Memory

Memory

Persistence of learning over time via the storage and retrieval of information

MEMORY...
IS THE
DIARY THAT
WE ALL CARRY
ABOUT WITH US.

–Oscar Wilde

List of Movies

- The eternal sunshine of a spotless mind
- Memento
- 50 first dates
- Unknown
- Before I go to sleep
- Total Recall….

Functions of Memory

- Gives us sense of self
- Brings organization in life
- Memory and adjustment
- Memory and emotions
- Memory and interpersonal relationship
- Memory of trauma
- Memory and decision making
- Data sheet containing every detail of life
  - However, what stored in the brain is far more than facts

Human Memory vs. Computer Memory

- Brains are analogue; computers are digital
- Content-addressable memory vs. byte-addressable memory
- The brain as a parallel machine vs. computers as a modular and serial
- Processing speed is not fixed in the brain; there is no system clock
- Short-term memory is not like RAM
- No hardware/software distinction can be made with respect to the brain or mind
- Synapses are far more complex than electrical logic gates
- Unlike computers, processing and memory are performed by the same components in the brain
- The brain is a self-organizing system

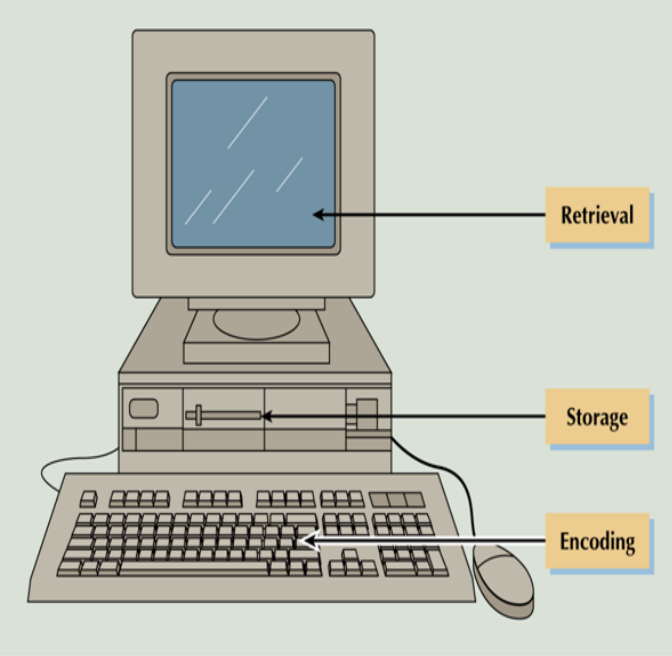
Three stages of Memory

Encoding
(Put into Memory)
Formation

Storage
(Maintain in Memory)
Retention

Retrieval
(Recover from Memory)
Recovery

Encoding - the set of mental operations used to convert sensory information into a form that is usable in the brain's storage systems.



Storage - holding onto information for some period of time.

Retrieval - getting information that is in storage into a form that can be used

- Memory can fail at any of these three stages

- Structures in the brain and different stages of memory
  - PET (Positron emission tomography)
  - f MRI (Functional magnetic resonance imaging)

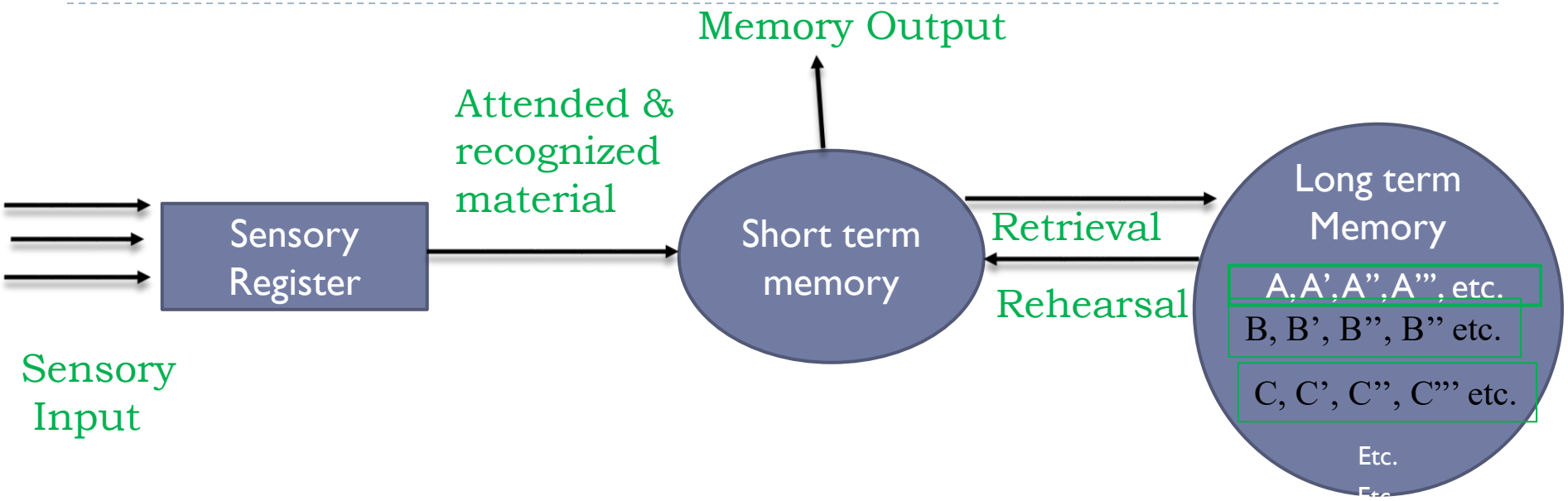
- Encoding: Left hemisphere

- Retrieval: Right hemisphere

Encoding

- Visual (picture)
  - Process of encoding images and visual sensory information.
- Acoustic/ Phonological (sound)
  - Processing and encoding of sound, words and other auditory inputs.
- Semantic (meaning)
  - Process of encoding sensory input that has particular meaning or can be applied to a particular context, rather than deriving from a particular sense.

Storage: Three Memory Stores



An Information processing Model of Memory (Atkinson & Shifrrin, 1968

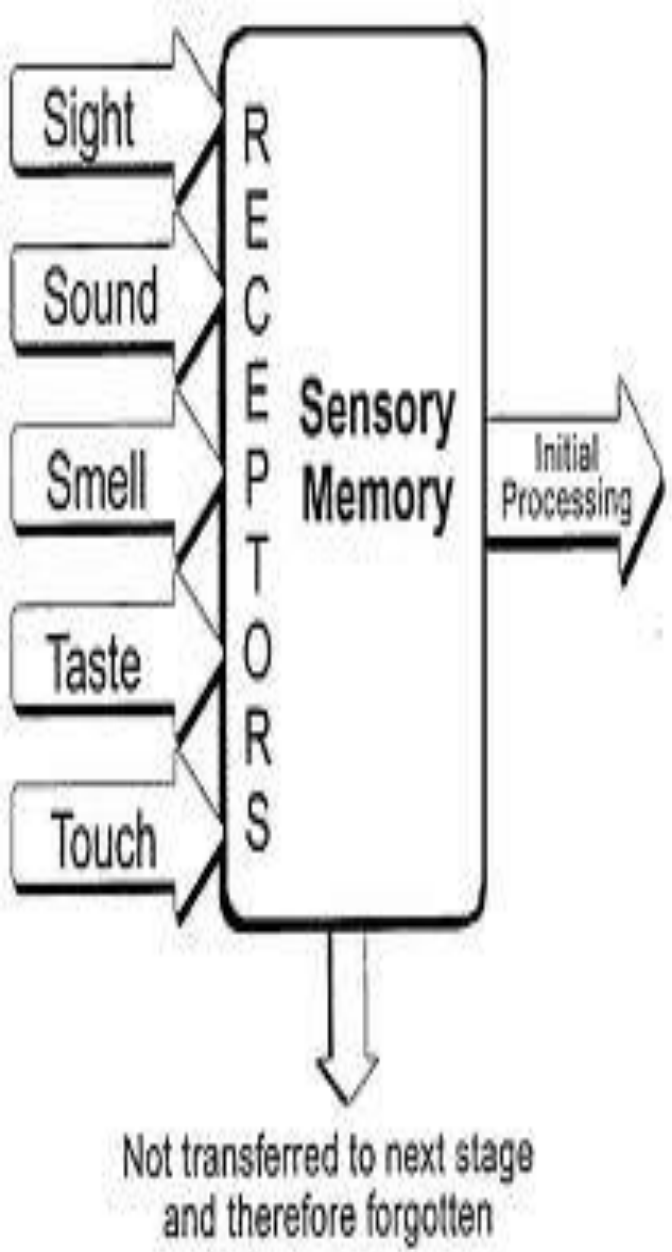
- Three memory stores differ in…
- *Capacity – How much information can be store*
- *Duration – How long the information can be stored*
- *Function – What is done with the stored informatin capacity and duration.*

Sensory Memory

- The very first stage of memory

- The point at which information enters the nervous system through the sensory systems

- The capacity of sensory memory is very large, but the information in it is unprocessed.



Sensory Memory: Types

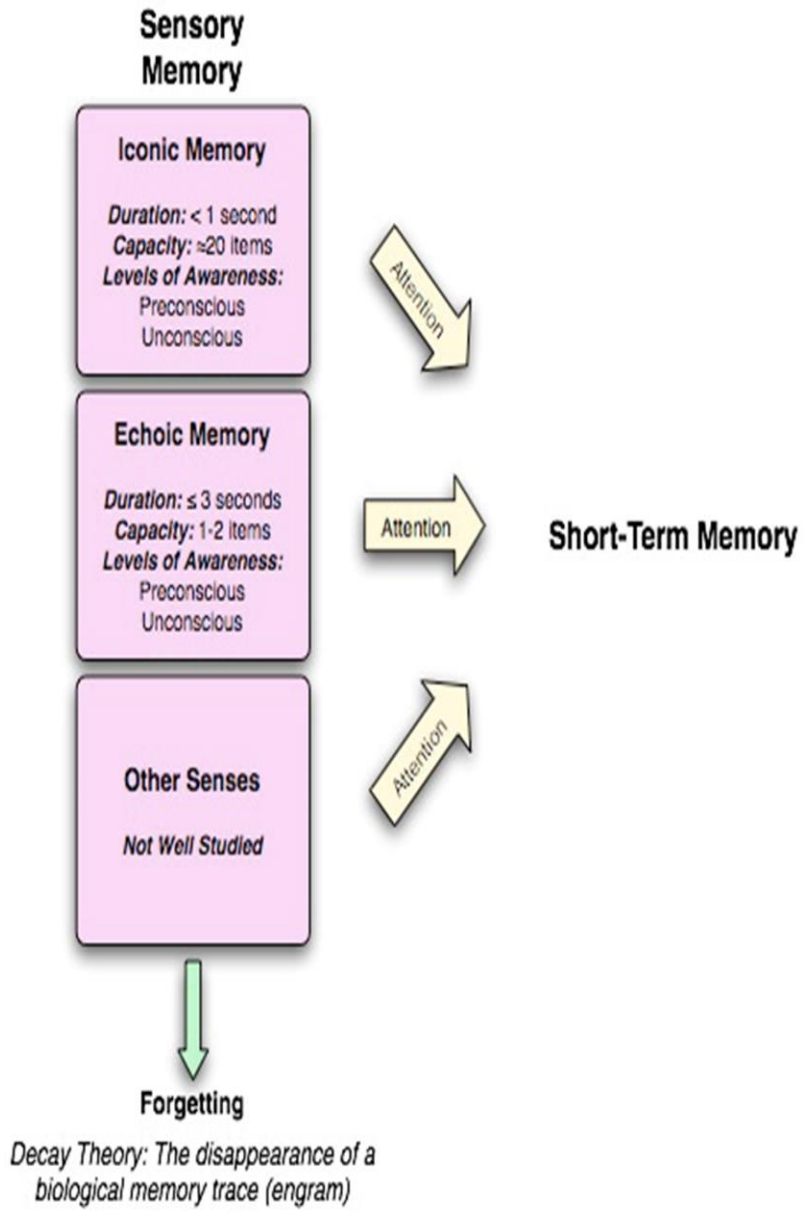
- Iconic memory - Visual sensory memory, lasting only a fraction of a second.
  - Capacity – Everything that can be seen at one time.
  - Duration - Information that has just entered iconic memory will be pushed out very quickly by new information, a process called masking.
  - Eidetic imagery - the rare ability to access a visual memory for 30 seconds or more.
    - People with photographic memories are called *eidetikers* (eye-DET-ik-ers)

- Echoic memory –

The brief memory of something a person has just heard.

  - Capacity - Limited to what can be heard at any one moment

  - Duration – Lasts longer than iconic — about 2 to 4 seconds



Short-Term Memory

- Level of Awareness:
  - Attention as the mental process that transfers information into the short-term store.
  - STM is at the conscious level of awareness.
- Maintenance rehearsal - Practice of saying some information to be remembered over and over in one's head in order to maintain it in short-term memory
- Encoding: Visual vs. phonological vs. Semantic?

- Phonological Buffer vs. Visual-Spatial Sketchpad
  - Left-Right hemispheric division

- STM is susceptible to interference (e.g., if counting is interrupted, have to start over).

- Storage: Seven pieces of information, plus or minus two items, or from five to nine bits of information.
  - “magical number” = 7+_2

Test

Vase	Teapot	Camera
Tiger	Book	Ice Cream
Cushion	Spade	Cloud
Piano	House	Orange
Hat	Table	Book
Tree	Shirt	Cat

- Retrieval
  - Serial Processing vs. Parallel Processing

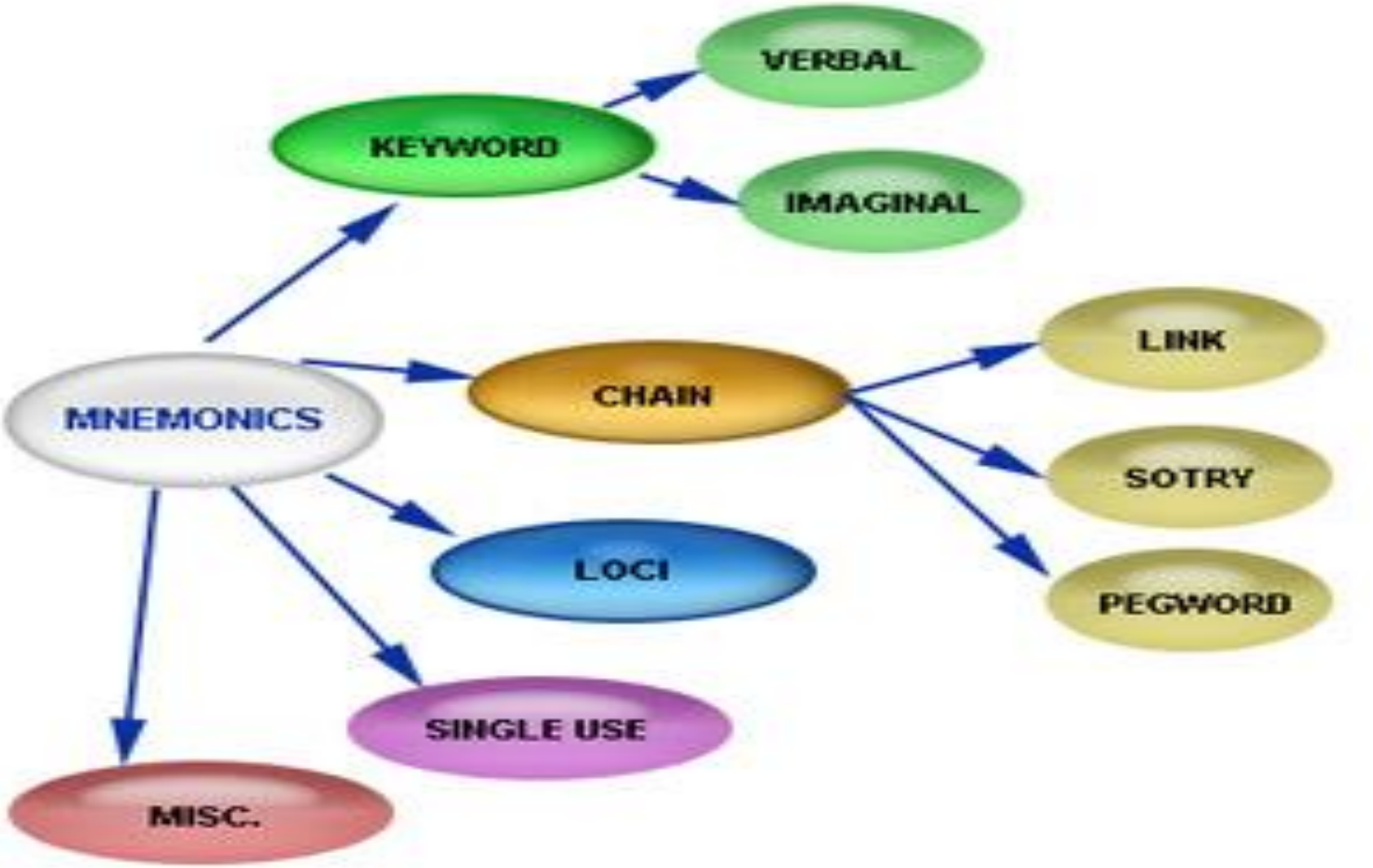
Mnemonics

- Chunking: Recoding a new material into larger, more meaningful units and storing those units in working memory.
  - SRUOYYLERECNIS

- Forgetting:
  - Information decay
  - Displacement of information by new items

Mnemonics

- A group of memory techniques, or mental ‘slights of hand’ that together facilitate the quick and easy assimilation of information of all kinds.
- ACRONYMS**:** by using each first letter from a group of words to form a new word
- SENTENCES/ACROSTICS. Instead of making a new word, use the letters to make a sentence.
  - My Dear Aunt Sally (mathematical order of operations: Multiply and Divide before you Add and Subtract)
- RHYMES & SONGS
- METHOD OF LOCI
- CHUNKING
- Practice


VERBAL
KEYWORD
IMAGINAL
LINK
MNEMONICS
CHAIN
SOTRY
LOCI
PEGWORD
SINGLE USE
MISC.

Functions of STM

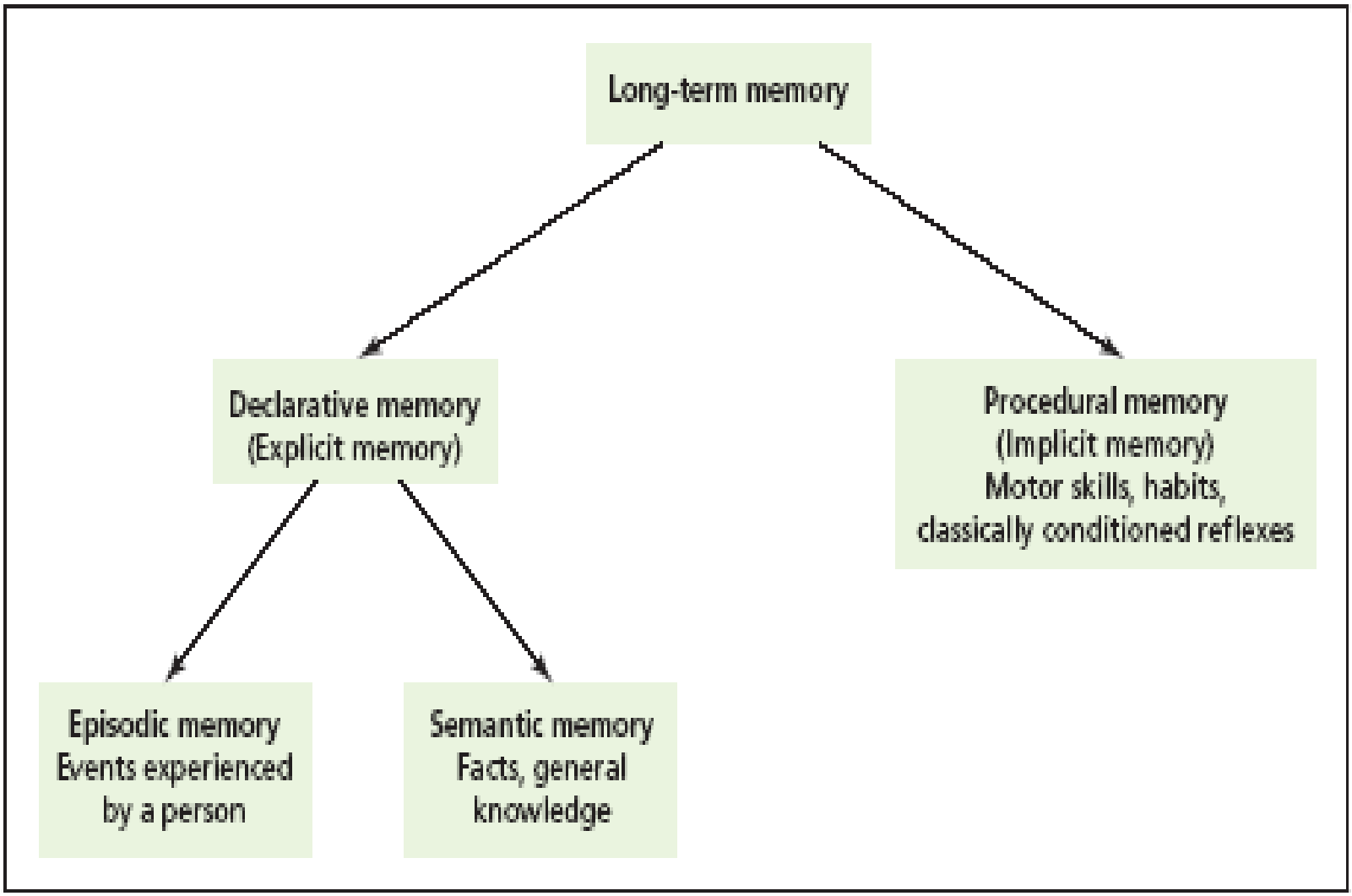
- Stores material needed for short term
- Work space for mental computation
- Serve as a way station to long term memory
- Neurons in prefrontal lobed hold information for short term memory

Long-Term Memory

- Long-term memory (LTM) - the system of memory into which all the information is placed to be kept more or less permanently.

- Elaborative rehearsal - a method of transferring information from STM into LTM by making that information meaningful in some way.
- Encoding: Acoustic vs Visual vs Semantic
- Storage: Unlimited
- Retrieval:
  - Recall vs. Recognition? Which one is better?
  - Serial search vs. parallel search

LTM


Long-term memory
Declarative memory
(Explicit memory)
Procedural memory
(Implicit memory)
Motor skills, habits,
classically conditioned reflexes
Episodic memory
Events experienced
by a person
Semantic memory
Facts, general
knowledge

Types of LTM

- Declarative memory – type of long-term memory containing information that is conscious and known (memory for facts).

- Procedural (non-declarative) memory - type of long-term memory including memory for skills, procedures, habits, and conditioned responses. These memories are not conscious but are implied to exist because they affect conscious behavior.

Procedural (Nondeclarative) LTM

- Skills that people know how to do.

- Also include emotional associations, habits, and simple conditioned reflexes that may or may not be in conscious awareness.

- Procedural memory often called implicit memory - memory that is not easily brought into conscious awareness.

Declarative LTM

- All the things that people know.
- Semantic memory - type of declarative memory containing general knowledge, such as knowledge of language and information learned in formal education.
- Episodic memory - type of declarative memory containing personal information not readily available to others, such as daily activities and events.
- Semantic and episodic memories are forms of explicit memory - memory that is consciously known.

Say the following list of words once to yourself, and then, immediately thereafter, try to recall all the words, in any order, without looking back at them

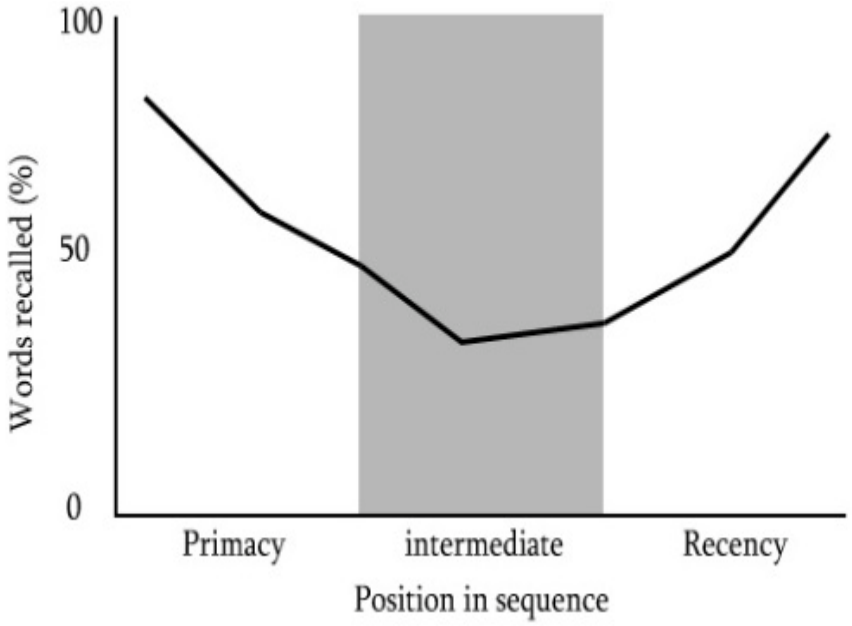
- Table,
- cloud,
- book,
- tree,
- shirt,
- cat,
- light,
- bench,
- chalk,
- flower,
- watch,
- bat,
- rug,
- soap,
- pillow
- mosquito
- magzine
- toffee

Evidence of STM and LTM

- Serial Position Curve
  - The position of an item in the list will affect memory for that item

Primacy effect. *This is the tendency to remember well the first items in a list.*

Recency effect. *This is the tendency to remember well the last items in a list.*



Forgetting and Memory Distortion in LTM

1. *Decay of Information*
2. *Interference theory*
3. *Distortion*

Two kinds of interference

- Proactive interference
  - Old information hinders recall of new information
  - Ex: Individuals who pick up bad habit have hard time in getting rid of it
- Retroactive interference
  - New information hinders the recall of old information
  - Ex: New password hinders the recall of old password

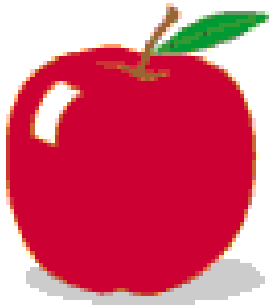
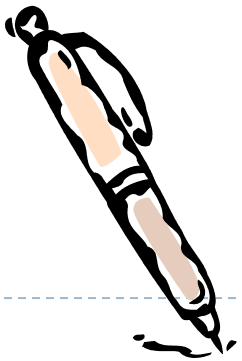
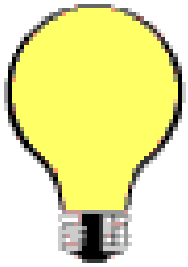
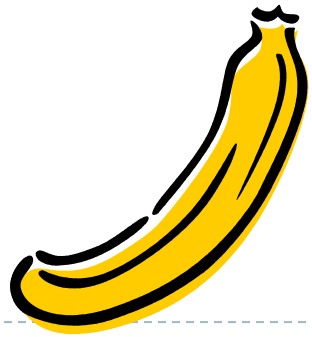
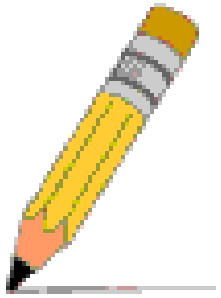
The Constructive Nature of Memory

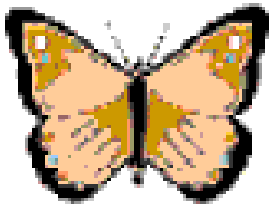
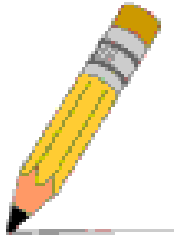
Eyewitness Testimony

- Experiments have shown people's great susceptibility to distortion in eyewitness accounts
- Problems with wrongful conviction when using eyewitness testimony
- Lineups can lead to faulty conclusions
- It is clearly suspect in children because they are highly susceptible to suggestive questioning

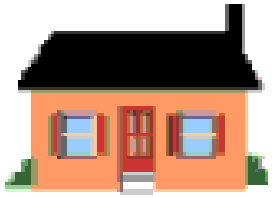
Memory Test

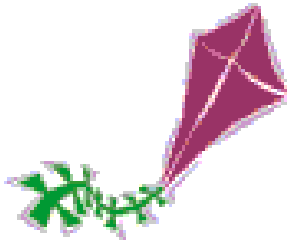
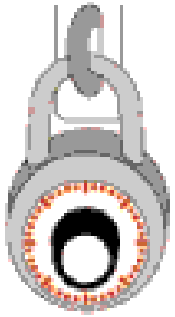
- Let's do another memory test…
- You will have 30 seconds to view the next slide
- Try to memorize all 20 items you see
- You are not allowed to write anything down until after the screen has been shown
- GOOD LUCK!!

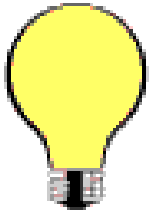
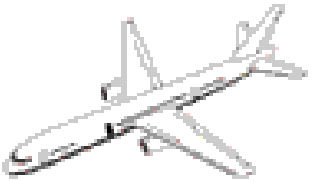
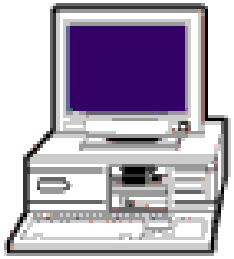
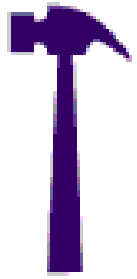






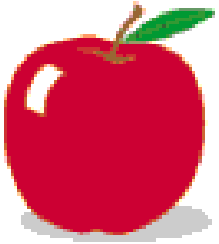









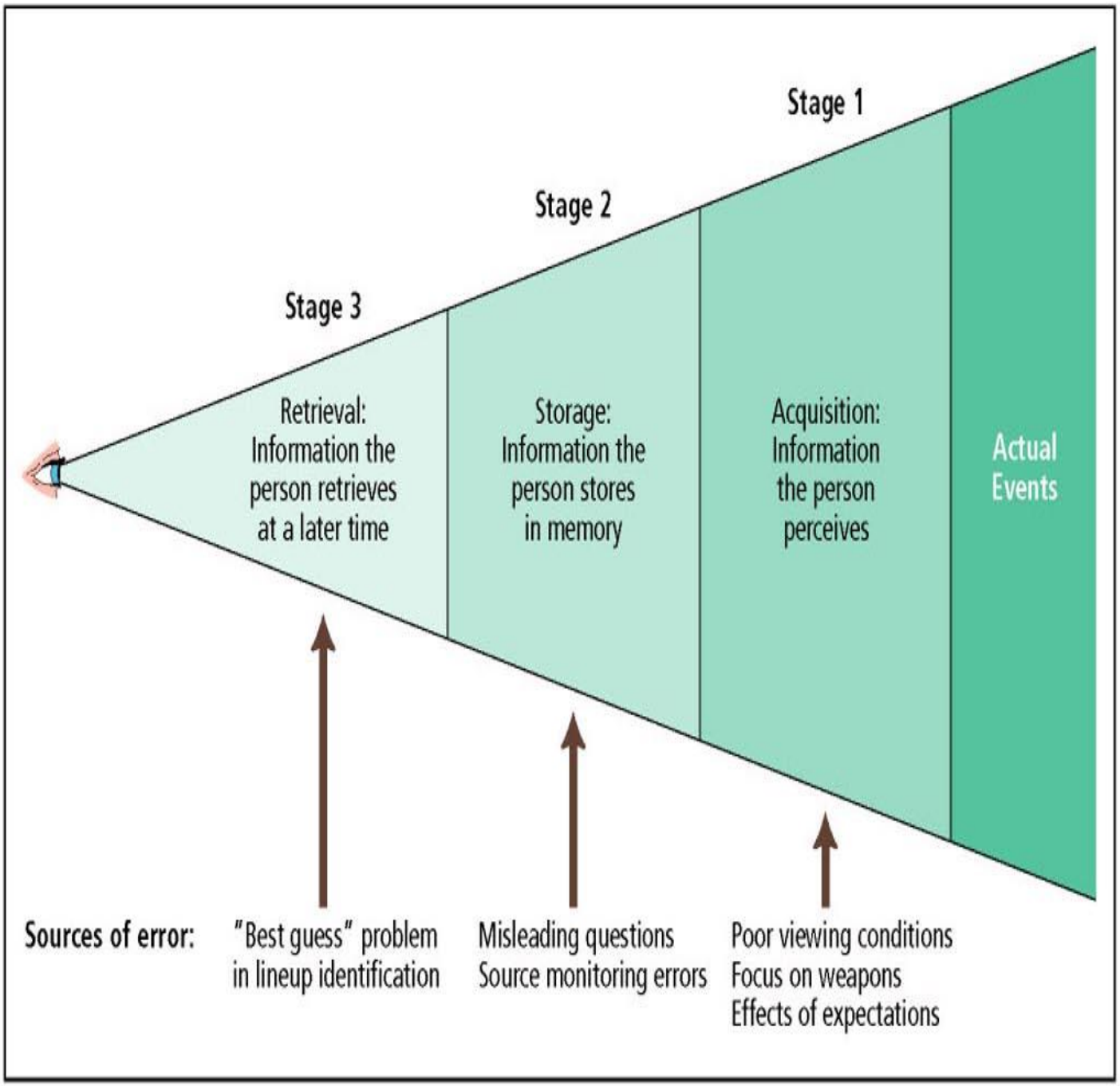
Finished!

Write down all the items you can remember

Figure SPA3.2

ACQUISITION, STORAGE, AND RETRIEVAL.

To be an accurate eyewitness, people must complete these three stages of memory processing. There are sources of error at each of the three stages.



Olny srmat poelpe can raed tihs.

I cdnuolt blveiee taht I cluod aulaclty uesdnatnrd waht I was rdanieg. The phaonmneal pweor of the hmuan mnid, aoccdrnig to rscheearch at Cmabrigde Uinervtisy.

It deosn't mttaer in waht oredr the ltteers in a wrod are, the olny iprmoatnt tihng is taht the frist and lsat ltteer be in the rghit pclae. The rset can be a taotl mses and you can sitll raed it wouthit a porbelm.

Tihs is bcuseae the huamn mnid deos not raed ervey lteter by istlef, but the wrod as a wlohe. Amzanig huh? yaeh and I awlyas tghuhot slpeling was ipmorantt! if you can raed tihs psas it on!!

"Remembering is not a completely independent function, entirely distinct from perceiving, imaging, or even from constructive thinking, but it has intimate relations with them all… One's memory of an event reflects a blend of information contained in specific traces encoded at the time it occurred, plus inferences based on knowledge, expectations, beliefs, and attitudes derived from other sources."

- Bartlett: Chinese Whisper

- **Repressed Memories**
  - No compelling evidence points to the existence of such memories

- **Context Effects on Encoding and Retrieval**
  - Flashbulb memory
    - Memory of an event so powerful that the person remembers the event as vividly as if it were preserved on film
  - We remember better event with significant emotional intensity
  - When information is encoded in various contexts, the information also seems to be retrieved more readily in various contexts