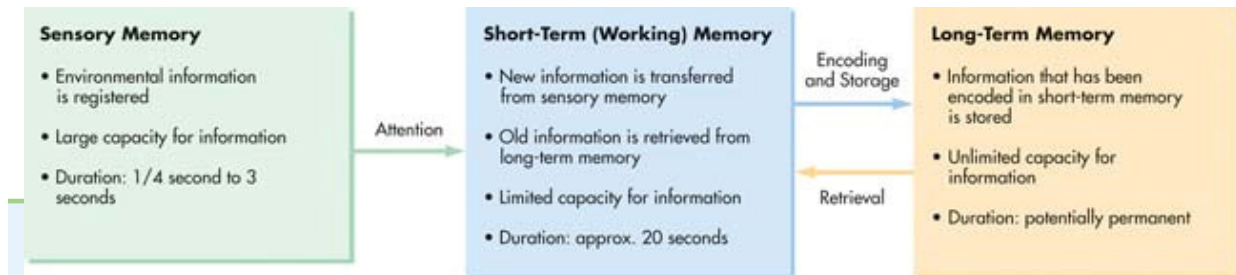
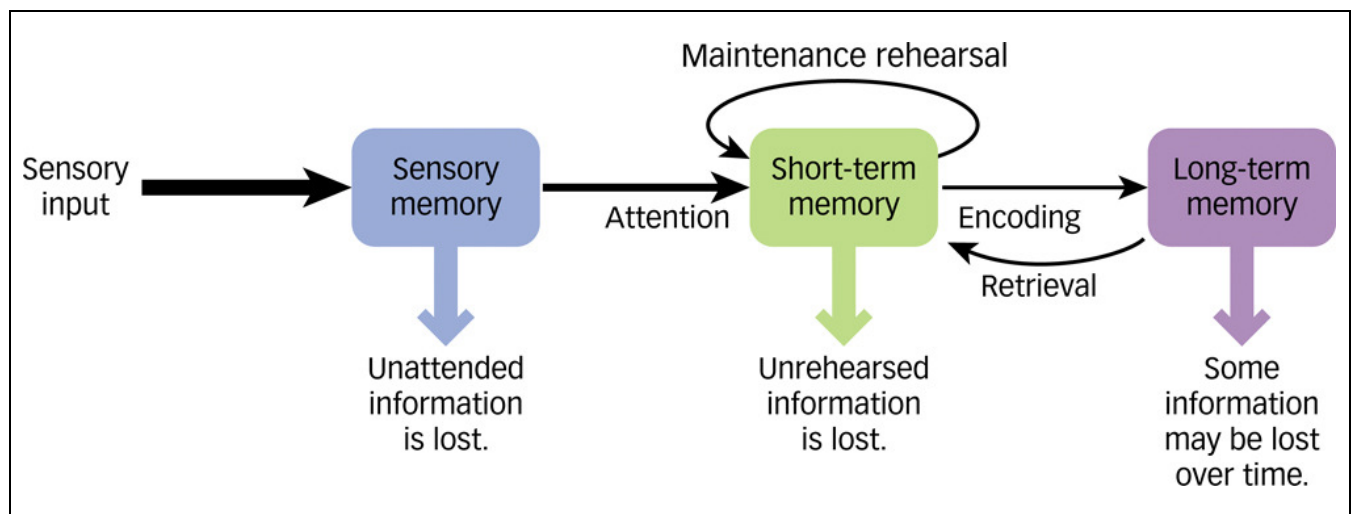


The Model of Memory



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.

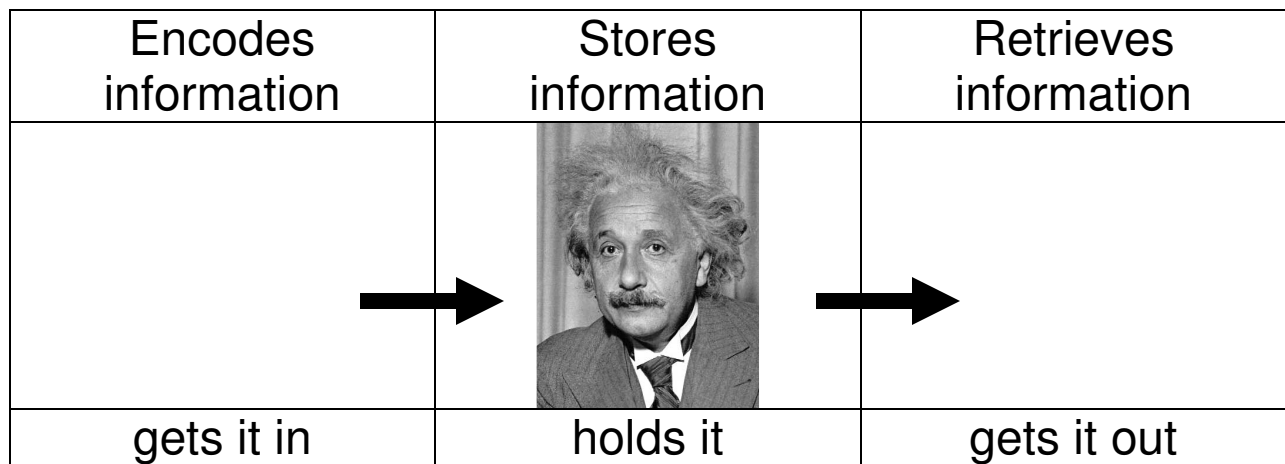


If we stare at the face long enough (rehearsal), or if we're sufficiently disturbed by it (it's deemed "important"), we will encode it for long-term storage, and we may, an hour later, be able to call up an image of the face.

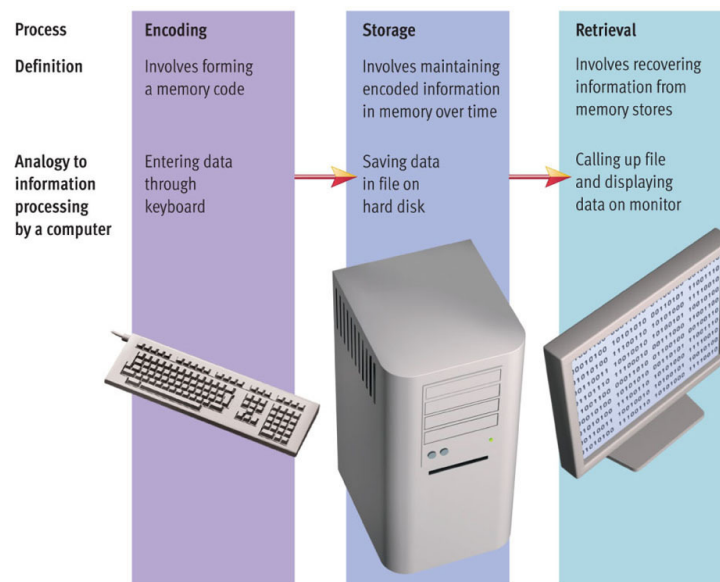
Memory as Information Processing

Psychologists use the *metaphor* that the brain is an information processor that

- encodes,
- stores and
- retrieves information.



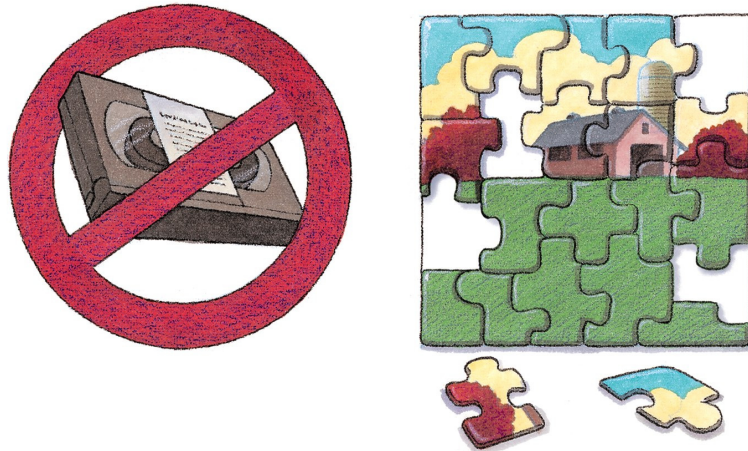
A *rough* analogy is that the brain is like computer processes.



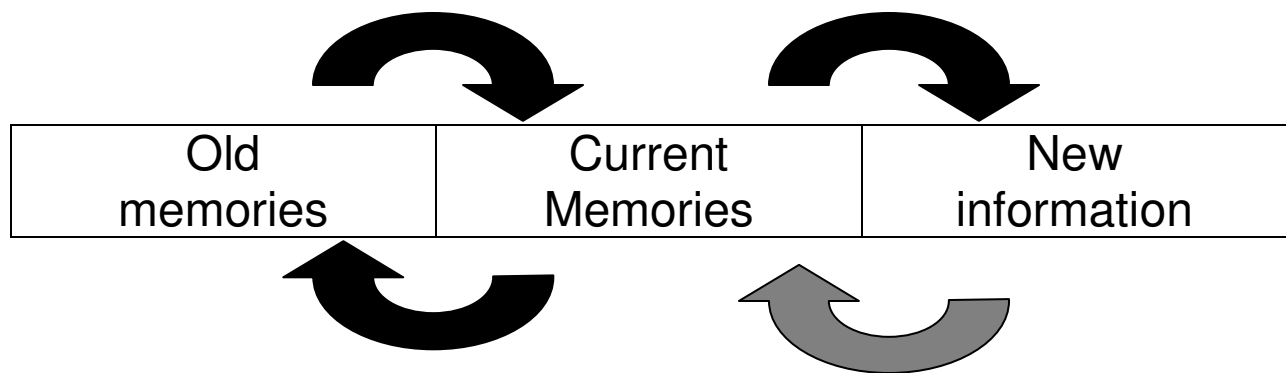
Memory as Information Processing

The computer analogy doesn't capture other features of memory such as that people forget and distort information and sometimes remember events in a way that is different than how the event actually occurred.

Memory is not like a video tape or movie. We cannot scroll to a particular event and retrieve it as it happened. It is like a jigsaw puzzle where we remember bits and pieces and fill in the blanks with what is reasonable and familiar.

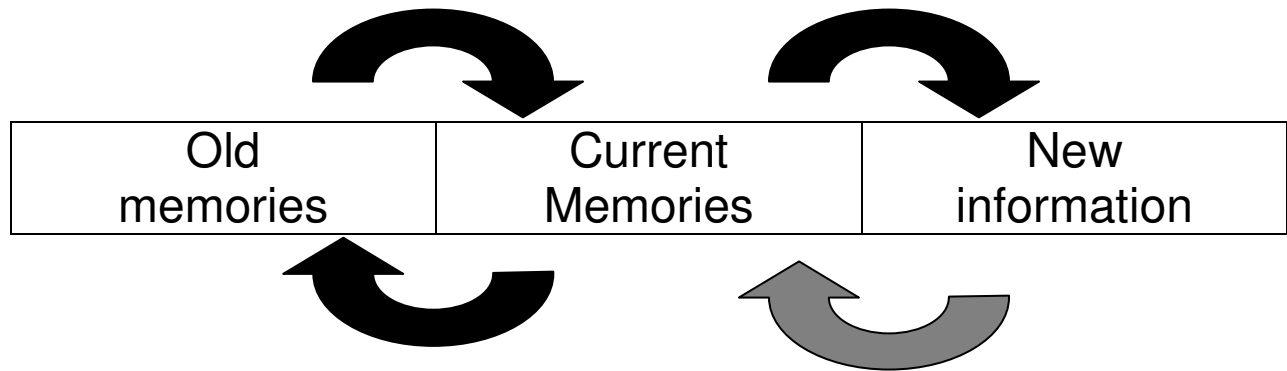


Memories are made by combining information we already have in our brains with new information that come in



Memory as Information Processing

Memories are made by combining information we already have in our brains with new information that come in.



Our past affects what we remember and what we pay attention to. What we currently remember and know affects our interpretation and memory of the past.

What we know affects what we pay attention to and interpret new information. New information can change what we currently know.

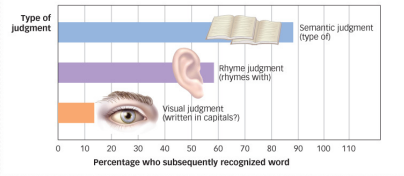
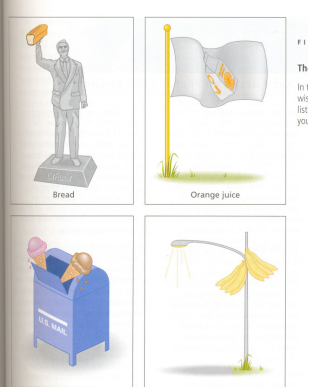
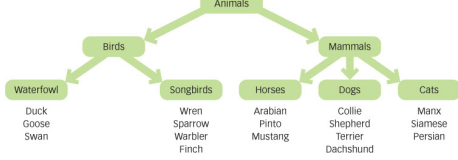
This explains why it is hard to overcome previous knowledge, how memories change and some of “The Seven Sins of Memory” (see later sections).

Encoding

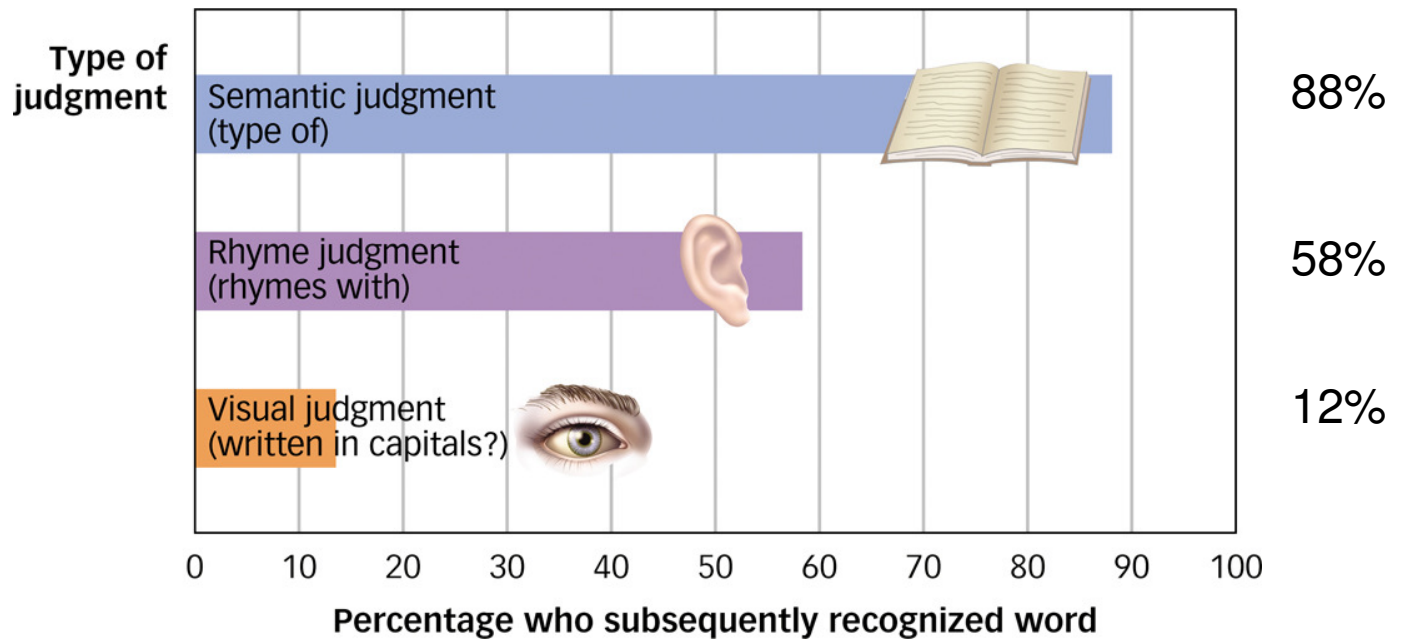
Memory is the mental processes that enable us to retain and use information over time that involve three fundamental processes: encoding, storage and retrieval

- **Encoding:** The process by which we transform what we perceive, think, or feel into an enduring memory
- **Storage:** The process of maintaining information in memory over time
- **Retrieval:** The process of actively bringing to mind information that has been previously encoded or stored

We are going to look at some efficient and less efficient strategies to encode information.

Elaborative Encoding	Visual Encoding	Organizational Encoding
 <p style="font-size: small;">Type of judgment</p> <p style="font-size: small;">Percentage who subsequently recognized word</p> <p>(image source: Schacter et al.)</p>	 <p style="font-size: x-small;">Bread</p> <p style="font-size: x-small;">Orange juice</p> <p style="font-size: x-small;">F I Th in I wd list you</p> <p>(image source: Gerrig and Zimbardo.)</p>	 <p style="font-size: x-small;">Animals</p> <p style="font-size: x-small;">Birds</p> <p style="font-size: x-small;">Mammals</p> <p style="font-size: x-small;">Waterfowl</p> <p style="font-size: x-small;">Duck Goose Swan</p> <p style="font-size: x-small;">Songbirds</p> <p style="font-size: x-small;">Wren Sparrow Warbler Finch</p> <p style="font-size: x-small;">Horses</p> <p style="font-size: x-small;">Arabian Pinto Mustang</p> <p style="font-size: x-small;">Dogs</p> <p style="font-size: x-small;">Collie Shepherd Terrier Dachshund</p> <p style="font-size: x-small;">Cats</p> <p style="font-size: x-small;">Manx Siamese Persian</p> <p>(image source: Schacter et al.)</p>

Encoding: Elaborative Encoding (Depth of Processing)



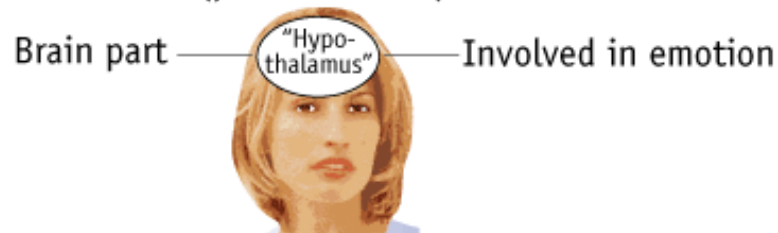
The type of judgment task influenced how you think about each word. The thinking strategies affect what you remember. When you can put meaning behind a memory, it makes it more likely that your memory will endure.

- What do these results suggest about bad strategies for studying information?
- What do these results suggest about good strategies for studying information?

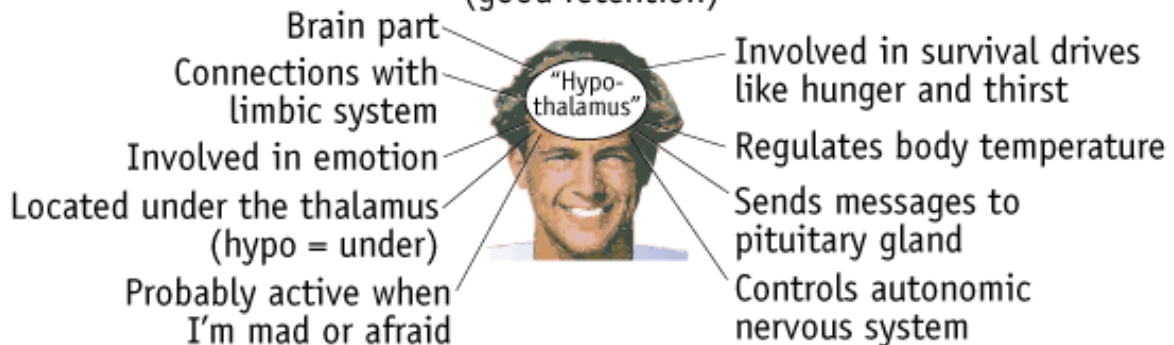
Encoding: Elaborative Encoding

If you can elaborate on the information and connect it with information you already know that is relevant, it increases the likelihood you will remember the information.

IMPOVERISHED ENCODING (poor retention)



ELABORATE ENCODING (good retention)



Encoding: Elaborative Encoding (types of Rehearsal)

Rehearsal or Maintenance Rehearsal: The process of keeping information in short term memory by mentally repeating it.

- hypothalamus, hippocampus, amygdala are all parts of the limbic system*
- hypothalamus, hippocampus, amygdala are all parts of the limbic system*
- hypothalamus, hippocampus, amygdala are all parts of the limbic system*

*your book breaks the limbic system down differently

Elaborative Encoding or Elaborative rehearsal: Encoding by actively relating new information to knowledge that is already in memory ([page 221](#)).

- “I knew it was lunchtime because my hypothalamus told me I was hungry, thirsty and cold. My hippocampus helped me remember a new restaurant on campus, but I got there and had to wait in line, which my amygdala made me angry.

1. What are other examples of these rehearsal strategies?
2. Why does elaborative rehearsal work better than maintenance rehearsal for remembering information?

Encoding: Visual Imagery Encoding

Visual imagery encoding: The process of storing new information by converting it into mental pictures.

If you can visually imagine the material to remember, it increases the likelihood that you are going to remember the information. Therefore, pay attention to the images in the text or lecture or generate your own visual images.

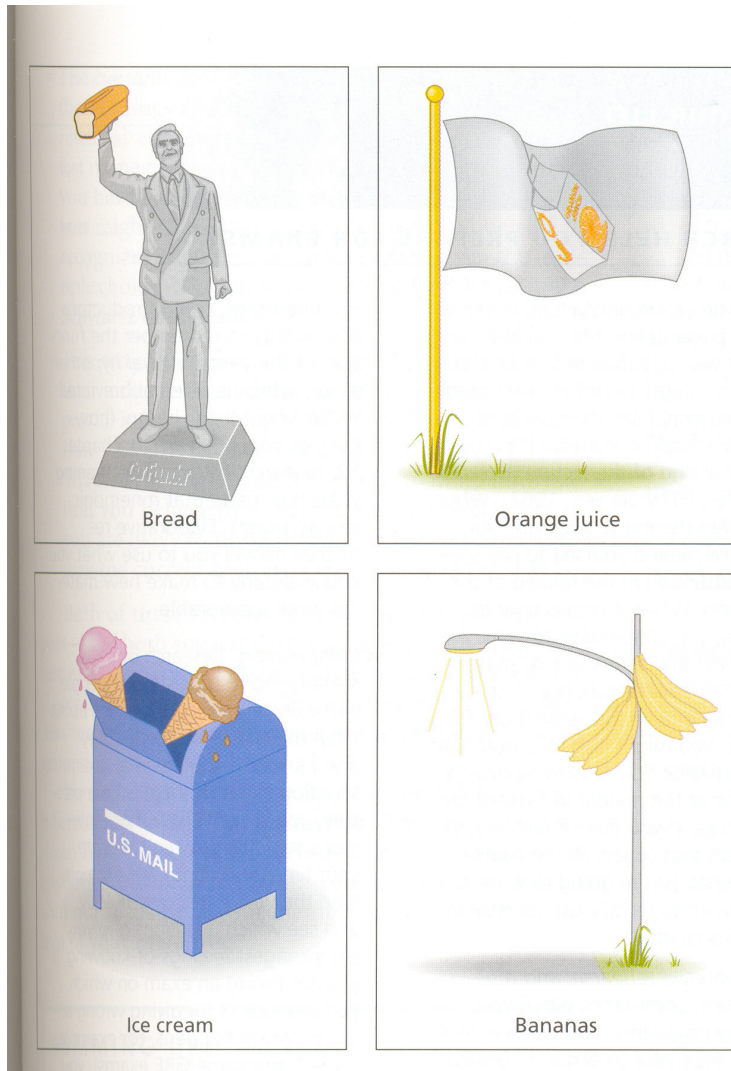


FIGURE 8.10

The Method of Loci

In the method of loci, you associate the items you wish to remember (such as the items on a grocery list) with locations along a familiar path (such as your route to and from school).

Encoding Memories: Organizational Encoding

The main theme is ORGANIZATION. How you organize information affects your ability to encode, store and recall the information. If you can find some way of organizing information, it increases the chance that you will remember the information.

The more you practice your organizational skills, the more you will be able to use these skills efficiently and automatically while recalling information at a faster rate.

Encoding: Organizational Encoding

Organizational Encoding: The process of categorizing information according to the relationships among a series of items.

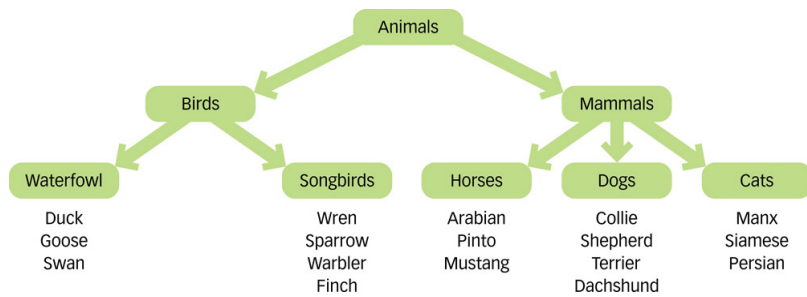
If you can find a way to organize information, it increases the likelihood that you will remember the information.

Examples are

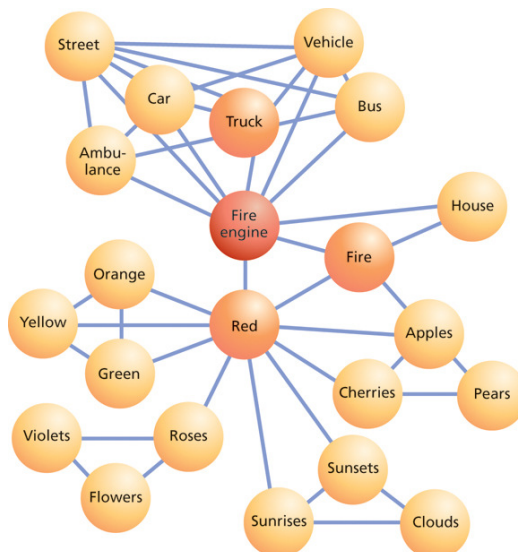
- Categories

A♠	6♥	K♦	8♣
8♠	3♥	5♦	7♣
5♠	2♥	4♦	2♣

- Hierarchies



- Semantic networks or associative networks



Encoding: Clustering or Categorize

Another way to help you organize information is to cluster similar items together. Concepts, ideas, items, words, etc. are grouped or categorized by similarity. Note that similarity is not “objective” and can depend on the individual and goal.

Examples:

- Demonstration of lists
- Harvey Korman in Blazing Saddles
- When I memorize my shopping list or “to do” list, I cluster my groceries or errands in “clusters” that are similar.

Fruits/Vegetables

Canned/Box

Meat/Deli

- When playing cards (such as bridge, hearts, pinochle), it is easier to remember the cards you have if you organize it by suit and then by number.

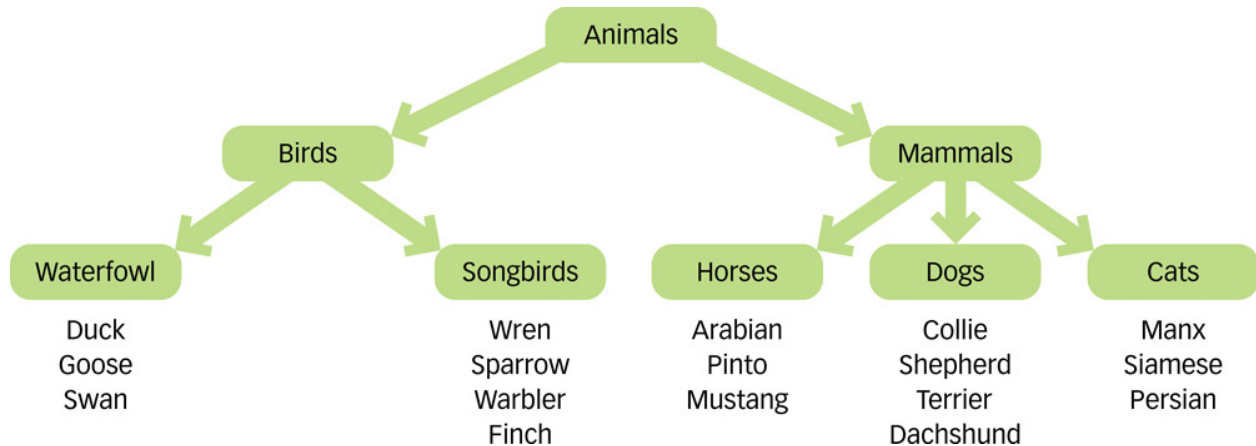
Spades	Hearts	Diamonds	Clubs	vs	A♠	8♠	5♠	3♥
A♠	6♥	K♦	8♣		K♦	7♣	5♦	2♣
8♠	3♥	5♦	7♣		8♣	6♥	4♦	2♥
5♠	2♥	4♦	2♣					

- When studying vocabulary/chapter key terms, organize by clusters

Classical Conditioning Operant Conditioning Observational Learning

Encoding: Hierarchies

Example #1:



Example #2:

Learning

Classical Conditioning	Operant Conditioning	Observational Learning

Example #3:

The Brain

Hindbrain	Midbrain	Forebrain Subcortical	Forebrain cortical
-----------	----------	-----------------------	--------------------

Medulla	Tectum	Thalamus	Corpus callosum
Pons	Tegmentum	Hypothalamus	Cerebral cortex
Cerebellum		Pituitary gland	
Reticular formation		Limbic System	

Encoding: Hierarchies

Organize these minerals in a way that make it easier to remember these minerals. There are different many different ways to organize the information.

emerald marble slate ruby

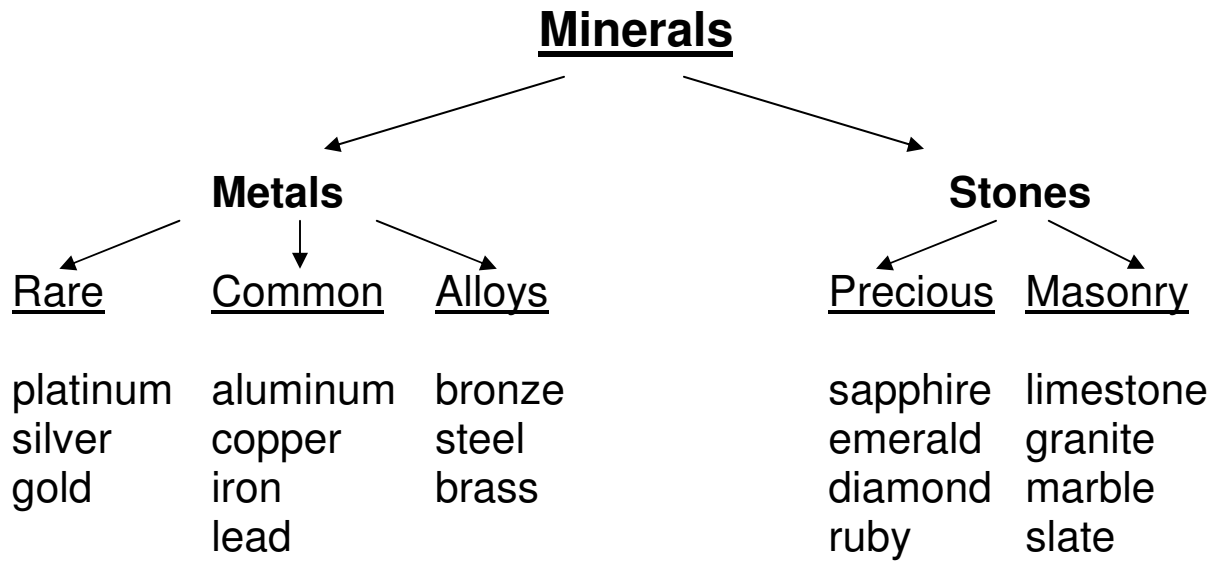
silver limestone diamond aluminum

steel brass bronze iron

granite sapphire gold lead

platinum copper

Encoding: Hierarchies



Role of organization in memory (from Baron, Psychology, p226)

Recall as many of the words from the list as possible.

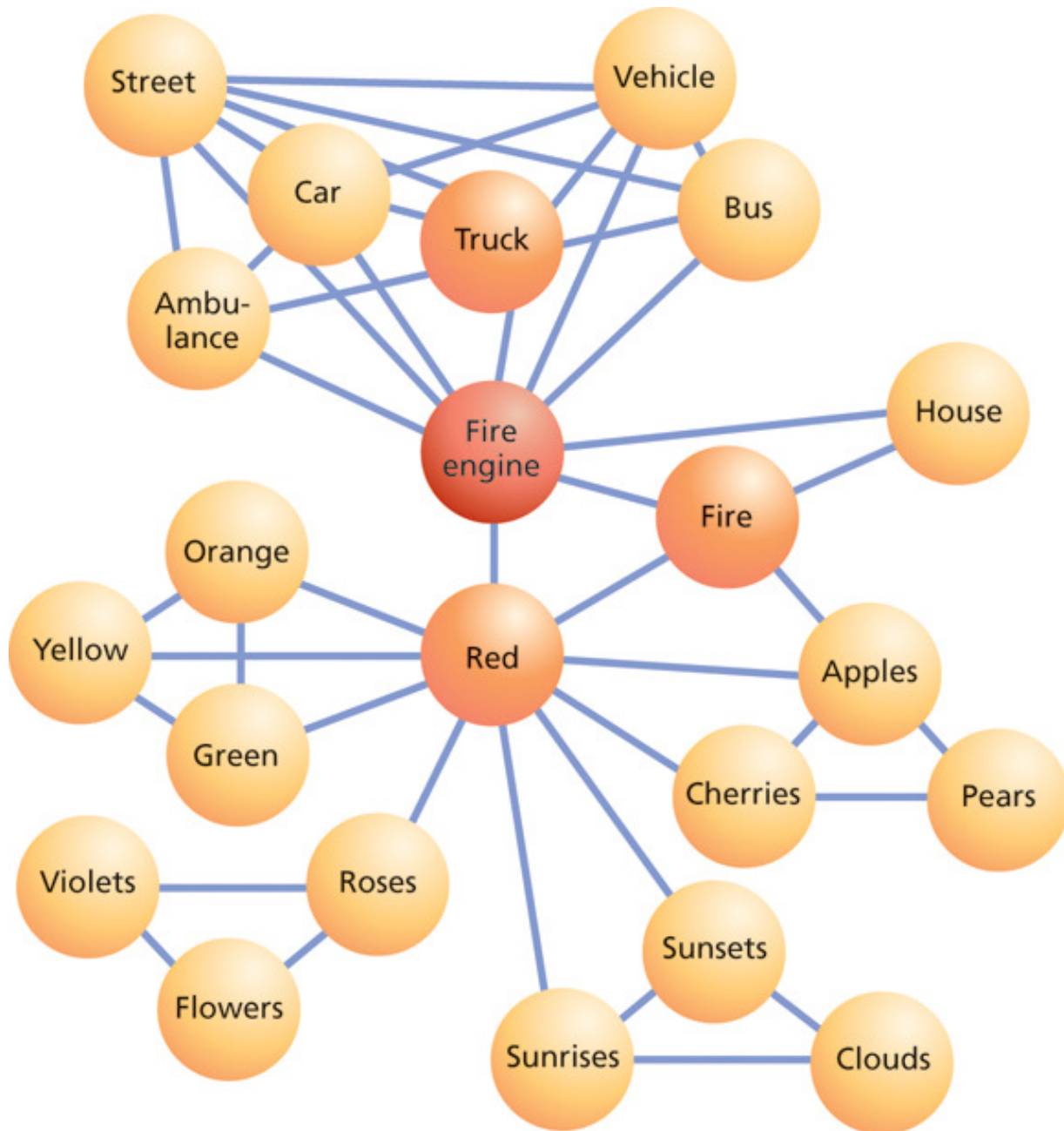
Street	Orange	Apples
Truck	Yellow	Cherries
Vehicle	Green	Pears
Bus	Red	Sunsets
Fire engine	Violets	Sunrises
Ambulance	Flowers	clouds
Car	Roses	
	Fire	
	house	

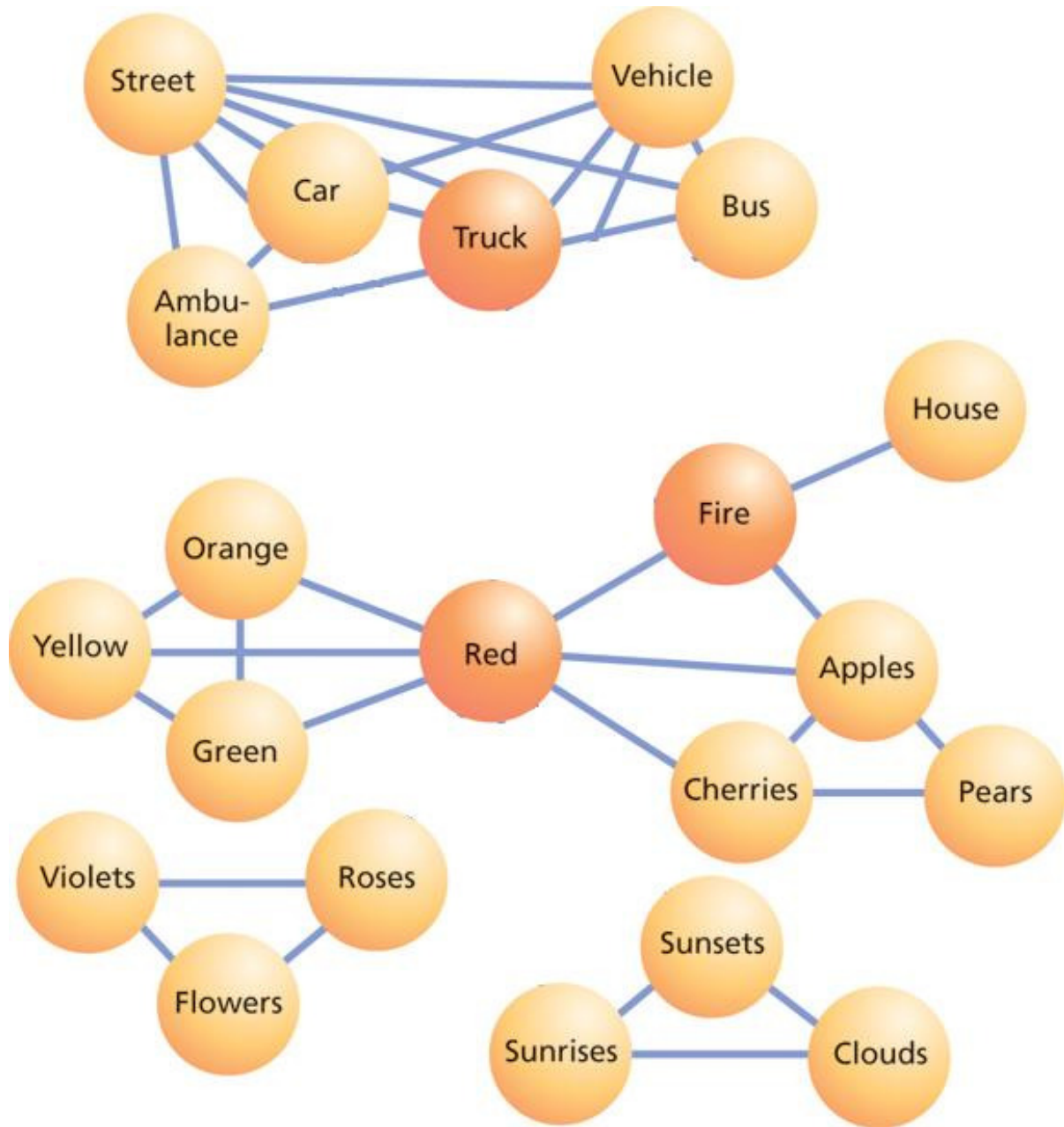
What are some strategies that you can use to increase the likelihood of you remembering this list?

Not very often will you have to memorize a list like this. How can you use the ideas presented in this demonstration to “real-life”?

Storage: Semantic Networks

Semantic networks: A model that describes units of information in long term memory as being organized in a complex network of associations. Notice the relation to elaborative rehearsal.







Encoding: Mnemonics and Acronyms

A mnemonic and acronym are memory strategies for placing information in an organized context to facilitate memory.

What are the Great Lakes?

HOMES

Do you add acid to water, or water to acid? (do you add hydrofluoric acid (HF) to the water, or the other way around?)

AAA

When checking vital signs, what is the sequence in which you check?

ABC

What are the five personality factors in “The Big Five” model of personality?

OCEAN

What is the relationship between sine, cosine, tangent and the length of each side of a triangle?

SOH CAH TOA

What are the nine “planets”?

My Very Earnest
Mother Just Showed
Us Nine Planets

What are the colors of the spectrum?

ROY G. BIV

What are the color codes for resistors?

BBROYGBVW

Try to recall as many letters as possible in the order it is written

A. KLCISNE NVESE YNA NI CSTITIH

Try to recall as many letters as possible in the order it is written

B. NICKELS SEVEN ANY IN STITCH

Try to recall as many words as possible

C. NICKELS SEVEN ANY IN STITCH DON'T
SAVES AGO A SCORE TIME AND
NINE WOODEN FOUR YEARS TAKE

Try to recall as many words as possible

D. DONT TAKE ANY WOODEN NICKELS
FOUR SCORE AND SEVEN YEARS AGO
A STITCH IN TIME SAVES NINE

Encoding: Chunking

Grouping related items together into a single unit or "chunk" to increase the amount of information that can be held in short-term memory (STM) of 7 ± 2 .

When information is organized into meaningful units, such as letters, words and phrases, it is easier to recall. Likewise, if you can put a phone number into two "chunks" instead of seven numbers, it is easier to remember (4658165 versus 465-8165).

- A. KLCISNE NVESE YNA NI CSTITIH
- B. NICKELS SEVEN ANY IN STITCH
- C. NICKELS SEVEN ANY IN STITCH DON'T
SAVES AGO A SCORE TIME AND
NINE WOODEN FOUR YEARS TAKE
- D. DONT TAKE ANY WOODEN NICKELS
FOUR SCORE AND SEVEN YEARS AGO
A STITCH IN TIME SAVES NINE

Strategies to Encoding Information--Getting Information into Memory

Before we can have a memory to retrieve, it needs to be encoded and stored. If you don't effectively encode information, it will be more difficult to retrieve that information.

Effective strategies:

- Elaboration,
 - elaborative rehearsal
 - encode with "depth" or semantic meaning
- Visual imagery,
- Organization
 - hierarchies
 - categories
 - associative networks
 - mnemonics

Less Effective strategies:

- Encode with superficial characteristics
- Maintenance rehearsal (extends short-term memory)

Reasons why we might forget:

- Encoding failure
 - Multitasking
 - Interference
-
- What were examples of these strategies?
 - How can you use these strategies?
 - Why is understanding these strategies important?

Sleep and Memory

REM sleep (short periods in which we dream) is thought to restore mental and brain functions.

- Both animal and human studies have shown that REM sleep increases after learning a novel task and
- deprivation of REM sleep following training disrupts learning when compared to those who are not deprived of REM sleep.

Being deprived of sleep can impair your ability to form new long-term memories

Why is it important to know about the relation between sleep and memory?