HUMAN MEMORY
stage theory: Long Term and Short Term Memory
-       (note: Short Term Memory = "Working Memory")

duration
Long Term Memory: relatively permanent
Short Term Memory: seconds to minutes

storage capacity
Long Term Memory: infinite?
Short Term Memory: 7+/-2 "chunks" (organized packets of
        information)

flow of information in memory
-       stimulus -> STM -> rehearsal* -> LTM

*two kinds of rehearsal:
        maintenance - holds info in STM
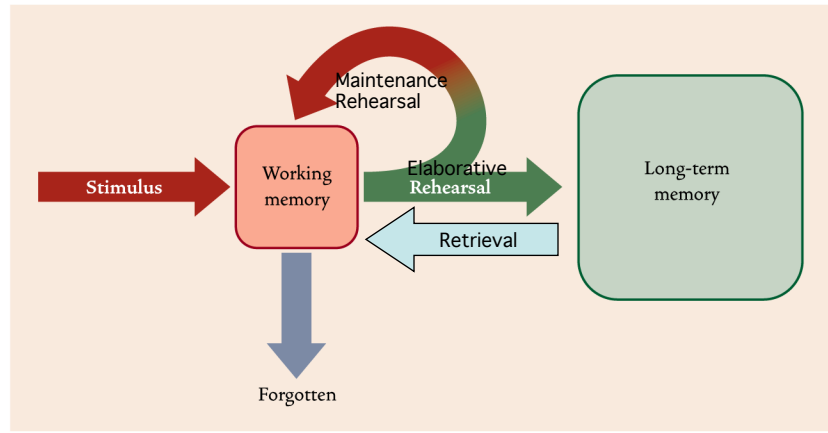   elaborative - moves info to LTM

Figure 7.1: The relation between working memory and long-term memory as envisaged by stage theory

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<u>serial position effect in free recall</u>
task: read 20 words one at a time, recall in any order

primacy effect - early part of list recalled better than middle: recalled from LTM

recency effect - last part of list recalled better than middle: recalled from STM

reduce <u>recency</u>: delay between 20th word and recall
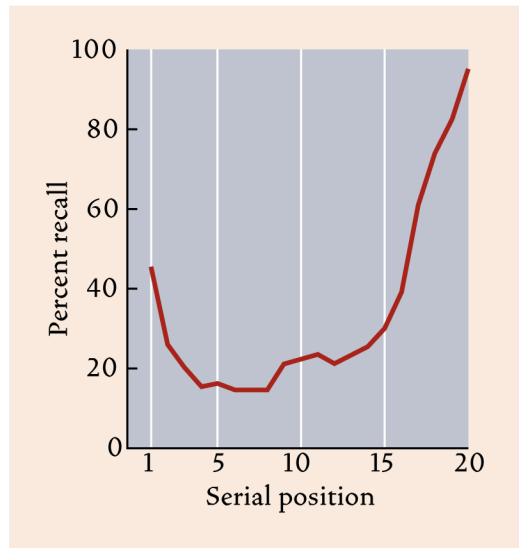reduce <u>primacy</u>: present words faster

Figure 7.2: Primacy and recency effects in free recall
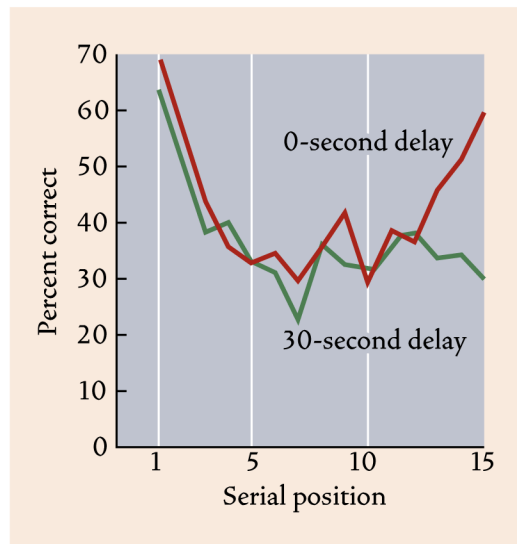
Figure 7.3: The recency effect and working memory
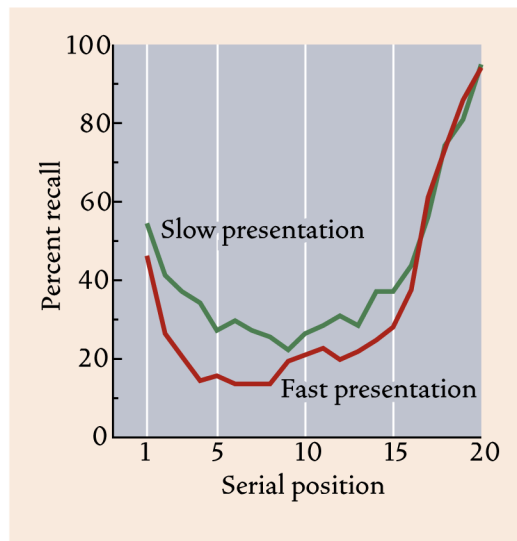
Figure 7.4: The primacy effect and long-term storage

FURTHER DIFFERENCES BETWEEN STM & LTM

<u>psychological code</u>

-       STM: phonological - based on speech sounds

        confuse "boat" with "coat"

-       LTM: semantic - based on meaning

        confuse "boat" with "ship"

FURTHER DIFFERENCES BETWEEN STM & LTM

neural code
STM: dynamic - pattern of activity among a group of cells
LTM: structural - pattern of connections within a group of cells

"trace consolidation" is what goes on during elaborative
rehearsal - a memory trace changes from a dynamic to a
structural pattern
-        amnesia - interruption of consolidation process
-        retrograde amnesia for events BEFORE trauma
-        anterograde amnesia for events AFTER trauma
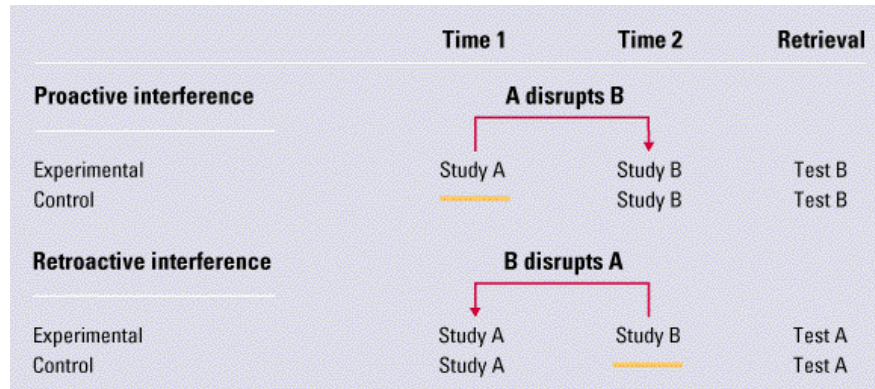
FURTHER DIFFERENCES BETWEEN STM & LTM

forgetting

STM: DISplacement and/or decay

LTM: MISplacement and/or retrieval failure
-        proactive interference: old info affects new
-        retroactive interference: new info affects old

Interference and Forgetting

	Time 1	Time 2	Retrieval
Proactive interference		**A disrupts B**	
Experimental	Study A	Study B	Test B
Control		Study B	Test B
Retroactive interference		**B disrupts A**	
Experimental	Study A	Study B	Test A
Control	Study A	Study B	Test A

WORKING MEMORY:

STM not just storage box; more like cognitive "workbench"

limit on storage capacity is viewed instead as limit on processing capacity

used in all processing of information: mental calculation, reading, etc. (16 x 231=?)

DEPTH OF PROCESSING

- what kind of encoding will be most successful?...
  <u>deeper (more meaningful) processing</u> leads to
  better memory
- connected to notion of elaborative rehearsal
- Craik and Tulving (1975) experiment

Elaborative Rehearsal

- Subjects were shown lists of
  words
- Asked to use one of three
  strategies:
  - Visual (shallow): Is the word
    printed in capital letters?
  - Acoustic / Phonological
    (intermediate): Does the word
    rhyme with _____?
  - Semantic (deep): Does the
    word fit into the following
    sentence? (for ex., "A _____
    rides on rails.")
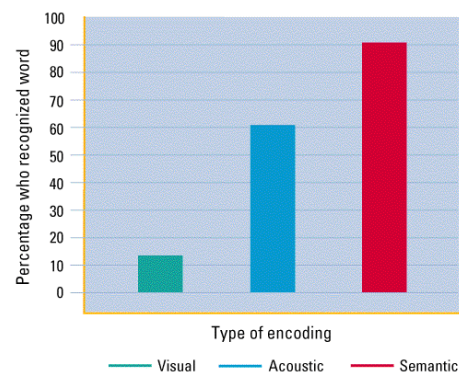
KINDS OF MEMORY:

long-term vs. short-term ("working memory")

episodic (episodes, events with time and place):
"I saw an elephant at a zoo in 2008."
vs.
generic / semantic (facts, concepts and meanings):
"An elephant has big floppy ears and a trunk."

KINDS OF MEMORY:

explicit (reference to prior learning experience)
recall - "what were the words on the list you read?"
recognition - "circle the words you saw earlier"

vs.

implicit (no conscious awareness of remembering)
priming - read list of words then do tasks...
        stem completion - "MOT_____"
        word fragment completion - "__U__O__O__I__E"
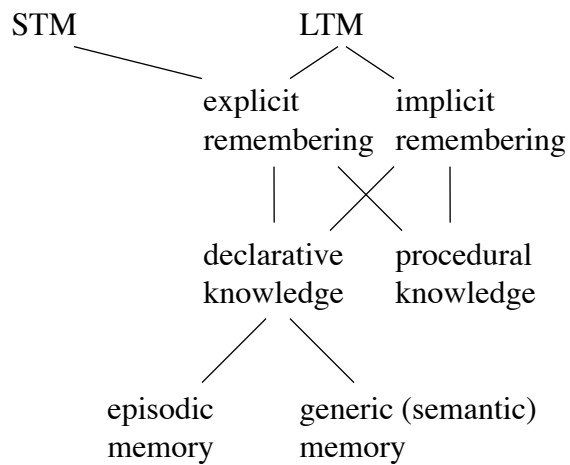
KINDS OF MEMORY:

declarative = knowing that (mainly explicit)
-        statements, using episodic and generic information

vs.

procedural = knowing how (mainly implicit)
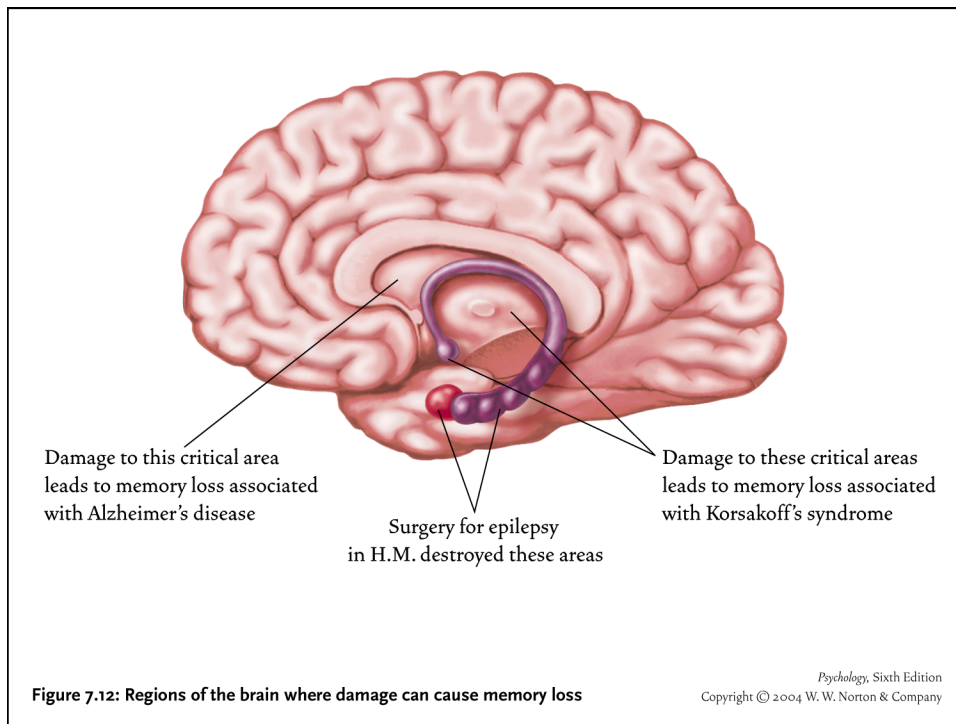-   skills: riding a bike, playing an instrument, etc.

STM   LTM

                explicit   implicit
                remembering remembering

                declarative   procedural
                knowledge   knowledge

        episodic   generic (semantic)
        memory   memory

Damage to this critical area
leads to memory loss associated
with Alzheimer's disease

Damage to these critical areas
leads to memory loss associated
with Korsakoff's syndrome

Surgery for epilepsy
in H.M. destroyed these areas

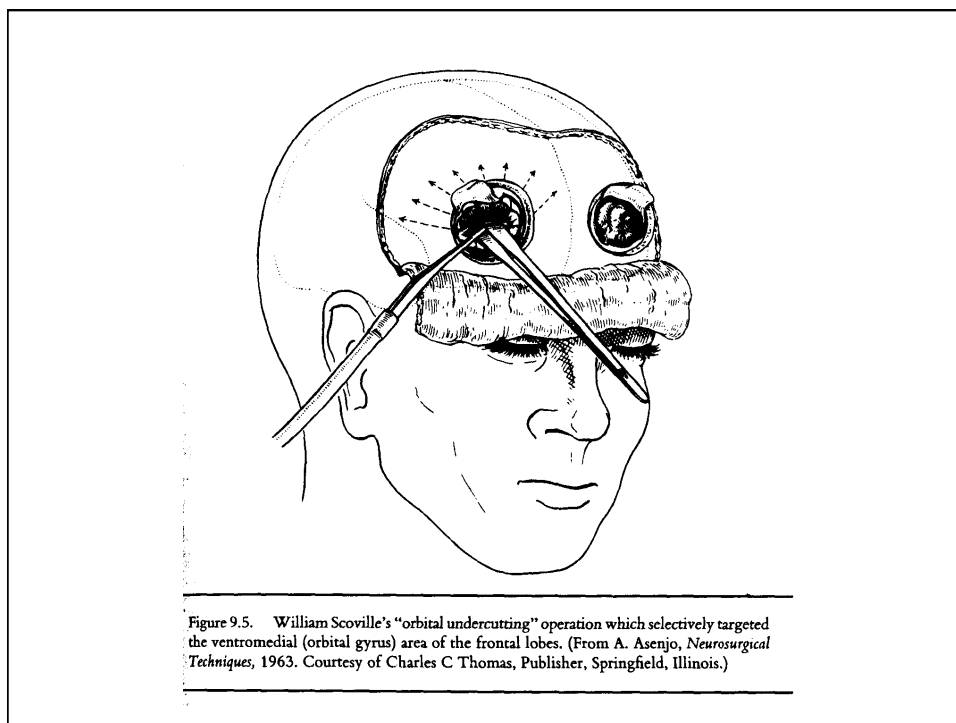**Figure 7.12: Regions of the brain where damage can cause memory loss**

Figure 9.5.   William Scoville's "orbital undercutting" operation which selectively targeted the ventromedial (orbital gyrus) area of the frontal lobes. (From A. Asenjo, *Neurosurgical Techniques,* 1963. Courtesy of Charles C Thomas, Publisher, Springfield, Illinois.)
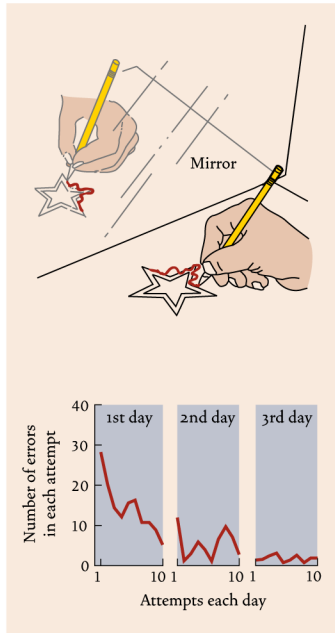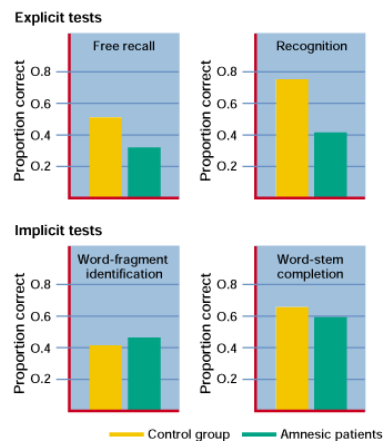
Figure 7.13: An example of what amnesiacs can learn

Retention Without Awareness

- Amnesic patients and normal controls tested for memory of words learned previously
- Amnesics performed poorly on explicit memory tasks
- Performance on implicit memory tasks was like control subjects

RETRIEVAL

ENCODING SPECIFICITY PRINCIPLE
(or COMPATIBILITY PRINCIPLE):
-        retrieval cue - current stimulus that aids retrieval
-        any memory for an item has the item's context wrapped
         up in it too
-        context (cues) at retrieval should be as much as possible
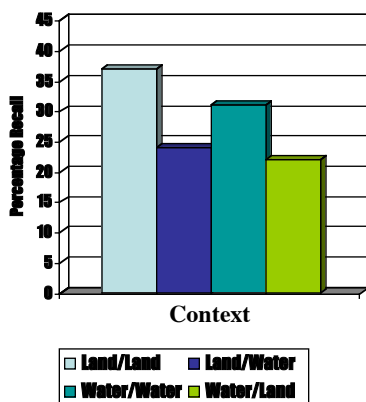   like context at encoding

ex. : learn list - "figure, data, diagram, table, chart, graph..."
-        then "FURNITURE" would <u>not</u> be a good retrieval cue
         for "table"
ex. : learn list - "Ford, Honda, Toyota, Saturn, Lexus..."
-        then "RINGS" would <u>not</u> be a good retrieval cue
         for "Saturn"

Context-Dependent Memory

- Scuba divers learned words either on land or underwater
- Tested for recall on land or underwater
- Recall was better in context where words had been learned

IS RETRIEVING A MEMORY LIKE PLAYING BACK A TAPE?

Loftus and Palmer (1974) experiment:

1) view slides of car accident

2) ask: "How fast were the cars going when they **hit** each other?"

or:

"How fast were the cars going when they **smashed into** each other?"

3) 1 week later: "Did you see any broken glass in the pictures?"

YES response more likely for "**smash**" group than "**hit**" group

CONCLUSION: at least in part, memory involves reconstruction of remembered information

-        memory may be distorted by other information

GENERIC /SEMANTIC MEMORY

-        retrieval = search through network of concepts
-        organized according to semantic relatedness (closeness of meaning)
-        activation of one concept spreads to other related concepts
-        "What does 'Rosebud' mean?"
         "Do chickens have lips?"
         "How many arms did Aristotle have?"
         "How many ears did Vincent van Gogh have?"

Semantic Networks