Introduction to Memory and Encoding

The processing of information into the memory system

The Memory process

- Encoding
- Storage
- Retrieval

Encoding

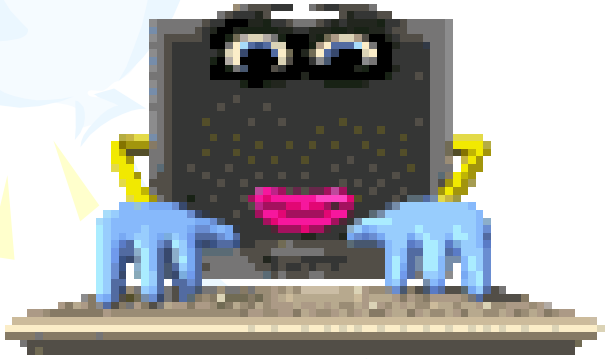
- The processing of information into the memory system.

Typing info into a computer

Getting a girls name at a party

Storage

- The retention of encoded material over time.



Pressing Ctrl S and saving the info.

Saying her name over and over when you leave the party.

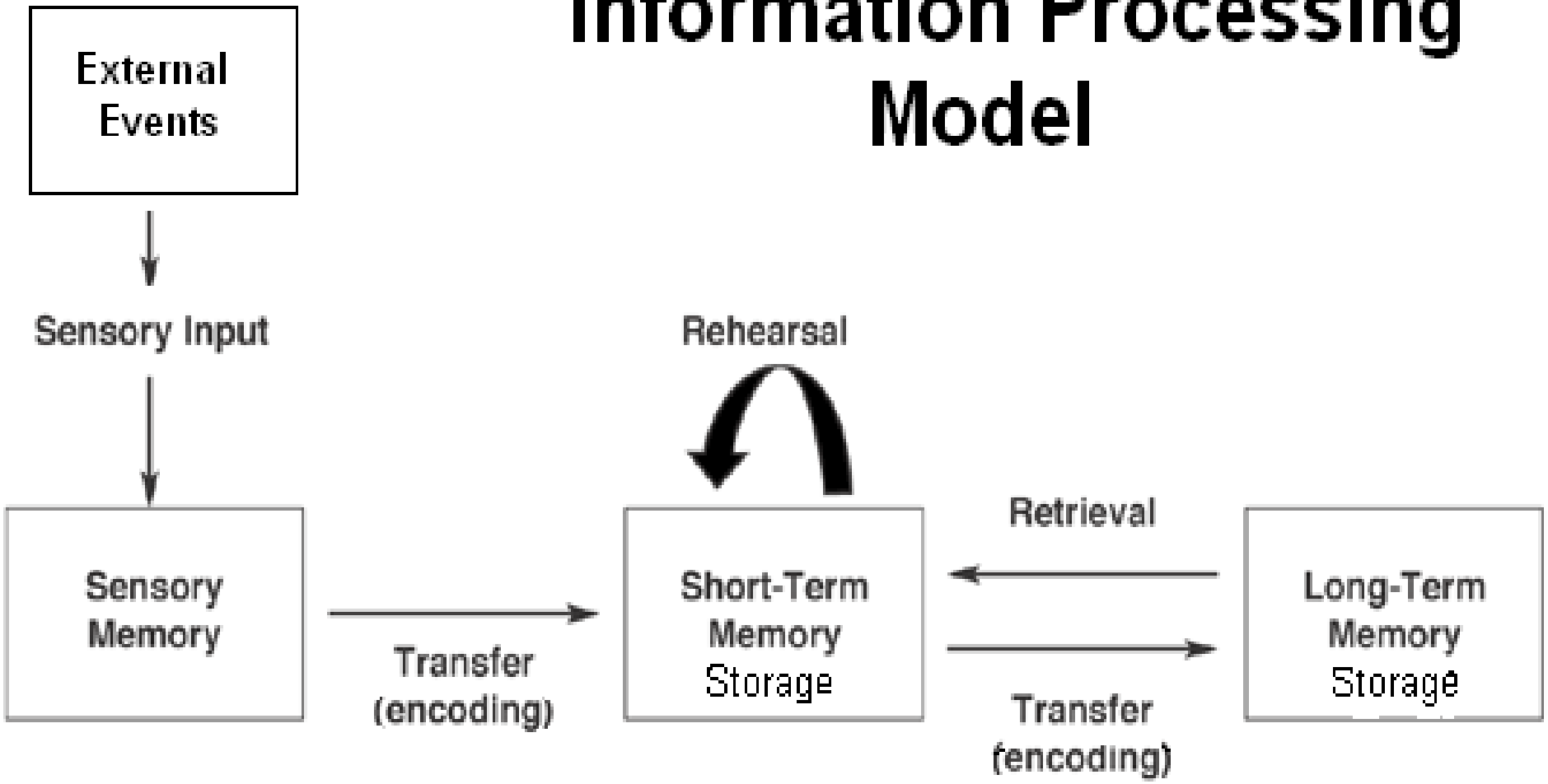
Retrieval

- The process of getting the information out of memory storage.

Finding your document and opening it up.

Seeing her the next day and calling her the wrong name (retrieval failure).

Information Processing Model



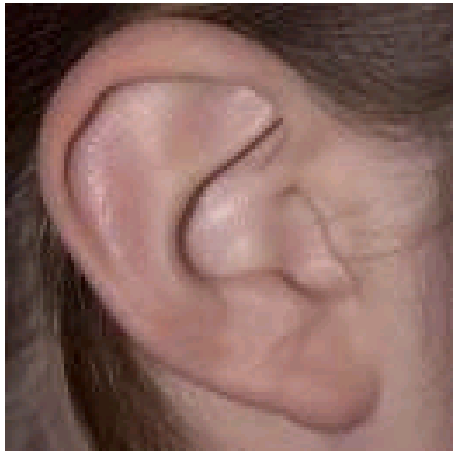
How does a computer encode, store, and retrieve information?

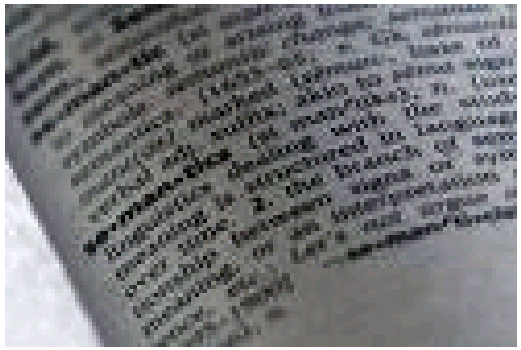
How well do you remember the story…?

- 1.) Where did Mr. O do his student teaching?
- 2.) What city did Mr. O drive back to for trivia?
- 3.) How many consecutive hours did the trivia contest run for?
- 4.) Who was Mr. O's cooperating teacher?
- 5.) What type of animal landed on Mr. O's windshield?
- 6.) Why did Mr. O get pulled over by the police officer?

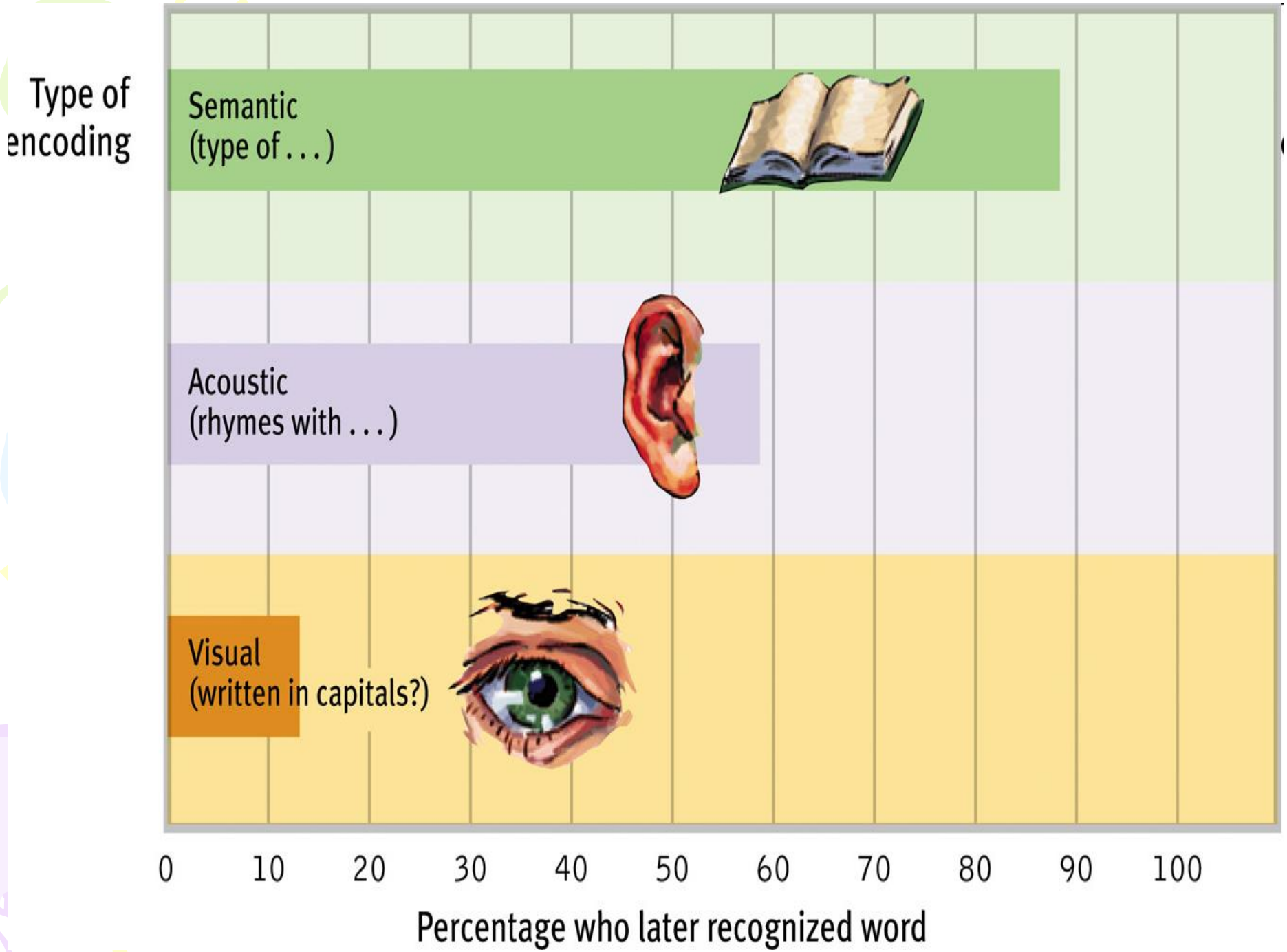
Levels of Processing

- **Visual**
  - The encoding of picture images
- **Acoustic**
  - The encoding of sound
- **Semantic**
  - The encoding of meaning





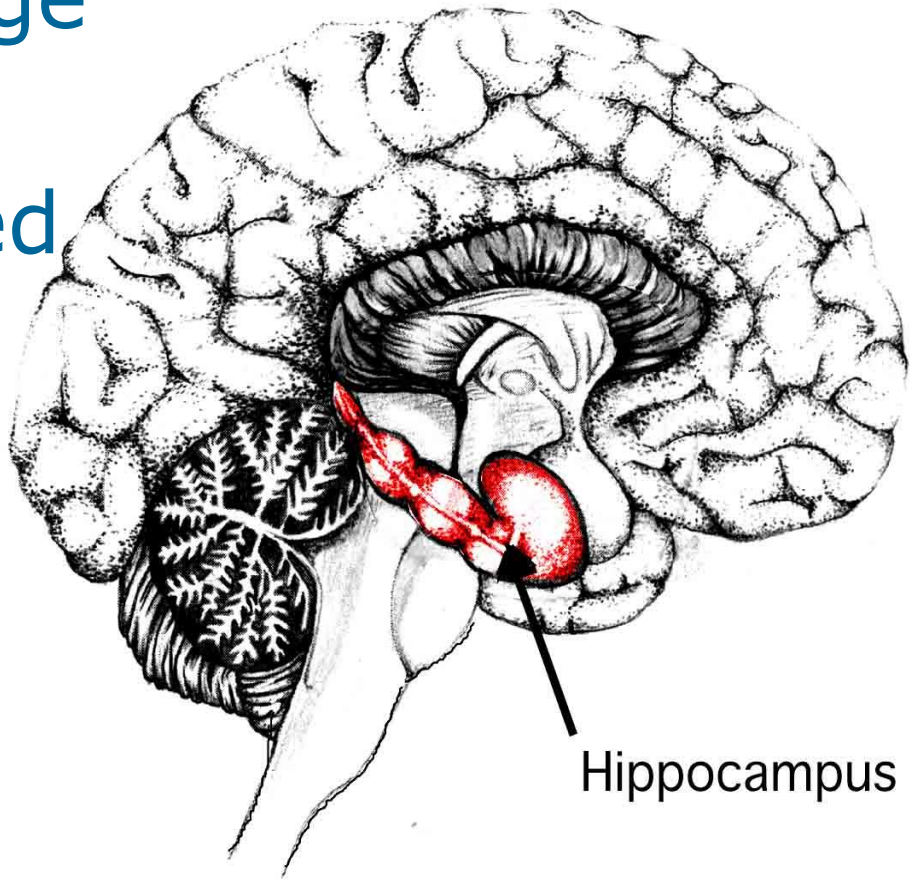
Of the three, semantic encoding retains the most information, combining encoding methods works even better, and attaching personal meaning is best.


Type of encoding
Semantic (type of . . .)
Acoustic (rhymes with . . .)
Visual (written in capitals?)
0
10
20
30
40
50
60
70
80
90
100
Percentage who later recognized word

FINISHED FILES ARE THE RE-SULTS OF YEARS OF SCIENTIFIC STUDY COMBINED WITH THE EX-PERIENCE OF YEARS.

Processing Memory

- **Hippocampus** – processes explicit memory for storage
- Study of London cab drivers showed they had larger than usual hippocampi
- Clive Wearing video update



Automatic vs. Effortful Processing

- **Effortful Processing**
  - Encoding that requires conscious effort and attention
  - EXAMPLES: learning new psychology material, first learning to read or ride a bike, learning a name
- **Automatic Processing**
  - Unconscious encoding of incidental information and of well-learned information
  - EXAMPLES: where you ate yesterday, reading a book or riding a bike at age 25, what clothes you slept in last night

Aids for Encoding

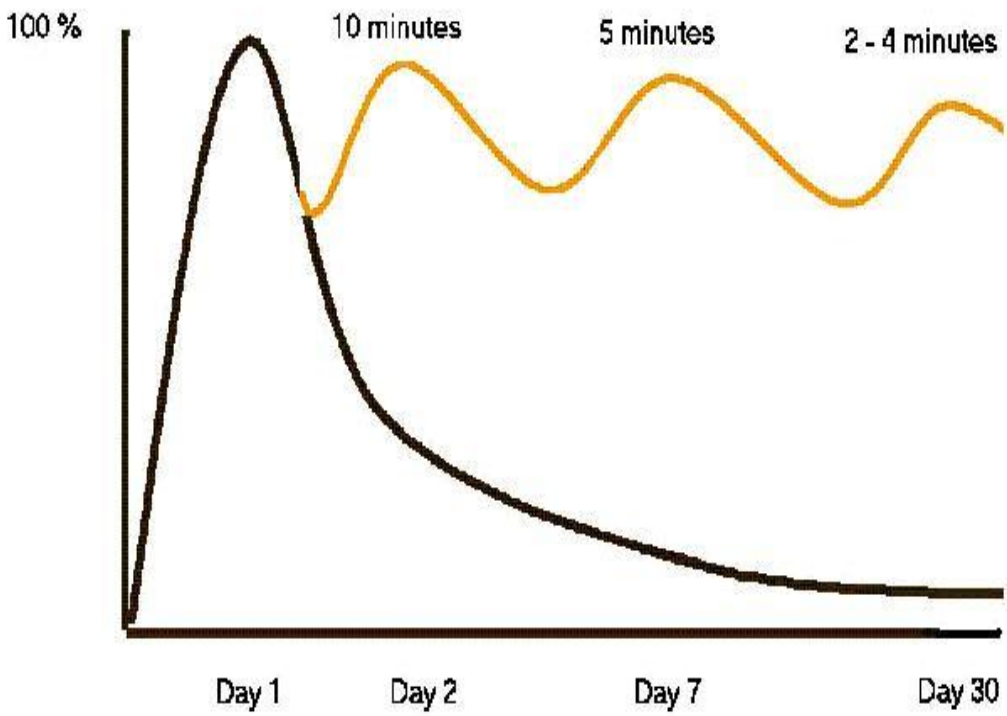
- **Rehearsal**: conscious repetition of information
- **Mnemonics**: memory aids, usually used as organizational devices
  - In 1492 Columbus sailed…
  - Please Excuse My Dear Aunt Sally
  - Freddy Krueger song, 50 states song

I will need a volunteer from the class for our next part…

1 4 9 2 1 7 7 6 1 8 1 2 1 9 4 1

Aids for Encoding

- **Chunking**: organizing items into familiar, manageable units
- **Spacing Effect** information is better retained when learned over a period of time rather than all at once



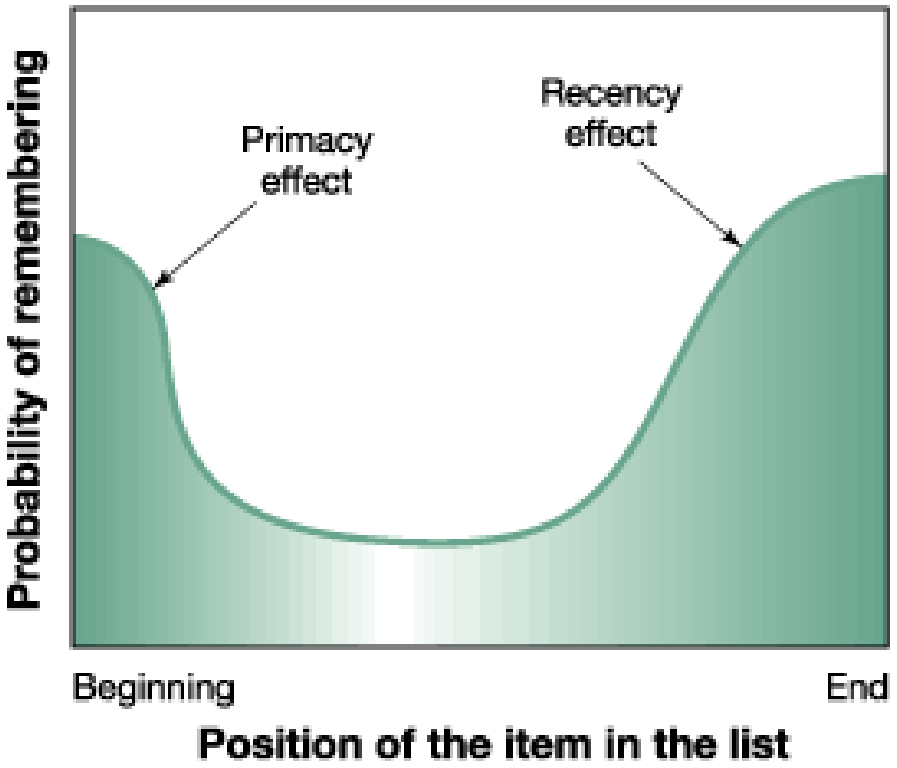
Serial Position Effect

- Listen to the grocery list below. After all items have been stated, you will write down as many as you can remember.
  - Class Circle Activity (each student says "I went to the store and bought a…"

- Eggs Butter Milk Grapes Cereal
  Cheese Wine Chicken Sugar
  Onions Cabbage Coffee Limes
  Alfredo Pineapple Apples Noodles
  Lettuce Sausage Waffles Ketchup

Serial Position Effect

- Our tendency to best recall the last and first items on a list
- **Primacy Effect** remembering the first items on a list
- **Recency Effect** remembering the last items on a list



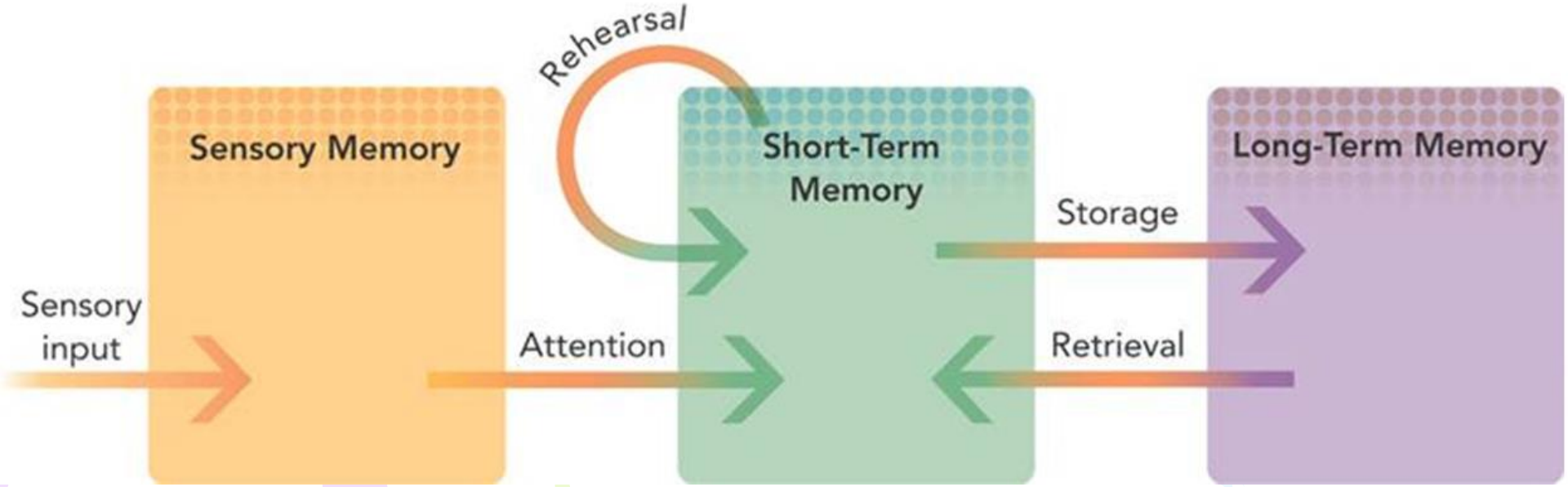
Serial Position Effect

- First items: Eggs, butter, milk, grapes, cereal, cheese, wine
- Middle items: Chicken, sugar, onions, cabbage, coffee, limes, alfredo
- Last items: Pineapple, apples, noodles, lettuce, sausage, waffles, ketchup

- What are real life implications of this?

  Job interviews!

  - –First person interviewed gets the job 18% of the time
  - –Last person interviewed gets the job 56% of the time

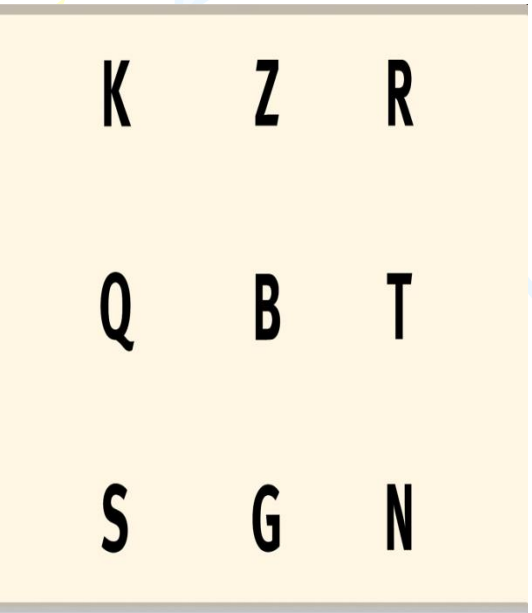


Storage

The retention of encoded information over time

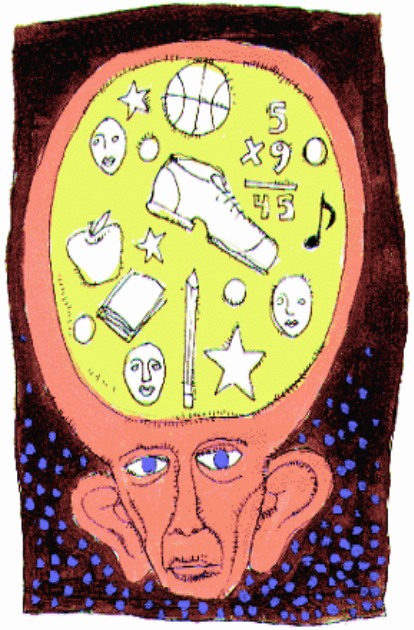
Sensory Memory: the immediate, initial recording of sensory information in the memory system

- **Iconic memory**:
- Momentary visual memory; last no more than .3 seconds
  - We remember every image in perfect detail, but only for the .3 seconds



- **Echoic Memory**:
- Momentary auditory memory; lasts 3-4 seconds
  - Sometimes while you're asking "What did you say", you then hear the original wording in your head

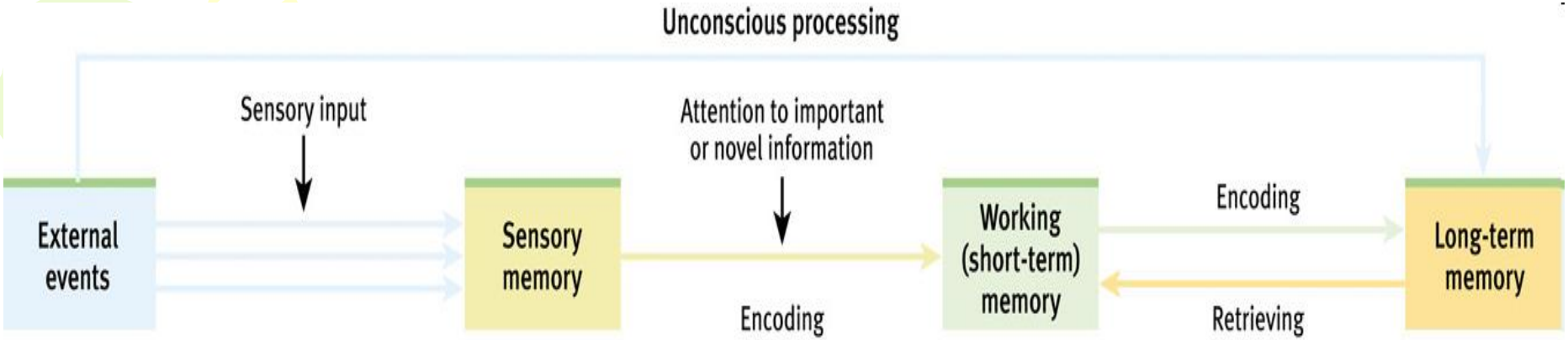
Short-Term and Long-Term Memory

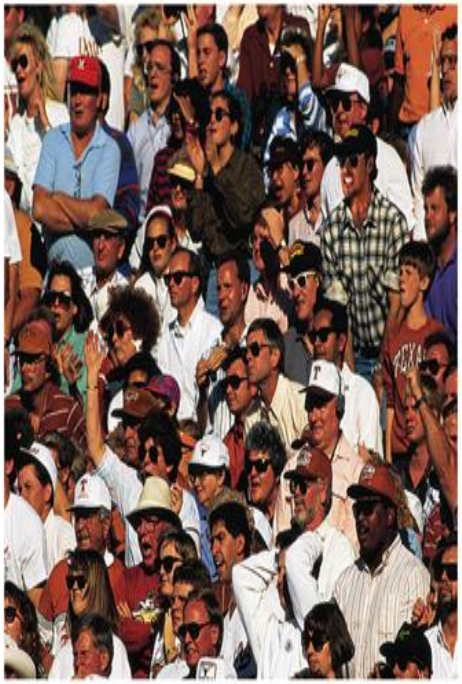


- **Short-Term Memory**
- (also called **Working Memory)**
- Activated memory that holds a few items briefly before the information is stored or forgotten
- Lasts about 20 seconds
- Can contain 7±2 items
- Where in life do you see numbers 5-9 digits long?

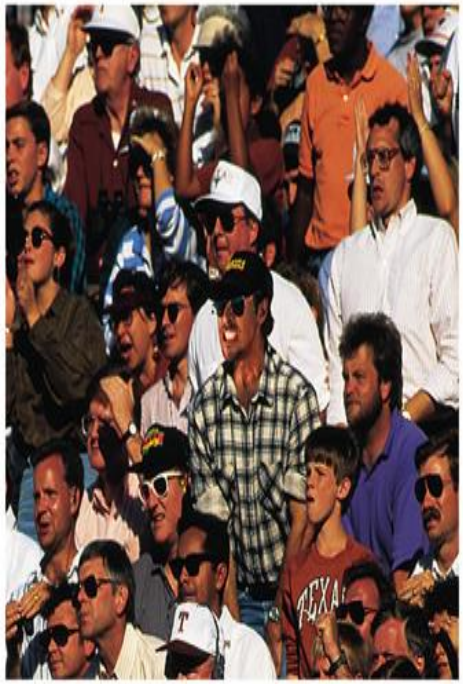
- **Long-Term Memory**
- The relatively permanent and unlimited storehouse of the memory system

How well did you perform on the "Simon" game?





Sensory memory registers incoming information, allowing your brain to capture for a fleeting moment a sea of faces.

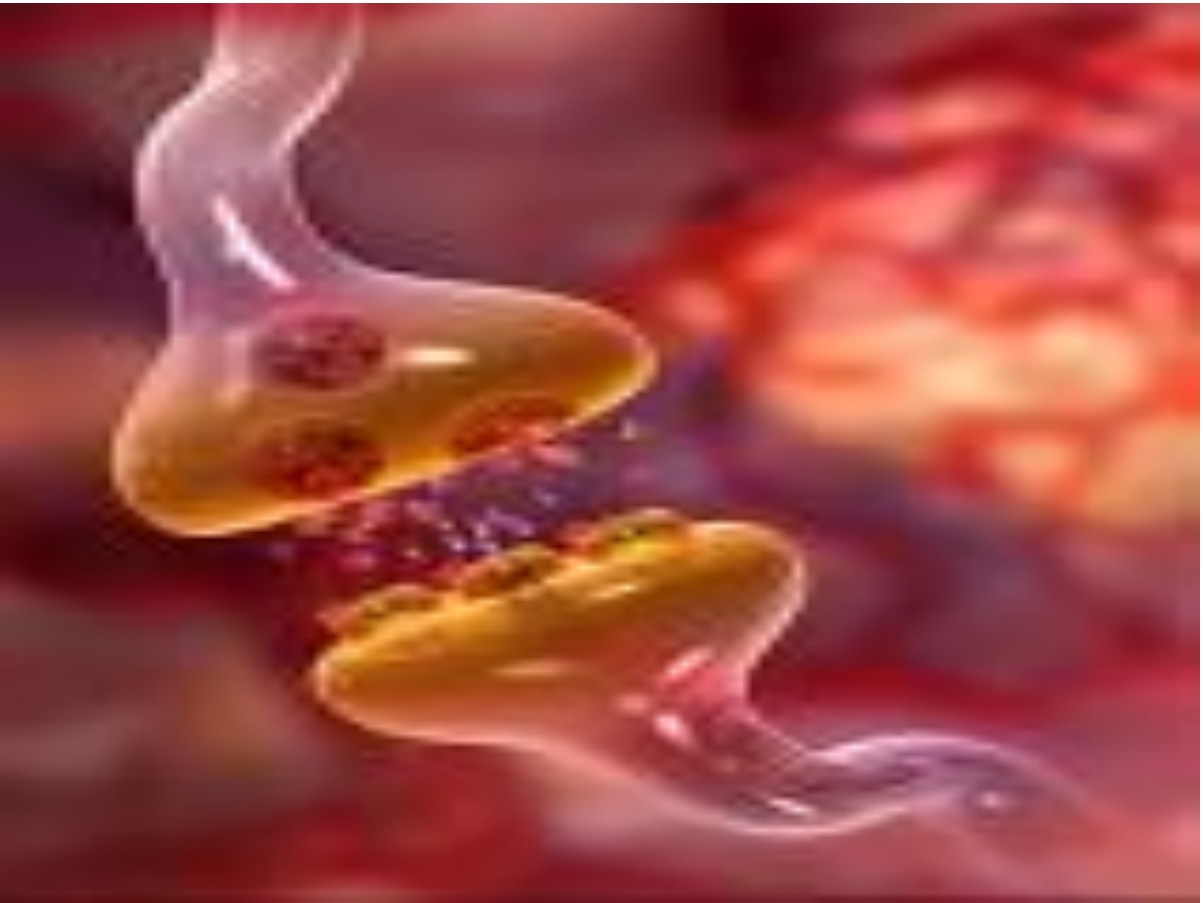


We pay attention to and encode important or novel stimuli—in this case an angry face in the crowd.

If we stare at the face long enough (rehearsal), or if we're sufficiently disturbed by it (it's deemed "important"), we will encode it for long-term storage, and we may, an hour later, be able to call up an image of the face.

Where are memories stored?

- Memories are stored all throughout the brain – no one single "spot"



- **Long-Term Potentiation (LTP)**: an increase in a synapse's firing potential (connections)

TABLE 9.1

WORLD MEMORY CHAMPIONSHIP RECORDS

From world memory competition, here are some current records, as of 2005:

Contest	Description	Record
Speed cards	Shortest time to memorize a shuffled pack of 52 playing cards	33 seconds
One-hour cards	Most cards memorized in one hour (52 points for every pack correct; 26 points if 1 mistake)	1170 cards
Speed numbers	Most random digits memorized in 5 minutes	324 digits
Names and faces	Most first and last names memorized in 15 minutes after being shown with faces (1 point for every correctly spelled first or last name; 1/2 point for every phonetically correct but incorrectly spelled name)	167.5 names
Binary digits	Most binary digits (101101, etc.) memorized in 30 minutes when presented in rows of 30 digits	3705

Sources: usamemoriad.com and worldmemorychampionship.com

Flashbulb Memories

- A clear memory of an emotionally significant memory or event

It's as if our brain commands —"**Capture this!**"

What is the most common type of flashbulb memory?

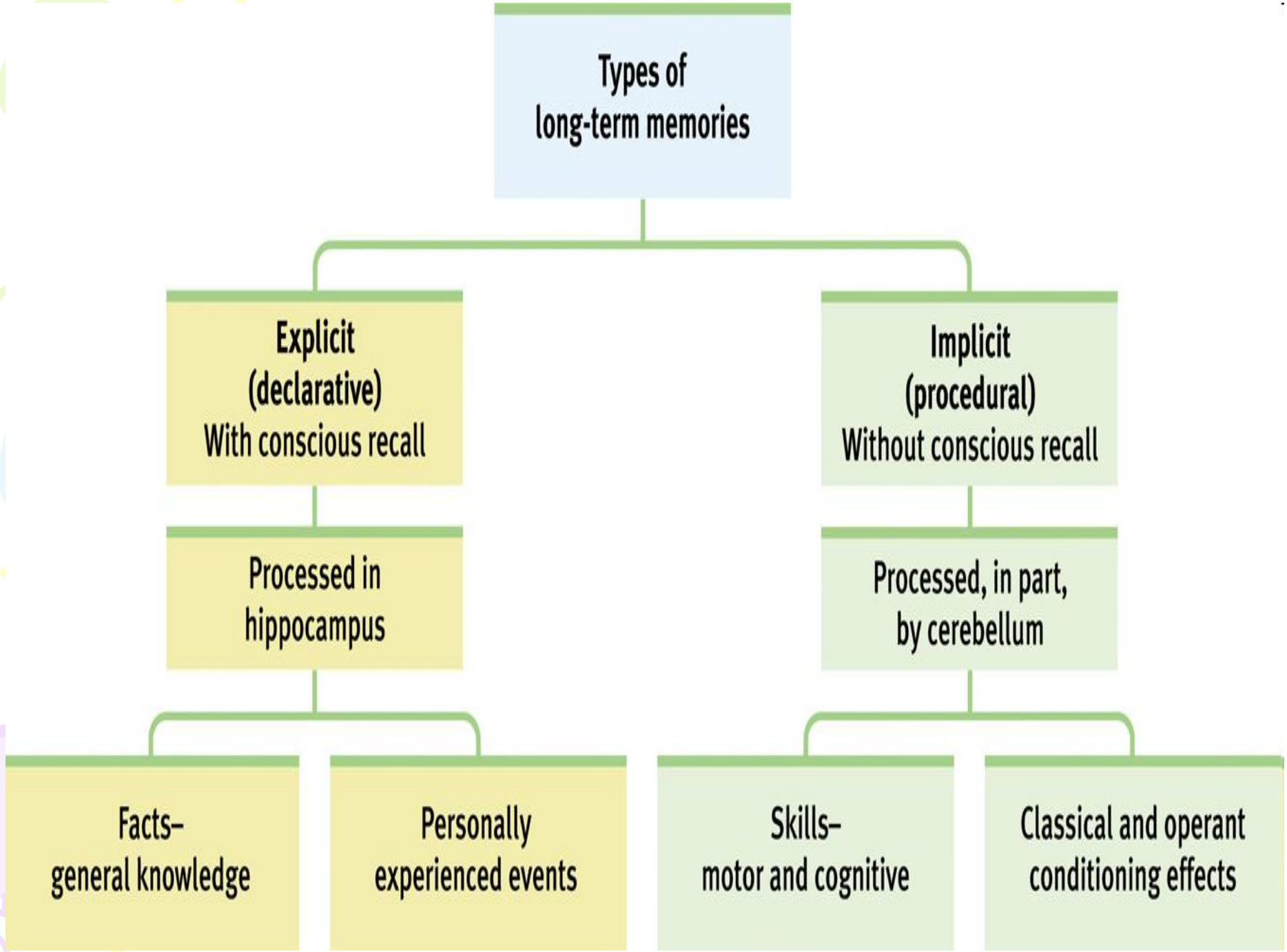
Injury/accident (18%), sports (11%), opposite sex (10%), animals (9%), deaths (5%), vacations (5%)

Explicit and Implicit Memories

- **Explicit Memories**
- Memory of facts (declarative) and experiences (episodic) that one can consciously know and "declare"
  - Stating how old you are

- **Implicit Memories**
- (aka Procedural memories):
- Retention without conscious recollection (such as skills)
  - Clive Wearing still knowing how to play piano
- Cerebellum plays a role in forming implicit memory

Did you know? The world record for memorizing pi is held by Japan's Akira Haraguchi, who in 2006 correctly recited the first 100,000 digits.


Types of long-term memories
Explicit (declarative) With conscious recall
Implicit (procedural) Without conscious recall
Processed in hippocampus
Processed, in part, by cerebellum
Facts– general knowledge
Personally experienced events
Skills– motor and cognitive
Classical and operant conditioning effects