** (getting information permanently filed in the system)
  - **Retrieval** (getting information out of the system).
- We shall review factors and processes associated with each aspect.
  - We will also consider effective teaching strategies associated with each aspect.

III. COMMITTING INFO INTO LTS
    A. Encoding & Chunking

- Short term memory factors affect whether information is **encoded** (translated into meaningful material to remember)
  - One factor affecting encoding is the capacity of STM or memory span. Short term memory span is limited for most people to about to 7 pieces of information
    - RSSUASUAWTMBI = 12 chunks
  - But how you organize the information matters in defining a piece of information.
  - Information can be group or **chunked** to reduce memory demands
    - IBM TWA USA USSR = 4 chunks

III. COMMITTING INFO INTO LTS
    A. Encoding & Chunking

- How information is encoded depends on a variety of things. Among these factors is the background and knowledge of the person encoding the information.
  - Knowledge and experience is very important in how information is *chunked* or grouped
    - Experts novices in chess are equally good in remembering randomly placed chess pieces on a chess board.
    - But experts performed better than novices in remembering real chess game arrangements

III. COMMITTING INFO INTO LTS
   B. Rehearsal

- Rehearsing information in STS is important for storing information in LTS.
- Two types of rehearsal strategies to remember. How can you remember the name Arnold Brown
  - **Maintenance Rehearsal**: Mental repetition that holds information in STS
    - Maintenance Rehearsal: Arnold Brown, Arnold Brown
  - **Elaboration Rehearsal**: Alters or adds new information or connections to information in STS.
    - Elaboration : Arnold Brown, AB the first two letters of the alphabet. (Better for memory).
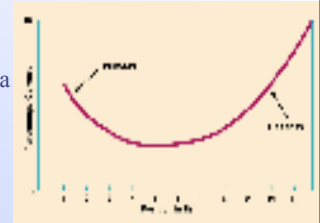
III. COMMITTING INFO INTO LTS
   B. Rehearsal

- Rehearsal is particularly important when learning serially presented information
  - Long sequences of unrelated items (letters) produce memory results which look like this:

Primacy & recency effects means that first (primacy) and last (recency) items in a list are better remembered

The first and last items get better rehearsed than the other items.

III. COMMITTING INFO INTO LTS
   B. Rehearsal

- Depth of Processing
  - Committing information to LTS depends on what you do with the information.
  - Limited or superficial processing of information produces poorer memory than more complete or deeper processing.
    - Superficial processing -- an objects' name or perceptual characteristics.
    - Deep processing -- an object's conceptual characteristics
- **Elaborate encoding and elaboration serves to improve memory.**

III. COMMITTING INFO INTO LTS
   C. Mnemonics

- **Mnemonics**: Strategies and tricks for improving memory such as the use of a verse or a formula.
- EVERY GOOD BOY DOES FINE: Notes on the line of the treble clef.
- ROY G. BIV: Colors of the spectrum (Red, Orange, Yellow, Green, Blue, Indigo, and Violet.
- MY VERY EDUCATED MOTHER JUST SERVED US NINE PIZZA: Planets of the solar system in order.

IV. CODES FOR STORING INFO IN LTS
A. Codes

- Files on a hard drive have different formats.
  - Some contain movies (.mpeg; .qtm)
  - Some contain text (.doc, .txt., .wpd)
  - Some contain pictures (.jpg)
  - Some contain instructions (.exe)
- Just as your hard disk contains files of different formats, so can your brain.
- Four formats we will consider
  - Episodic (time-based)
  - Semantic (symbol-based)
  - Images (picture-based)
  - Procedural (action-based)

IV. CODES FOR STORING INFO IN LTS
A. Codes

- **1. Episodic Memory**: Memory for personally experienced events, and the order of their experience.
- Two types of episodic memories: **Scripts** and **Autobiographical Memory**.
  - **1.i Scripts** code memories for specific sequences in particular contexts, like going to a restaurant.
  - Scripts serve to organize information and set up expectations.
    - Go to fast food Restaurant ➔ Pay before you eat
    - Go to nice restaurant ➔ Eat before you pay.
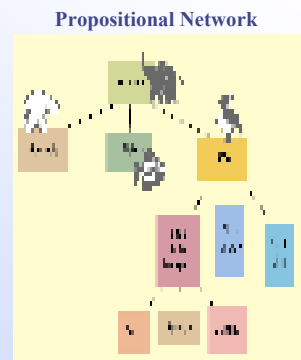
IV. CODES FOR STORING INFO IN LTS
A. Codes

- **1.ii Autobiographical Memory**: Memory for personal information.
  - More general than scripts because such memories are about the self in a variety of different contexts or scenes.
  - Updated and reorganized with new information.
    - New experiences may change a lot about your autobiographical memory.
  - Memory for date when songs were released.
    - To figure it out, you tend to try to remember what you were doing when you hear the song.
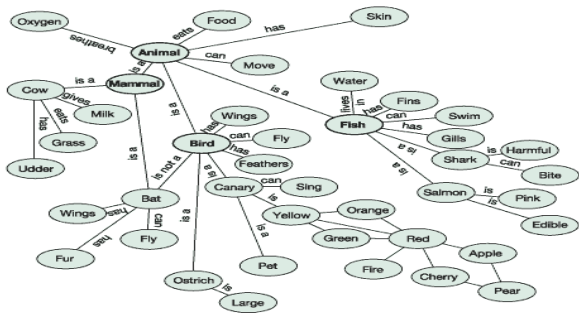
IV. CODES FOR STORING INFO IN LTS
A. Codes

- **2. Semantic Memory**
- Memory for words, symbols, concepts and facts which are often organized as hierarchical propositional networks.
- Judging that birds are animals is faster than judging that robins are animals. See distance traveled for each judgments on the propositional network.

Propositional Network

IV. CODES FOR STORING INFO IN LTS
A. Codes

- A fairly typical semantic network

IV. CODES FOR STORING INFO IN LTS
A. Codes

- **3. Procedural Memory:** Memory for actions like riding bicycles.
  - Procedural memory is usally implicit –no awareness of learning.
  - HM without a hippocampus canlearn procedures.
  - Cerebellum is implicated.
- **4. Imagery:** Memory for mental pictures that resemble physical reality.
 - Image of objects better remembered than just the word.

IV. CODES FOR STORING INFO IN LTS
A. Categorizing Codes

- These storage formats can be categorized as Declarative or Procedural memory and involving Implicit or Explicit memory processes.
  - **Declarative vs. Procedural:** Declarative memory is memory for rules, semantics and events whereas procedural memory is memory for actions and action-condition (S=>R) relations.
  - **Explicit vs. Implicit:** Explicit memory involves largely conscious and effortful recollection processes whereas implicit memory involves unconscious and automatic recollection processes.

IV. CODES FOR STORING INFO IN LTS
A. Categorizing Codes
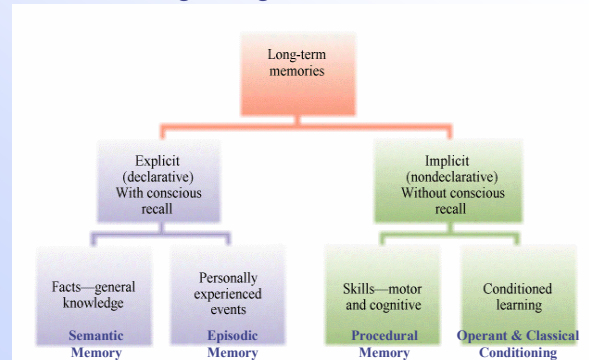
IV. REMEMBERING AND FORGETTING
   A. Recall and Recognition

- **Retrieval**: The process by which that information in LTS, is brought back to STS.
- There are many factors to explain retrieve success or failure.
  - Whether information is *recalled* or *recognized* affects retrieval success.
  - **Recognition**: Identify something as having been previously learned (automatic activation of LTM information). Pictures of elementary school friends.
  - **Recall**: Produce knowledge from memory (self-activation of the LTM information). Names of friends recognized.
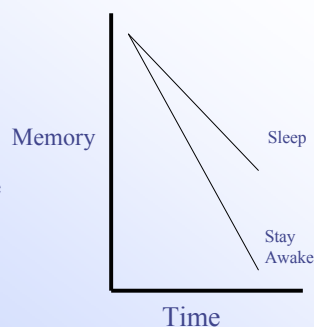

IV. REMEMBERING AND FORGETTING
   B. Decay

- But even using recognition as a measure, there are many factors which can explain failure to retrieve information in LTS.
- **Decay**: Memory traces are weakened or decay over time.
  - Not a popular view as LTM is thought to keep information for a very long time.
  - The problem is that decay confounds lots many factors.
  - Over time, new things are learned which affects what has been learned etc. It looks like decay but really involves other factors at work.

IV. REMEMBERING AND FORGETTING
   B. Decay

- Consider the effect of time on two groups who learned nonsense syllables equally well.
- One group sleeps and one stays awake doing other things.
- Memory was worse when staying awake than sleeping
- Why?

Memory

Sleep

Stay Awake

Time

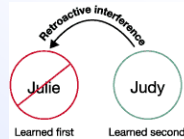IV. REMEMBERING AND FORGETTING
   C. Replacement and Interference

- Replacement: New information may just wipe out or replace old information.
  - The awake group encountered new information which wiped out the old information
- Interference: The process of forgetting in which a new memory interferes with the old one.
  - Maybe new information caused some confusion when recalling the old information (retroactive interference)
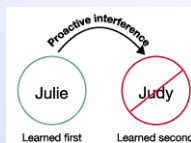
IV. REMEMBERING AND FORGETTING
    C. Replacement and Interference

- Two types of interference:
  - **Retroactive Interference**: Forgetting that occurs when recently learned material interferes with the ability to remember similar material stored previously.
  - **Proactive Interference**: Forgetting that occurs when previously stored material interferes with the ability to remember similar, more recently learned material.

IV. REMEMBERING AND FORGETTING
    D. Context Effects and Mood.

- Retrieval may be helped or hindered depending on the physical and psychological context.
  - Greater recall occurs when learning and retrieval contexts are the same.
    - Remembering learned under water are better recalled underwater and word learned on the land arebetter recalled on the land.
    - Contexts can prime memories (déjà vu experiences).
  - Mood
    - Emotional states can also prime memories. Remembering items best when in the same mood as when it was learned.

IV. REMEMBERING AND FORGETTING
    D. Retrieval Cues

- Sometime we can later remember something which we can not remember at the time.
  - **Tip of the Tongue**: Information in LTS is available but inaccessible
- This type of forgetting is called **cue-dependent**.
  - It is as if the retrieval cue to remembering the target material is forgotten, not the material itself.
  - One retrieval cue is the context under which info is first encoded and remembered.
    - **State-dependent memory**: The tendency to between remember material when in the same state as when first learning it.

IV. REMEMBERING AND FORGETTING
    E. Repression and Amnesia

- **Repression**: Unconscious defense mechanism, suggested by Freud, by which memories existing in LTS are stopped from being made conscious.
  - Difficult to explain how memories are evaluated before being made aware.
- **Psychogenic Amnesia**: Partial or complete loss of memory due to non-organic causes for threatening or traumatic experiences.
  - Very controversial. May be due to suggestibility.