# The model of memory

- Memory as processing of information
- Encoding, storage and retrieval
- The model of memory
  - Sensory memory
  - Short-term memory
  - Long-term memory
  - Duration and capacity of each
- Depth of processing and memory
- Maintenance versus elaborative rehearsal

# Forgetting

- Encoding failure
- Decay
- Interference
  - Proactive
  - Retroactive
- Motivated forgetting
  - Suppression
  - Repression
- Amnesia
  - Retrograde
  - Anterograde
  - Infantile

# Organization of information and Memory

- Serial position effect
  - Primacy effect
  - Recency effect
- Clustering (categories)
- Hierarchies
- Chunking
- Mnemonics

# How Reliable is Memory?

- Memory as a constructed process
- Memory distortions and schemas
- Perceptual sets and memory
- Misinformation and leading questions
- Why is learning about the reliability of memory important?

# Storage and Retrieval

- Associative networks (semantic networks)
- Types of long term memories
  - Procedural
  - Semantic
  - Episodic
- Methods of retrieving information
  - Recall
  - Recognition
  - Free recall
- Encoding specificity principle
  - Context effects
  - Mood congruence
  - State dependent retrieval
Forgetting

Encoding Failure:
The information never got to long-term memory because it was not properly encoded (penny demo).

Decay:
Forgetting is due to normal metabolic processes that occur in the brain over time.

Interference:
- **Proactive:** Forgetting in which an old memory (the past) interferes with remembering a new memory; forward-acting memory interference. New memories are hard to form.
  - It is like “new procedures are hard to remember due to old ways”).
  - I automatically give people the old phone number for the apartment I lived in last year.
- **Retroactive:** Forgetting in which a new memory interferes with remembering an old memory; backward-acting memory interference
  - (eg. "going home", false memories). Old memories are being replaced by new memories.

Motivated Forgetting
- **Suppression:** Conscious forgetting
- **Repression:** Unconscious forgetting
Forgetting

Reasons why we forget:
• Encoding failure: sometimes it doesn’t get in
  o invited inferences
  o schemas, and
  o _______________
• Decay
• Interference
  o Proactive
  o Retroactive
• Motivated forgetting
  o Suppression
  o Repression
• Amnesia
  o Retrograde
  o Anterograde
  o Infantile
Forgetting: Encoding Failure

Which coin portrays a real penny?

The reason why most people can't pick out the correct penny is due to encoding failure—the tendency to not encode ALL the features of the penny.
Forgetting: Decay

Forgetting is due to normal metabolic processes that occur in the brain over time.

![Graph showing forgetting over time]

Percentage of original vocabulary retained

Time in years after completion of Spanish course
Forgetting: Interference

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<tr>
<th>Information yesterday</th>
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<td>Psychology of Learning</td>
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Severe Memory Loss and the Biological Basis of Memory

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<th>Type of amnesia</th>
<th>Definition</th>
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</table>
| Retrograde      | Backward-acting memory loss; especially for episodic memory. It is believed that the process of memory consolidation is impaired with severe blows to the head.  
• Trevor Reese Jones (Princess Diana’s bodyguard) has retrograde amnesia. |
| Anterograde     | Loss of memory caused by the inability to store new memories; forward acting memory loss.  
• H.M. could not form new explicit memories (episodic and semantic), but could learn and form new procedural memories. |
| Infantile       | The inability to remember experiences during childhood. This is generally attributed to the lack of organization about the world and information is quickly lost as well as an immature hippocampus that prevents us from encoding explicit memories. |
Brain Structures and Memory

**Prefrontal Cortex**
Memory involving the sequence of events, but not the events themselves

**Amygdala**
Encodes emotional aspects of memories

**Medial Temporal Lobe**
(not visible) Encodes and transfers new explicit memories to long-term memory

**Hippocampus**
Encodes and transfers new explicit memories to long-term memory

**Cerebellum**
Memories involving movement
Memory and the Brain--What Do We Know?

- Anterograde Amnesia
- Retrograde Amnesia
- Infantile Amnesia
- Sleep and Memory
Anterograde Amnesia

Anterograde Amnesia: Memory loss for events that occur after the initial onset of amnesia

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<th>Past</th>
<th>Onset of amnesia</th>
<th>Present</th>
<th>Future</th>
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<tr>
<td>Has long term memories</td>
<td></td>
<td>Can’t form new long-term declarative (explicit) memories, but can form new procedural memories</td>
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Hypothalamus
Peanut-sized structure that maintains homeostasis, links endocrine system to brain, and is involved in motivation and emotional drives

Thalamus
Processes and integrates information from all the senses except smell, and relays information to appropriate higher brain centers

Amygdala
Almond-shaped structure involved in emotion and memory

Hippocampus
Wishbone-shaped structure involved in forming new memories
# Retrograde Amnesia

Retrograde amnesia: Memory loss for events that took place sometime in life before the onset of amnesia.

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<td>e.g. an accident</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>What occurred a few</td>
<td>The accident</td>
<td>Later</td>
<td>memories are intact</td>
</tr>
<tr>
<td>moments before the</td>
<td></td>
<td></td>
<td></td>
</tr>
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- **Hypothalamus**: Peanut-sized structure that maintains homeostasis, links endocrine system to brain, and is involved in motivation and emotional drives.
- **Thalamus**: Processes and integrates information from all the senses except smell, and relays information to appropriate higher brain centers.
- **Amygdala**: Almond-shaped structure involved in emotion and memory.
- **Hippocampus**: Wishbone-shaped structure involved in forming new memories.
Infantile Amnesia

Memory loss for early childhood (typically, memories before 3 to 4 years old) experiences

It is unknown why we can’t remember early childhood memories. It is hypothesized that
- The brain regions involved in encoding episodic memories are still immature, or
- We don’t encode our earliest experiences deeply and fail to form good retrieval cues
Forgetting

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Amnesia:
- **Retrograde:** Backward-acting memory loss; especially for episodic memory.
- **Anterograde:** Loss of memory caused by the inability to store new memories; forward acting memory loss.
- **Infantile:** The inability to remember experiences during childhood.
Sleep and Memory

REM sleep (short periods in which we dream) is thought to restore mental and brain functions.
  • Both animal and human studies have shown that REM sleep increases after learning a novel task and
  • deprivation of REM sleep following training disrupts learning when compared to those who are not deprived of REM sleep.

Being deprived of sleep can impair your ability to form new long-term memories

Why is it important to know about the relation between sleep and memory?