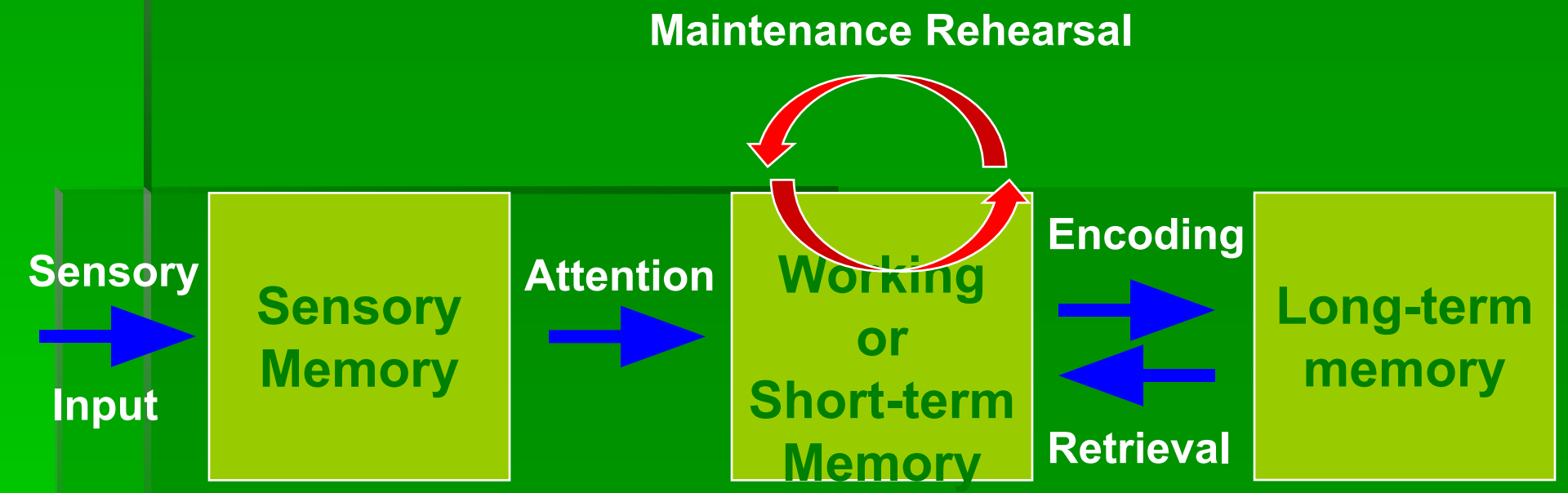
Memory

Memory Processes

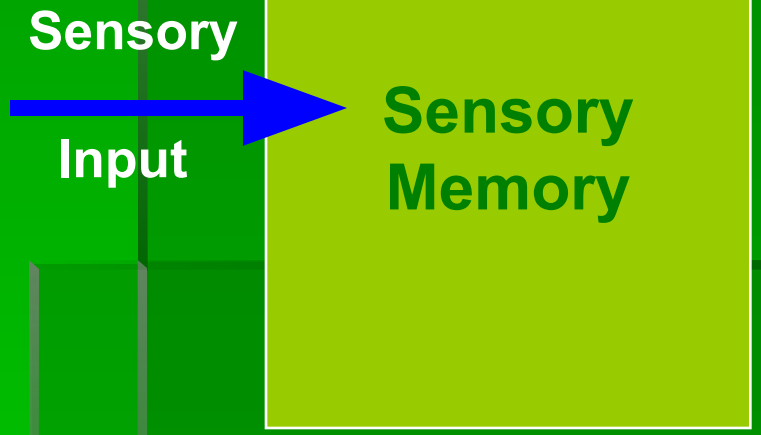
- Encoding--transforming information into a form that can be entered and retained in the the memory system
- Storage--retaining information in memory so that it can be used at a later time
- Retrieval--recovering information stored in memory so that we are consciously aware of it

Three Stages of Memory

- Three memory stores that differ in function, capacity and duration



Sensory Memory

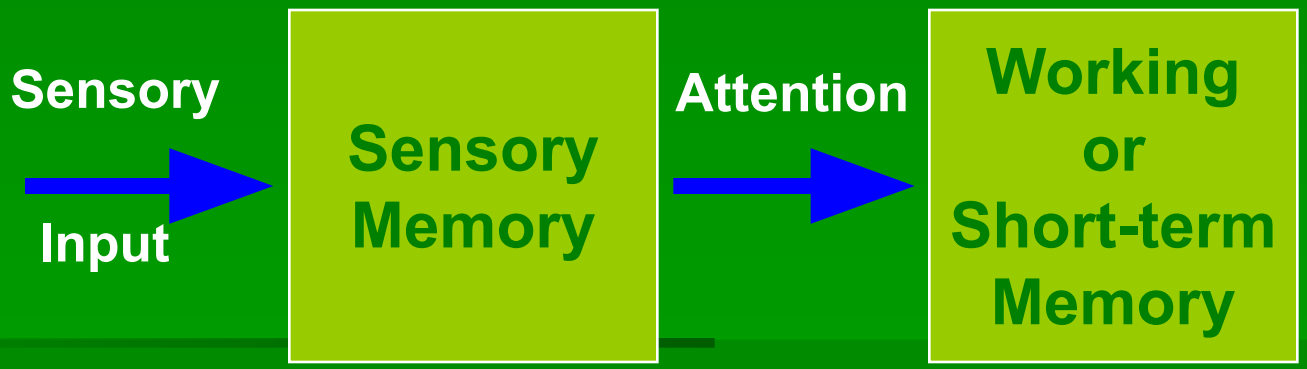


- Function —process for basic physical characteristics
- Capacity—large
  - can hold many items at once
- Duration—very brief retention of images
  - .3 sec for visual info
  - 2 sec for auditory info
- Divided into two types:
  - iconic memory–visual information
  - echoic memory– auditory information
- Attention is needed to transfer information to working memory

Sensory Memory

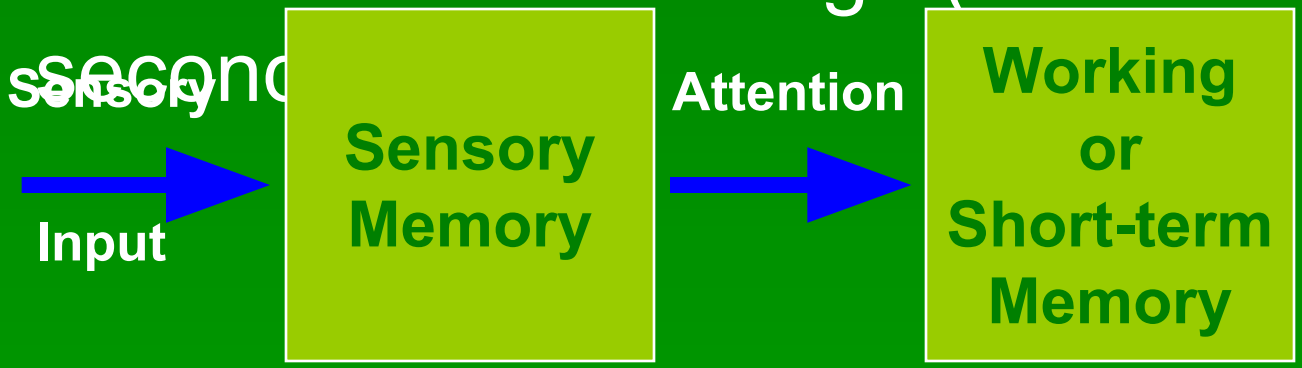
- Visual sensory memory—brief memory of an image or icon. Also called iconic memory.
- Auditory sensory memory—brief memory of a sound or echo. Also called echoic memory.
- Auditory sensory memories may last a bit longer than visual sensory memories

Short Term or Working Memory



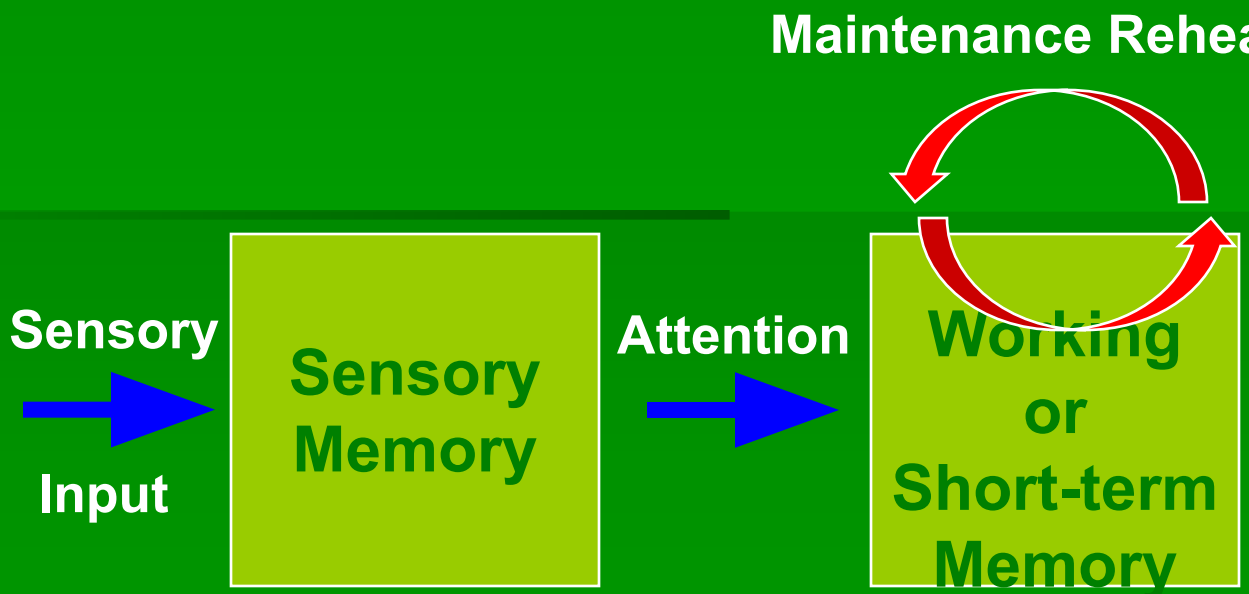
Short-Term Memory

- Function—conscious processing of information
  - where information is actively worked on
- Capacity—limited (holds 7+/-2 items)
- Duration—brief storage (about 30 seconds)



Maintenance Rehearsal

- Mental or verbal repetition of information allows information to remain in working memory longer than the usual 30 seconds

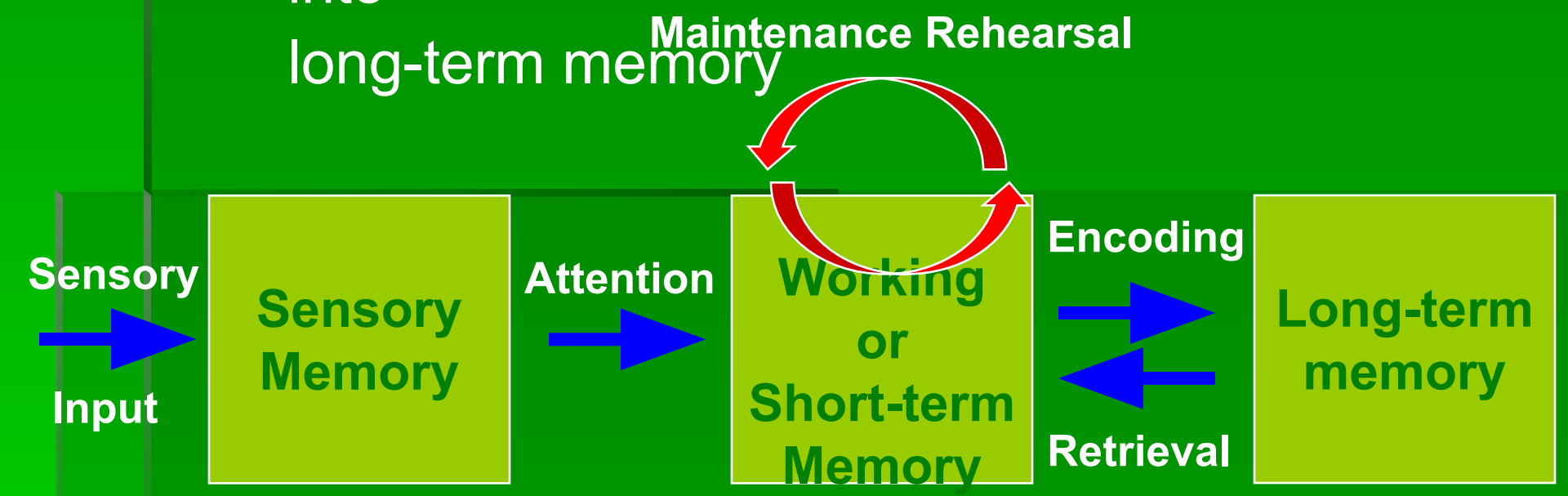


Chunking

- Grouping small bits of information into larger units of information
  - expands working memory load
- Which is easier to remember?
  - 4 8 3 7 9 2 5 1 6
  - 483 792 516

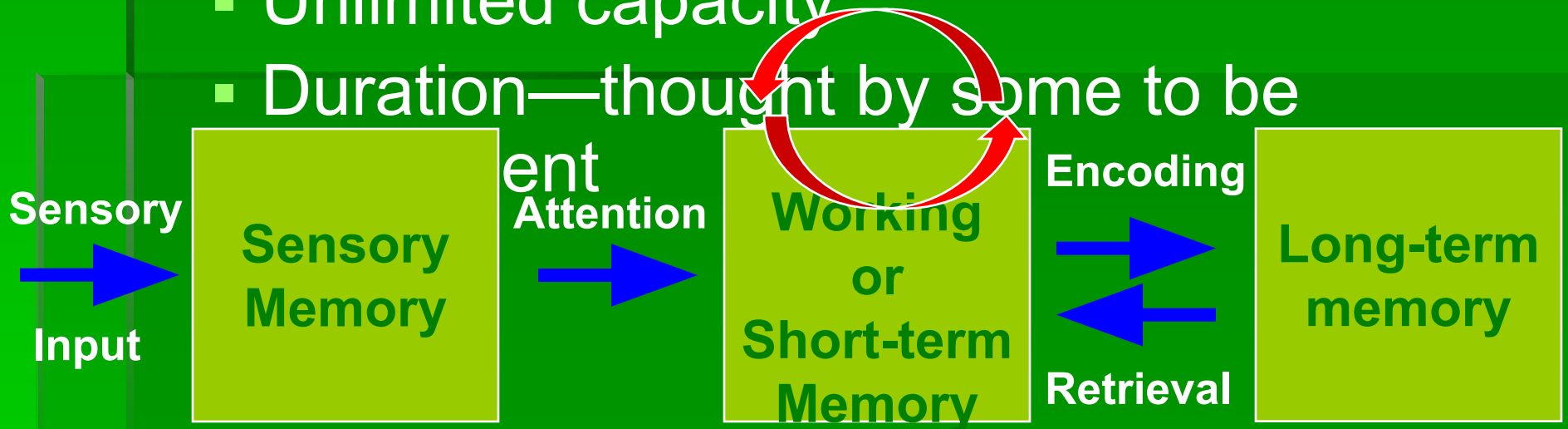
Long-Term Memory

- Once information passes from sensory to working memory, it can be encoded into long-term memory



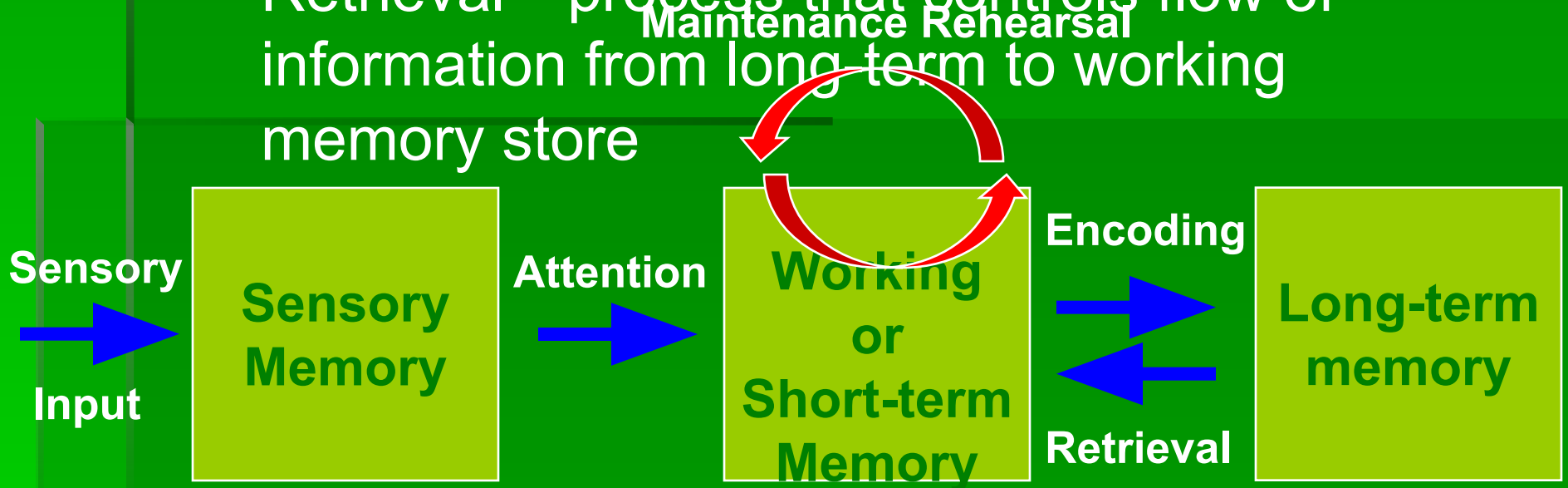
Long-Term Memory

- Function—organizes and stores information
  - more passive form of storage than working memory
- Unlimited capacity
- Duration—thought by some to be
  ent



Long-Term Memory

- Encoding—process that controls movement from working to long-term memory store
- Retrieval—process that controls flow of information from long-term to working memory store



Automatic vs. Effortful Encoding

- Automatic processing
  - Unconscious encoding of information
  - Examples:
    - What did you eat for lunch today?
    - Was the last time you studied during the day or night?
    - You know the meanings of these very words you are reading. Are you actively trying to process the definition of the words?

Automatic vs. Effortful Encoding

- Effortful processing
  - Requires attention and conscious effort
  - Examples:
    - Memorizing your notes for your upcoming Introduction to Psychology exams
    - Repeating a phone number in your head until
      you can write it down

Types of Long-Term Memory

- Explicit memory—memory with awareness; information can be consciously recollected; also called declarative memory
- Implicit memory—memory without awareness; memory that affects behavior but cannot consciously be recalled; also called nondeclarative memory

Explicit Memory

- Declarative or conscious memory
- Memory consciously recalled or declared
- Can use explicit memory to directly respond to a question
- Two subtypes of explicit

Explicit Memory

- Episodic information—information about events or “episodes”
- Semantic information—information about facts, general knowledge, school work

Episodic Memory

- Memory tied to your own personal experiences
- Examples:
  - What month is your birthday?
  - Do you like to eat caramel apples?
- Q: Why are these explicit memories?
- A: Because you can actively declare your answers to these questions

Semantic Memory

- Memory not tied to personal events
- General facts and definitions about the world
- Examples:
  - How many tires on a car?
  - What is a cloud?
  - What color is a banana?
- Does NOT depend on tying the item to your past

Implicit Memory

- Nondeclarative memory
- Influences your thoughts or behavior, but does not enter consciousness

Procedural Memory

- Memory that enables you to perform specific learned skills or habitual responses
- Examples:
  - Riding a bike
  - Using the shift stick while driving
  - Tying your shoe laces
- Q: Why are these procedural memories implicit?
- A: Don’t have to consciously remember the steps involved in these actions to perform them
  - Try to explain to someone how to tie a shoelace

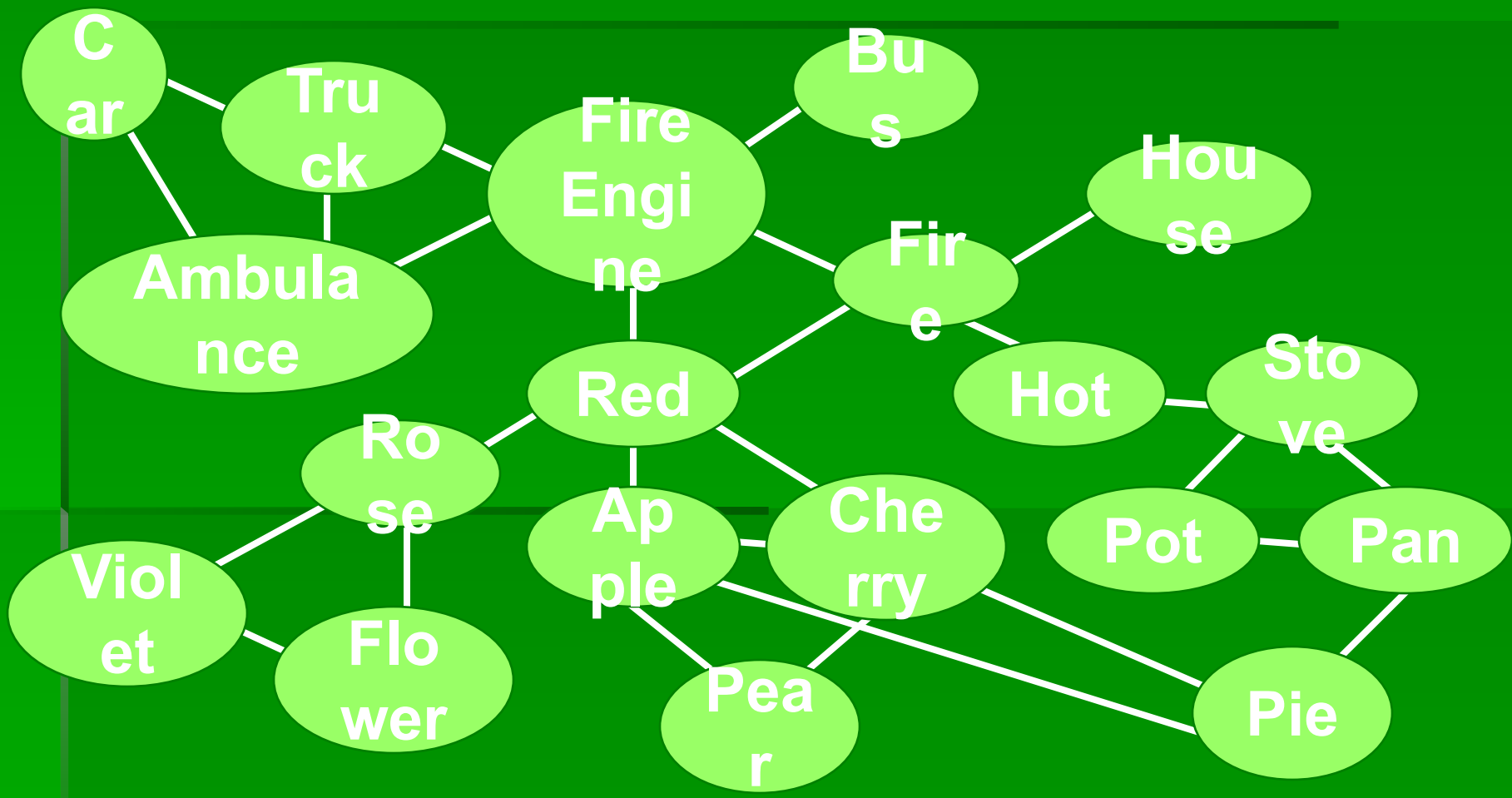
How are memories organized?

Clustering--organizing items into related groups during recall from long-term memory

Semantic Network Model

- Mental links between concepts
  - common properties provide basis for mental link
- Shorter path between two concepts = stronger association in memory
- Activation of a concept starts decremental spread of activity to nearby concepts

Semantic Network Model



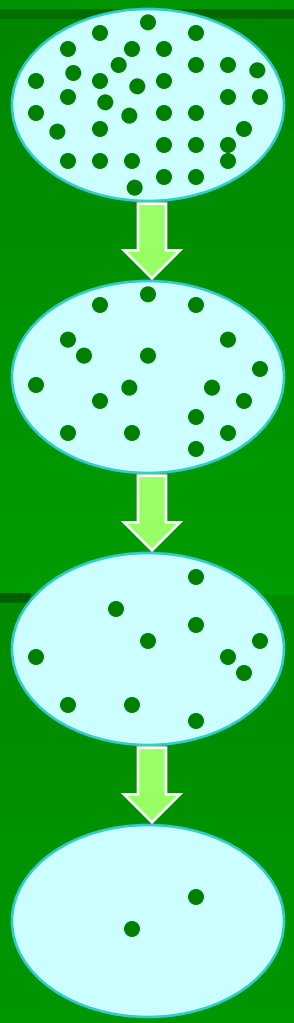
Why do we forget?

Sensory memory
The senses momentarily register amazing detail

Short-term memory
A few items are both noticed and encoded

Long-term storage
Some items are altered or lost

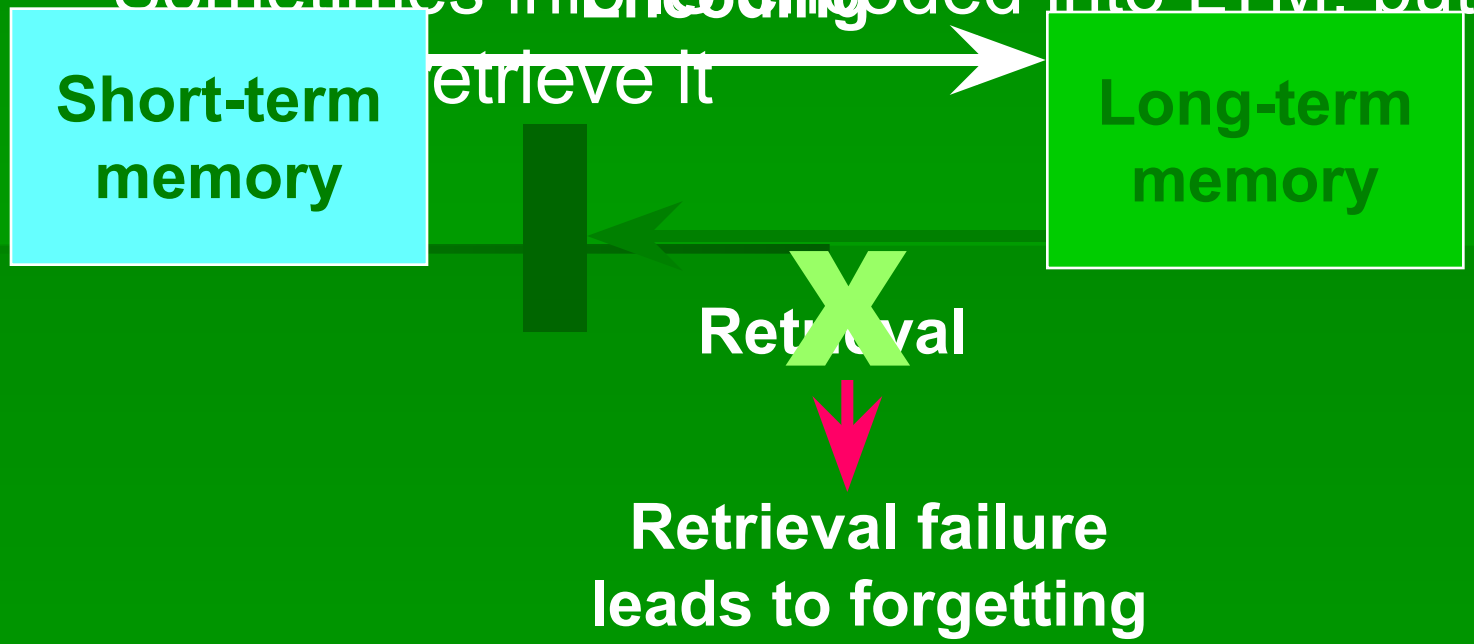
Retrieval from long-term memory
Depending on interference, retrieval cues, moods, and motives, some things get retrieved, some don't



- Forgetting can occur at any memory stage

Forgetting as retrieval failure

- Retrieval—process of accessing stored information
- Sometimes info is encoded into LTM, but we can't retrieve it



Measures of Retrieval

- Recall—test of LTM that involves retrieving memories without cues, also termed free recall
- Cued recall—test of LTM that involves remembering an item of information in response to a retrieval cue
- Recognition—test of LTM that involves identifying correct information from a series of possible choices
- Serial position effect—tendency to remember items at the beginning and end of

Encoding Specificity

- When conditions of retrieval are similar to conditions of encoding, retrieval is more likely to be successful
- You are more likely to remember things if the conditions under which you recall them are similar to the conditions under which you learned them

Encoding Specificity

- Context effects—environmental cues to recall
- State dependent retrieval—physical, internal factors
- Mood Congruence—factors related to mood or emotions

Flashbulb Memories

- Recall of very specific images or details about a vivid, rare, or significant event
- May seem very vivid and specific, but they are not more accurate than ordinary memories

Memory Distortion

- Memory can be distorted as people try to fit new info into existing schemas
- Giving misleading information after an event causes subjects to unknowingly distort their memories to incorporate the new

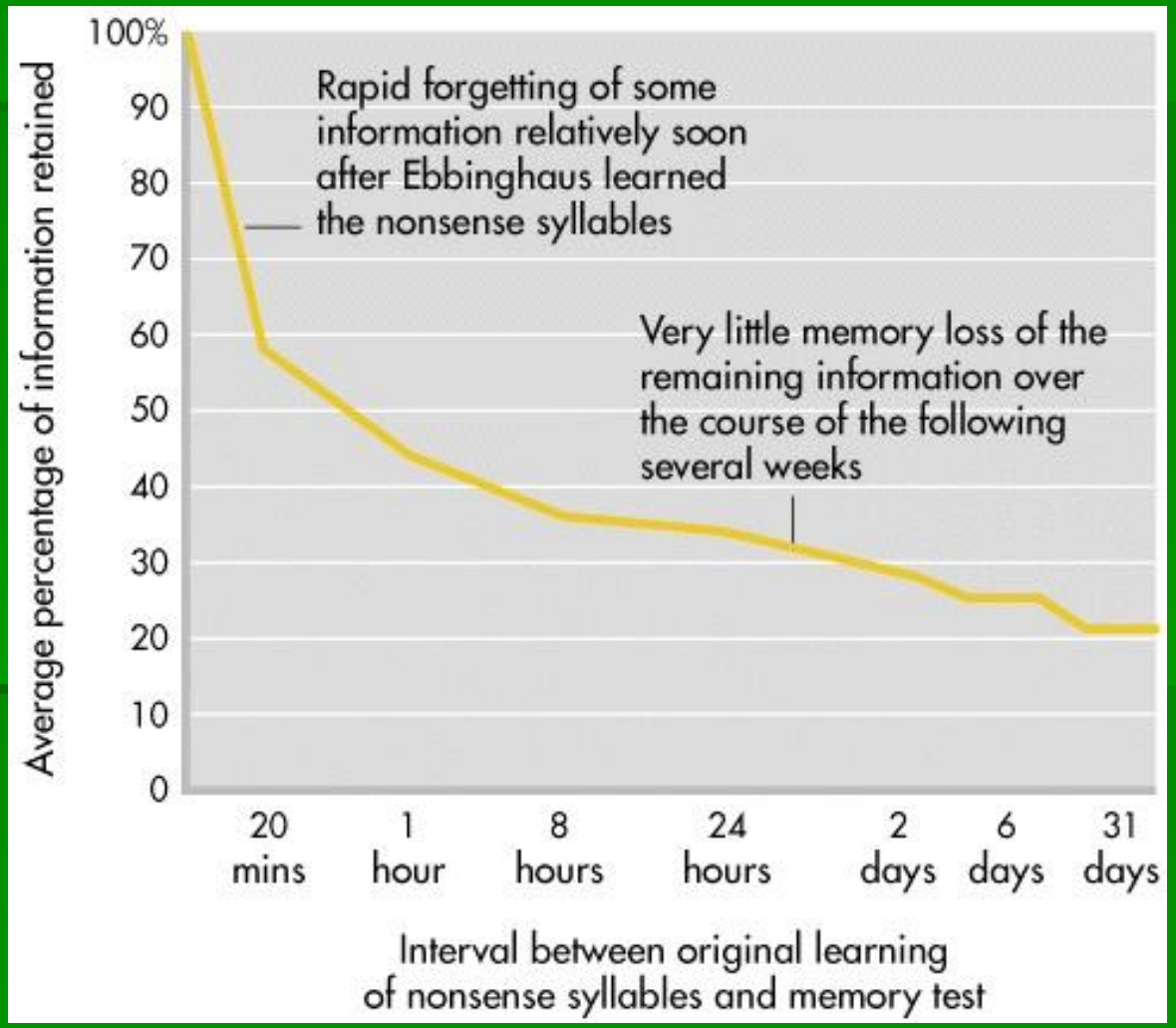
Loftus Experiment

- Subjects shown video of an accident between two cars
- Some subjects asked: How fast were the cars going when they smashed into each other?
- Others asked: How fast were the cars going when the hit

The Forgetting Curve

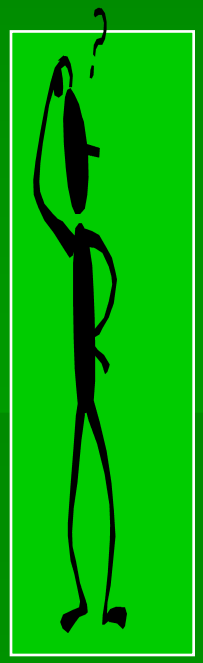
Hermann Ebbinghaus first began to study forgetting using nonsense syllables

Nonsense syllables are three-letter combinations that look like words but are meaningless (ROH, KUF)



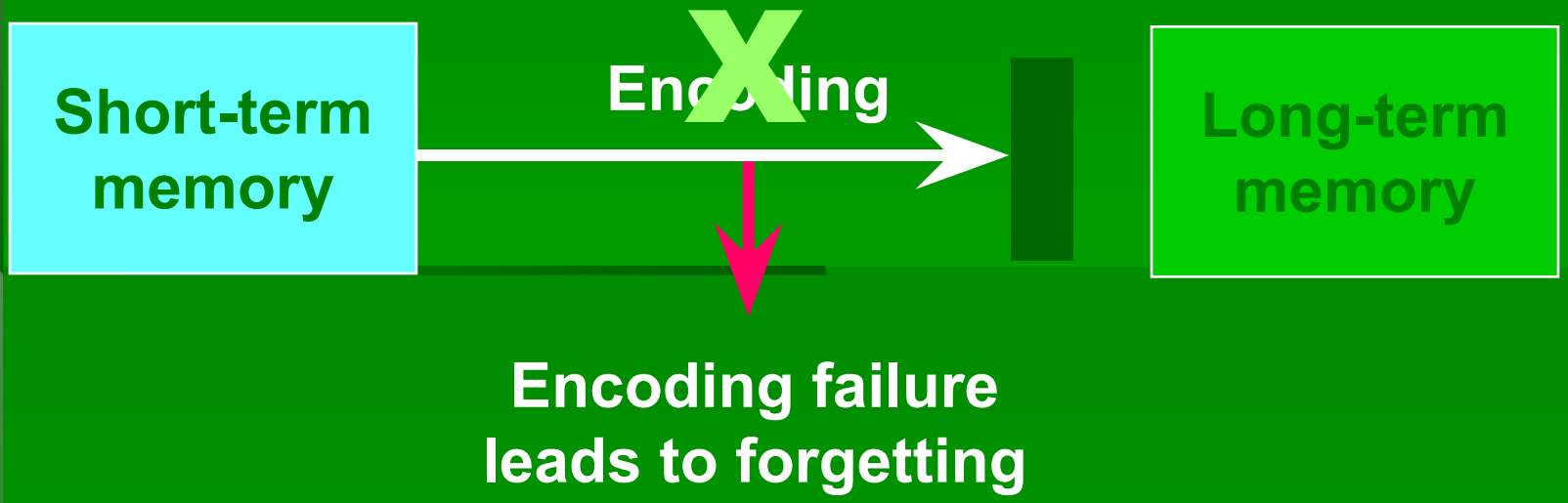
Forgetting Theories

- Encoding failure
- Interference theories
- Motivated forgetting
- Decay

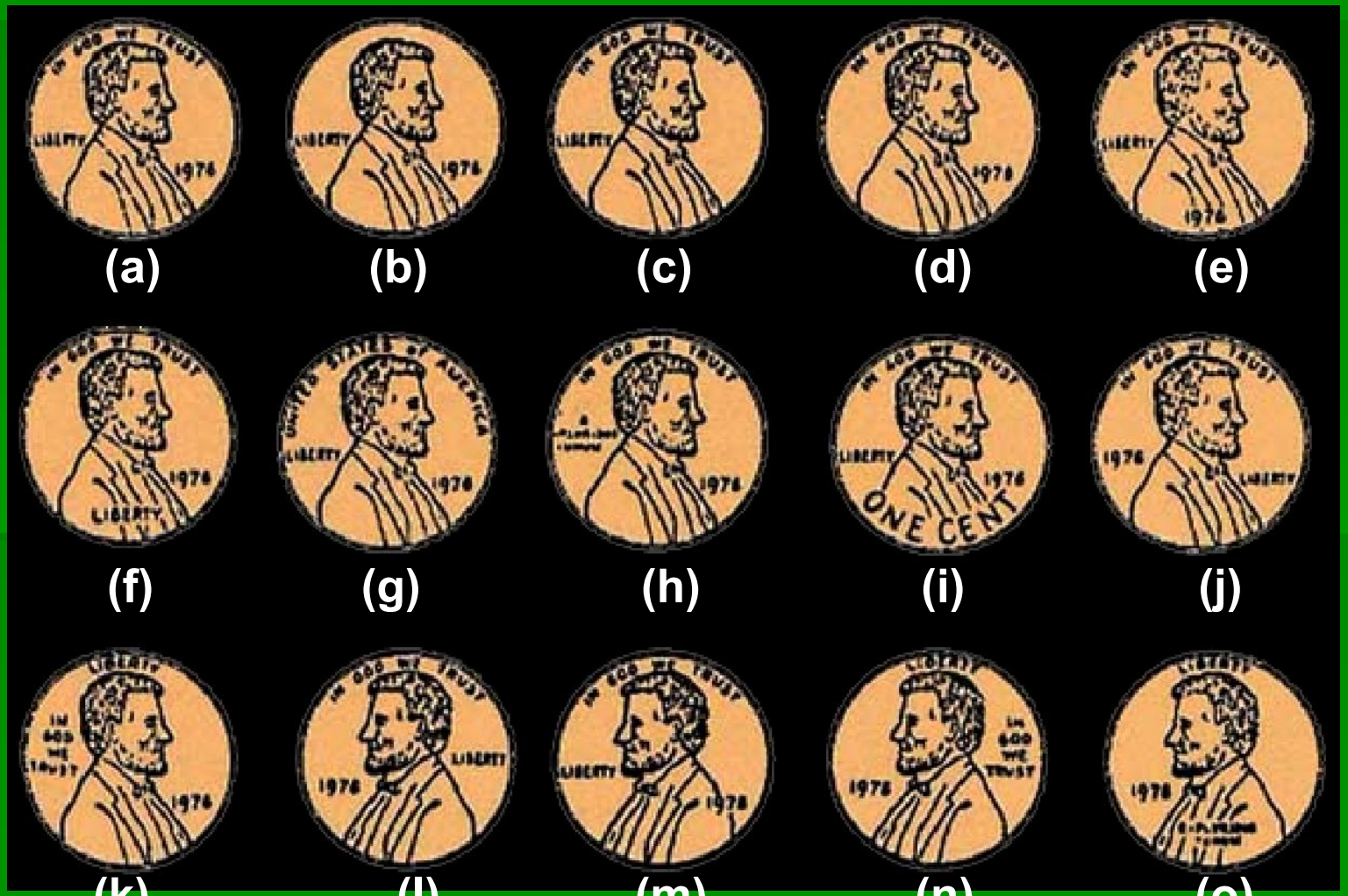


Forgetting as encoding failure

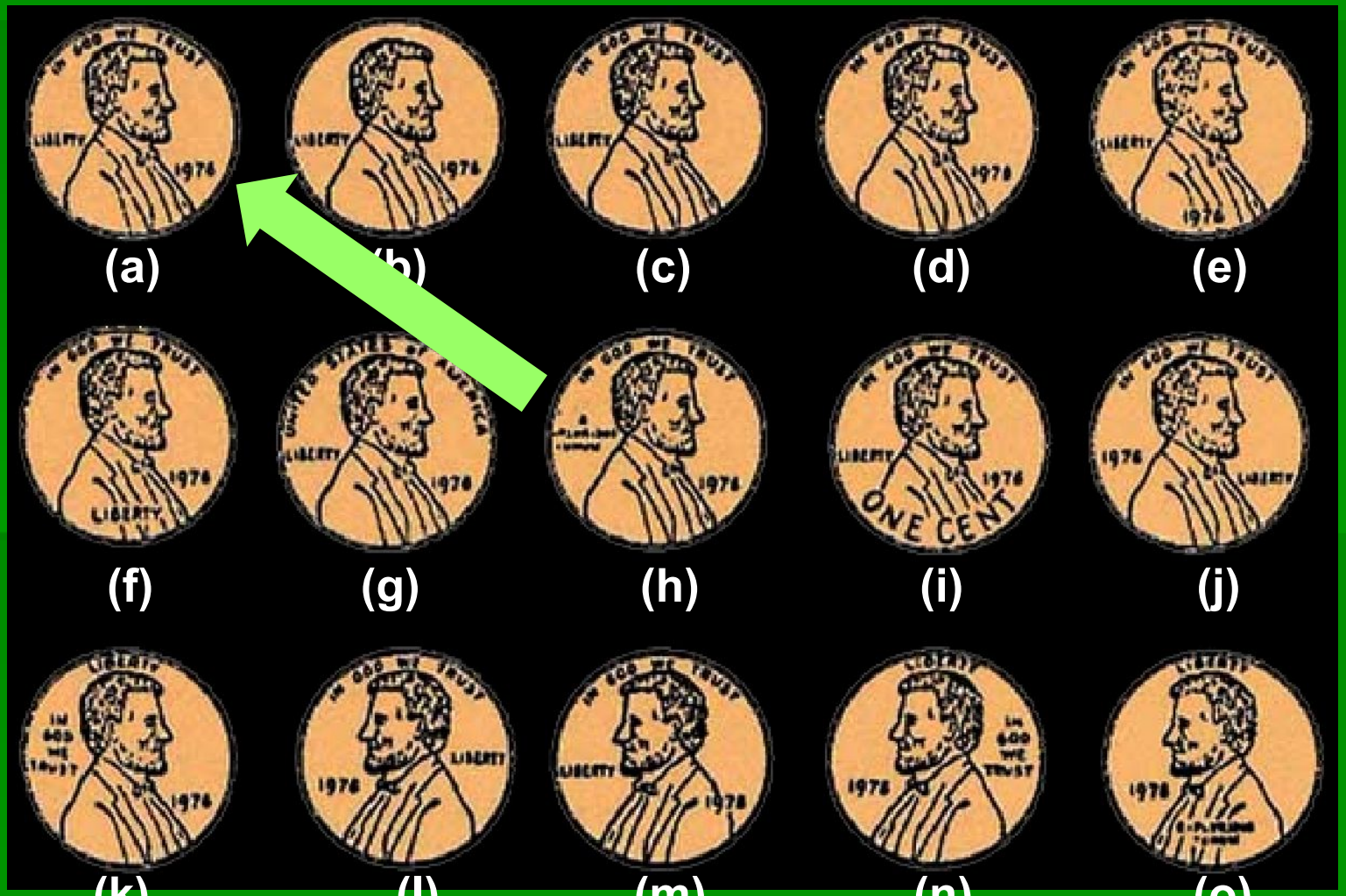
- Info never encoded into LTM



Which is the real penny?



Answer



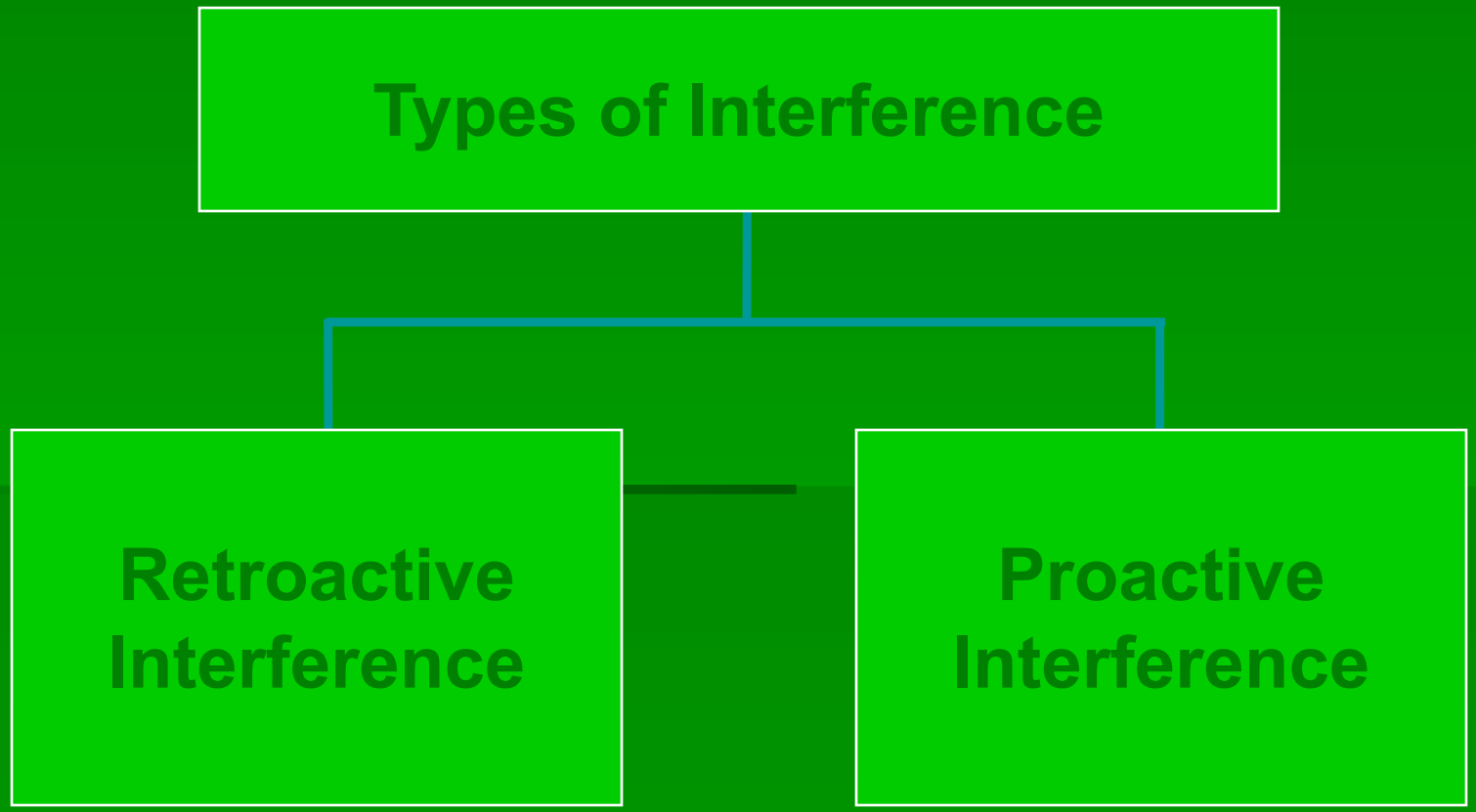
Encoding Failures

Even though you've seen thousands of pennies, you've probably never looked at one closely to encode specific features

Interference Theories

- “Memories interfering with memories”
- Forgetting NOT caused by mere passage of time
- Caused by one memory competing with or replacing another memory
- Two types of interference

Two Types of Interference

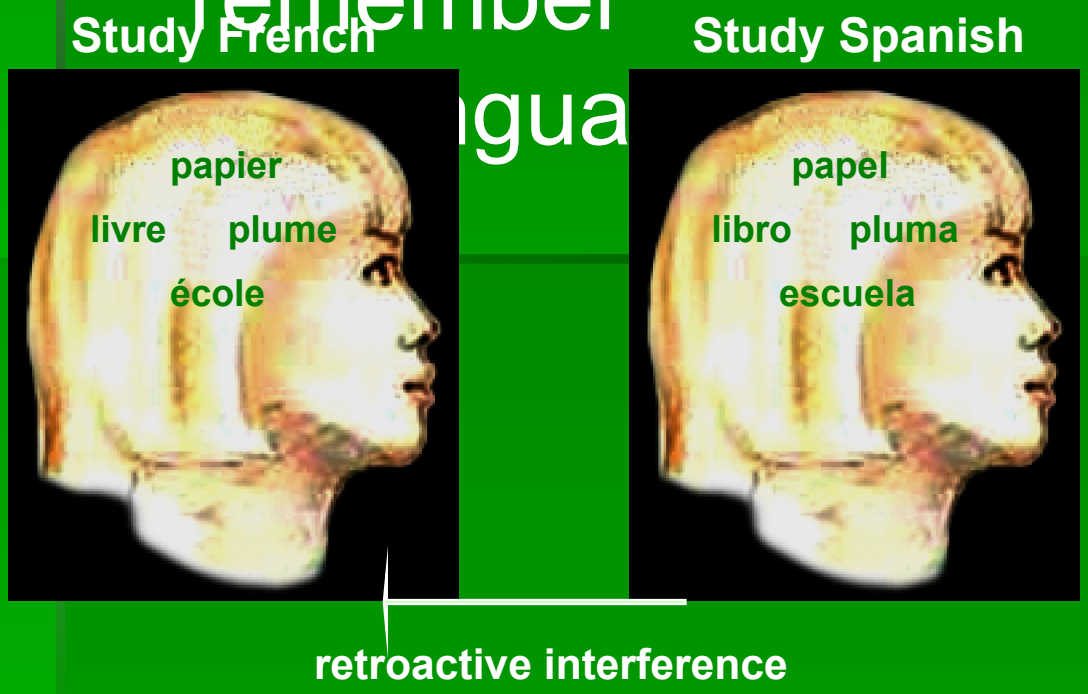


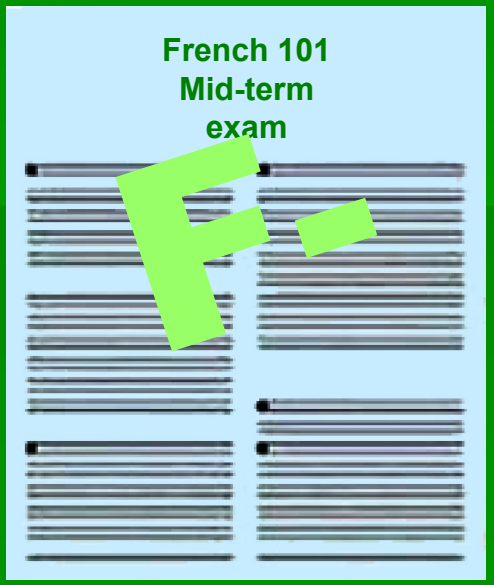
Retroactive Interference

- When a NEW memory interferes with remembering OLD information
- Example: When new phone number interferes with ability to remember old phone number

Retroactive Interference

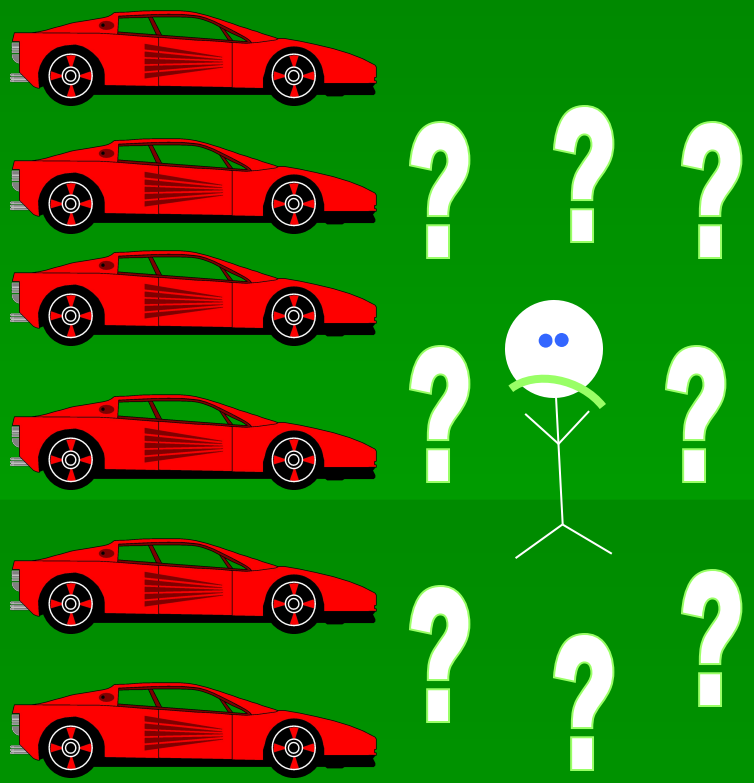
- Example: Learning a new language interferes with ability to remember
ngua





Proactive Interference

- Opposite of retroactive interference
- When an OLD memory interferes with remembering NEW information
- Example: Memories of where you parked your car on campus the past week interferes with ability find car today

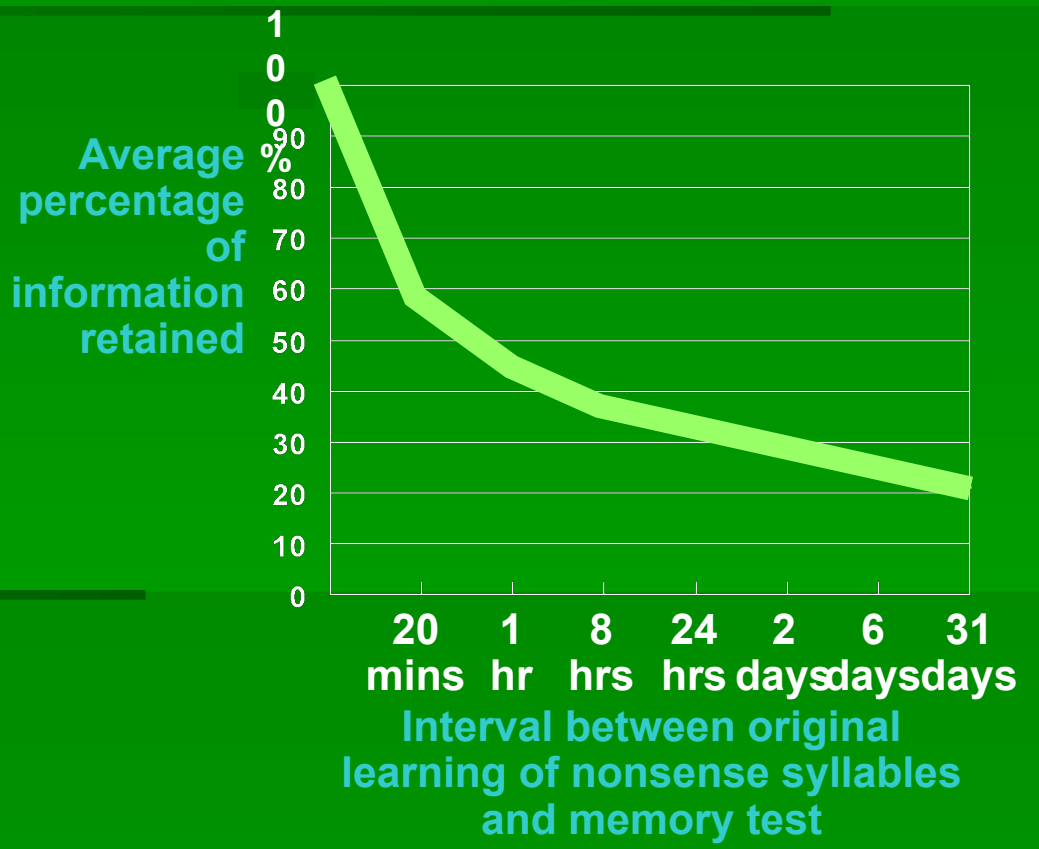


Motivated Forgetting

- Undesired memory is held back form awareness
  - Suppression—conscious forgetting
  - Repression—unconscious forgetting (Freudian)

Decay Theories

- Memories fade away or decay gradually if unused
- Time plays critical role
- Ability to retrieve info declines with time after original



Decay Theories

- Biology-based theory
- When new memory formed, it creates a *memory trace*
  - a change in brain structure or chemistry
- If unused, normal brain metabolic processes erode memory trace
- Theory not widely favored today

Biological Basis of Memory

- Karl Lashley searched for a localized memory trace or *engram*
- Found that maze-learning in rats was distributed throughout the brain
- Richard Thompson found that memory for simple classically conditioned responses was localized (in the cerebellum)

Amnesia

- Amnesia—severe memory loss
- Retrograde amnesia—inability to remember past episodic information; common after head injury; need for *consolidation*
- Anterograde amnesia—inability to form new memories; related to hippocampus damage