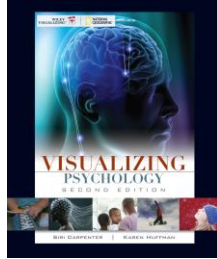
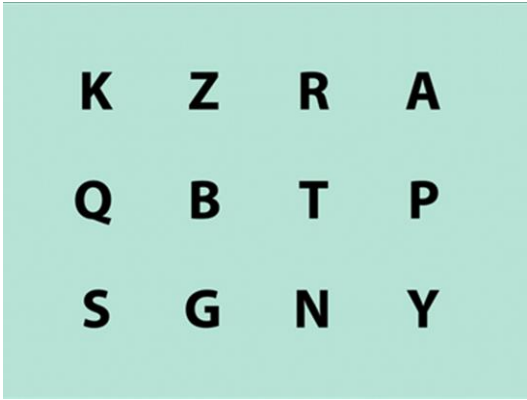




CHAPTER 7

Memory







Lecture Overview

- The Nature of Memory
- Biological Bases of Memory
- Forgetting
- Memory Distortions





The Nature of Memory

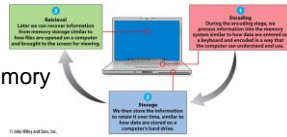
- **Memory:** internal record or representation of some prior event or experience
- Memory is also a **constructive process**, in which we actively organize & shape information as it is processed, stored, & retrieved.





Information Processing Model: Important Definitions

- **Encoding:** processing information into the memory system
- **Storage:** retaining information over time
- **Retrieval:** recovering stored information



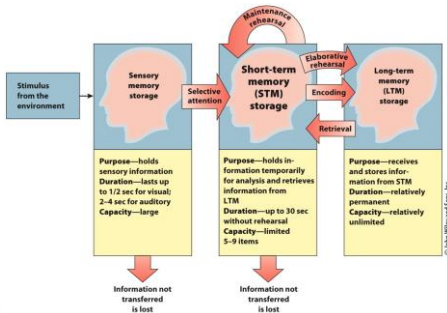


Traditional Three-Stage Memory Model

- Three different storage “boxes” or memory stages that hold & process information. Each stage has a different purpose, duration, & capacity.
- Three stages:
 - Sensory Memory
 - Short-Term Memory (STM)
 - Long-Term Memory (LTM)



Three-Stage Memory Model





Three Stage Memory Model: Sensory Memory

• **Sensory Memory:** first memory stage, which briefly preserves a relatively exact replica of sensory information

- Sensory memory has a large capacity but information only lasts a few seconds.
- Selected information is sent on to **short-term memory (STM)**.





Sperling's Experiment with Sensory Memory

• When flashed an arrangement of 12 letters for 1/20 of a second, most people can only recall 4 or 5. Sperling proved all 12 letters were available in sensory memory if they can be attended to quickly.





Two Forms of Sensory Memory



(a) Iconic memory



(b) Echoic memory



Three Stage Memory Model: Short-Term Memory (STM)

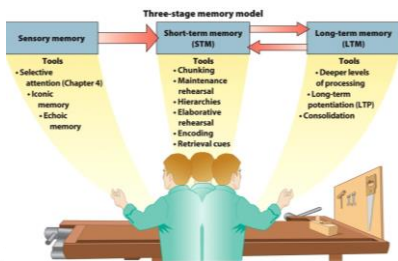
- **Short-Term Memory (STM)**: second memory stage, which temporarily stores sensory information & decides whether to send it on to **long-term memory (LTM)**
 - Holds 5-9 items for about 30 seconds, but duration improves with **maintenance rehearsal**
 - Capacity increased with **chunking**





Short-Term Memory (STM)

STM also called **working memory**, reflecting that it's more than just a passive, temporary holding area





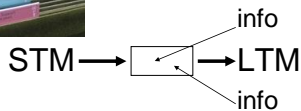
Long-Term Memory (LTM)

- **Long-Term Memory (LTM):** third stage of memory with relatively permanent memory storage & a virtually limitless capacity





LTM

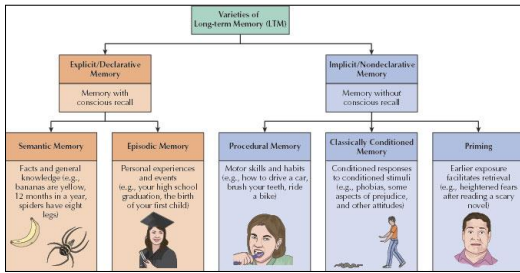




LTM

- **Explicit/Declarative Memory**
 - Semantic
 - Episodic
- **Implicit/Nondeclarative Memory**
 - Procedural memory
 - Classically conditioned memory
 - Priming

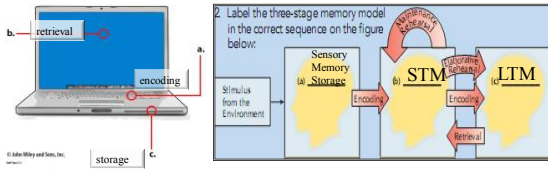






**Pause & Reflect:
Assessment**

- Using these two figures, can you label the key parts of these two memory models?





Improving Long-Term Memory (LTM)

- LTM can be improved with:
 - Organization (Hierarchies)
 - Elaborative Rehearsal
 - Retrieval Cues
 - Recognition
 - Recall





LTM

- **Organization:** hierarchies
- **Rehearsal:** improves encoding for STM & LTM
 - STM – Keep **repeating**
 - LTM – requires **elaborative rehearsal** – linking new info to stored info
 - Goal is to **understand** – not memorize.





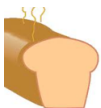
LTM

- Retrieval: critical to improving LTM
- Retrieval cues:
 - **Specific Cues** require you only to **recognize** the correct response
 - **General Cues** require you to **recall** previously learned material





LTM

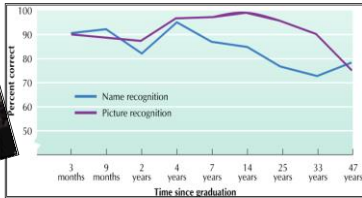


- **Encoding Specificity Principle**
 - Retrieval of info is improved when the conditions of recovery are similar to the conditions that existed when the information was encoded.
 - Location
 - Mood congruence
 - State-dependent retrieval





Recognition vs. Recall



• Research shows people are better at recognizing photos of previous high school classmates than recalling their names.



A Test for Recall: Can You Name Santa's Nine Reindeer?





Now Try *Recognizing* the Names (Need Help? Answers Appear on Next Slide)

- A) Rudolph
- B) Dancer
- C) Cupid
- D) Lancer
- E) Comet
- F) Vixen
- G) Blitzen

- H) Crasher
- I) Donner
- J) Prancer
- K) Sunder
- L) Thunder
- M) Dasher
- N) Donder



Answers to Previous Slide on Santa's Reindeers

- **A) Rudolph**
- **B) Dancer**
- **C) Cupid**
- D) Lancer
- **E) Comet**
- **F) Vixen**
- **G) Blitzen**

- H) Crasher
- **I) Donner**
- **J) Prancer**
- K) Sunder
- L) Thunder
- **M) Dasher**
- **N) Donder**



Pause & Reflect: Assessment

- Elaborative rehearsal helps improve **LTM** memory, whereas maintenance rehearsal improves **STM** memory.





Biological Bases of Memory

- Biology affects memory in at least two ways:
 1. Neuronal & synaptic changes in memory
 2. Hormonal changes





Neuronal & Synaptic Changes

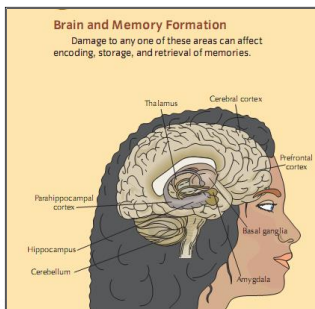
- **Long-term potentiation (LTP)** = long-lasting increase in neural excitability, due to:
 - Repeated stimulation of a synapse, which strengthens it
 - Neurotransmitter release which is increased or decreased



- See book on studies of sea slugs and smart mice
- Mice were genetically engineered with an extra receptor for a neurotransmitter. They did better on memory tests.
- Sea slugs: during learning there was a release of more neurotransmitters at certain synapses. These synapses became more efficient at transmitting signals.



Where Are Memories Located?



- Memory tends to be localized & distributed **throughout the brain**--not just the cortex.



Biological Bases of Memory (Continued)

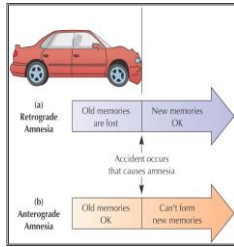


- **Hormonal changes** also affect memory (e.g., **flashbulb memories**--vivid & lasting images associated with surprising or strongly emotional events).



Biology & Memory Loss: Injury & Disease

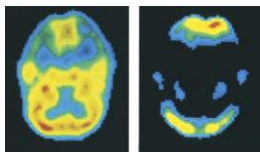
- **Amnesia:** memory loss from brain injury or trauma
- **Retrograde amnesia:** old memories lost, partially due to lack of **consolidation**
- **Anterograde amnesia:** new memories lost





Biology & Memory Loss: Injury & Disease (Continued)

- **Alzheimer's Disease (AD):** progressive mental deterioration characterized by severe memory loss (note larger areas of yellow-colored activity in normal brain on the left)

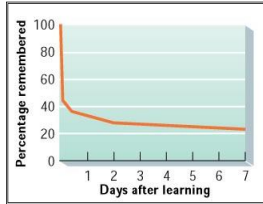




Forgetting: How Quickly Do We Forget?

Ebbinghaus found:

- **Forgetting** occurs most rapidly immediately after learning
- **Relearning** takes less time than initial learning.





Why Do We Forget? Five Key Theories

1. **Decay**
2. **Interference**
3. **Motivated Forgetting**
4. **Encoding Failure**
5. **Retrieval Failure**





Five Theories of Forgetting (Continued)



1. **Decay Theory:** memory degrades with time
2. **Interference Theory:** one memory competes (*interferes*) with another
 - Retroactive Interference** (new information *interferes* with old)
 - Proactive Interference** (old information *interferes* with new)



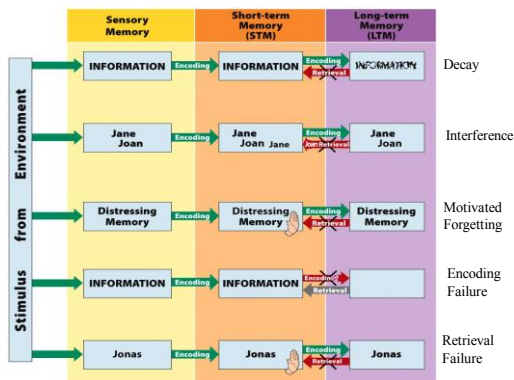
Examples of the Two Forms of Interference



Five Theories of Forgetting (Continued)



3. **Motivated Forgetting:** *motivation* to forget unpleasant, painful, threatening, or embarrassing memories
4. **Encoding Failure:** information in STM is not *encoded* in LTM
5. **Retrieval Failure:** memories stored in LTM are momentarily inaccessible (*tip-of-the-tongue phenomenon*)





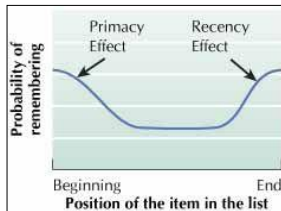
Key Factors in Forgetting

- **Misinformation Effect:** memory distortion from misleading post-event information
- **Serial Position Effect:** first & last information remembered better
- **Source Amnesia:** forgetting the true source of a memory
- **Sleeper Effect:** information from an unreliable source, which was initially discounted, later gains credibility because source is forgotten
- **Spacing of Practice:** spacing learning periods with rest periods (**distributed practice**) is better than cramming (**massed practice**)
- **Culture:** cultural practices play a role in memory & forgetting



Overcoming the Serial-Position Effect

- **Serial-Position Effect:** remembering material at the beginning & end of a list better than material in the middle





Pause & Reflect: Assessment

motivated

1. The theory of _____ forgetting best explains why you forgot the name of a previous employer who gave you a bad performance evaluation.
2. You remember material from the first & last of the chapter better than material in the middle. This is a good example of the _____ effect.





Memory Distortions

- Why do we distort our memories?
 - We need to maintain *logic & consistency*.
 - It's more *efficient* to do so.





Memory & the Criminal Justice System



Two memory problems with profound legal implications:
Eyewitness Testimony- very persuasive but can be flawed
Repressed Memories- false or repressed?



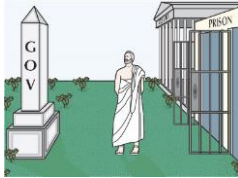
Pause & Reflect: Psychology & Life

- Psychological research conducts **basic research**, which helps us describe & understand our own & others' memory processes. This basic research also leads to **applied research** that shows us how to improve our **sensory, short-term, & long-term memory**.



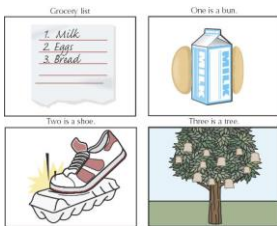
Improving Memory: Mnemonics— Method of Loci

- Greek & Roman orators remembered long speeches by “walking through” speech while visualizing highly memorable specific places.





Mnemonics—Peg-Word



- Memorize a set of 10 images that you can use as “pegs” on which to hang items you want to remember (e.g., one is a bun, two is a shoe...).



Mnemonics--Acronyms

- Create a new code word from the first letters of items you want to remember (e.g., using “homes” to recall names of the five great lakes).



PEMDAS!!



Additional Tips for Memory Improvement

1. Pay attention & reduce interference
2. Use rehearsal techniques
3. Improve your organization
4. Counteract the serial-position effect





Additional Tips for Memory Improvement (Continued):

5. Improve your time management
6. Employ self-monitoring & overlearning
7. Use **mnemonic devices** (e.g., method of loci, peg-word, acronyms)





Pause & Reflect: Critical Thinking

- Which of the “Additional Tips for Memory Improvement” do you need to use to improve your academic performance? Will you try them? Why or why not?





End of CHAPTER 7

Memory

