

Memory Systems

U4 Ch24



Outline

Multiple types; multiple time scales

Two types of long term stores

Under the hood: Working Memory

Under the hood: Declarative memory

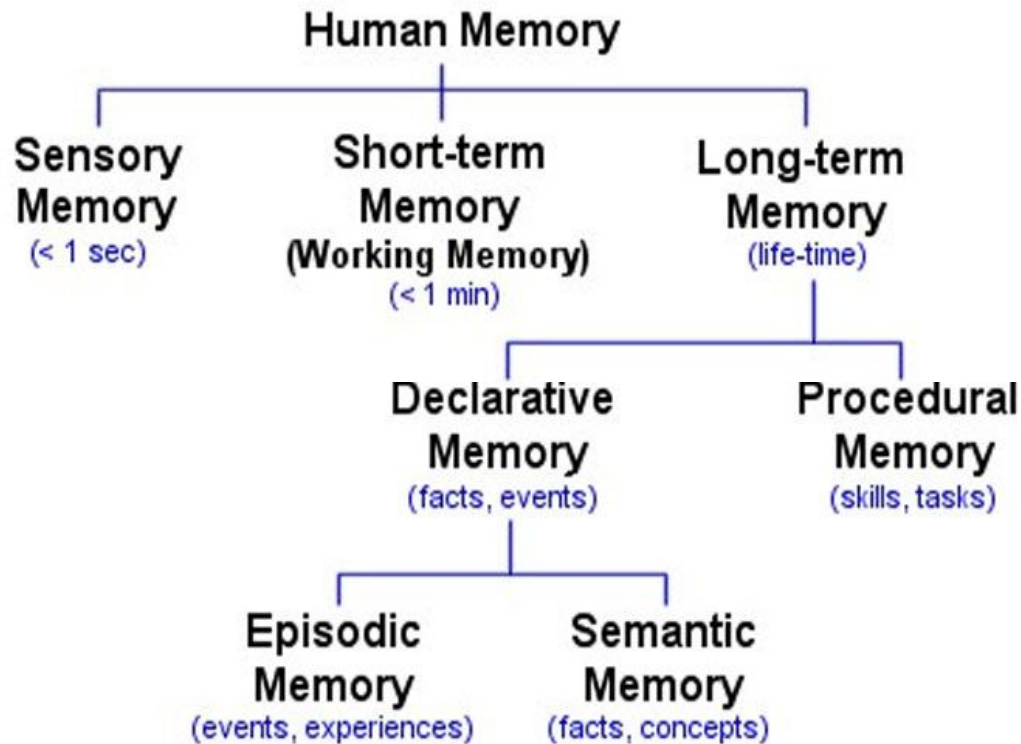
Outline

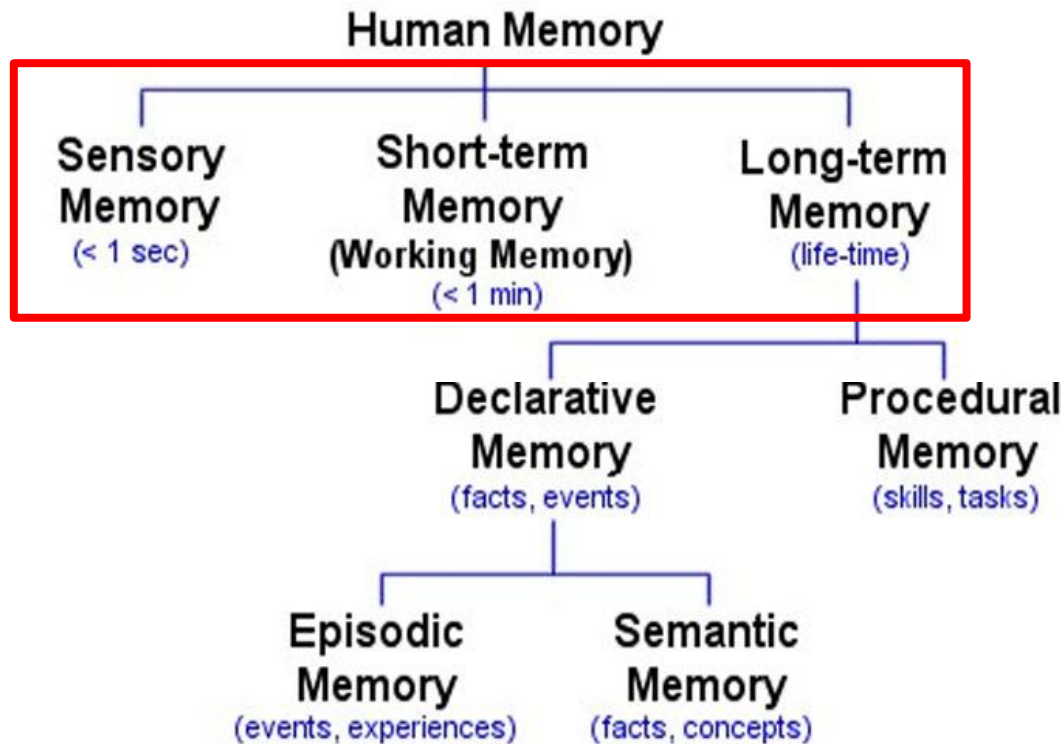
Multiple types; multiple time scales

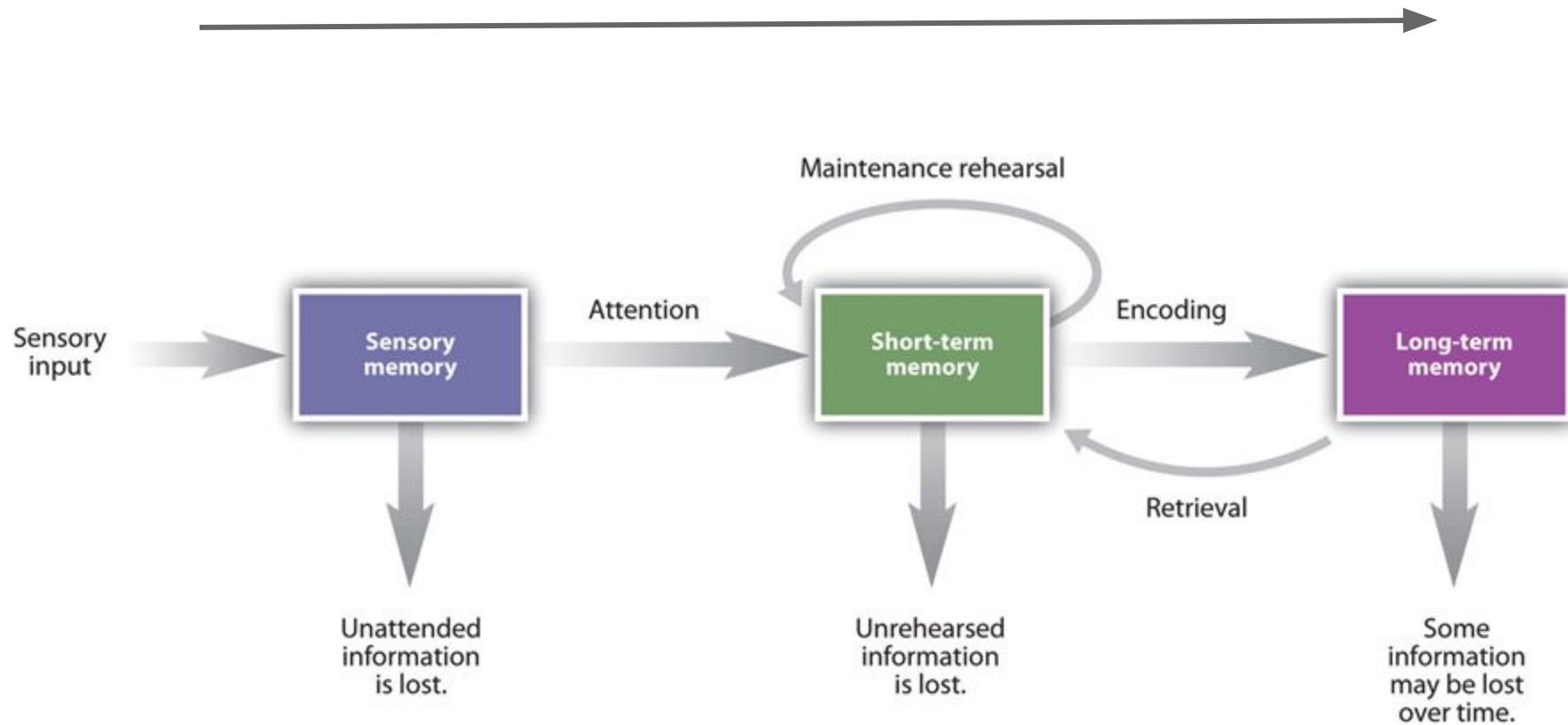
Two types of long term stores

Under the hood: Working Memory

Under the hood: Declarative memory









Seconds - minutes:

Working memory

Minutes - hours:

Short term memory

Days - years:

Long term memory

Seconds - minutes:

Working memory

(Keep it in mind)

Minutes - hours:

Short term memory

(Easy come, easy go)

(bring back to mind)

Days - years:

Long term memory

(Hard earned, well kept)

(bring back to mind)

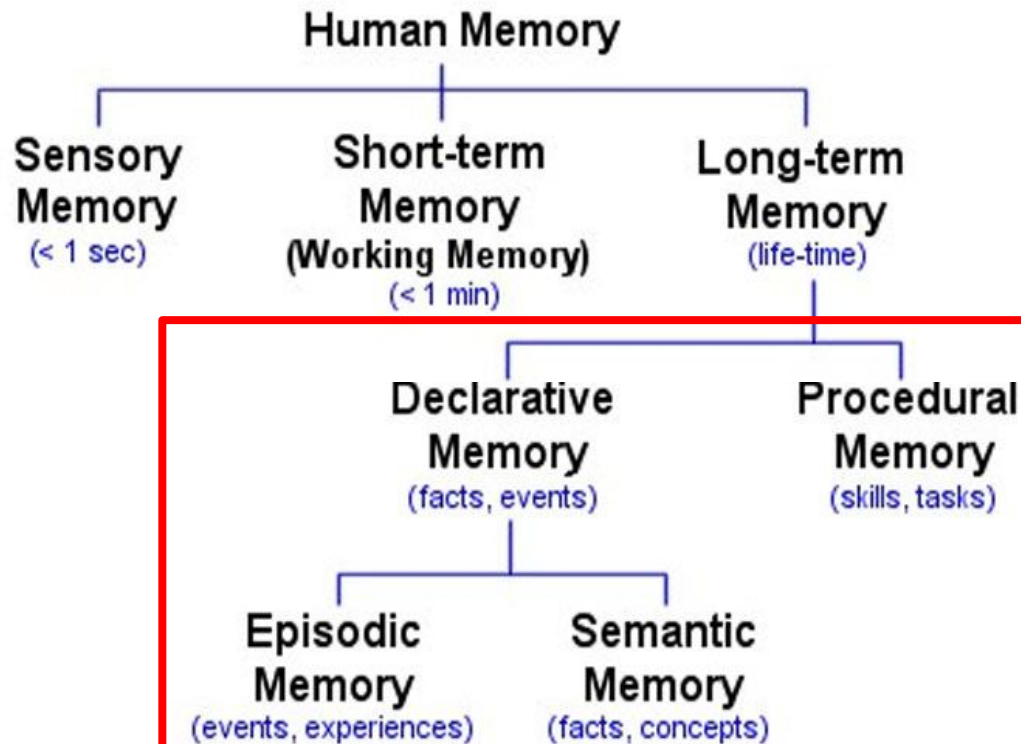
Outline

~~Multiple types; multiple time scales~~

Two types of long term stores

Under the hood: Working Memory

Under the hood: Declarative memory



<http://www.human-memory.net/types.html>

Declarative

Semantic:

Facts:

“mitochondria is the powerhouse of the cell”

Episodic:

Events:

“Last year’s thanksgiving when Uncle Bob burnt the turkey”

Non-Declarative

Procedural:

How to ride a bike

Classical Conditioning:

The Coke “PsssCH” and thirst

Instrumental Conditioning:

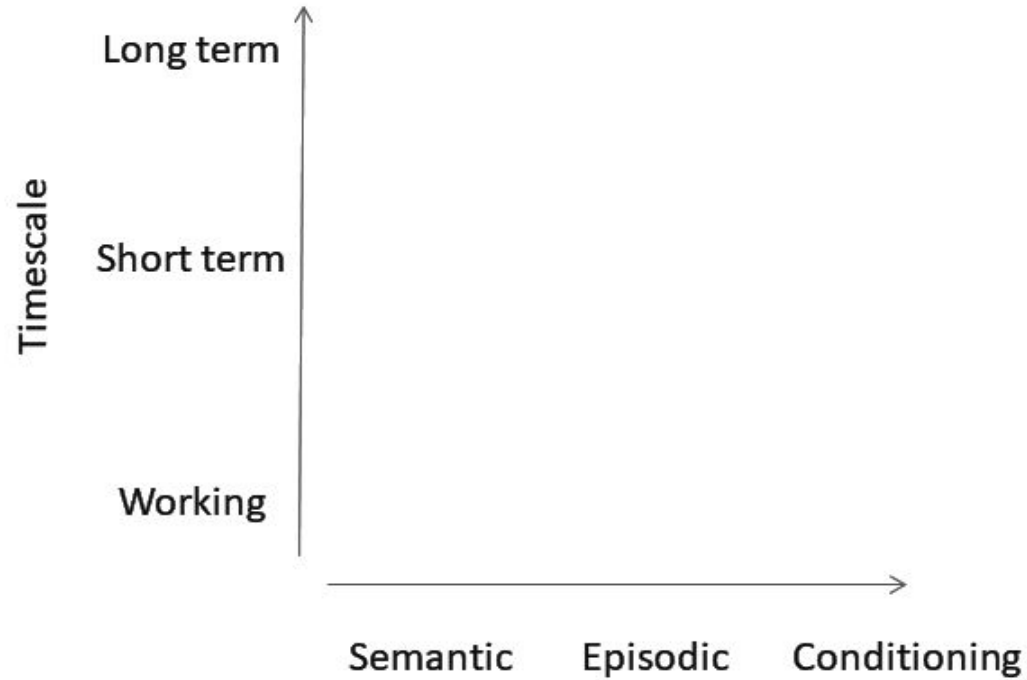
Cat learning to open screen door

Priming:

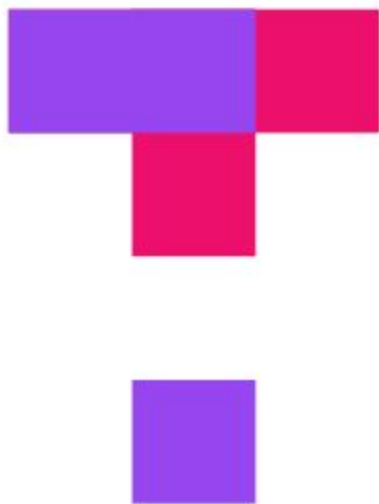
Scared of your basement when it's dark

Spatial:

Navigating from your apt. to classroom



Temporal scale and content are orthogonal



TOP HAT

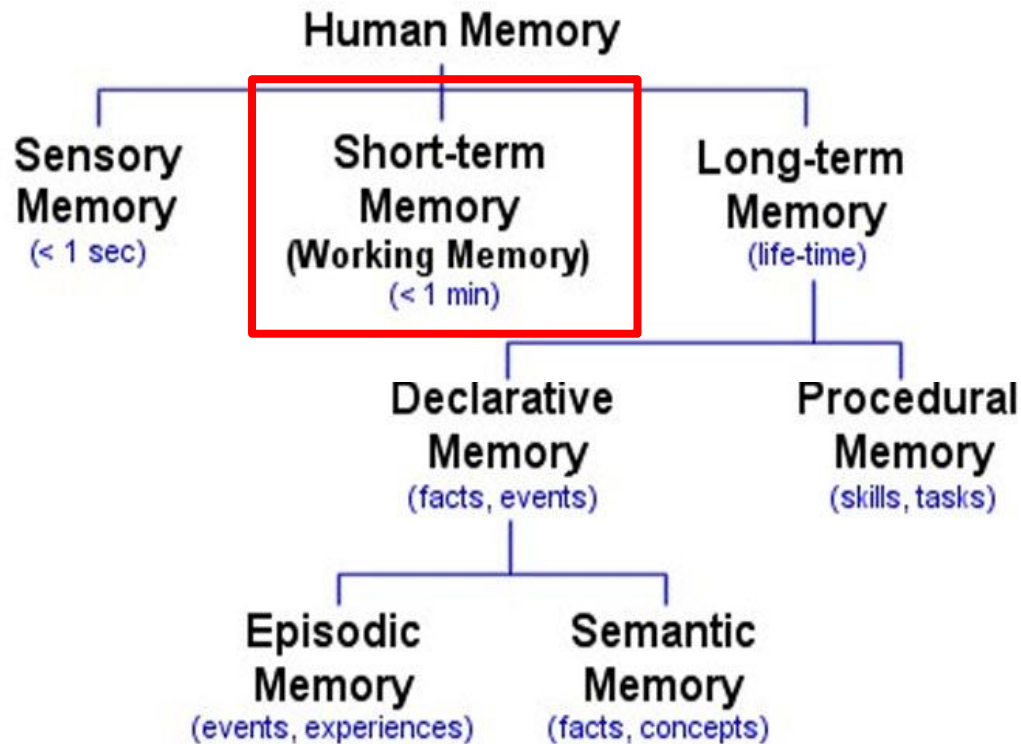
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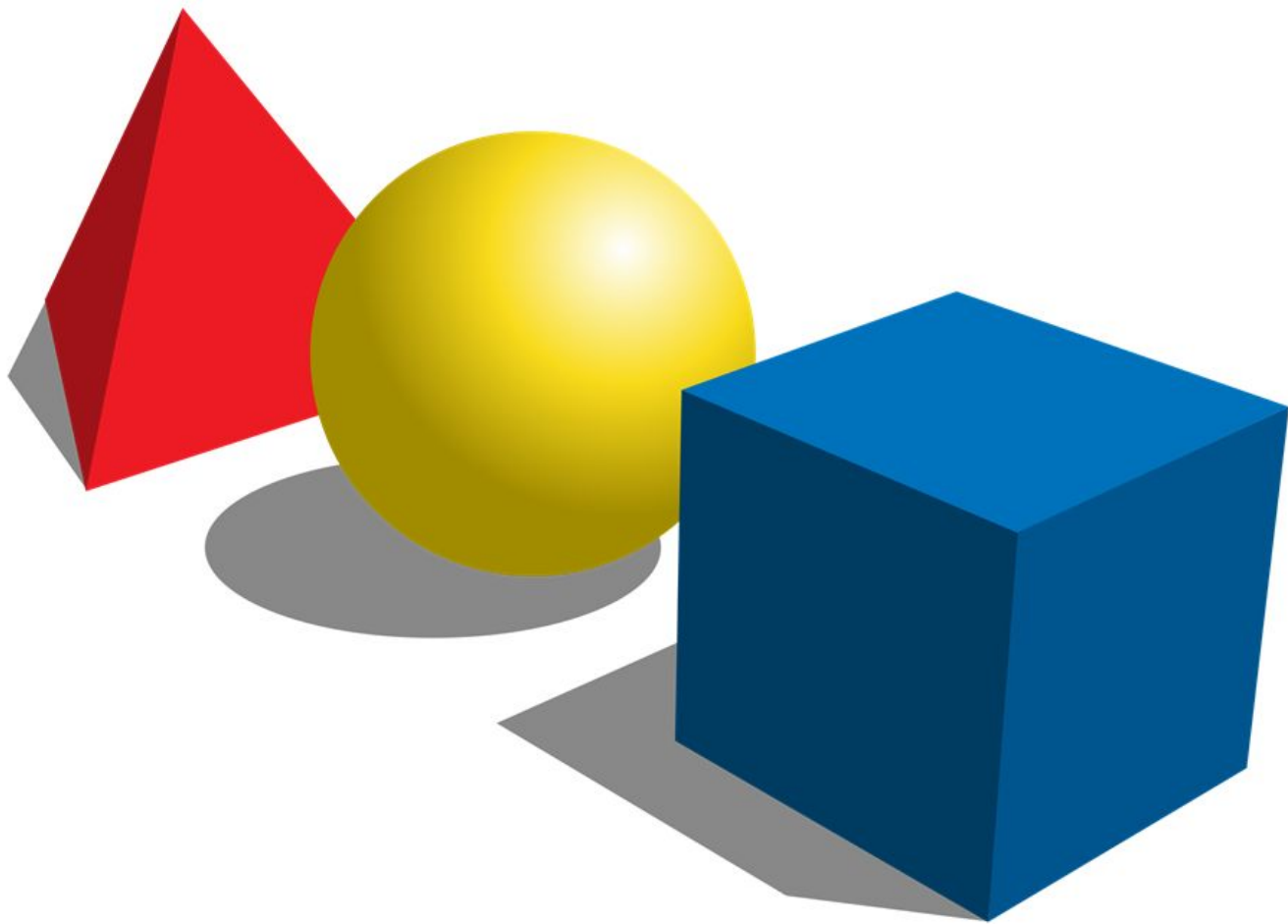
Under the hood: Working Memory

Under the hood: Declarative memory



Visuo-spatial

(Remember these shapes)



Visuo-spatial

What shape was the center object?

What color was the leftmost object?

Phonological Loop

(Remember these numbers)

Phonological Loop

What were the numbers?

Central Executive

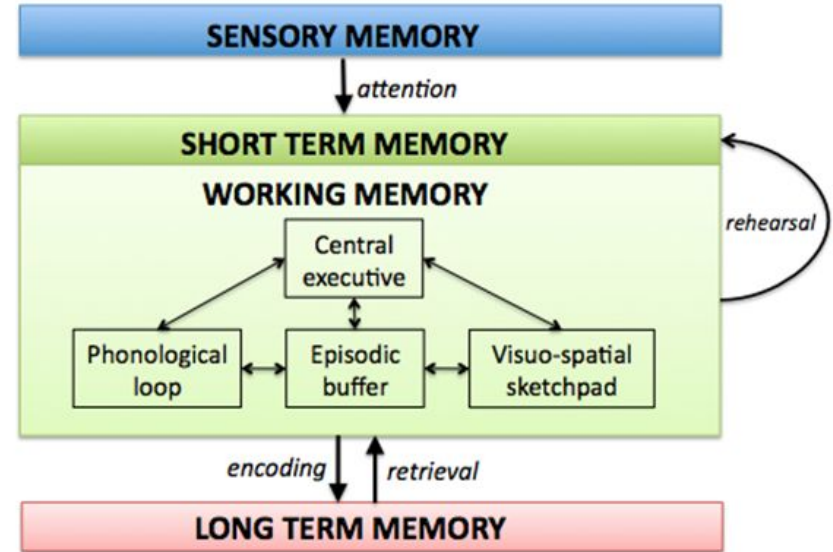
What was the sum of the numbers in the 1's place?

Baddeley's Model

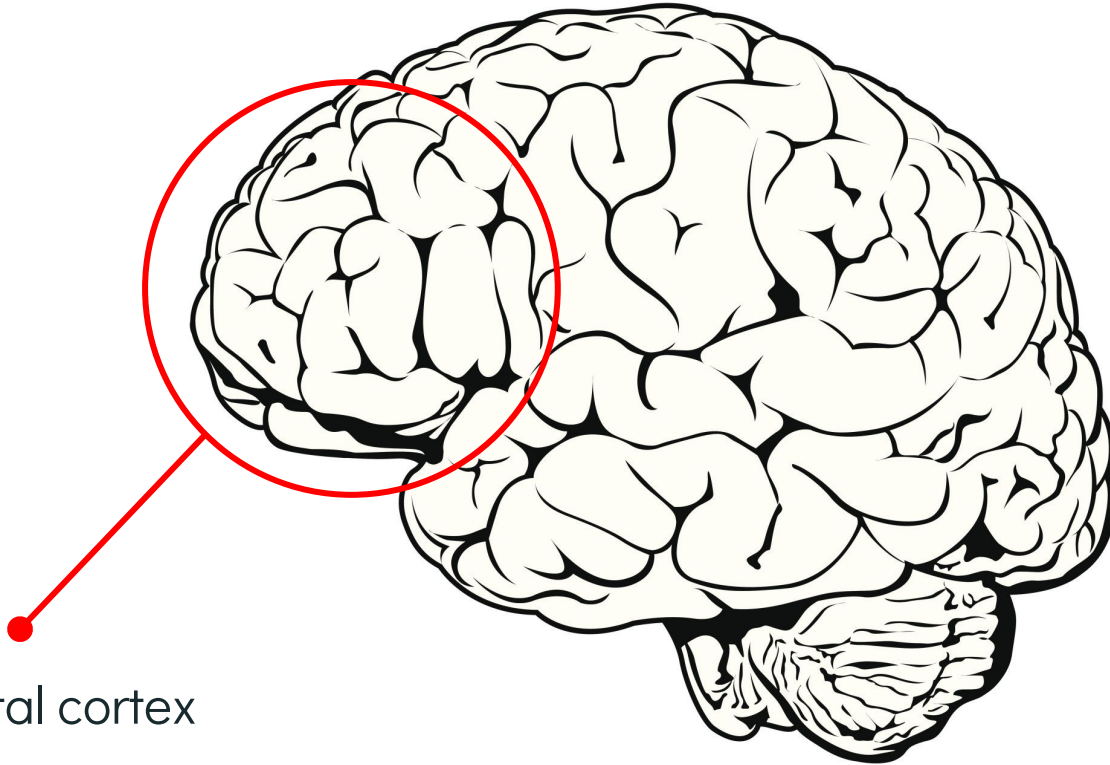
Active maintenance of stimuli

Visuo-spatial sketchpad: (e.g., colored shapes)

Phonological loop: (e.g., Digits)

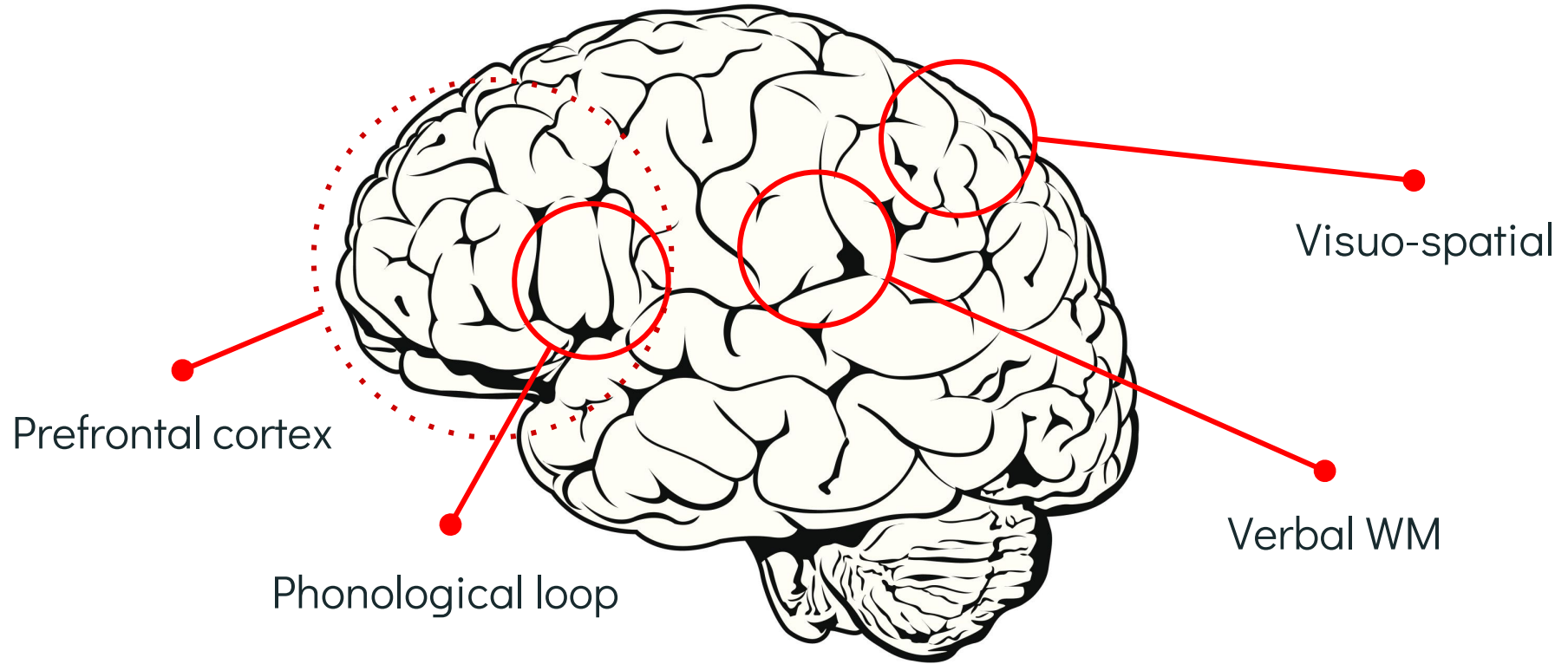


Where is it...?

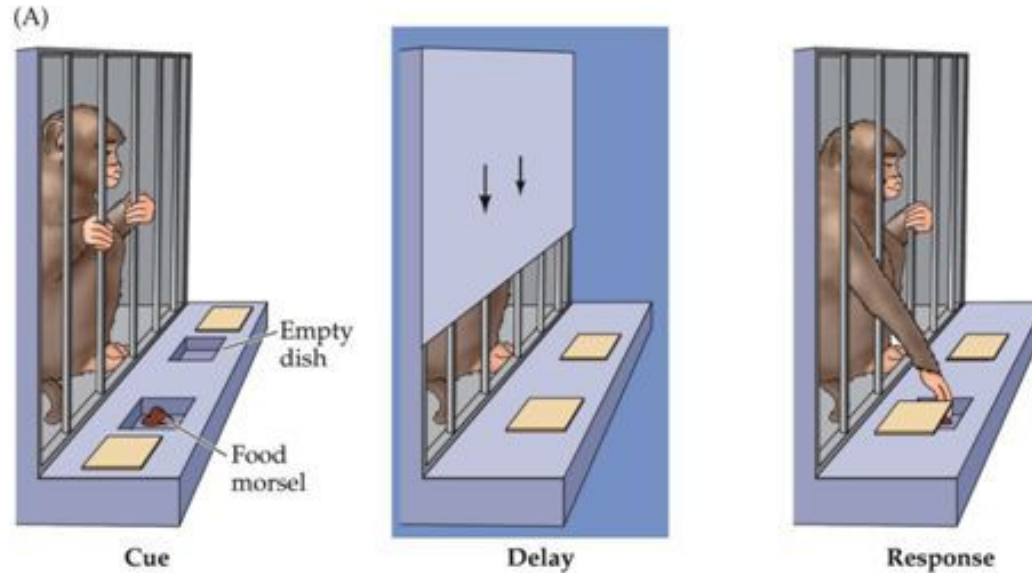


Prefrontal cortex

But damage to these regions also impairs...



A potential mechanism may be sustained activation...

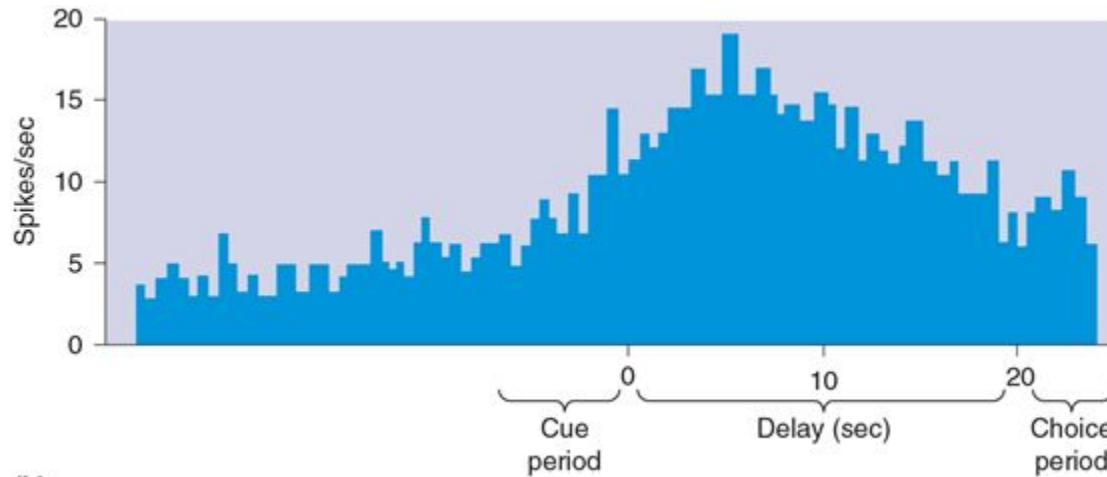


NEUROSCIENCE, Fourth Edition, Figure 26.14 (Part 1)

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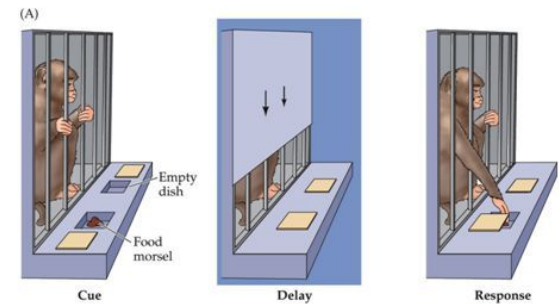
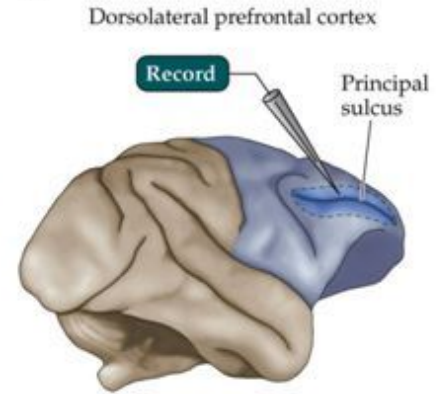
“Delayed response task”

A potential mechanism may be sustained activation...



(b)

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Recap...

WM allows you to **manipulate and maintain** information in “Mind”

Has a **limited capacity**: 7 ± 2 “items”

Whole brain may be involved, but mostly **prefrontal cortex** is implicated

Sustained activation is a potential mechanism

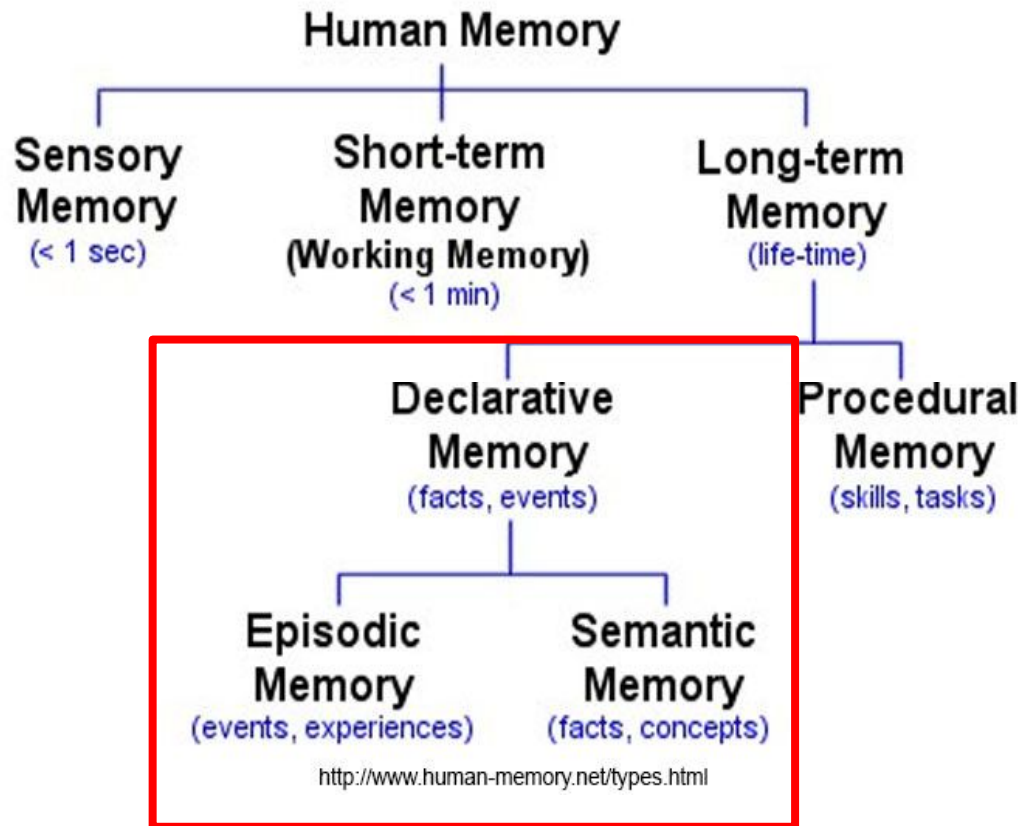
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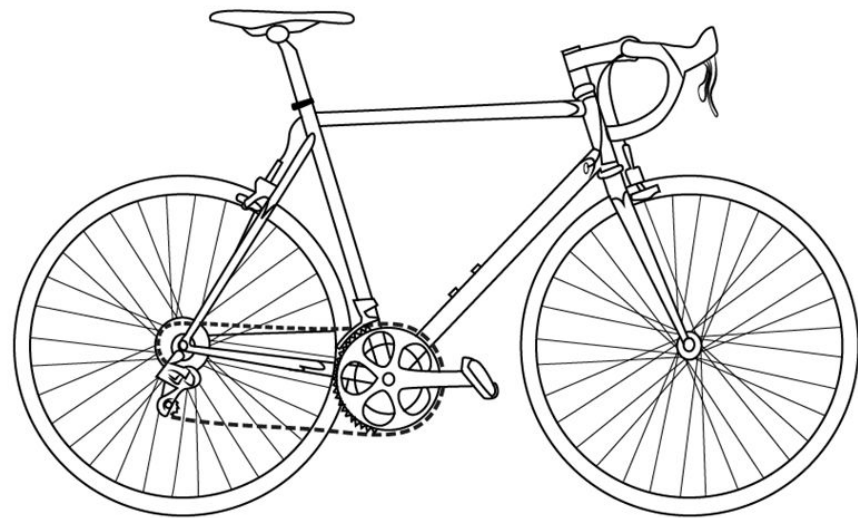
~~Under the hood: Working Memory~~

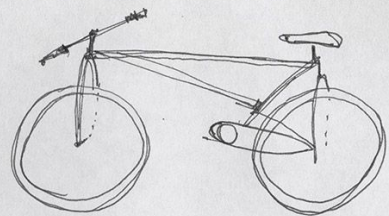
Under the hood: Declarative memory



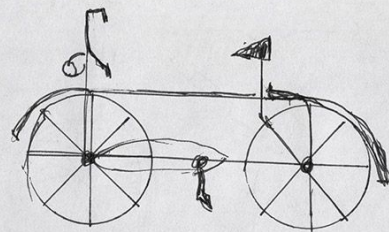
<http://www.human-memory.net/types.html>

Quickly draw a bike

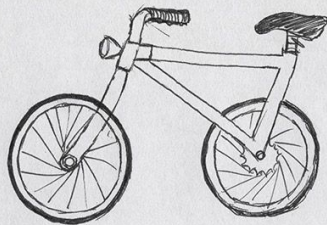




Anna 24 anni Studente



Rosella 54 collaboratore scoll.



LEONARDO 19 ANNI STUDENTE



Gianluca Gimini

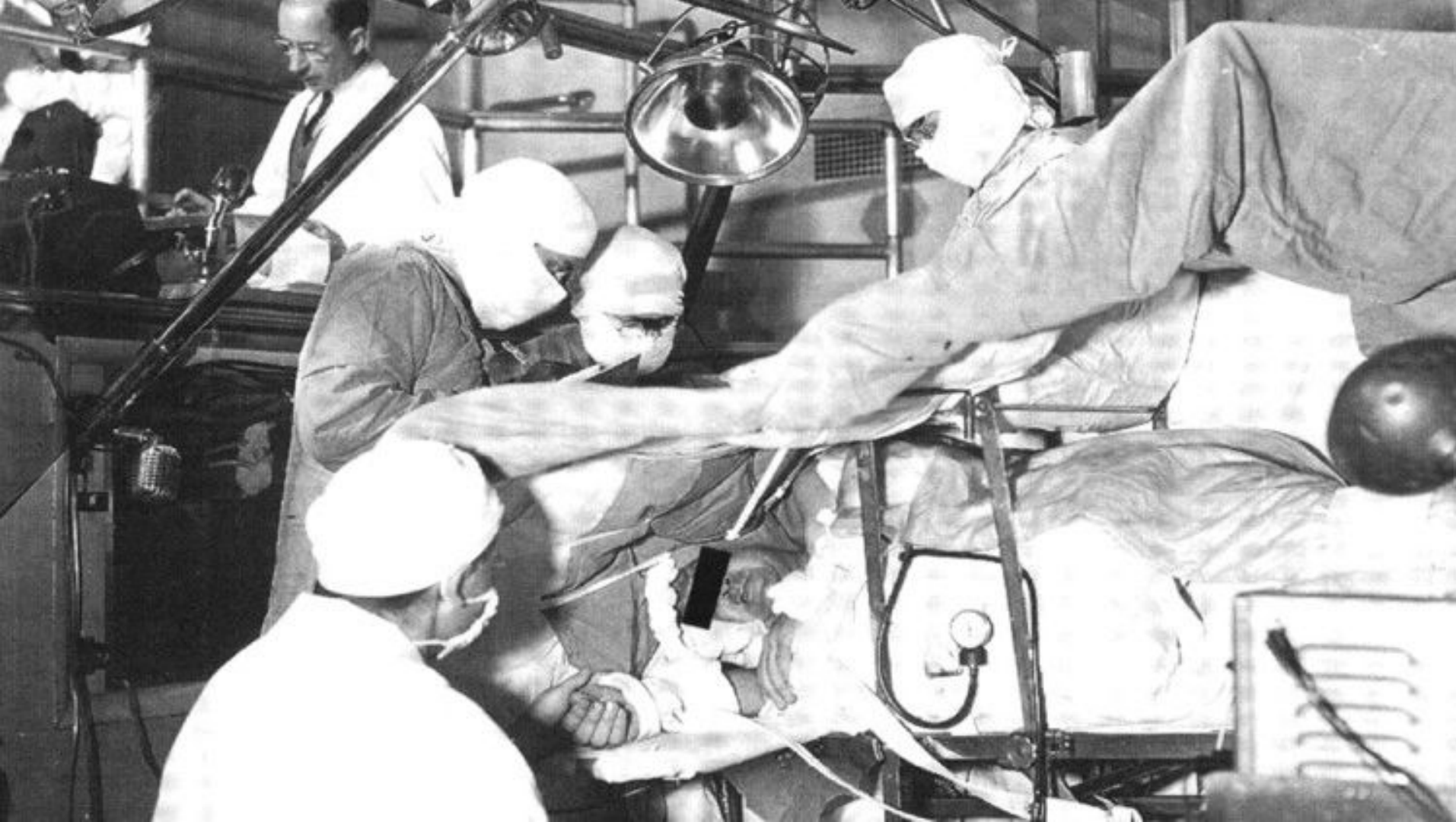
Declarative memory

Memory is sparse; memory is fallible

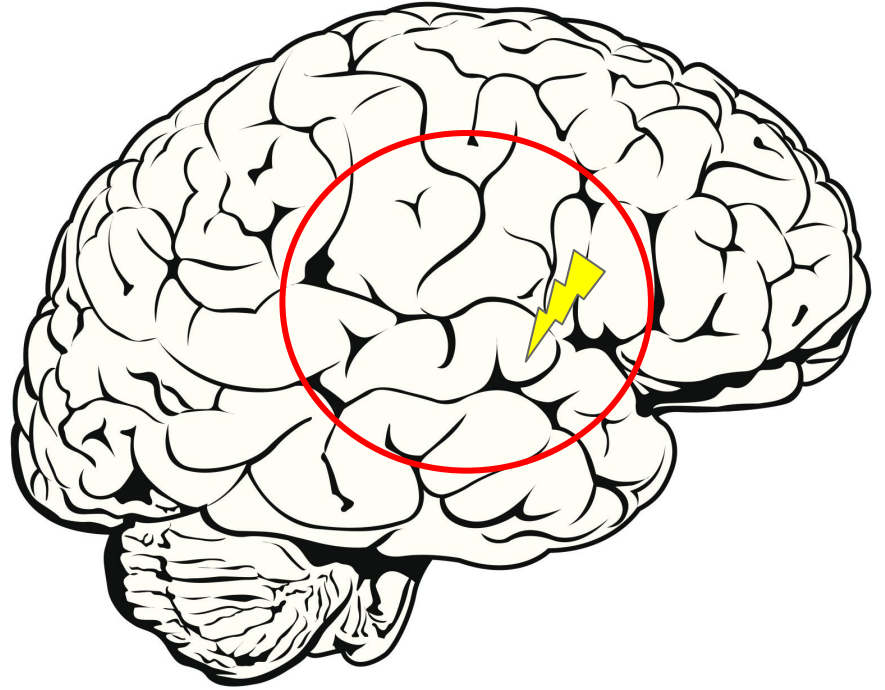
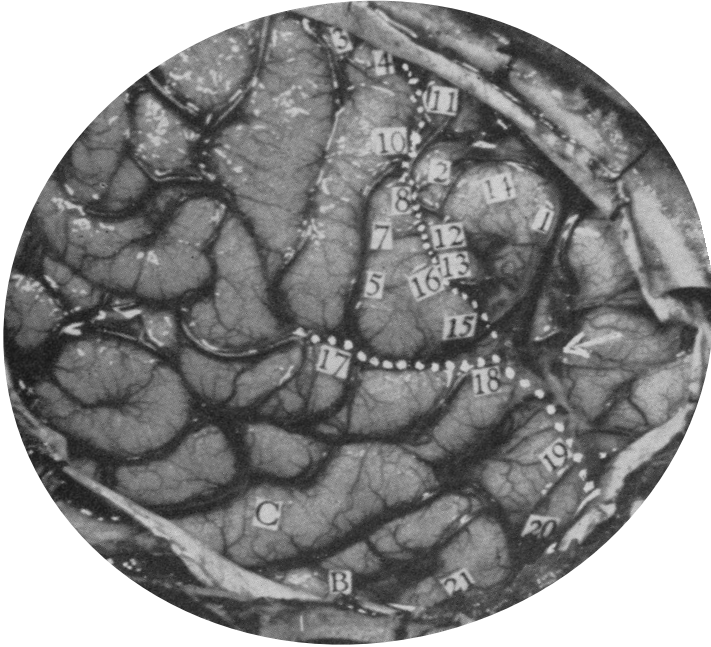
Declarative memory

Episodic (Do you remember the first time you rode a bike?)

Semantic (How many wheels does a unicycle have?)

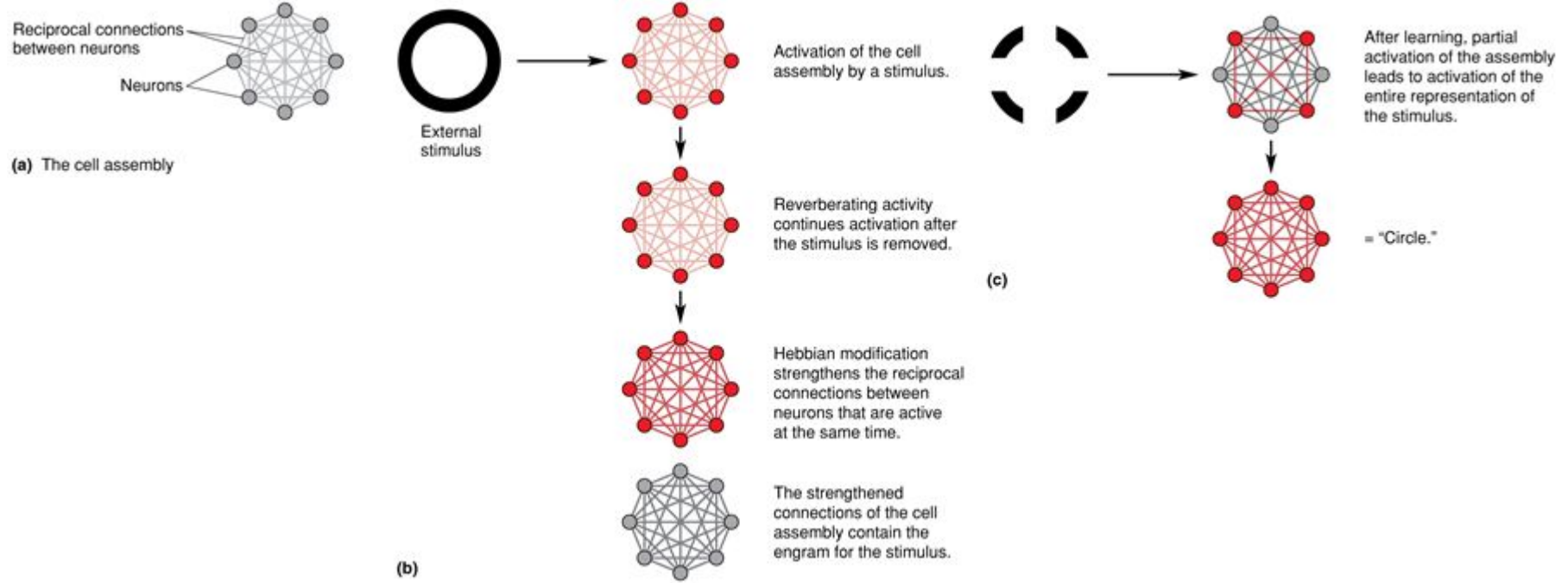


TL Stimulation



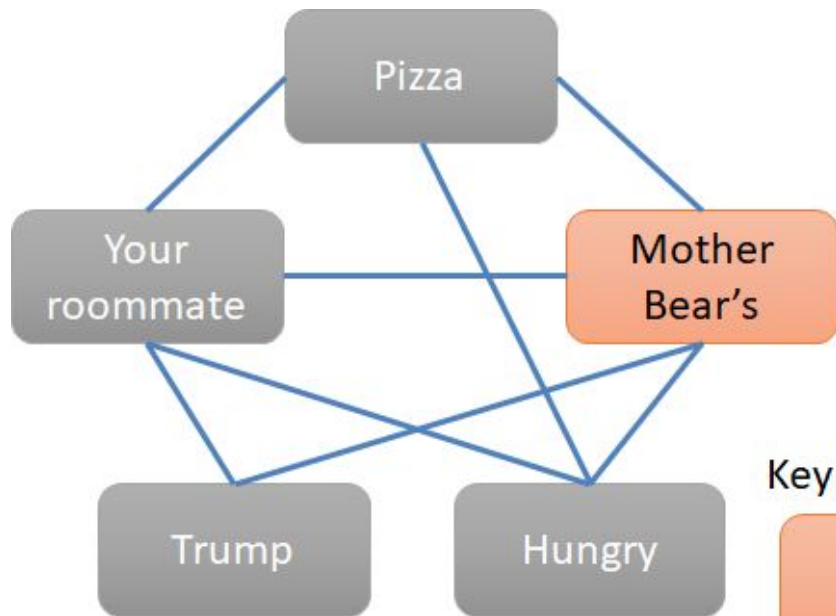
At the time of operation, stimulation of a point on the anterior part of the first temporal convolution on the right caused him [the patient] to say, “I feel as though I were in the bathroom at school.” Five minutes later, after negative stimulations elsewhere, the electrode was reapplied near the same point. The patient then said something about “street corner.” The surgeon asked him, “where” and he replied, “South Bend, Indiana, corner of Jacob and Washington.” When asked to explain, he said he seemed to be looking at himself— at a younger age. (Penfield, 1958, p. 25.)

A potential mechanism may be Hebbian learning



“Neurons that fire together, wire together”

A potential mechanism may be Hebbian learning

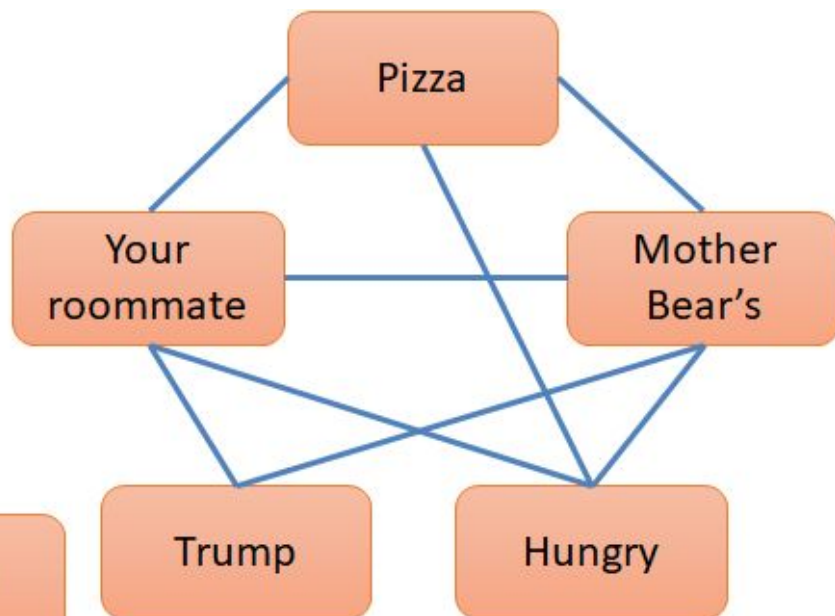


Next day – 11:00 am

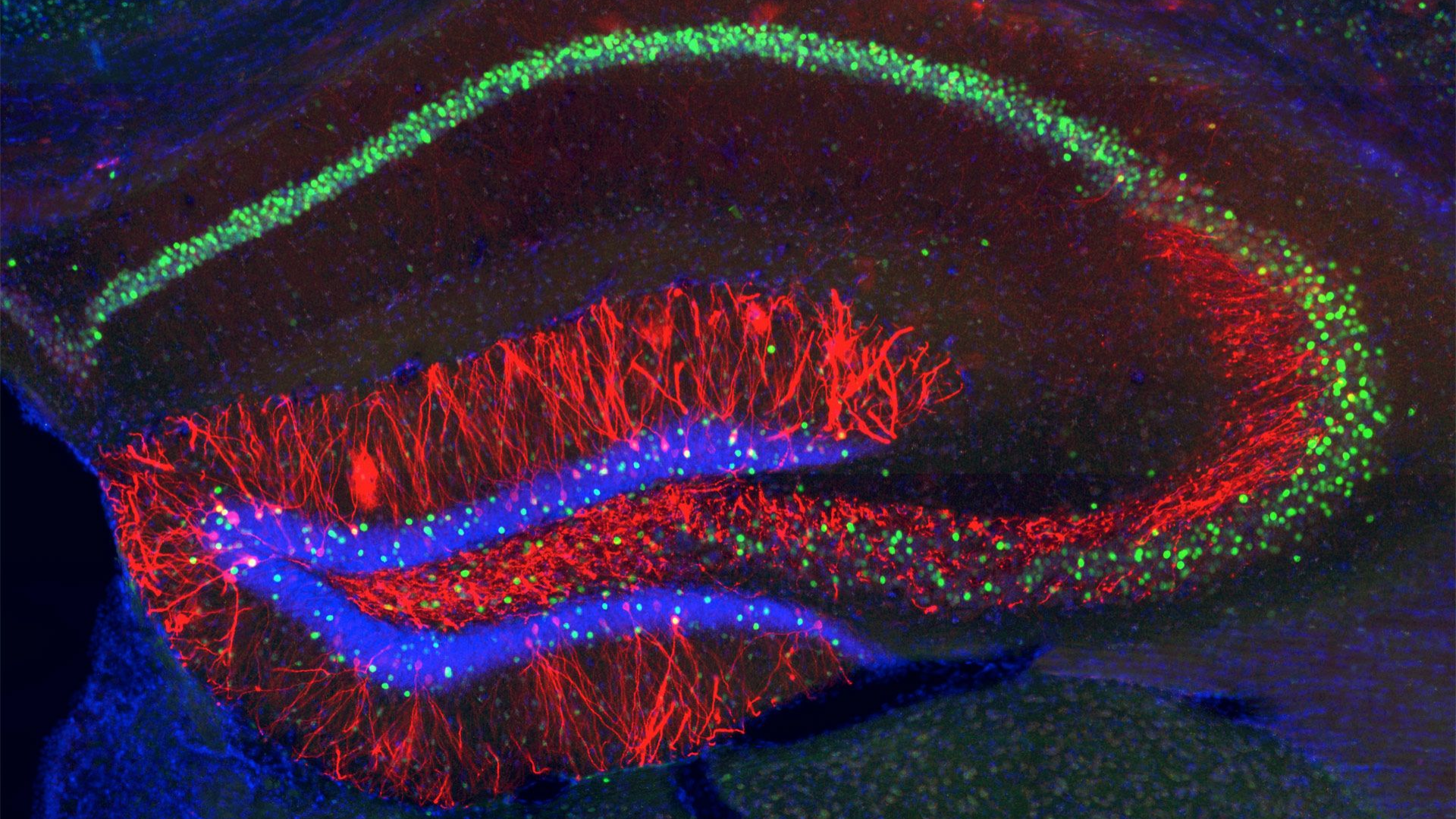
Key:

Active

Inactive



Next day – 11:01 am



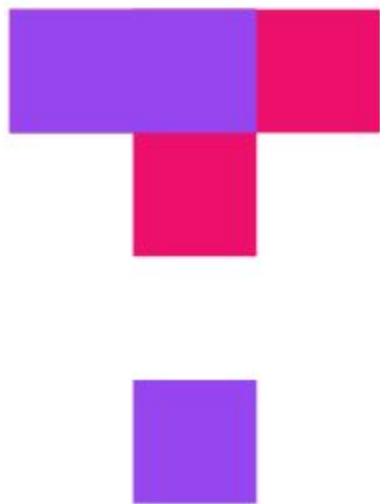
Recap...

Declarative memory **isn't perfect**

Comprises **episodic** and **semantic** memory

Temporal lobe and **Hippocampus** seems to play a crucial role

Hebbian learning may be a potential mechanism



TOP HAT

Test Yourself

Everyday examples of long/medium/short term memory time scales?

What are the two main types of long term memory? How do they differ?

What is working memory? What brain areas support it? Mechanism?

What is declarative memory? What brain areas support it? Mechanism?

