

MEMORY

Memory refers to the processes that are used to acquire, store, retain , and, later, retrieve information.

There are three major processes involved in memory: **encoding**, **storage** and **retrieval**.

“Without **encoding**, the brain has nothing to process for storage. Without **storage**, the brain would always live in the present. Without **retrieval**, memories stored in the brain would remain there to no practical purpose.”
(Sweeney, 2008, pp239)

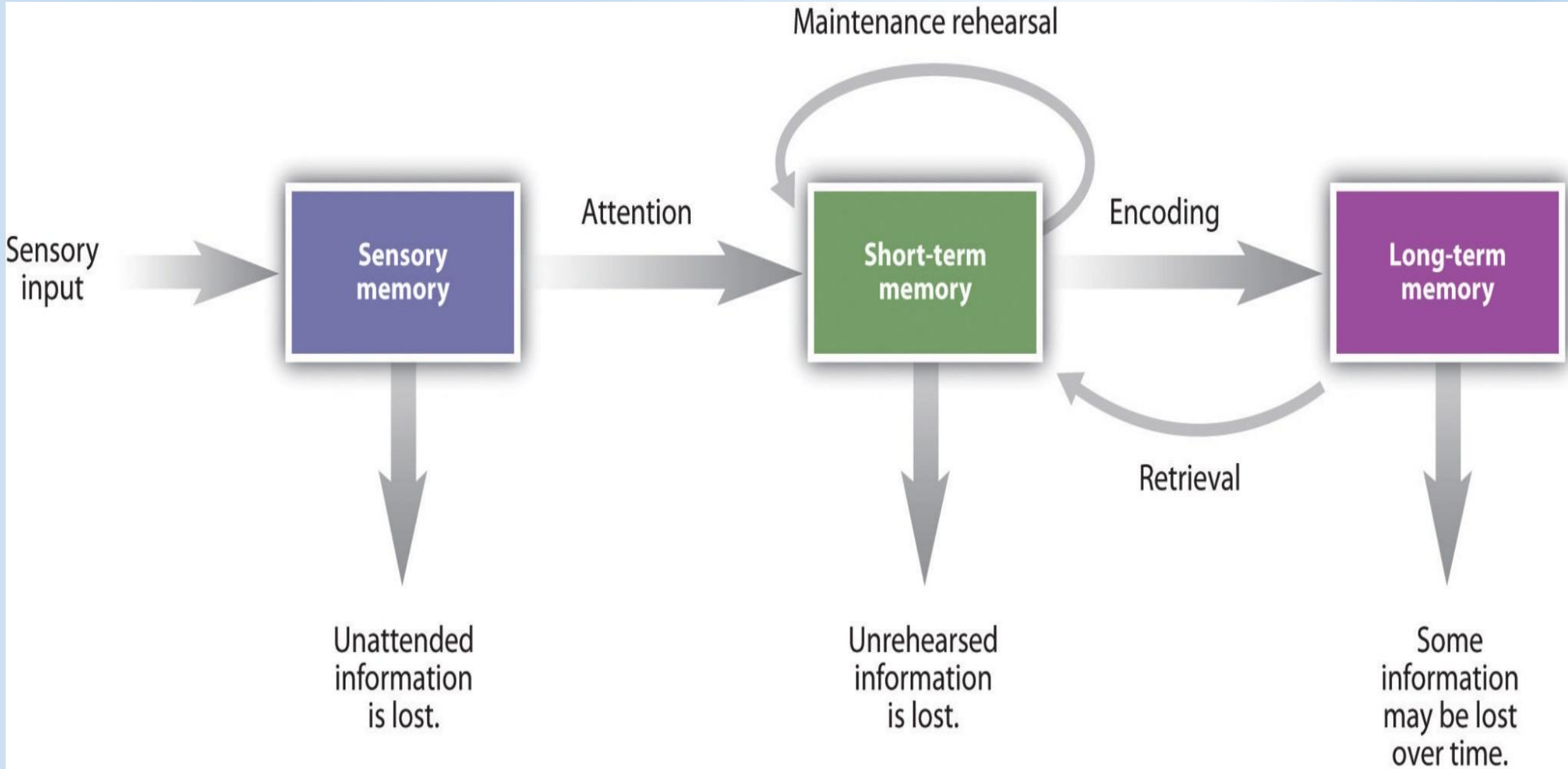
ENCODING

- **Encoding** is the process of getting information into memory. If information (or stimuli) never gets encoded, it will never be remembered.
- When information comes into our memory system (from sensory input), it needs to be changed into a form that the system can cope with, so that it can be stored; hence different ways of encoding verbal information:
 - **Structural encoding** focuses on what words look like. For instance, one might note whether words are long or short, in uppercase or lowercase, or handwritten or typed.
 - **Phonemic encoding** focuses on how words sound.
 - **Semantic encoding** focuses on the meaning of words. Semantic encoding requires a deeper level of processing than structural or phonemic encoding and usually results in better memory.

STORAGE

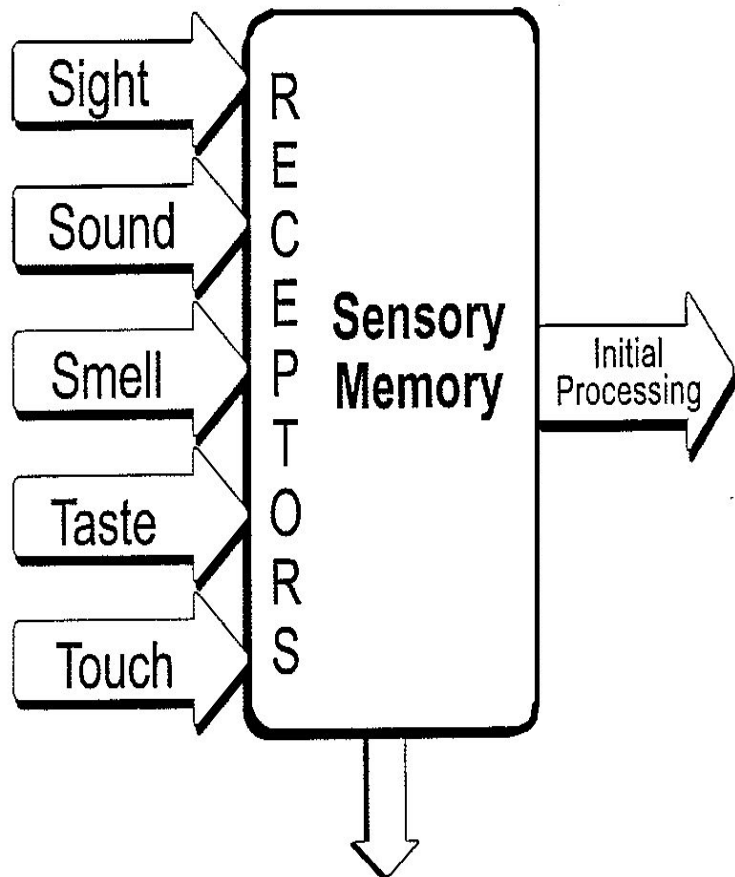
- **Storage** consists of retention of information over time.
- To describe the process of storage, many psychologists use the three-stage model proposed by **Richard Atkinson** and **Richard Shiffrin**.
 - According to this model, information is stored sequentially in three memory systems: sensory memory, short-term memory, and long-term memory.

THREE-STAGE PROCESSES (Systems)

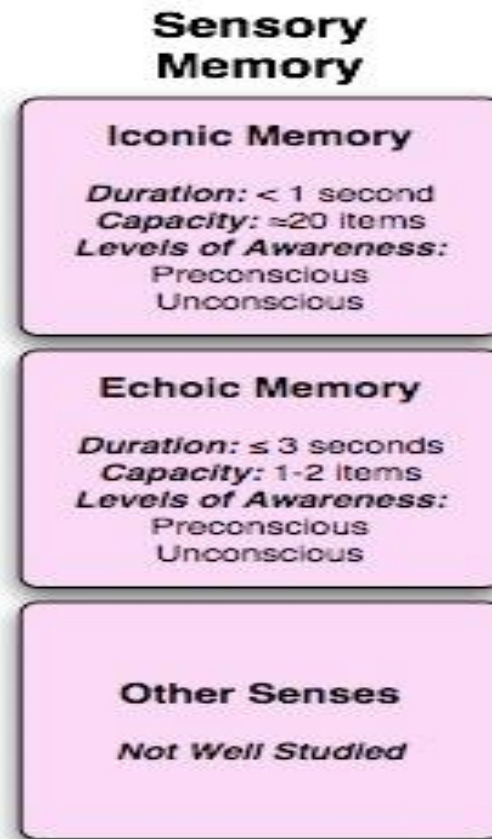


SENSORY MEMORY

- **Sensory memory** stores incoming sensory information in detail but only for an instant. The capacity of sensory memory is very large, but the information in it is unprocessed.



Not transferred to next stage and therefore forgotten



Short-Term Memory

Forgetting

Decay Theory: The disappearance of a biological memory trace (engram)

SHORT-TERM MEMORY (Working Memory)

- **Working memory** is an active system that allows people to remember, manipulate, and store information.
- Some of the information in sensory memory transfers to **short-term memory**, which can hold information for approximately twenty seconds.
- Rehearsing can help keep information longer in **short-term memory**.
- **Short-term memory** has a limited capacity: it can store about seven pieces of information, plus or minus two pieces.
- Chunking (combining small bits of information into bigger, familiar pieces) can help increase the capacity of **short-term memory**.

LONG-TERM MEMORY

- **Long-term memory** has an almost infinite capacity.
- In long-term memory, information usually stays for the duration of a person's life.
- However, people may not be able to *retrieve* information from LTM.
- **Long-term memory** is organized into categories, as well as by familiarity, relevance, and relationship to other memories.

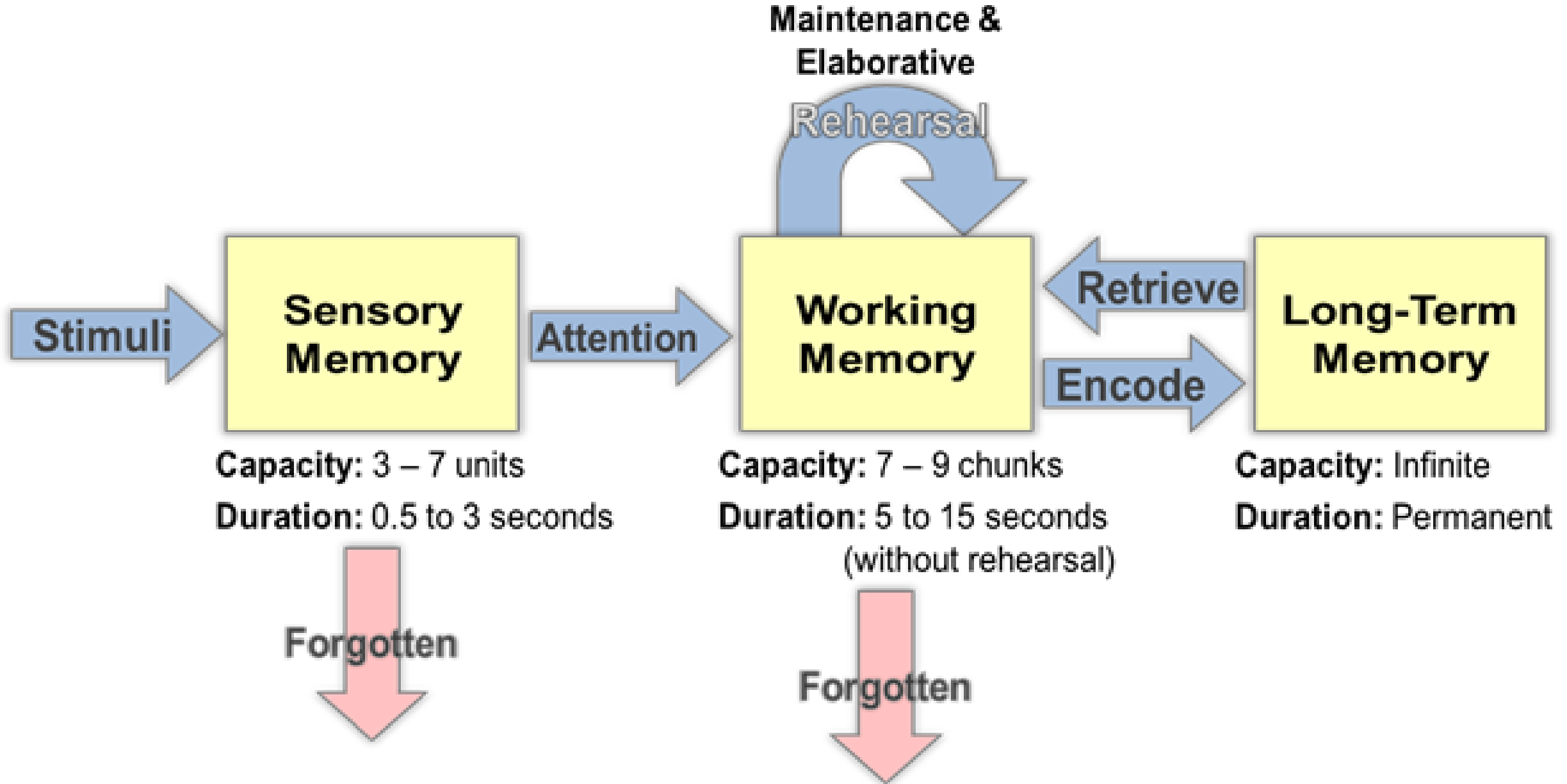
LONG-TERM MEMORY

- According to psychologists, one way the brain organizes information in long-term memory is by category; for example, *orange* may be organized within the semantic category *fruit*.
- Categories can also be based on how words sound or look.
- Information can also be organized by its familiarity, relevance, or connection to other information.

RETRIEVAL

- **Retrieval** is the process of getting information out of memory.
- **Retrieval cues** are stimuli that help get information out of memory including associations, context, and mood.
 - **Associations:** Because the brain stores information as networks of associated concepts, recalling a particular word becomes easier if another, related word is recalled first. This process is called **priming**.
 - **Context:** People can often remember an event by re-placing themselves in the same context they were in when the event happened.
 - **Mood:** If people are in the same mood they were in during an event, they may have an easier time recalling the event.

THE THREE-STAGE MODEL



TYPES OF LONG-TERM MEMORY

- There are three main types of memory according to psychologists:
 1. Implicit vs. explicit memory
 2. Declarative vs. procedural memory
 3. Semantic vs. episodic memory
 - **Implicit memory** is unconscious retaining of information, whereas **explicit memory** is conscious, intentional remembering.
 - **Declarative memory** is recall of factual information, whereas **procedural memory** is recall of how to do things.
 - **Semantic memory** is recall of general facts, while **episodic memory** is recall of personal facts.

Human Memory

Sensory Memory
(< 1 sec)

Short-term Memory
(Working Memory)
(< 1 min)

Long-term Memory
(life-time)

Explicit Memory
(conscious)

Implicit Memory
(unconscious)

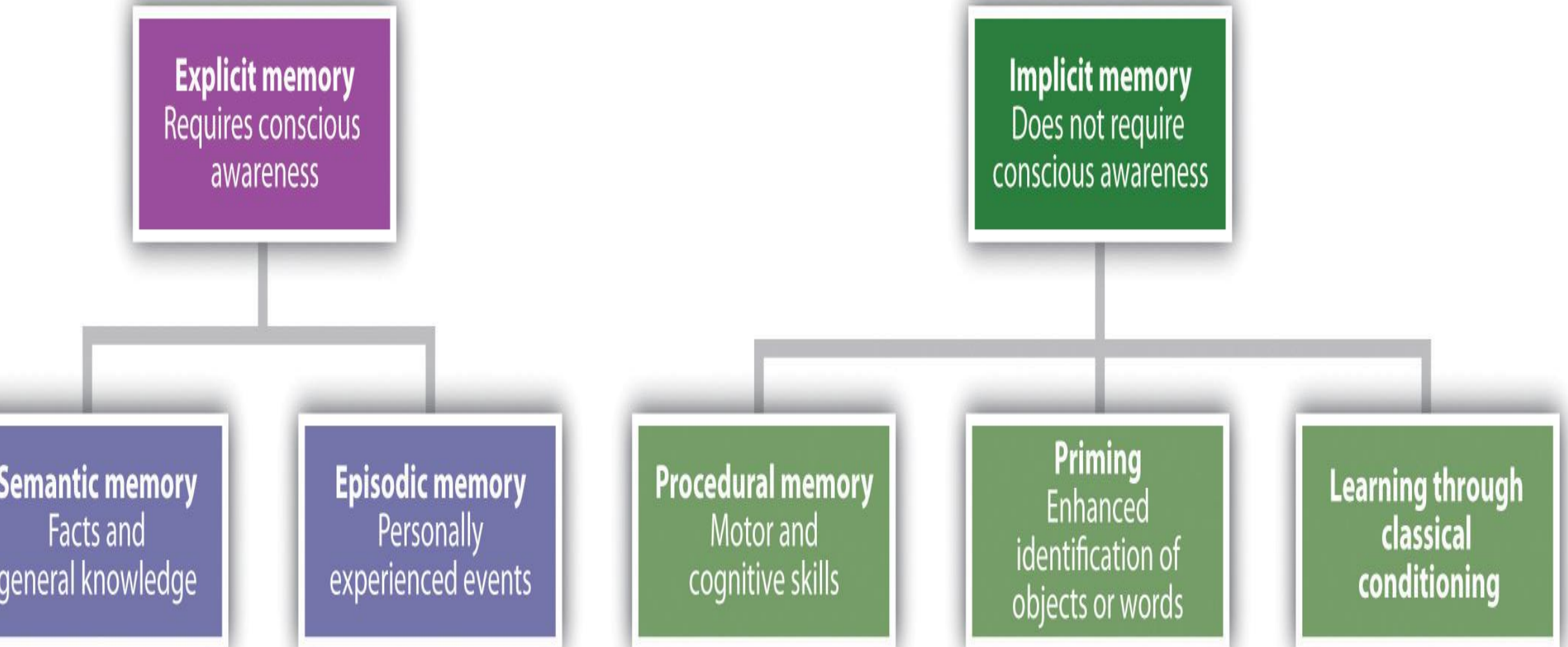
Declarative Memory
(facts, events)

Procedural Memory
(skills, tasks)

Episodic Memory
(events, experiences)

Semantic Memory
(facts, concepts)

TYPES OF LONG-TERM MEMORY

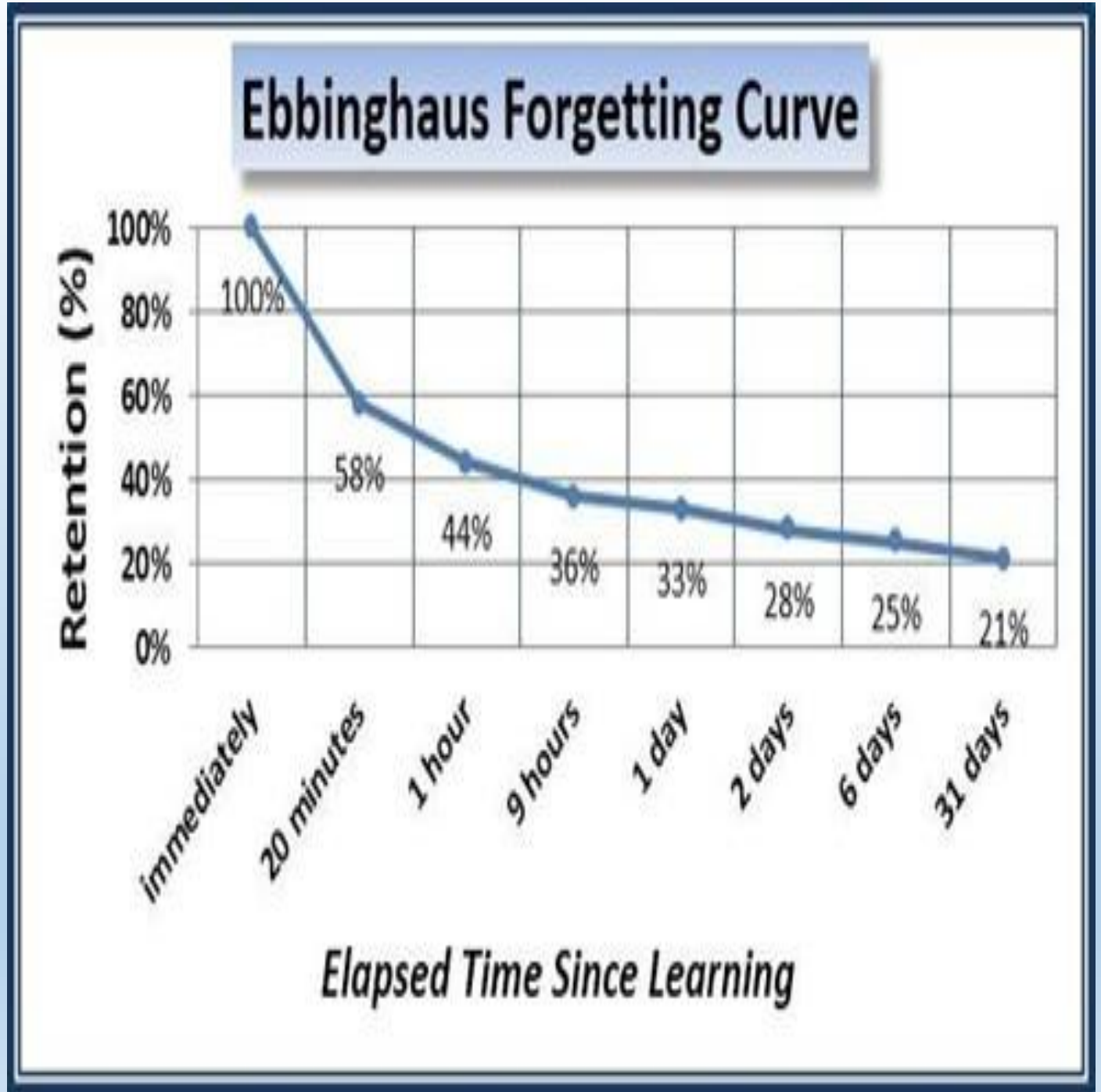


FORGETTING

- **Hermann Ebbinghaus** , the first researcher to conduct scientific studies of forgetting, discovered that much information is forgotten within a few hours after learning it.
- Researchers measure forgetting and retention in three different ways: recall, recognition, and relearning.
- **Retention** is the proportion of learned information that is remembered.
 - **Recall** is remembering without any external cues.
 - **Recognition** is identifying learned information using external cues.
 - **Relearning** refers to the process of learning again what has already been stored to long-term memory, but may have decayed over time.

- **FORGETTING**

The forgetting curve demonstrates the decline of memory retention in time – how information is lost over a period when there is no attempt to retain it.



CAUSES OF FORGETTING

- There are six main reasons for forgetting: ineffective encoding, decay, interference, retrieval failure, motivated forgetting, and physical injury or trauma.
 - **Ineffective encoding:** Processing information at a deeper level makes it harder to forget. However, if the information is not encoded properly, it is more likely to be forgotten.
 - **Decay:** According to decay theory, memory fades with time. Decay explains the loss of memories from sensory and short-term memory.
 - **Interference:** According to **Interference theory**, people forget information because of interference from other learned information.
 - When newly learned information makes people forget previously learned information, this is retroactive interference.
 - when old information makes forget newly learned information, it is a case of proactive interference.

CAUSES OF FORGETTING

- **Retrieval Failure:** Forgetting may also result from failure to retrieve information in memory, such as if the wrong sort of retrieval cue is used.
- **Motivated Forgetting:** Because of repulsion, a phenomenon proposed by Freud, people forget because they push unpleasant or intolerable thoughts and feelings deep into their unconscious.
- **Physical Injury or Trauma:** Anterograde amnesia is the inability to remember events that occur after an injury or traumatic event. Retrograde amnesia is the inability to remember events that occurred before an injury or traumatic event.

ENHANCING MEMORY

Memory is enhanced by:

- **Rehearsal:** Practicing material helps people remember it.
- **Overlearning:** Continuing to practice material even after it is learned increases retention.
- **Distributed practice:** Learning material in short sessions over a long period is called **distributed practice** or the “spacing effect.”
- **Minimizing interference:** People remember material better if they don't learn other, similar material right before or soon after their effort.

ENHANCING MEMORY

- **Deep processing:** People also remember material better if they pay attention while learning it and think about its meaning rather than memorize the information by rote.
- **Organizing information:** Organizing material hierarchically or in categories and subcategories and chunking material into segments can be particularly helpful.
- **Mnemonic devices:** These are strategies for improving memory. Different kinds of mnemonics include acronyms, acrostics, the narrative method, and rhymes.
- **Visual imagery:** Some well-known memory improvement methods involve using visual imagery to memorize or recall lists, e.g., **Method of Loci, Link Method, and Peg Word Method.**