

Memory 2011



67,890 Chao Lu (China)

3.

1415 9265 3589 7932 3846 2643 3832 7950 2884 1971 6939 9375 1058 2097 4944 5923
0781 6406 2862 0899 8628 0348 2534 2117 0679 8214 8086 5132 8230 6647 0938 4460
9550 5822 3178 4502 8410 2701 9385 2110 5559 6446 2294 8954
9303 8196 4847 5648 2337 8678 3165 2712 0190 9145 6485
6692 3460 3386 1326 1339 3607 2602 4914 7375 8700 6606 3155 8817
4881 5209 2096 2540 5364 3678 9259 9260 0113 3903 0548 8204 6652 1384
1469 5194 1511 0305 3657 5959 1953 0921 8617 8193 9326 1179 3105 1185
4807 4462 3799 9567 8575 2719 9381 8183 0149 4912 9833 6733 6244
0656 6430 8602 9463 4737 1907 0217 9860 1370 0539 2171 7629 3176
7523 8467 4815 6940 0001 812 7145 2635 6082 7785 7775 4275 7789 8091
7363 7178 7090 0901 146 5495 8537 1050 7922 7968 9258 9235 4201
9956 1121 2580 8640 3481 8136 2977 4771 3099 6051 8707 2113 4999 9998
3729 7804 9951 0597 3173 2816 0963 1859 5024 4594 5534 6908 3026 4252 2308 2533
4468 5035 2619 3118 8171 0100 0313 7838 7528 8658 7533 2083 8142 0617 1776 6914
7303 5982 5349 0428 7554 6873 1159 5628 6388 2353 7875 9375 1957 7818 5778 0532
1712 2680 6613 0019 2787 6611 1959 0921 6420 1989 3809 5257 2010 6548 5863 2788

Can you repeat string of 60 numbers after one hearing?

- <http://www.recordholders.org/en/list/memory.html>



I AM A GOOD PERSON

Memory and YOU

- the taste of your grandmother's chocolate chip cookies...the scent of an freshly mowed grass
- These are memories that make up the ongoing experience of your life -- they provide you with a sense of self.
- They're what make you feel comfortable with familiar people and surroundings, tie your past with your present, and provide a framework for the future.
- In a profound way, it is our collective set of memories -- our "memory" as a whole -- that makes us who we are.

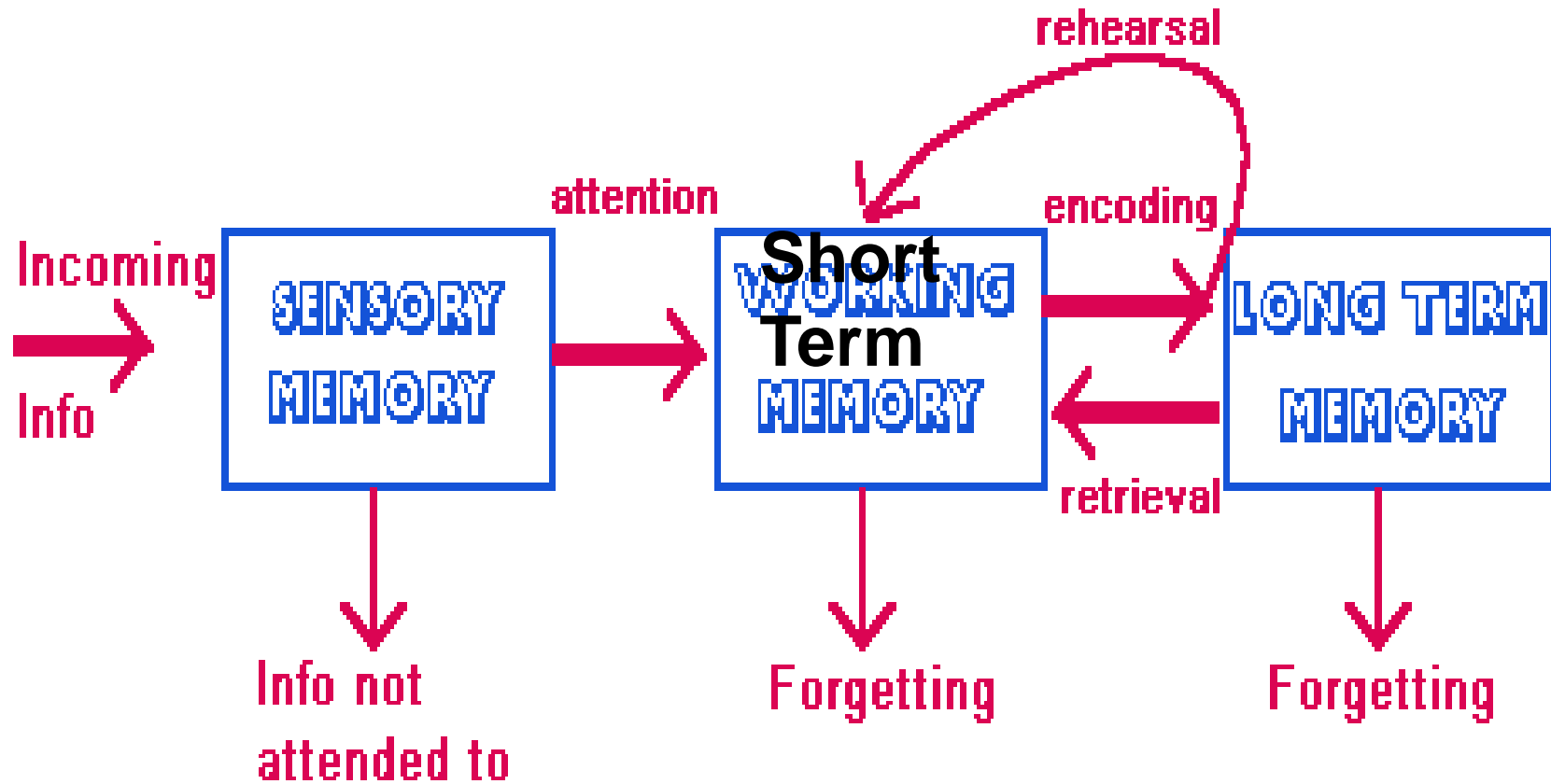
- Your "memory" is really made up of a group of systems that each play a different role in creating, storing, and recalling your memories.
- When the brain processes information normally, all of these different systems work together perfectly to provide cohesive thought.



- If you're riding a bike, the memory of how to operate the bike comes from one set of brain cells;
- the memory of how to get from here to the end of the block comes from another;
- the memory of biking safety rules from another; and that nervous feeling you get when a car veers dangerously close, from still another.
- Yet you're never aware of these separate mental experiences, nor that they're coming from all different parts of your brain, because they all work together so well.
- In fact, experts tell us there is no firm distinction between how you remember and how you think.



MEMORY



Memory Consists of

1. The Sensory Information Store (SIS)
2. The Short-Term Memory (STM)
3. The Long-Term Memory (LTM)

... and 3 processes

- **Encoding** (putting information into a store)
- **Maintenance** (keeping it "alive")
- **Retrieval** (finding encoded information)

Encoding

- The process of laying down a memory begins with **attention** (regulated by the **thalamus** and the **frontal lobe**), in which a memorable event causes **neurons to fire more frequently**, making the experience more intense and increasing the likelihood that the event is encoded as a memory.
- **Emotion** tends to increase attention, and the emotional element of an event is processed on an unconscious pathway in the brain leading to the **amygdala**.

- **Encoding** is the **first step** in creating a memory.
- It's a biological phenomenon, rooted in the senses, **that begins with perception.**
 - Consider, for example, the memory of the first person you ever **fell in love with.**
 - When you met that person, your visual system likely registered physical features, such as the color of their eyes and hair.
 - Your auditory system may have picked up the sound of their laugh.
 - You probably noticed the scent of their perfume or cologne.
 - You may even have felt the touch of their hand.
- **Each of these separate sensations traveled to the part of your brain called the hippocampus, which integrated these perceptions as they were occurring into one single experience -- your experience of that specific person.**

Memory Process-You already KNOW IT 😊

- Although a memory begins with perception, it is encoded and stored using the language of electricity and chemicals.
- Here's how it works: Nerve cells connect with other cells at a point called a synapse. All the action in your brain occurs at these synapses, where electrical pulses carrying messages leap across gaps between cells.

- As you **learn and experience** the world and changes occur at the synapses and dendrites, more **connections in your brain** are created.
- The **brain organizes and reorganizes** itself in response to your experiences, **forming memories** triggered by the effects of outside input prompted by experience, education, or training.



- To properly encode a memory, **you must first be paying attention.**
- Since you cannot pay attention to everything all the time, most of what you encounter every day is simply filtered out, and only a few stimuli pass into your conscious awareness.
- If you remembered every single thing that you noticed, your memory would be full before you even left the house in the morning.
- What scientists aren't sure about is whether stimuli are screened out during the sensory input stage or only after the brain processes its significance.
- **What we do know is that how you pay attention to information may be the most important factor in how much of it you actually remember.**



How do we ENCODE?

Effortful Processing

- Next-in-line
 - When we are next in line, we focus on own performance and often fail to process the last person's words
- Spacing effect
 - Spacing of studying rather than cramming
- Serial position effect
 - We remember last and first items better than those in the middle

- REST
- SNORE
- SOUND
- TIRED
- ARTICHOKE
- BED
- COMFORT

- AWAKE
- EAT
- ARTICHOKE
- WAKE
- DREAM
- SLUMBER
- NIGHT

- EYE
- PIN
- POINT
- HURT
- SYRINGE
- PAIN
- THIMBLE

- THREAD
- PRICK
- SHARP
- SEWING
- INJECTION
- KNITTING
- HAYSTACK

Encoding Meaning

- Images, sounds, meaning
 - (acoustic, visual, tactile, semantics, etc...)
- Mnemonic devices
 - Please Excuse My Dear Aunt Sally.
 - My Very Educated Mother Just Served Us Noodles
 - Every Good Boy Deserves Fudge

Storage

1. Sensory memory

- ¼ second to 3 seconds-selective attention

2. Short Term memory (STM)

- Store, use, dispose
- Magical number 7 +/- 2
- Rehearsal, chunking, acronyms, hierarchies

3. Long Term memory (LTM)

- Hippocampus & cross reference
- Neural changes in synapses
- Increase levels of serotonin
- Stress amygdala, and hormones
- Flashbulb memories

• 9 2 5
• 8 6 4 2
• 3 7 6 5 4
• 6 2 7 4 1 8
• 0 4 0 1 4 7 3
• 4 8 6 8 5 7 6 3
• 2 9 5 1 9 3 4 2
• 9 2 6 3 4 9 8 1
• 7 3 5 2 4 9 8 9 8
• 6 1 7 2 5 8 7 3 1
• 3 2 5 6 8 9 7 4 2
6

• U V A F C I C R B S A I

• C N N A B C T N T P B
S

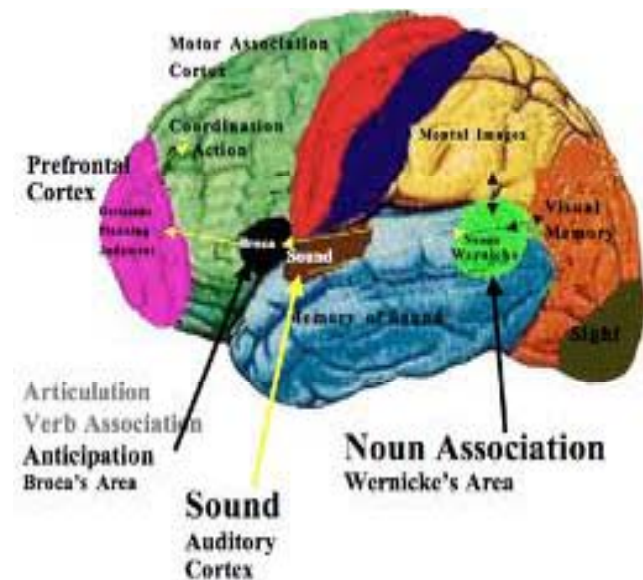
• T H E D O G S A W C A
T

Peg Word System

1. Bun
 2. Shoe
 3. Tree
 4. Door
 5. Hive
 6. Sticks
 7. Heaven
 8. Gate
 9. Shine
 10. Hen
- Honey
 - Dog food
 - Oranges
 - Peanut butter
 - Ice cream
 - sugar
 - bread
 - Pork chops
 - Potato chips
 - Milk

Memory

- Working Memory or STM occurs in the prefrontal cortex
- Coordinates w/ long term memory, so you can respond to events as they occur



STM

- is described as having a limited storage capacity (seven, +/- two items)
- also "decay" and become inaccessible after a relatively brief interval
 - (estimates range from 12 to 30 seconds)

- In addition to decay, loss of information from the STM can occur by **interference** when new information displaces older information.
- Interference does not always cause information to be lost, but may instead produce memory **retrieval errors** in which one recalls information that is similar to but not identical with that which is needed.

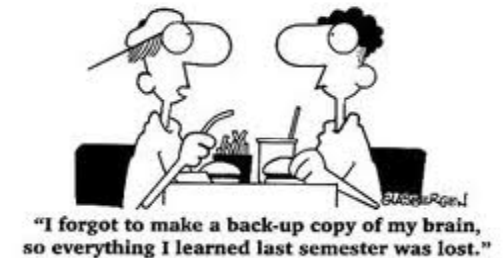
- Long Term Memory is processed in the Hippocampus
- Brain transfers newly gained information into long term memories

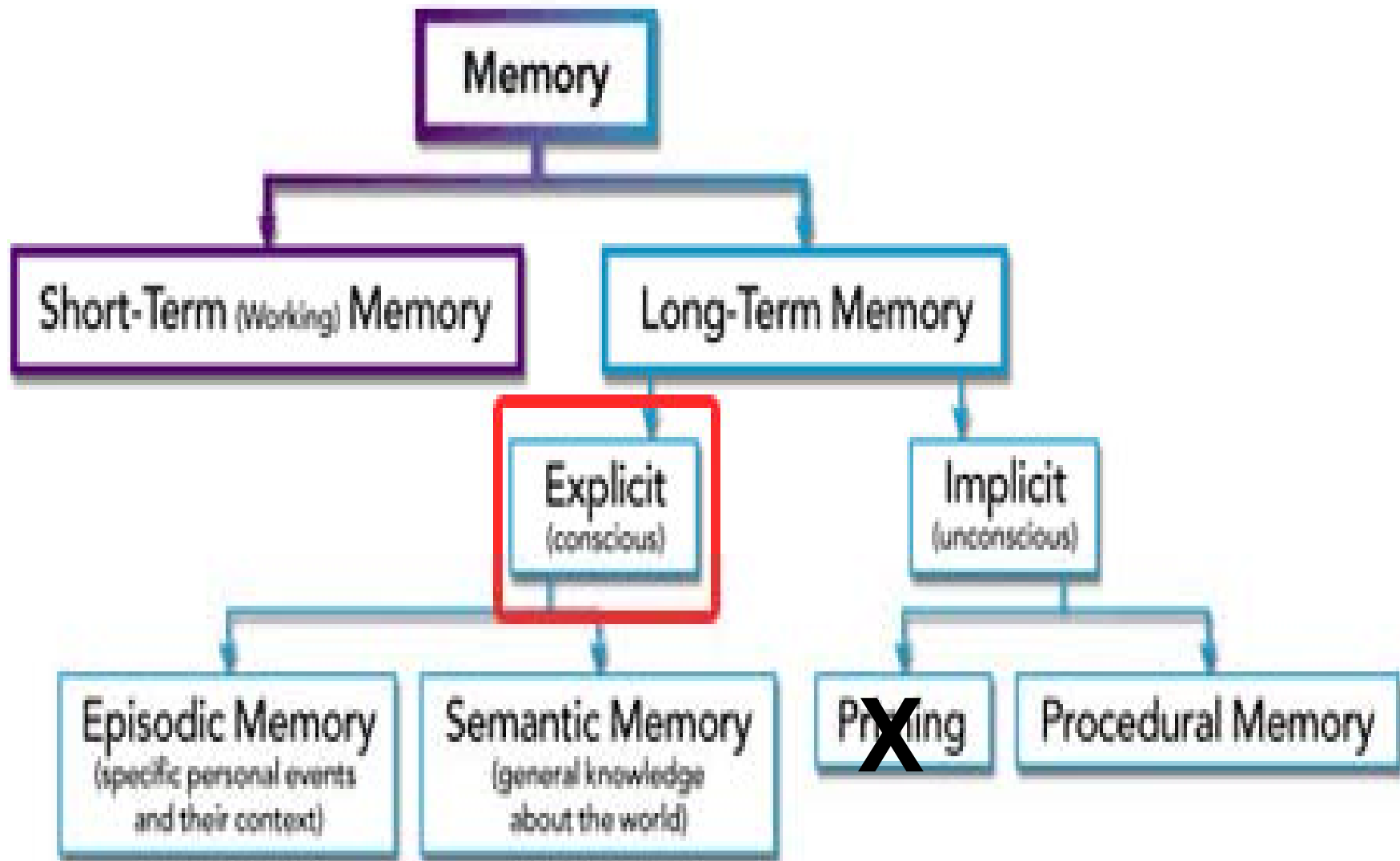


Hippocampus in Greek = seahorse

- Important information is gradually transferred from STM into LTM
- The more the information is repeated or used, the more likely it is to eventually end up in LTM, or to be "retained."
- (That's why studying helps people to perform better on tests. REALLY??)
- Unlike sensory and STM, which are limited and decay rapidly, LTM can store unlimited amounts of information indefinitely.

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Implicit & Explicit Memory

- **Implicit Memory** depends on previous experiences aid in the performance of a task **without conscious awareness** of these previous experiences
- Implicit memory every day in the form of procedural memory, the type of memory that allows people to remember how to tie their shoes or ride a bicycle **without consciously** thinking about these activities

Procedural Memory

- Motor skills, Cerebellum movement
- An example is remembering how to brush your teeth. You probably do not need to think about it. These forms of memory—called *implicit memory*
- Other examples: (biking, typing, playing piano)

- **Explicit memory requires conscious thought**—such as recalling who came to dinner last night or naming animals that live in the rainforest.
- It's what most people have in mind when they think of "memory," and whether theirs is good or bad.
- Explicit memory is often **associative**; your brain links memories together. For example, when you think of a word or occasion, such as an Bulldoge, your memory can bring up a whole host of associated memories

1. Semantic

- It accounts for our "textbook learning" or general knowledge about the world.
- Knowledge of facts, concepts, words, definitions, language rules
- It's what enables us to say, without knowing exactly when and where we learned, that a zebra is a striped animal, or that Paris is the major city in France

2. Episodic

- Personally experienced events
- Autobiographical
- What you ate last night
- Also referred to Flashbulb Memories
 - 9/11, Princess Diane killed,

- A newspaper is better than a magazine. A seashore is a better place than the street. At first it is better to run than to walk. You may have to try several times. It takes some skill but is easy to learn. Even young children can enjoy it. Once successful, complications are minimal. Birds seldom get too close. Rain, however, soaks in very fast. Too many people doing the same thing can also cause problems. One needs lots of room. If there are no complications, it can be very peaceful. A rock will serve as an anchor. If things break loose from it, however, you will not get a second

- The procedure is actually quite simple. First you arrange things into different groups. Of course, one pile may be sufficient depending on how much there is to do. After the procedure is completed one arranges the materials into different groups again. Then they can be put into their appropriate places. Eventually they will be used once more and the whole cycle will then have to be repeated. However, that is part of life.

Retrieval

1. Recall v. Recognition

2. Retrieval Cues

- Associations, emotions, moods

3. Forgetting

- Encoding failure, blocking, confusion, decay, misinformation

4. Retrieval Failure

- PON, RNO
- Motivated forgetting-Repression

Sleep & Memory



- No longer any doubt. Sleep does improve the getting or consolidation of memory for recently encoded information.
- Research is now focusing on how this happens and what other factors interact with the sleep effect.
- At least two processes seem to be at work:
 - 1) sleep protects new memories from disruption by the interfering experiences that are inevitable during wakefulness
 - 2) sleep consolidates memories according to their relative importance and the learner's expectations for remembering.



Memory and Age

- Studies also have shown that many of the memory problems experienced by older people can be lessened -- or even reversed. Studies of nursing-home populations show that patients were able to make significant improvements in memory when given rewards and challenges. Physical exercise and mental stimulation also can really improve mental function.
- Evidence from animal studies suggests that stimulating the brain can stop cells from shrinking and can even increase brain size in some cases. Studies show that rats living in enriched environments with lots of toys and challenges have larger outer brains with larger, healthier brain cells. And animals given lots of mental exercise have more dendrites, which allow their cells to communicate with each other. Research has shown that, in our later years, a stimulating environment encourages the growth of these dendrites, while a dull environment impedes it.



- Pain is not only a physical experience; the association of cognition -- higher awareness -- and emotion attach meaning to the experience of pain. These additional features of pain appear to help humans create more refined memories of a painful experience, which may help keep the person from repeating it in the future



- the cognitive mind isn't alone in forming memories of pain. Research into the nervous system has found that it can also **form memories of pain**, which can persist even after tissue removal. The so-called **phantom limb phenomenon** illustrates how the mind may retain its ability to experience pain, even after the limb is no longer present. Studies show that patients who have undergone amputation tend to experience the phantom limb sensation far more frequently than people missing a limb congenitally

