


**UNIT VII** Cognition

**MODULES**


- 31 Studying and Encoding Memories
- 32 Storage and Retrieving Memories
- 33 Forgetting, Memory Construction, and Improving Memory
- 34 Thinking, Concepts, and Creativity
- 35 Solving Problems and Making Decisions
- 36 Thinking and Language



The woman who can't forget.

Jill Price remembers every day of her life since age 14 with detailed clarity, including both the joys and the hurts.

Jill possesses a very detailed episodic long-term memory.



**Learning Targets**

**Module 33**

Forgetting, Memory Construction, and Improving Memory

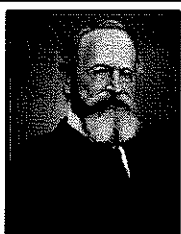
- 33-1 Explain why we forget.
- 33-2 Discuss how misinformation, imagination, and source amnesia influence our memory construction, and describe how we decide whether a memory is real or false.
- 33-3 Analyze why reports of repressed and recovered memories have been so hotly debated.
- 33-4 Describe the reliability of young children's eyewitness descriptions.
- 33-5 Discuss how you can use memory research findings to do better in this and other courses.

Let's pause for a quote...

"Whenever I see a date flash on the television (or anywhere for that matter) I automatically go back to that day and remember where I was, what I was doing, what day it fell on, and on and on and on and on. It is nonstop, uncontrollable, and totally exhausting."

~Jill Price

**William James on forgetting...**



William James (1842-1910)

"If we remembered everything, we should on most occasions be as ill off as if we remembered nothing."

~William James, 1890


**Who was H.M.?**

Henry Molaison, or H.M., had much of his **hippocampus** removed in order to stop persistent seizures. This resulted "in severe disconnection of the remaining hippocampus" from the rest of the brain. For the rest of his life, Molaison was unable to form new conscious memories.

For about half a minute he could keep something in mind, enough to carry on a conversation. When distracted, he would lose what was just said or what had just occurred.

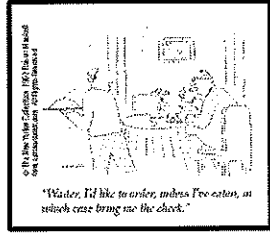
**How is H.M.'s brain still being studied?**

Although studied throughout his life, Jacopo Annese and other scientists at the University of California, San Diego's Brain Observatory are preserving Henry Molaison's brain for the benefit of future study.



**TRY IT**

**What type of memory loss is depicted in this cartoon?**



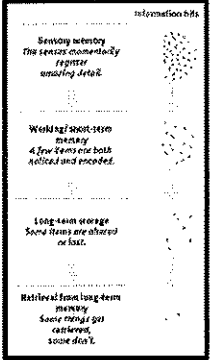
**What are two types of forgetting?**

<b>anterograde amnesia</b>	<b>retrograde amnesia</b>
<p>an inability to form new memories due to injury or illness</p> <p><i>As with H.M., he could recall his past, but not make new memories.</i></p>	<p>an inability to retrieve information from one's past due to injury or illness</p>

**When do we forget?**

Forgetting can occur at any memory stage – encoding, storage or retrieval.

When we process information, we filter, alter, or lose much of it.



**1. What Would You Answer?**

**Which of the following is an example of anterograde amnesia?**

- Halle can remember her new locker combination, but her memory of last year's combination is blocked.
- William has lost his memory of the 2 weeks before he had surgery to remove a benign brain tumor.
- Louis can remember his past, but nothing since experiencing a brain infection 4 years ago.
- Maddie can't remember the details of when she was mugged downtown 6 months ago.
- Kalund knows French, Latin, and Spanish and frequently gets them confused on exams.

**Why do we forget?**

1	encoding failure
2	storage decay
3	retrieval failure

### What is encoding failure?

```

    graph LR
      A[External Events] --> B[Sensory Memory]
      B --> C[Attention]
      C --> D[Working/Short-term Memory]
      D --> E[Encoding]
      E --> F[Long-term Memory Storage]
      E -.-> G[Encoding failure leads to forgetting]
    
```

Much of what we sense we never notice, and what we fail to encode, we will never remember.

### What is retrieval failure?

```

    graph LR
      A[External Events] --> B[Sensory Memory]
      B --> C[Attention]
      C --> D[Working/Short-term Memory]
      D --> E[Encoding]
      E --> F[Long-term Memory Storage]
      F -.-> G[Retrieval failure leads to forgetting]
    
```

Often, forgetting is not memories faded but memories unretrieved. We store in **long-term memory** what's important to us or what we've **rehearsed**. But sometimes important events defy our attempts to access them.

### What is storage decay?

After learning lists of nonsense syllables, such as YOX and JIH, Ebbinghaus studied how much he retained up to 30 days later. He found that memory for novel information fades quickly, then levels out.

Hermann Ebbinghaus' Forgetting Curve

### What are two factors that influence memory retrieval errors?

<i>proactive interference</i>	<i>retroactive interference</i>
the forward-acting disruptive effect of older learning on the recall of new information  <i>...so, the old 'stuff' you learned last month is getting in the way of the new 'stuff' you are trying to remember now....</i>	the backward-acting disruptive effect of newer learning on the recall of old information  <i>...so, the new 'stuff' you learned this week is making it hard to remember the 'stuff' you learned a few months ago...</i>

### What research has been conducted on the forgetting curve?

Harry Bahrick (1984) found a similar forgetting curve for Spanish vocabulary learned in school. Compared with those just completing a high school or college Spanish course, people 3 years out of school had forgotten much of what they had learned.

### What are some examples of interference?

<i>proactive interference</i>	<i>retroactive interference</i>
If you buy a new combination lock, your well-rehearsed old combination may interfere with your retrieval of the new one.	If someone sings new lyrics to the tune of an old song, you may have trouble remembering the original words.

**What are some other examples of interference?**

<b>proactive interference</b>	<b>retroactive interference</b>
You changed your email password last week, but you still keep typing in the old password.	Your teacher gives a cumulative exam covering all 10 chapters from the first semester, but you can only recall the more recent material, not the chapters from the beginning of school.

**What does the research show?**

Information presented in the hour before sleep suffers less retroactive interference because the opportunity for interfering events is minimized.

**TRY IT**

With your partner, create a situation or example that illustrates each of the following four retrieval errors.

retrograde amnesia	anterograde amnesia
proactive interference	retroactive interference

**What is motivated forgetting?**

Memory is an "unreliable, self-serving historian."  
 (Tavris & Aronson, 2007, p. 6)

Sigmund Freud suggested that people may forget unwanted memories, either consciously or unconsciously. In other words, they may be 'motivated' to forget....forgetting may be in people's best interests sometimes.

**TRY IT**

Interpret this graph.

What does this graph show about the relationship between retroactive interference and sleep?

**2. What Would You Answer?**

Suzanne gets a new phone number. Each time she tries to give someone the new number, she gives her old one instead. The fact that her old number is causing difficulty remembering the new is an examples of

- A. retroactive interference.
- B. retrograde amnesia.
- C. priming.
- D. proactive interference.
- E. anterograde amnesia.

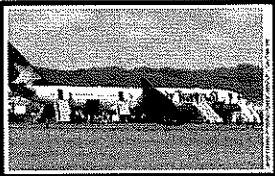
**Consider this study...**

Researchers told some participants (but not others) about the benefits of frequent toothbrushing.

Those individuals informed about the benefits of toothbrushing then recalled (more than others did) having frequently brushed their teeth in the preceding two weeks.

*(Ross et al., 1981)*

**Margaret McKinnon would disagree.**



Psychologist Margaret McKinnon, interviewed 15 passengers who nearly died in a plane crash and found that all exhibited vivid, detailed memories. With trauma comes not repression, but, far more often, "robust" memory.

**TRY IT**


**Check your understanding... can you label the independent variable (IV) and dependent variable (DV) in Tavris' study?**

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Those individuals then recalled (more than others did) having frequently brushed their teeth in the preceding two weeks.

**TRY IT**

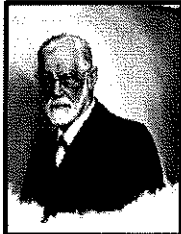
**Which president was Alexander Hamilton?**



A. 2<sup>nd</sup>  
B. 4<sup>th</sup>  
C. 5<sup>th</sup>  
D. 7<sup>th</sup>  
E. 8<sup>th</sup>

Write down your answer then stay tuned!

**What is repression?**



Sigmund Freud, a psychoanalyst, proposed that forgetting may be due to **repression** - the basic defense mechanism that banishes from consciousness anxiety-arousing thoughts, feelings, and memories.

Sigmund Freud (1856-1939)

**What is reconsolidation?**

a process in which previously stored memories, when retrieved, are potentially altered before being stored again

*Our memories are like Wikipedia pages, capable of continuous revision. When we "replay" a memory, we often replace the original with a slightly modified version, rather like what happens in the telephone game, as a whispered message gets progressively altered when passed from person to person.*

*(Hardt et al., 2010)*

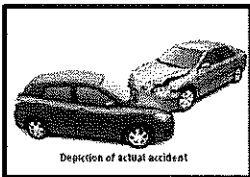
**What is the misinformation effect?**

occurs when misleading information has distorted one's memory of an event

Elizabeth Loftus demonstrated that when exposed to subtle misleading information, people may misremember.  
*(Loftus et al., 1992)*

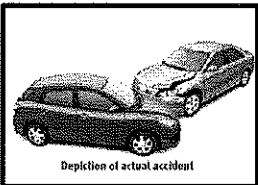
And now... the misinformation.

One week later, when asked whether they recalled seeing any broken glass, people who had heard *smashed* were more than 2x as likely to report seeing glass fragments. In fact, the clip showed no broken glass.




**How did Elizabeth Loftus test the misinformation effect?**

Two groups of people watched a film clip of a traffic accident and then answered questions about what they had seen.  
*(Loftus & Palmer, 1974)*



**What did you answer on the TRY IT?**

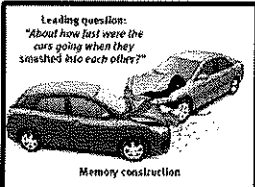
Sometimes our mind tricks us into misremembering dates, places, and names. In one study, many people mistakenly recalled Alexander Hamilton—the subject of a popular Broadway musical whose face also appears on the U.S. \$10 bill—as a U.S. President.  
*(Roediger & DeSoto, 2016)*



**How did leading questions influence recall?**

Those asked, "About how fast were the cars going when they *smashed* into each other?" gave higher speed estimates than those asked, "About how fast were the cars going when they *hit* each other?"

Leading question:  
"About how fast were the cars going when they *smashed* into each other?"



**How does imagination impact memory?**

Repeatedly *imagining* nonexistent actions and events can create false memories.

Misinformation and imagination effects occur partly because visualizing something and actually perceiving it activate similar brain areas. Imagined events also later seem more familiar, and familiar things seem more real. The more vividly we can imagine things, the more likely they are to become memories. *(Loftus, 2001; Porter et al., 2000)*

### How can digitally altered photographs produce imagination inflation?

When *Slate* magazine readers in 2012 were shown a doctored photo of U.S. President Barack Obama and Iranian President Mahmoud Ahmadinejad shaking hands, 26 percent recalled the event—despite it never having happened.

(Frenda et al., 2013)

### How does “Mr. Science” help us understand source amnesia?

Preschoolers interacted with “Mr. Science,” who engaged them in activities such as blowing up a balloon with baking soda and vinegar.

Three months later, on three successive days, their parents read them a story describing some things the children had experienced with Mr. Science and some they had not.

### What is source amnesia?

faulty memory for how, when, or where information was learned or imagined

(Also called *source misattribution*.)

Source amnesia tends to affect a person’s explicit memory and along with the misinformation effect, is at the heart of many false memories.

### What were the results?

When a new interviewer asked what Mr. Science had done with them—

“Did Mr. Science have a machine with ropes to pull?”

—4 in 10 children spontaneously recalled him doing things that had happened only in the story. They recalled a false memory.

(Poole & Lindsay, 1995, 2001)

### What are some examples of source amnesia?

We may recognize someone but have no idea where we have seen the person.

We may tell a friend some gossip, only to learn we got the news from that friend.

A friend tells you about an internet story about the woman who had 75 cats. You know you have heard the story before, but cannot remember where.

### What is déjà vu?

that eerie sense that “I’ve experienced this before”

Cues from the current situation may unconsciously trigger retrieval of an earlier experience. **Source amnesia** is one possible explanation for this phenomenon.

**So how can we tell true memories from constructed memories?**

It is hard to separate false memories from real ones.

False memories can be persistent and feel like real ones.

We more easily remember the gist than the events themselves.

**So, can memories of child abuse be reconstructed as well?**

2. Innocent people are falsely accused, as therapists prompt "recovered" memories of childhood sexual abuse.

Sometimes, a well-meaning therapist, *the misinformation effect* and rehearsal of incorrect information can lead to false accusations of child abuse.

**TRY IT**

**Talk with your partner.**

Can you think of an instance when you were sure you remembered something, only to discover later that your memory—or some aspect of it—was false?

Which of the memory construction errors we discussed might be to blame?

**What are three arguments against repression of child abuse memories?**

Psychologists question whether *repression* ever occurs.

Traumatic experiences typically lead to vivid, persistent, haunting memories.

When memories are 'recovered' after long periods of amnesia, particularly when extraordinary means were used to secure the recovery of memory, there is a high probability that the memories are false."

**Why have reports of repressed and recovered memories been so hotly debated?**

The debate (between memory researchers and some well-meaning therapists) focuses on whether memories of early childhood abuse are *repressed* and can be recovered during therapy.

Professional organizations seek to find common ground between the potential for doubting true accusations of abuse and the potential for false accusations.

**What do psychologists agree on?**

Psychologists now agree that

- (1) sexual abuse happens;
- (2) injustice happens;
- (3) forgetting happens;
- (4) Recovered memories are commonplace;
- (5) memories of things that happened before age 4 are unreliable (*infantile amnesia*);
- (6) Memories "recovered" under hypnosis are especially unreliable; and
- (7) memories, whether real or false, can be emotionally upsetting.





### How reliable are young children's eyewitness descriptions?

If memories can be sincere, yet sincerely wrong, how can jurors decide cases in which children's memories of sexual abuse are the only evidence?



### How can you use memory research to do better in your courses and on the AP® Exam?

Memory research findings suggest the following strategies for improving memory:

- study repeatedly,
- make material meaningful,
- activate retrieval cues,
- use mnemonic devices,
- minimize interference,
  - sleep more,
- and test yourself to be sure you can retrieve, as well as recognize, material.

### What research has been conducted on children's recall?

Stephen Ceci and Maggie Bruck's studies of children's memories have made them aware of how easily children's memories can be molded.

For example, they asked 3-year-olds to show on anatomically correct dolls where a pediatrician had touched them.

Of the children who had not received genital examinations, 55 percent pointed to either genital or anal areas.

### Learning Target 33-1 Review



Explain why we forget.

- **Anterograde amnesia** is an inability to form new memories due to injury or illness.
- **Retrograde amnesia** is an inability to retrieve old memories due to injury or illness.
- Normal forgetting happens because we have never encoded information, because the physical trace has decayed, or because we cannot retrieve what we have encoded and stored.

### How reliable is children's recall?

In one analysis of eyewitness data from over 20,000 participants, children regularly identified innocent suspects as guilty.  
(Fitzgerald & Price, 2015)

"[The] research," said Stephen Ceci, "leads me to worry about the possibility of false allegations. It is not a tribute to one's scientific integrity to walk down the middle of the road if the data are more to one side."

### Learning Target 33-1 Review cont.



Explain why we forget.

- Retrieval problems may result from **proactive interference**, as prior learning interferes with recall of new information, or from **retroactive interference**, as new learning disrupts recall of old information.
- Some believe that motivated forgetting occurs, but researchers have found little evidence of **repression**.

### Learning Target 33-2 Review

Discuss how misinformation, imagination, and source amnesia influence our memory construction, and describe how we decide whether a memory is real or false.

- Repeatedly “replaying” memories may alter them, leading to the introduction of inaccuracies (a process called **reconsolidation**).
- In experiments demonstrating the **misinformation effect**, people have formed false memories by incorporating misleading details—either after receiving wrong information after an event, or after repeatedly **imagining** and rehearsing something that never happened.

### Learning Target 33-3 Review cont.

Analyze why reports of repressed and recovered memories have been so hotly debated.

- Psychologists now agree that (1) sexual abuse happens; (2) injustice happens; (3) forgetting happens; (4) recovered memories are commonplace; (5) memories of things that happened before age 4 are unreliable; (6) memories “recovered” under hypnosis are especially unreliable; and (7) memories, whether real or false, can be emotionally upsetting.

### Learning Target 33-2 Review cont.

Discuss how misinformation, imagination, and source amnesia influence our memory construction, and describe how we decide whether a memory is real or false.

- When we reassemble a memory during retrieval, we may attribute it to the wrong source (**source amnesia**). Source amnesia may help explain **déjà vu**.
- False memories feel like real memories and can be persistent but are usually limited to the main gist of the event.

### Learning Target 33-4 Review

Describe the reliability of young children’s eyewitness descriptions.

- Children are susceptible to the **misinformation effect**, but if questioned in neutral words they understand, they can accurately recall events and people involved in them.

### Learning Target 33-3 Review

Analyze why reports of repressed and recovered memories have been so hotly debated.

- The debate focuses on whether memories of early childhood abuse are **repressed** and can be recovered during therapy.
- Professional organizations seek to find common ground between the potential for doubting true accusations of abuse and the potential for false accusations.

### Learning Target 33-5 Review

Discuss how you can use memory research findings to do better in this and other courses.

- Memory research findings suggest the following strategies for improving memory: Study repeatedly, make material meaningful, activate retrieval cues, use mnemonic devices, minimize interference, sleep more, and test yourself to be sure you can retrieve, as well as recognize, material.