The Reconstruction of the Past

Lecture 20
Knowledge and Memory

• Semantic Memory
  – Generic Knowledge, Beliefs
    • Abstract

• Episodic Memory
  – Particular Experiences and Behaviors
    • Specific Events

What is the Relation Between General Knowledge and Memory for Specific Events?
Person Memory Paradigm

• Variant on Verbal-Learning Paradigm
  – List Items are Behaviors, Experiences
    • Rather than Words, Pictures

• Knowledge of a Person
  – Generic (Semantic) Knowledge
    • Traits, Attitudes
  – Episodic Knowledge
    • Specific Behaviors and Experiences
Phase 1:
Study Trait Ensemble

Judy is:

• Intelligent
• Intellectually Sophisticated
• Artistically Sensitive
• Refined
• Imaginative
• Witty
Unitary Impression as Schema
Bartlett (1932)

• Organized Knowledge Structure
  – Knowledge, Beliefs
  – Expectations
• Generalized, Abstract
• Cognitive Basis for Perception and Memory
• Basis for “Effort after meaning”

plural: Schemata or “Schemas”
Phase 2: Study Behaviors

• Schema-Congruent
  – $p(\text{behavior} \mid \text{schema}) > p(\text{behavior} \mid \text{no schema})$
    • Judy won the chess tournament.
    • Judy attended the symphony concert.

• Schema-Incongruent
  – $p(\text{behavior} \mid \text{schema}) < p(\text{behavior} \mid \text{no schema})$
    • Judy made the same mistake three times.
    • Judy was confused by the daytime television show.

• Schema-Irrelevant
  – $p(\text{behavior} \mid \text{schema}) = p(\text{behavior} \mid \text{no schema})$
    • Judy ordered a sandwich for lunch.
    • Judy took the elevator to the third floor.
Schema-Congruence and Memory
Hastie & Kumar (1979)

Relation between Event and Schema

Proportion Recalled

0.0 0.1 0.2 0.3 0.4 0.5 0.6

Congruent Irrelevant Incongruent
The Schematic Processing Principle

Memory for a specific event is a function of the relationship between that event and pre-existing schemata (knowledge, expectations, beliefs).
Two Processes in Schema-Dependency

• **Schema-Congruent Behaviors**
  – Easily Encoded
  – Schema Provides Retrieval Cues
    • Cue-Dependency

• **Schema-Incongruent Behaviors**
  – Must Be Explained
  – Explanation Requires Processing
    • Elaboration

• **Schema-Irrelevant Behaviors**
  – Receive Neither Benefit
The Schematic Processing Principle Expanded

• Memory is a function of the relationship between an event and pre-existing schemata.

• *Schema-relevant* events are remembered better than schema-irrelevant events.

• Among schema-relevant events, *schema-incongruent* events are remembered better than schema-congruent events.
Principles of Memory

• Encoding
  – Elaboration
  – Organization

• Storage
  – Time-Dependency
    • Interference

• Retrieval
  – Cue-Dependency
    • Availability vs. Accessibility
  – Encoding Specificity
  – Schematic Processing
The Library Metaphor of Memory

**Principles of Memory**
- Encoding
  - Elaboration
  - Organization
- Storage
  - Time-Dependency
    - Interference
- Retrieval
  - Cue-Dependency
    - Availability vs. Accessibility
  - Encoding Specificity
  - Schematic Processing

**The Library Metaphor**
- Encoding
  - Purchase a Book
  - Catalog a Book
- Storage
  - Book on Shelf
- Retrieval
  - Look up Book in Catalog
  - Get Book from Shelf
    - Dewey Decimal System
    - Library of Congress
  - Read Contents
Memory as Reproduction
(ever since Ebbinghaus)

• Remembering as Reproducing Event
  – Encoding makes Knowledge Available
  – Retrieval Gains Access to Knowledge

• Mechanisms of Forgetting
  – Unavailability
    • Poor Encoding
  – Inaccessibility
    • Poor Retrieval
Memory as Narrative
Bartlett (1932)

• Objections to Verbal-Learning Paradigm
  – Rote Associations
• Remembering More Like Telling Stories
• Study Memory for Stories, Not for Lists
  – Method of Repeated Reproduction
    • Subjects Repeat the Same story
  – Method of Serial Reproduction
    • Subjects Repeat Each Others’ Stories
The War of the Ghosts

Native American Folktale Collected by Franz Boas
Bartlett (1932)
One night two young men from Egulac went down to the river to hunt
seals, and while they were there it became foggy and calm.
Then they heard war-cries, and they thought: “Maybe this is a war-party”.
They escaped to the shore, and hid behind a log.
Now canoes came up, and they heard the noise of paddles, and saw one
canoe coming up to them.
There were five men in the canoe, and they said: “What do you think? We
wish to take you along. We are going up the river to make war on the
people”.
One of the young men said: “I have no arrows”.
“Arrows are in the canoe”, they said.
“I will not go along. I might be killed. My relatives do not know where I
have gone. But you”, he said, turning to the other, “may go with them”.
So one of the young men went, but the other returned home.
And the warriors went on up the river to a town on the other side of Kalama. The people came down to the water, and they began to fight, and many were killed.

But presently the young man heard one of the warriors say: “Quick, let us go home: that Indian has been hit”.

Now he thought: “Oh, they are ghosts”. He did not feel sick, but they said he had been shot.

So the canoes went back to Egulac, and the young man went ashore to his house, and made a fire.

And he told everybody and said: “Behold I accompanied the ghosts, and we went to fight. Many of our fellows were killed, and many of those who attacked us were killed. They said I was hit, and I did not feel sick”.

He told it all, and then he became quiet. When the sun rose he fell down. Something black came out of his mouth. His face became contorted. The people jumped up and cried.

He was dead.
Memory Errors in *The War of the Ghosts*  
Bartlett (1932)

- **Errors of Omission**
  - Progressive Forgetting
    - Gist vs. Minor Details
  - Unexpected Details

- **Errors of Commission**
  - Rationalization
  - Transformation of Detail
  - Transformation of Order
Memory as Reconstruction
Bartlett (1932)

• Retrieve Dominant Details
  – Trace Information
    • Vague, Fragmentary, Ambiguous
  – General “Attitude” Toward Story

• Schema-Based Inferences
  – Attitudes
  – Expectations
  – World Knowledge

• Coherent Story
  – But May Not Be Accurate
The Reconstruction Principle

Memory reflects a blend of information contained in memory traces and knowledge, expectations, and beliefs derived from other sources.
Eyewitness Memory Paradigm
Loftus, Miller, & Burns (1978)

• Variant on Verbal-Learning Paradigm
  – List is Continuous Scene
    • Rather than Words, Pictures
  – View Slide Show, Film
  – Subsequent Memory Test
Imagine That You’re a Bystander Watching the Following Scenes

Courtesy of Prof. Elizabeth F. Loftus
UC Irvine
Now, For Some Questions
Visual Recognition Test
What Did You See?

A

B
What Did You See?

A

B
What Did You See?

A

B

Correct
What Did You See?

A

Correct

B
Post-Event Misinformation Effect
Loftus, Miller, & Burns (1978)

• Staged Traffic Accident

• Critical Question
  – Nonleading
    • Did you see another car pass the red Datsun while it was stopped at the yield sign?
  – Leading
    • Did you see another car pass the red Datsun while it was stopped at the stop sign?

• Recognition Tests
  – Car at Yield Sign or Stop Sign
## Structure of the Study

<table>
<thead>
<tr>
<th>Stimulus</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yield Sign</td>
<td>Nonleading</td>
</tr>
<tr>
<td>Stop Sign</td>
<td>Misleading</td>
</tr>
</tbody>
</table>
Correct Recognition of Sign
Loftus, Miller, & Burns (1978)

% of Subjects

Nonleading

Misleading

Word of Question
Post-Event Misinformation Effect

- Leading Questions Can Influence Eyewitness Report
  - Memory Not “Pure”
- Misinformation Gleaned from Leading Questions Can Be Incorporated into Memory for Event
The “Needle” List

Thread
  Pin
  Eye
Sewing
  Sharp
  Point
  Prick
  Thimble

Haystack
  Thorn
  Hurt
Injection
  Syringe
  Cloth
  Knitting
The Associative Memory Illusion
Roediger & McDermott (1995)

![Bar graph showing proportion recognized across item types: Studied Items, Critical Lures, and Unrelated Lures.](image)
Semantic Associates of *Needle*

- Thread
- Pin
- Eye
- Sewing
- Sharp
- Point
- Prick
- Thimble
- Haystack
- Thorn
- Hurt
- Injection
- Syringe
- Cloth
- Knitting

“Forward” Associations

**Needle**
Inducing the Associative Memory Illusion

"Backward" Associations

Thread → needle
Pin → needle
Eye → needle
Sewing → needle
Sharp → needle
Point → needle
Prick → needle
Thimble → needle
Haystack → needle
Thorn → needle
Hurt → needle
Injection → needle
Syringe → needle
Cloth → needle
Knitting → needle
Illusions in Perception and Memory

• Perceptual Illusions
  – Perceive the *Present* Inaccurately
    • Systematic Distortion, Bias
  – Product of Constructive Activity
    • “Going Beyond the Information Given” in Stimulus

• Memory Illusions
  – Remember the *Past* Inaccurately
    • Systematic Distortion, Bias
  – Product of Reconstructive Activity
    • “Going Beyond the Information Given” in Trace
Implications of the Reconstruction Principle

Memory reflects a blend of information contained in memory traces and knowledge, expectations, and beliefs derived from other sources.

Memories are Not *Records Of* the Past.
Memories are *Beliefs About* the Past.
Seven (Plus or Minus Two) Principles of Memory

• Encoding
  – Elaboration
  – Organization

• Storage
  – Time-Dependency
    • Interference

• Retrieval
  – Cue-Dependency
    • Availability vs. Accessibility
  – Encoding Specificity
  – Schematic Processing
  – Reconstruction

At least so far as conscious recollection is concerned….
Explicit and Implicit Memory
Schacter (1987)

• Explicit Memory
  – Conscious Recollection of Past Event
    • Recall, Recognition

• Implicit Memory
  – Change in Experience, Thought, Action
    • Attributable to Past Event

• Dissociation
  – Explicit Memory Impaired
  – Implicit Memory Spared
“Guessing Game”

• Word-Stem Completion
   I’m thinking of a word that begins with these three letters. Can you fill in the blanks?
   
   Ash______  Bel______
   Cle______  Exp______

• Word-Fragment Completion
   I’m thinking of a word that has these letters in it. Can you fill in the blanks?
   
   D___k  F_I__w
Memory in the Amnesic Syndrome
After Warrington & Weiskrantz (1970)

![Bar chart showing the proportion of targets across different memory tests for controls and amnesics.](chart.png)
Priming as Implicit Memory

• Performance of One Task
  – Studying a List of Words

• Facilitates Performance of Another Task
  – Word-Stem, Word-Fragment Completion
Unified View of Perception, Memory

• Constructive Activity in Conscious Cognition
  – Perceptual Construction
    • Builds Up Representation of Present Experience
  – Memory Reconstruction
    • Builds Up a Representation of Past Experience

• Unconscious Cognition
  – Implicit Perception
    • “Subliminal” Perception
  – Implicit Memory
    • Priming Effects in Amnesia
      – and “Subliminal” Perception