Psych 390 - Section 002

Research Methods in Memory

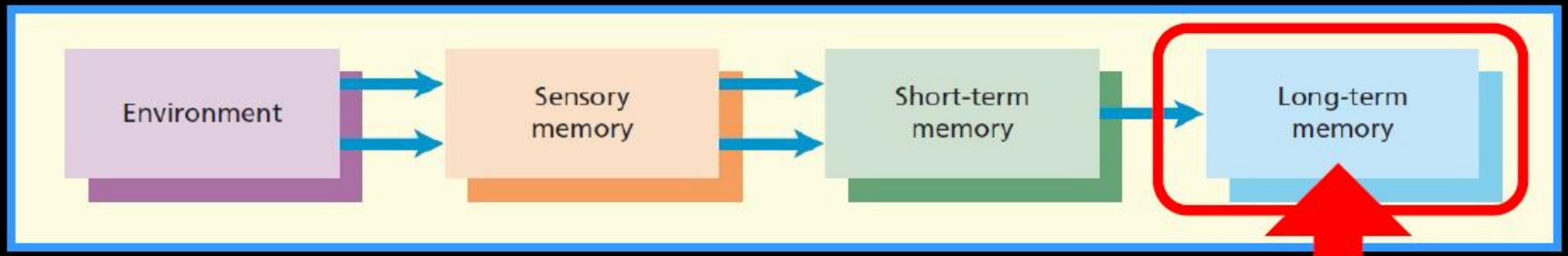
Lecture 7 – Winter 2022

Episodic Memory

Today's Agenda

- Memory is reconstructive
- The role of meaning in memory
- Organizing memories
- Contextual factors
- Episodic memory in the brain

What is Episodic Memory?



Explicit

Implicit

Episodic

Semantic

Priming

Procedural

Memory for specific events that occurred at a particular time and place

Is episodic memory unique to humans?

Is Episodic Memory Unique to Humans?

Some researchers (even famous ones) argue the answer is ‘no’ because...

Episodic memory … "makes possible mental time travel through subjective time, from the present to the past, thus allowing one to re-experience, through autonoetic awareness, one's own previous experiences" (Tulving, 2002).

What do you think?

Is Episodic Memory Unique to Humans?

But then came along Clayton & Dickinson (1999)…

Memory is reconstructive

Bartlett’s War of the Ghosts

War of the Ghosts

One night two young men from Egulac went down to the river to hunt seals and while they were there it became foggy and calm. Then they heard war-cries, and they thought: "Maybe this is a war-party". They escaped to the shore, and hid behind a log. Now canoes came up, and they heard the noise of paddles, and saw one canoe coming up to them. There were five men in the canoe, and they said:

"What do you think? We wish to take you along. We are going up the river to make war on the people."

One of the young men said, "I have no arrows."

"Arrows are in the canoe," they said.

"I will not go along. I might be killed. My relatives do not know where I have gone. But you," he said, turning to the other, "may go with them."

So one of the young men went, but the other returned home.

And the warriors went on up the river to a town on the other side of Kalama. The people came down to the water and they began to fight, and many were killed. But presently the young man heard one of the warriors say, "Quick, let us go home: that Indian has been hit." Now he thought: "Oh, they are ghosts." He did not feel sick, but they said he had been shot.

So the canoes went back to Egulac and the young man went ashore to his house and made a fire. And he told everybody and said: "Behold I accompanied the ghosts, and we went to fight. Many of our fellows were killed, and many of those who attacked us were killed. They said I was hit, and I did not feel sick."

He told it all, and then he became quiet. When the sun rose he fell down. Something black came out of his mouth. His face became contorted. The people jumped up and cried.

He was dead.

Bartlett's (1932) War of the Ghosts Study

- "canoe" became "boat"
- "arrows" became "bullets"
- "something black" became "foaming at the mouth"

- Showed two key things:
  - Memory is reconstructive
  - The reconstruction is influenced by our existing knowledge (i.e., 'schemas')

The role of meaning in memory

Levels of Processing

(Craik & Tulving, 1975)

- Participants were presented with sequences of unrelated words and had to either…

  - 1) Decide whether the word was **upper or lower case**
    visual → *shallow processing*
  - 2) Decide whether the word **rhymed with another word**
    visual + phonological → *intermediate processing*
  - 3) Decide whether a word fit **into a sentence**
    visual + phonological + semantic → *deep processing*

Levels of Processing

(Craik & Tulving, 1975)

Results

- Deeper encoding led to better recognition of studied words

Key aspects of deep encoding are…

- Semantic encoding – an item is connected to previous knowledge at the level of meaning

- Elaborative rehearsal – an item is encoded with rich detail

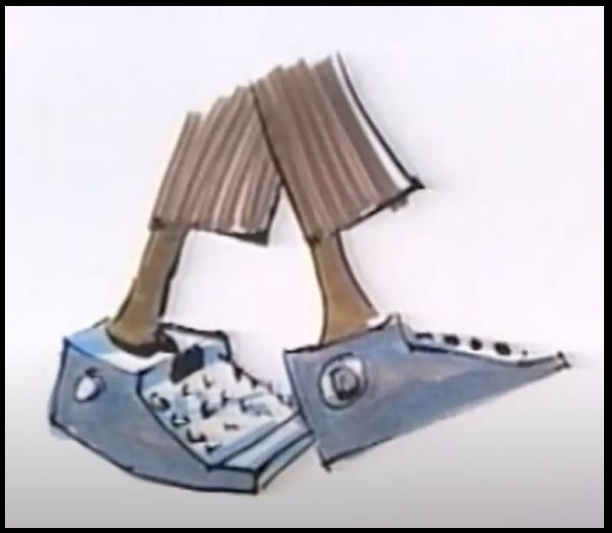
Harry Lorayne

Famous mnemonist (memory technique expert)

https://www.youtube.com/embed/8UM9ziKHK7w

Watch a bit at the start for laughs, then watch 6:13-7:35

Harry Lorayne



Imagine someone's name was "Tiypshoo"

Harry Lorayne is not just "making connections"…

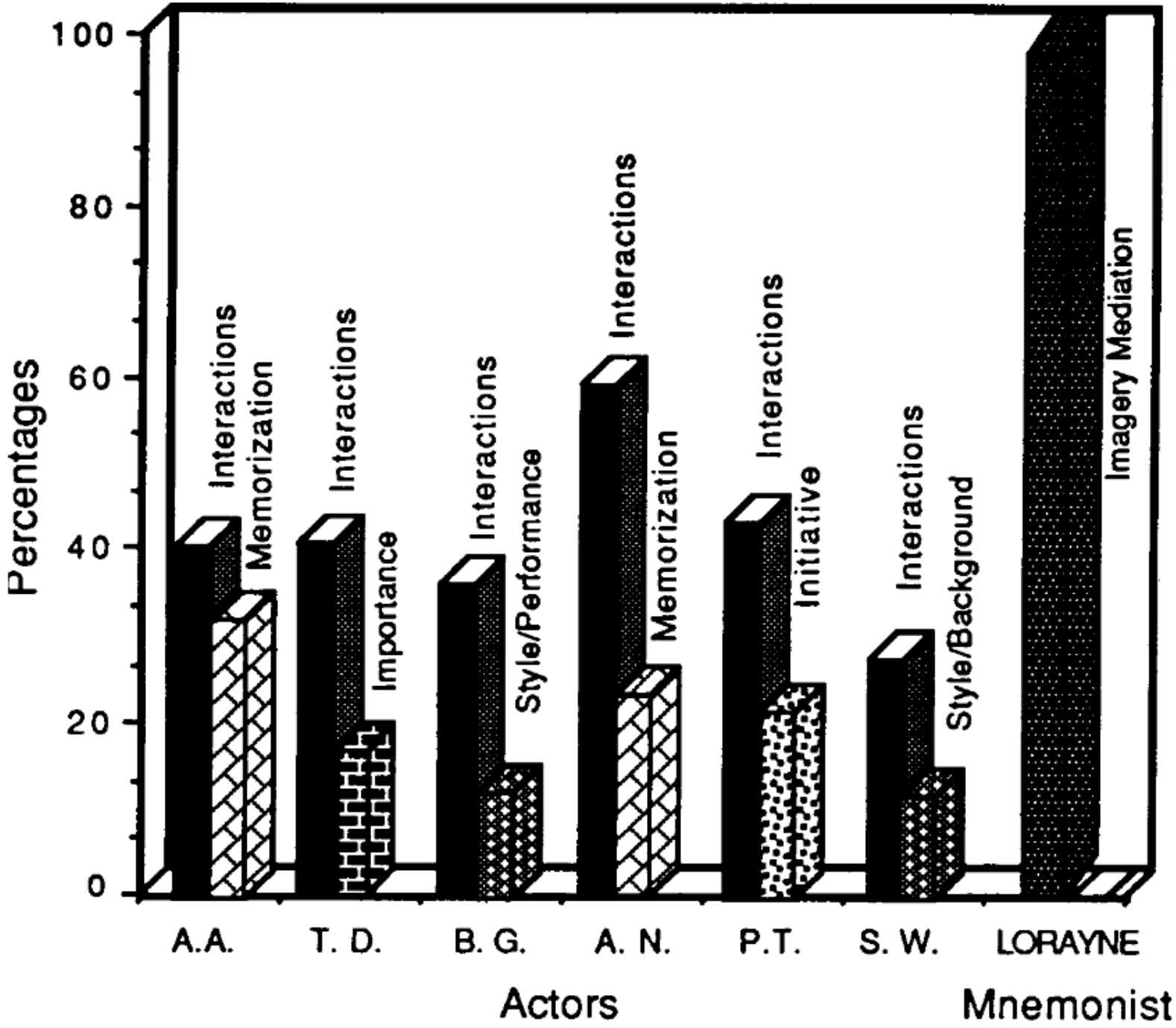
- Generation effect
- Bizarreness effect
- Mental imagery
- Distinctiveness heuristic

Noice & Noice, 1996

A study of different mnemonic strategies

- 6 male actors and Harry Lorayne
- They all read one scene from a play (six pages)

- Read the text and then told to ‘do whatever they normally do’ to correctly remember their lines and act out scene
  - Performance was recorded
  - Individuals’ methods were then reported afterwards


100
80
60
40
20
0
Percentages
Interactions
Memorization
Interactions
Importance
Interactions
Style/Performance
Interactions
Memorization
Interactions
Initiative
Interactions
Style/Background
Imagery Mediation
A.A.
T. D.
B. G.
A. N.
P.T.
S. W.
LORAYNE
Actors
Mnemonist

Noice & Noice, 1996

The Actors

- All actors attended primarily to the mental and emotional interactions with other characters
- Very little deliberate memorization

Harry Lorayne

- Used a strategy of visualization and linking

  e.g., Kendall Frayne [image of candles raining down]

Other Useful Mnemonics

https://www.youtube.com/embed/mlrOJgyPySw?&start=209

How to improve memory?

- Application of mnemonics on a daily basis
- Strengthen retrieval route
- Use of external aids
- Link events (especially new onto old)
- Lessen cognitive load

Applications of memory techniques to real world

Say you're a doctor…

How might knowledge of factors affecting memory change the way in which you would give instructions to patients about which prescription medications to take, and when?

Take a couple minutes to think about / write down the most effective method you can think of.

Can you only prescribe meaning to individual items?

Organizing memories

Is anyone a waitress or bartender?

How do ***you*** remember all those orders?

Beach (1988) - The bartender study

Compare strategy used by novice bartenders and experts

- Goal is to learn to mix standard drinks
  - Each drink associated with a glass of a particular shape and color
- Does the type of mnemonic used influence the type of interference produced by distraction?
  - Correct drink order
  - Correct ingredients

How might mnemonic strategies differ across these groups of bartenders?

Beach (1988) - The bartender study

Method

Novice and Experts groups each asked to prepare…

4 different drinks

- Mojito
- Martini
- Strawberry daquiri
- Sangria

Beach (1988) - The bartender study

Method

Novice and Experts each asked to prepare 4 drinks

1. Alone with no distractions

2. While counting backwards by threes aloud
   - Interferes with short term memory and rote rehearsal

104, 101, 98, 95, 92…

3. Without any visual aids (shape/color of glasses omitted)
   - Use black glasses of identical shape for each drink
   - Interferes with visual mnemonics

Beach (1988) - The bartender study

- Experts were unaffected by the ‘counting backwards’ distractor, but novices were greatly affected
- Novices were unaffected by the ‘lack of visual aids’ manipulation, but experts were greatly affected
- The strategy / mnemonic that one uses to perform a task determines which external distractions interfere with memory

Overall Principle

Learning benefits from meaningful organization of information

This can occur through…

- Internal systems
- External links / cues
- Discovering rules that bind information

Other Evidence of Organization

Tulving & Pearlstone, 1966

Study: Try to remember 4 words from each of 6 categories (category names were not provided)

Test: Cued recall using category labels as the cue, or no category labels provided

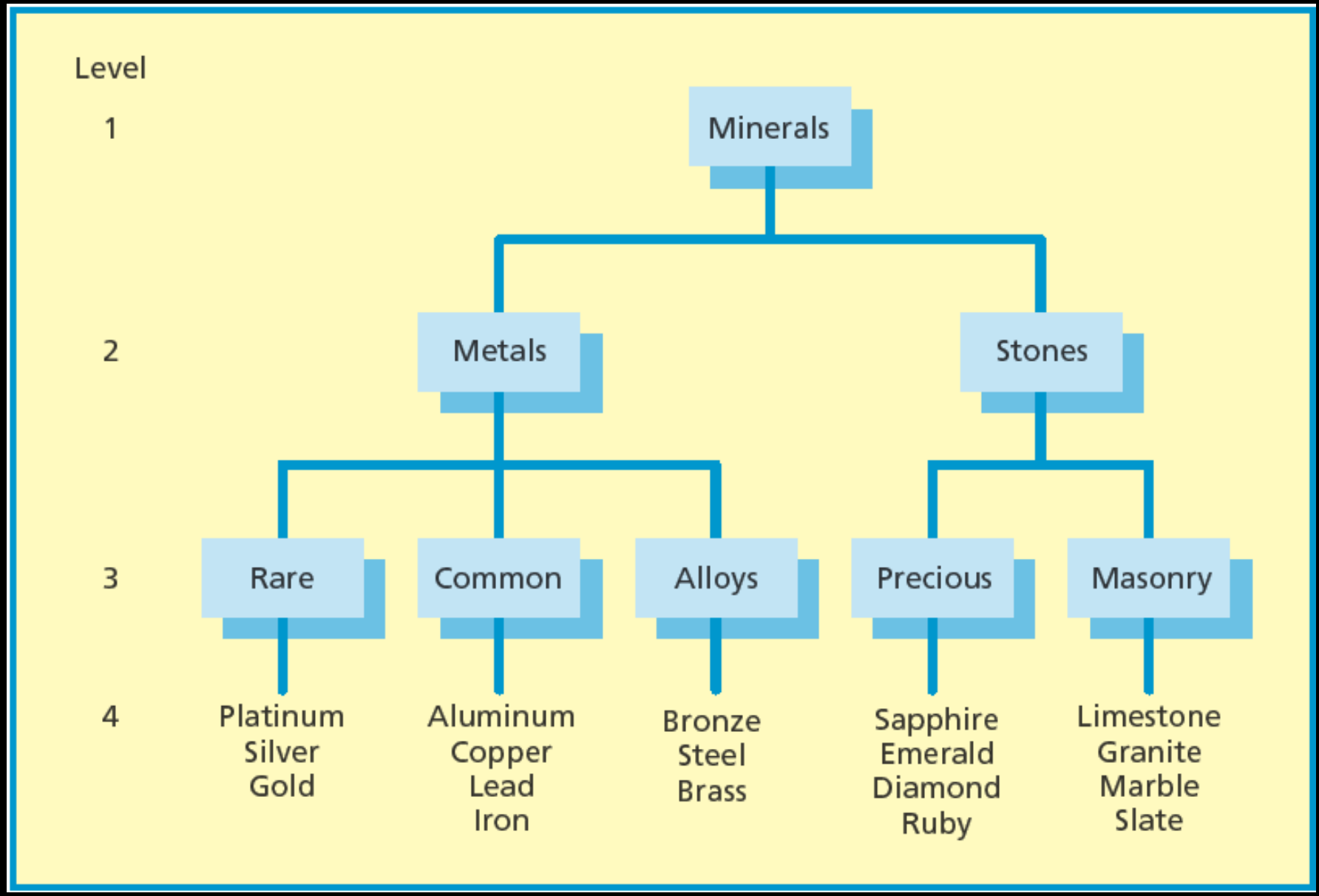
Memory improves if given category names

Other Evidence of Organization

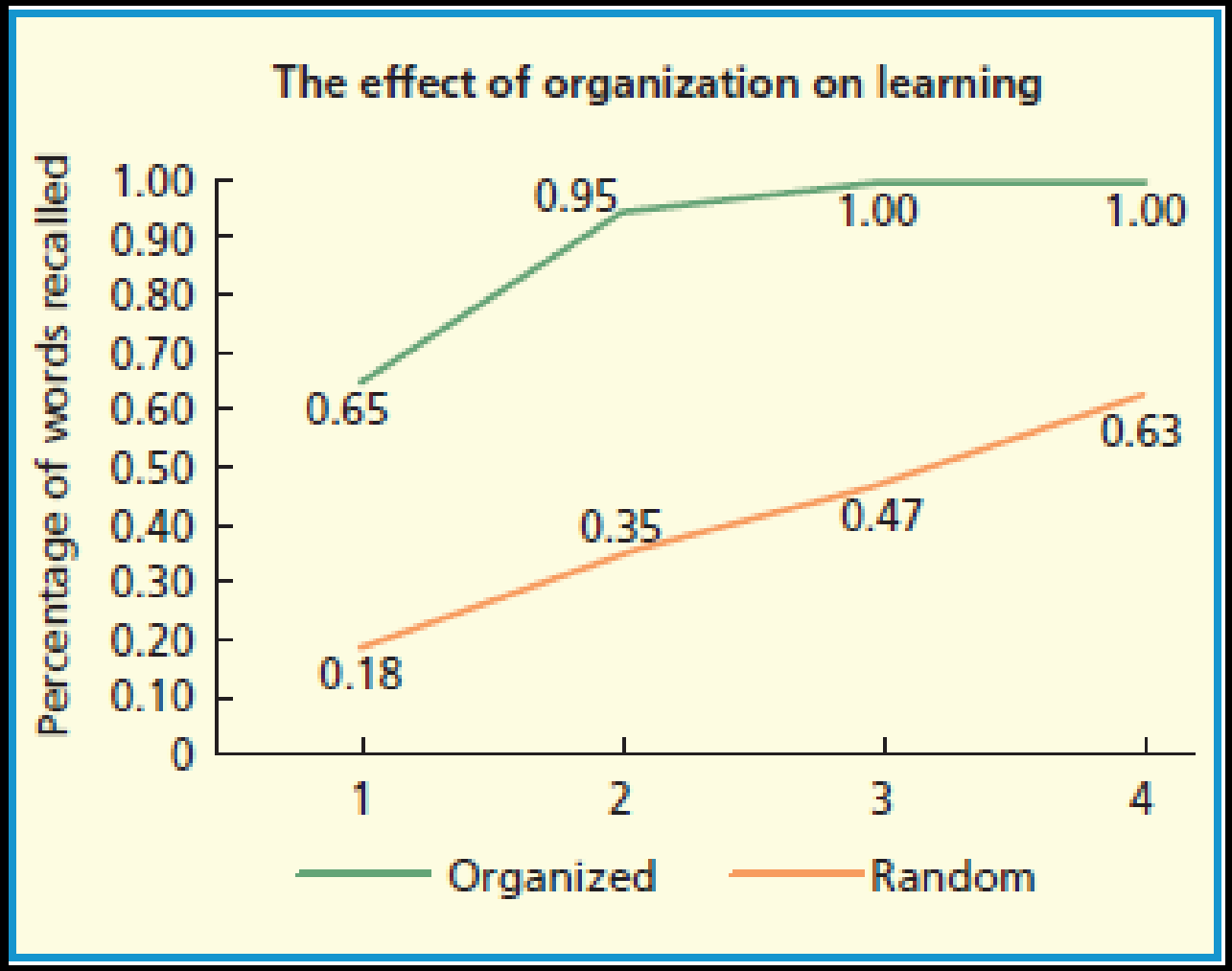
Massive effect of organization of material prior to study

Bower et al, 1969

- **Method**: Remember the names of 112 minerals
- **Hypothesis**: If a hierarchy is used to when presenting material, then later recall should be much higher relative to if the same words are simply presented randomly in a list



The “minerals” conceptual hierarchy used by Bower et al. (1969).

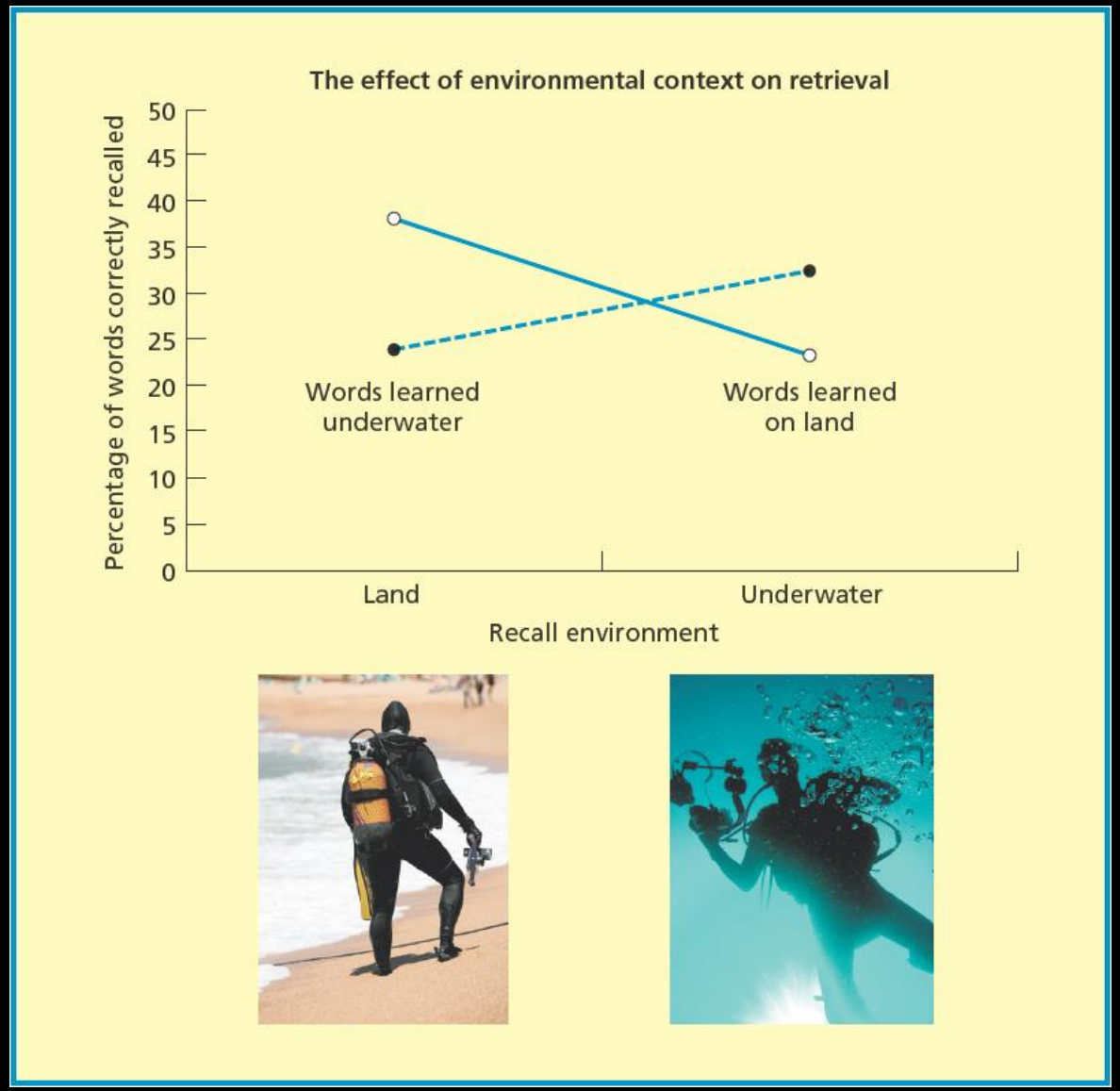


Recall was much better for pre-organized information.

"Skim the textbook chapter before the lecture!"

Contextual factors

Godden and Baddeley (1975)



Words learned and tested in the same environment are better recalled than those items for which the environmental context varied between study and test

Context-Dependent Memory

State Dependency

- Recall partially depends on the match between the learner's internal environment (i.e., physiological state, including heart rate) at encoding and retrieval

Recall is best if encoding and retrieval *both* occur when, for example:

- Drunk (Goodwin et al., 1969)
- Under the influence of marijuana (Eich, 1980)
- Under the influence of caffeine
- Sober
- Exercising
- At rest

However, state dependency disappears on recognition tests. Why?

Context-Dependent Memory

Context-Dependent Memory

Mood-Congruent Memory

- It is easier to recall events that have an emotional tone that matches the current mood of the person
  - One idea is that depressed individuals are likely to recall mostly unpleasant memories, furthering their depression

Mood-Dependent Memory

- Recall is dependent on the match in mood states between encoding and retrieval

Mood-Dependent Memory

Eich et al., 1994

Task:

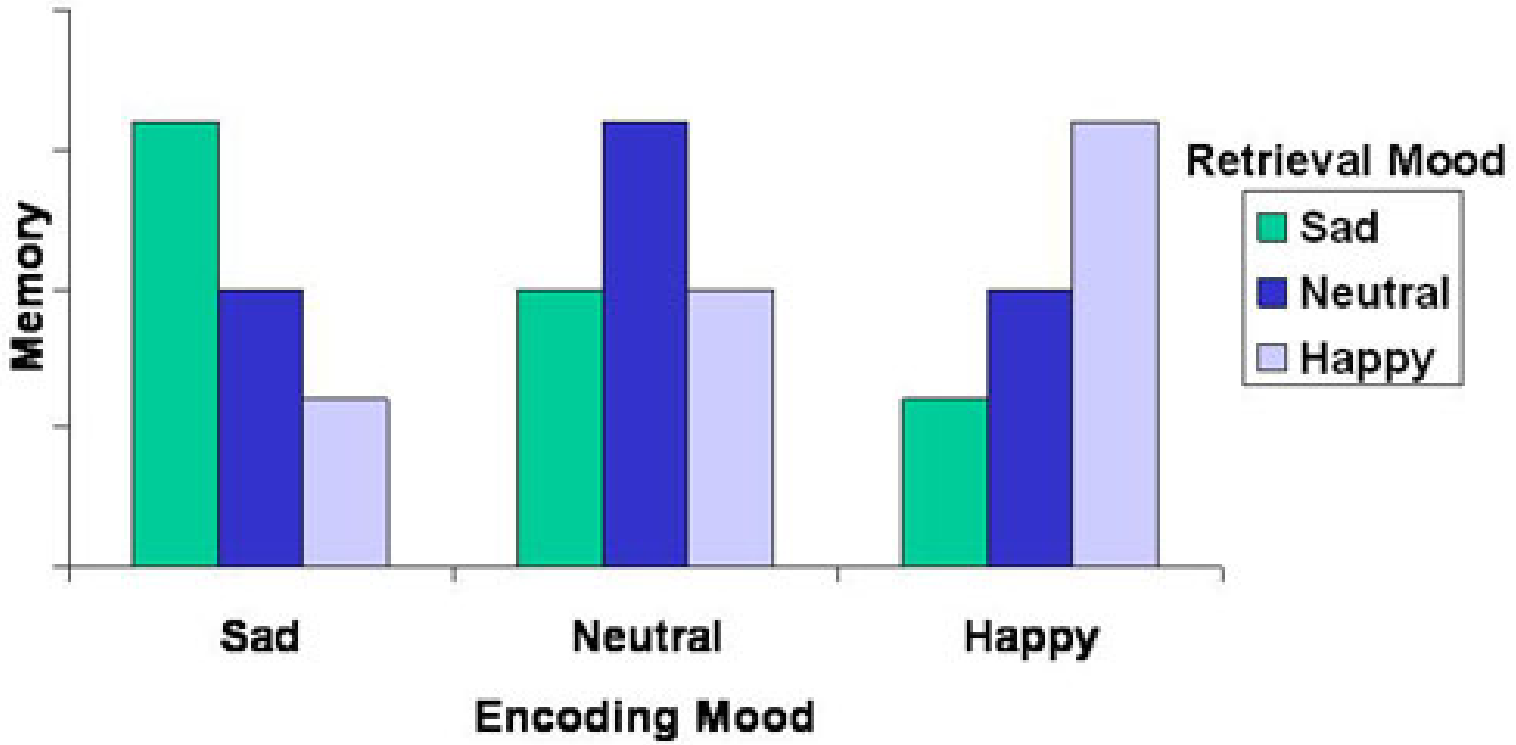
- Induced either a pleasant or unpleasant mood at encoding by:
  - Playing merry or melancholy music
  - Asking participants to think about happy or depressing thoughts
- Two days later, induced either the same or the opposite mood prior to recall

Results:

- Free recall was vastly improved when mood states matched
  - This occurred regardless of the emotion of the event recalled

Mood-Dependent Memory

Bower (1981); Eich & Metcalfe (1989)

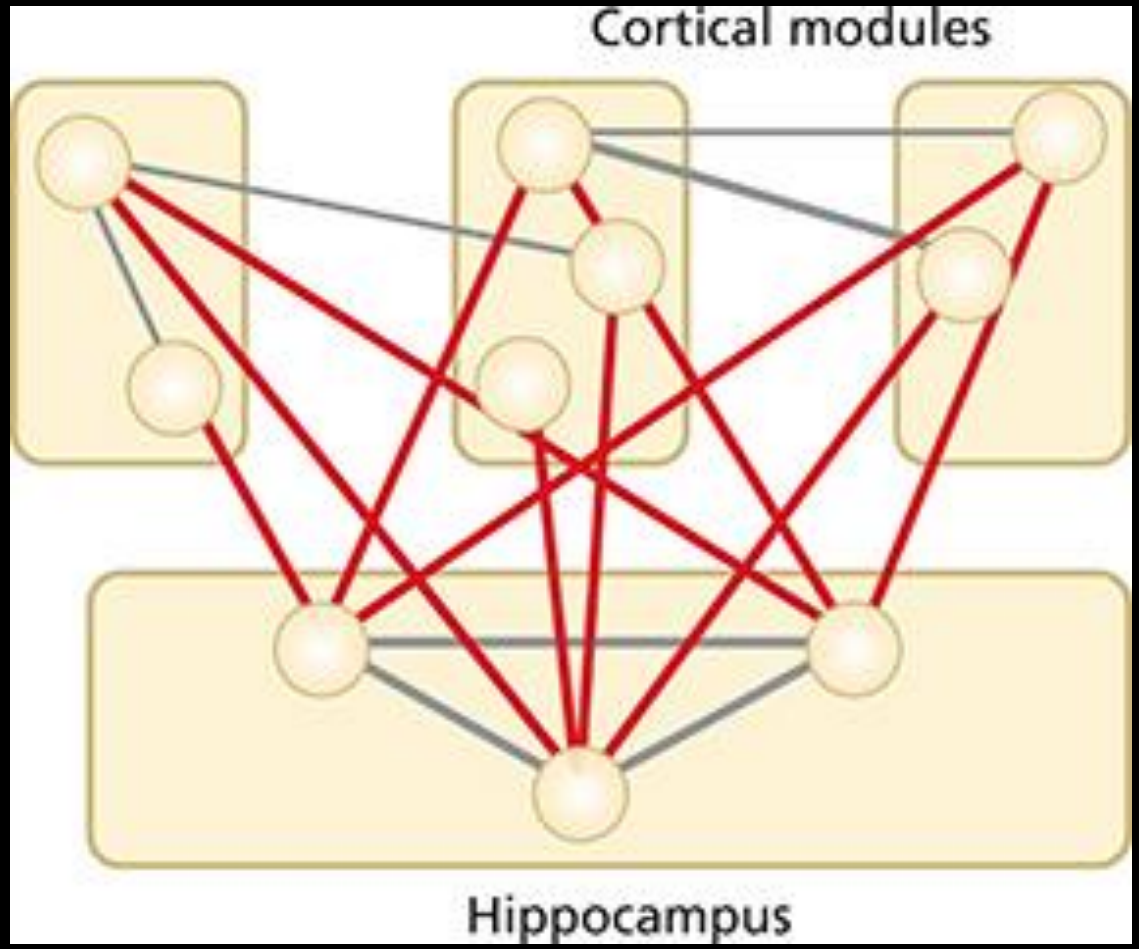


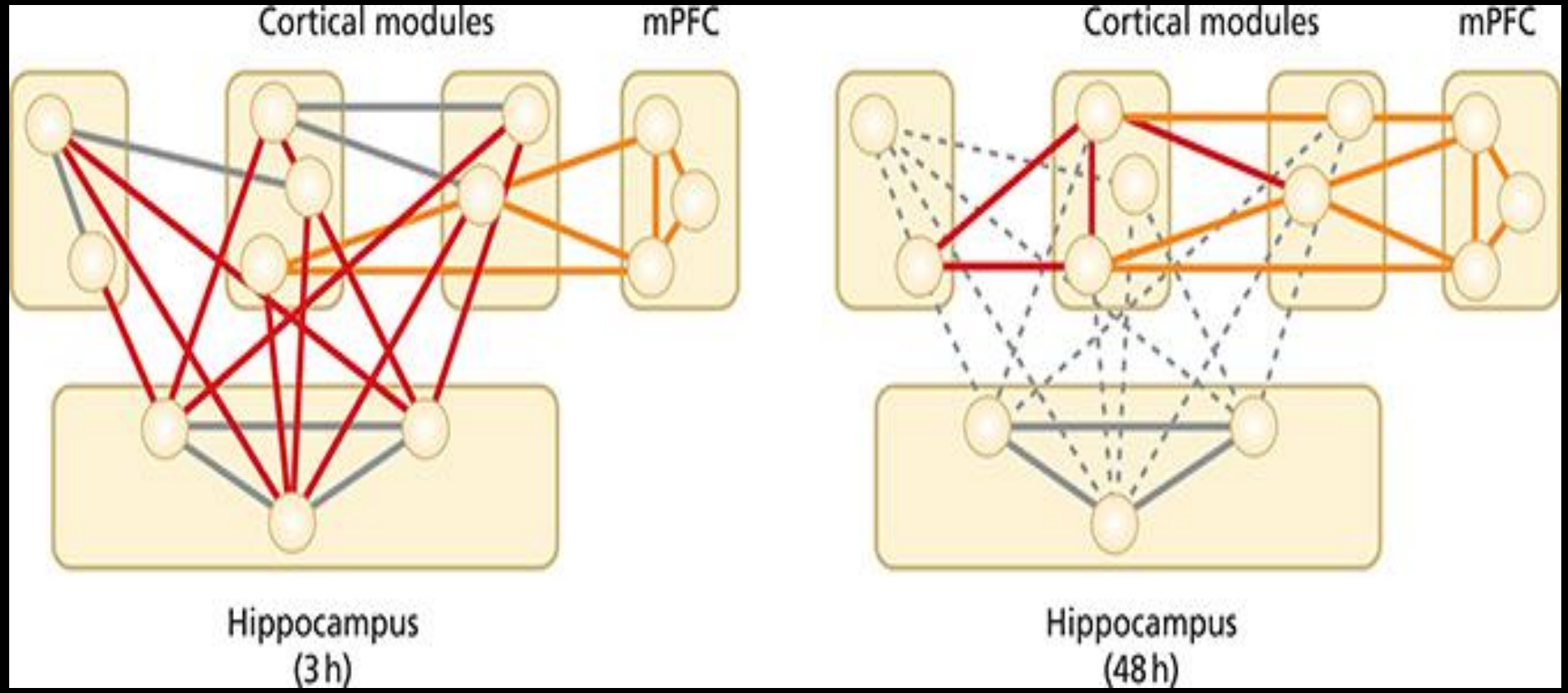
Episodic memory in the brain

How do we store episodic memories in the brain?

Multimodal representations

- The hippocampus binds multimodal inputs together to form a representation of the spatial temporal context
- A representation that draws together inputs from many different sensory modalities, such as vision, hearing, touch, taste, and smell
- A multimodal representation can also include conceptual and emotional features

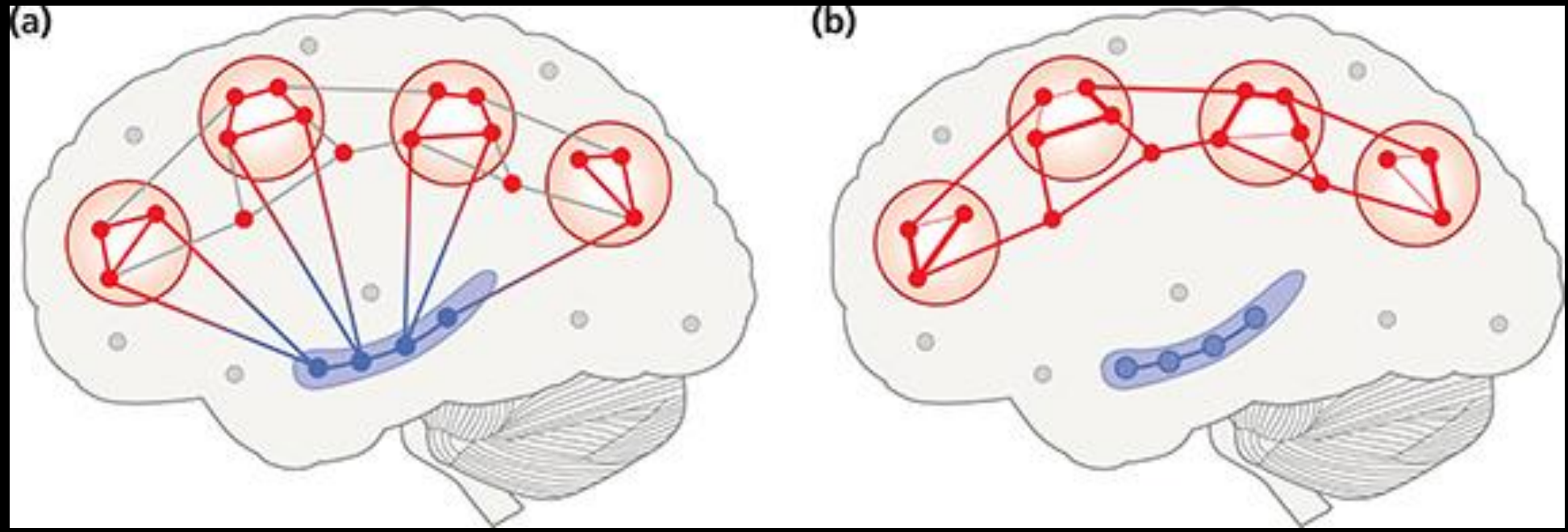




- Although the new memory is initially dependent on the hippocampus, it very rapidly (within a day or two) can undergo systems consolidation and become hippocampally independent (the right side of the figure)

- The medial prefrontal cortex (mPFC) is thought to provide a schematic scaffold that integrates cortical modules, leading to rapid consolidation

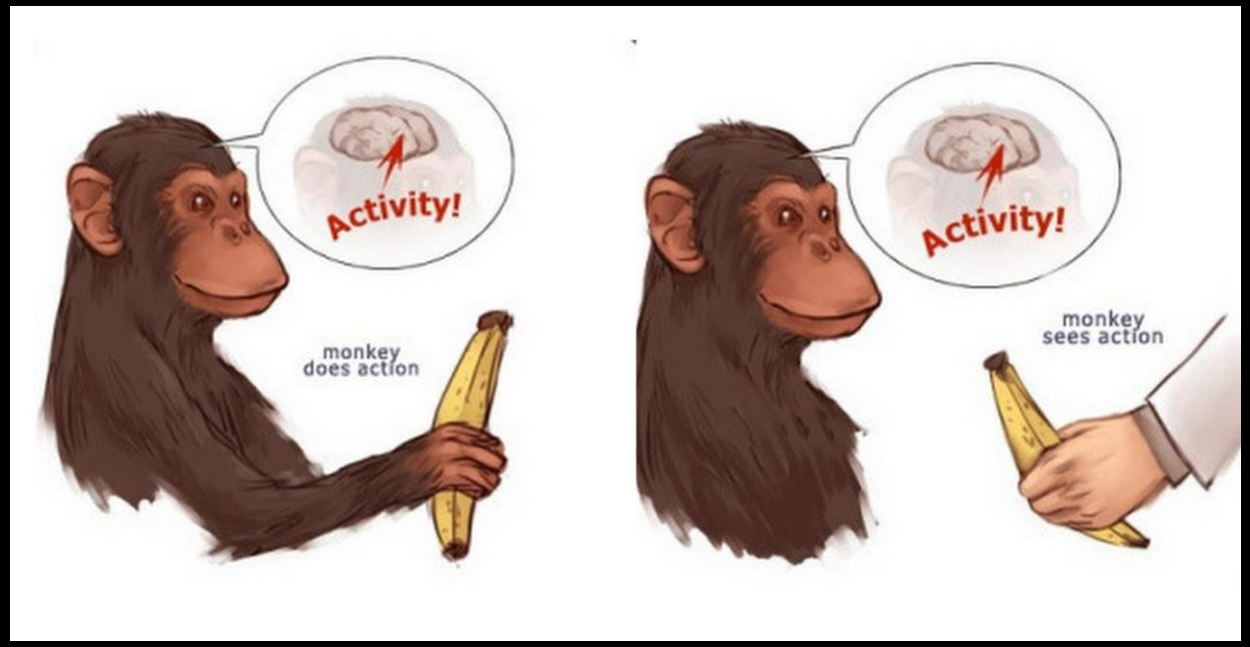
How do we store episodic memories in the brain?



Cortical reinstatement

- The reactivation of sensory memory traces throughout the brain, as propagated by the hippocampus, effectively reinstating the original experience

Brain-to-Brain Communication???
Not really… But…



Mirror Neuron System

- A group of specialized neurons that “mirrors” the actions and behaviour of others
- Good evidence for distributed ‘sensory memory’

Today's Summary

- Memory is reconstructive
  - When memories are retrieved, they are re-built. This allows for intrusions
- The role of meaning in memory
  - Attaching meaning to a memory is a powerful way to remember it
- Organizing memories
  - Organizing assigns meaning and provides a scaffold for retrieval
- Contextual factors
  - Matching / differing contexts between study and test can influence memory retrieval
- Episodic memory in the brain
  - Memories start in the hippocampus and then undergo systems consolidation