DISCLOSURES

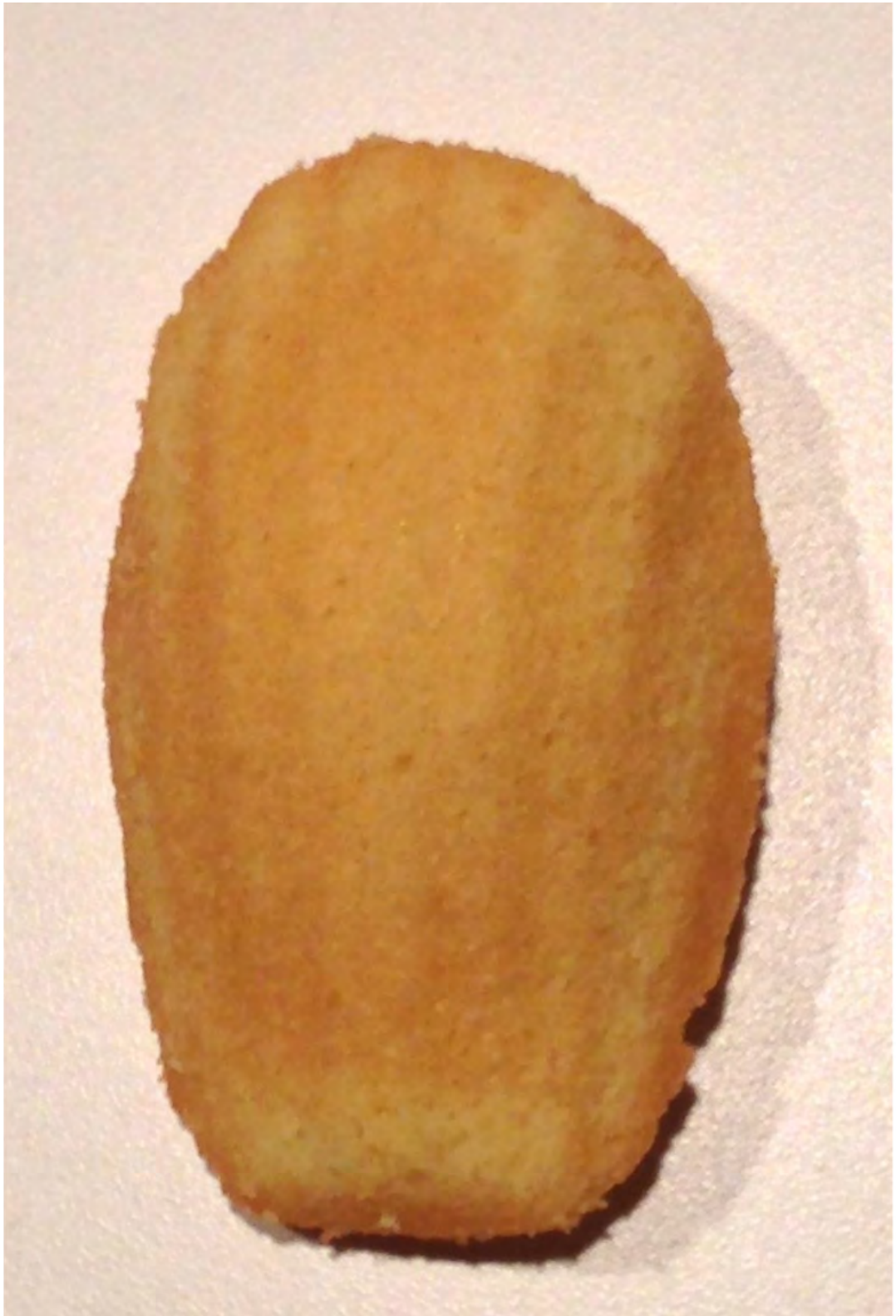
No income or benefit from pharma

Partner/Author: Brain Educators LLC

braineducators.com

publisher of The Brain Card®

neuropsychiatry pocket reference



566-468 BCE

What if we had PERFECT recall?

THE HUMAN BRAIN CAN THEORETICALLY HOLD THE EQUIVALENT OF 2.5 PETABYTES OF DATA

Paul Reber Sci Amer 4/19/10

How much is a petabyte?

1 Byte=True/False

1 Kilobyte=1 word

1 Megabyte=500 pg book or
1 min of MP3 audio

1 Gigabyte=20 min video
(4.7 gigabytes=DVD)

1 Terabyte=60 stacks of paper
the height of the Eiffel Tower
or 200,000 photos or songs

1 Petabyte=1000 terabytes or
1 million gigabytes

2.5 Petabytes could store about 300 years of standard def TV

or 25% of the US Library of Congress' entire print and media collections

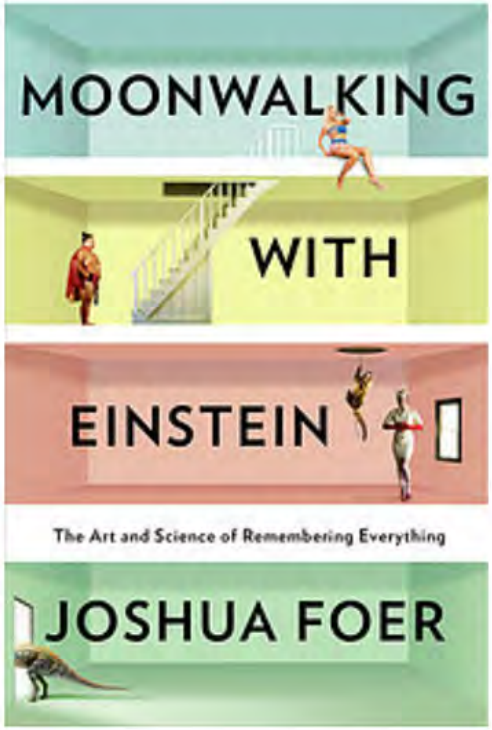
Memory Palaces: Castles in the Air

Sir Francis Bacon
1561-1626

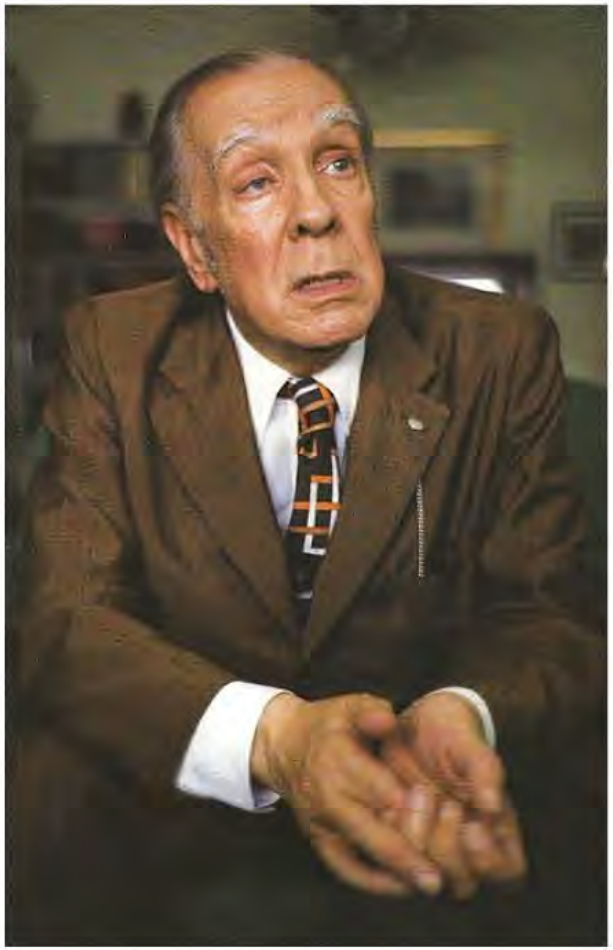
On mnemonic devices:

Of ostentation prodigious,
but fundamentally barren.

...matters of strangeness
without worthiness.



PERFECT recall may not be so perfect



Jorge Luis Borges

Funes the Memorious

Perfect recall since a brain injury at 19. He was bothered that a dog at 3:14 seen from the side would have the same name as a dog at 3:15 seen from the front.

Tortured by his memory, the fictional Funes could barely sleep.

If we remembered everything, we should on most occasions be as ill off as if we remembered nothing."

Wm James

Prodigious memory or pattern recognition usually comes at a social cost

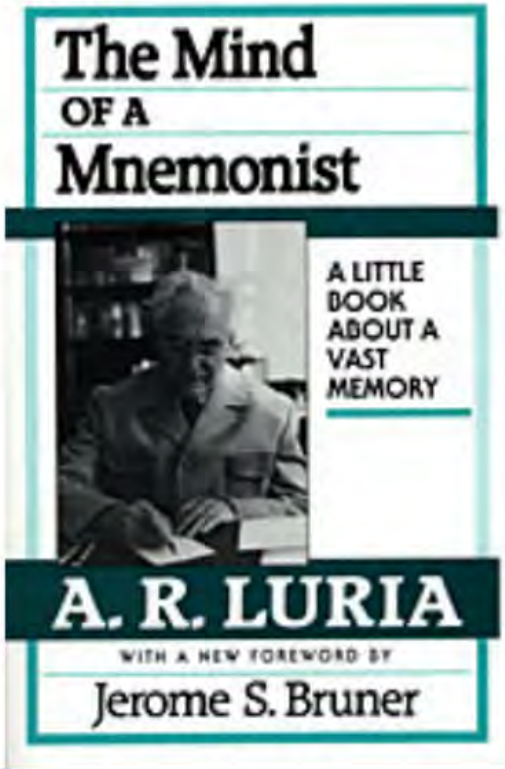
A calendar savant with social deficits.
Could remember details of 12,000 books he'd read. Inspired the character Raymond in the Rain Man.
Not autistic. His hemispheres were disconnected due to FG Syndrome.

Kim Peek
1951-2009

Solomon Shereshevsky
1886-1958

a journalist called on carpet for not taking notes at an important meeting

SYNESTHESIA, NORMAL IQ
METAPHOR A MYSTERY TO HIM



Why are some memories so powerful?

EMOTIONAL VALENCE

Emotional (limbic) valence aids memory

Flashbulb memory of traumatic events
Stores so much data that time can appear to slow down

The brain stores the data AND the emotional importance (valence)

Common Flashbulb Memory: 9/11

Without emotional valence we are not changed by our memories

The Capgras Delusion

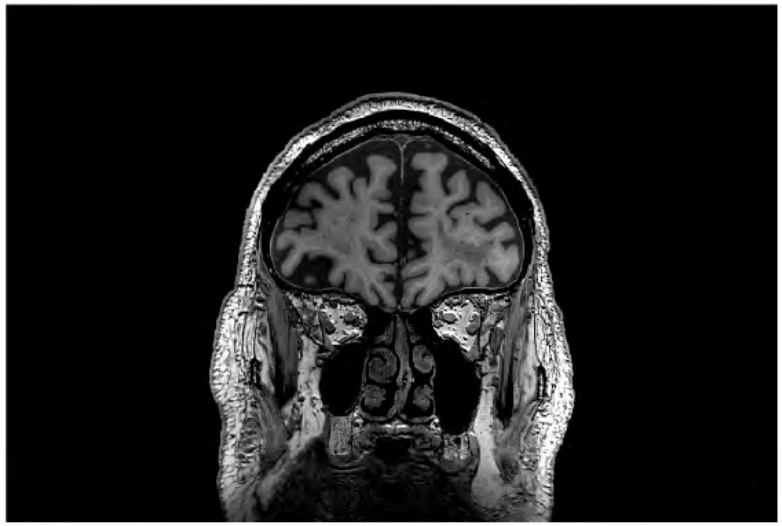
A family member has been replaced by an imposter

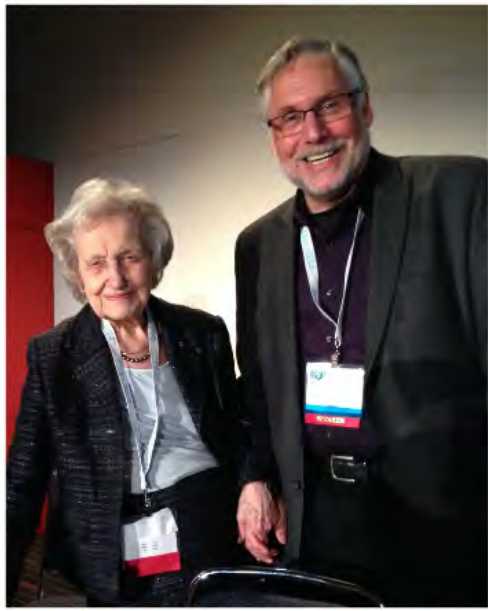
The face is the same but there is no emotional connection (no emotional valence) so the person doesn't feel familiar

Without emotional valence memories don't feel familiar

What if we had NO ability to remember?

HM





with Brenda Milner

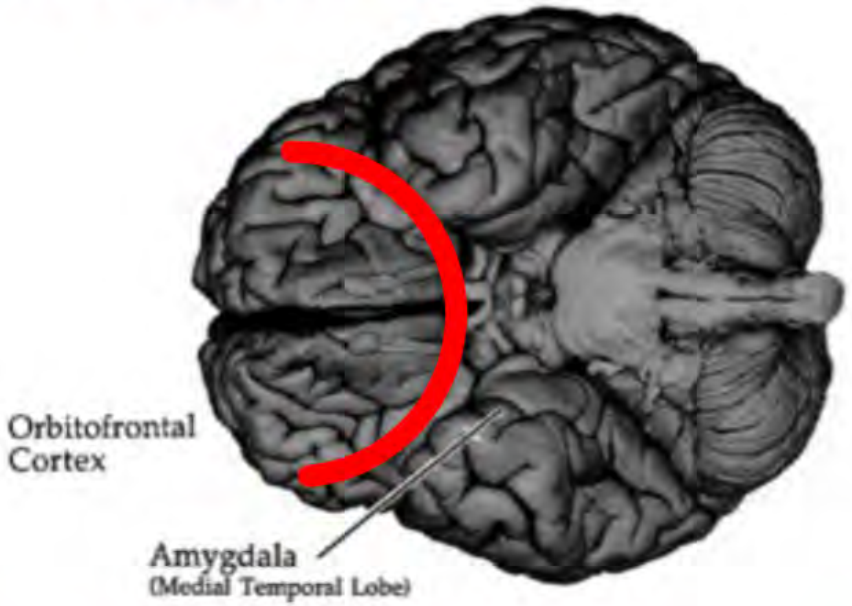
Can this degree of amnesia occur without the help of a surgeon?


© Jiri Rezac Photogra

WHY DO SOME AMNESICS SPIN TALL TALES TO FILL IN THE GAPS?

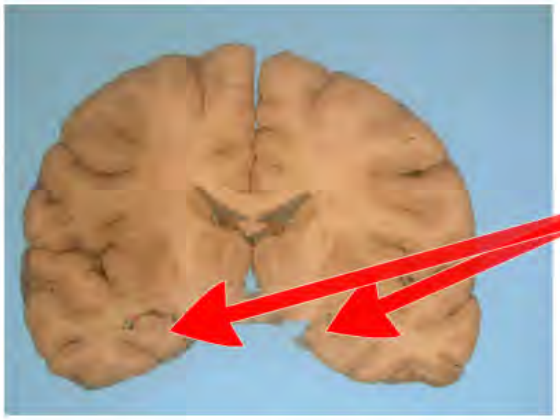
Confabulation (honest lying) may require orbitofrontal damage

This causes loss of self monitoring



How do we remember?

A thought is put in working memory



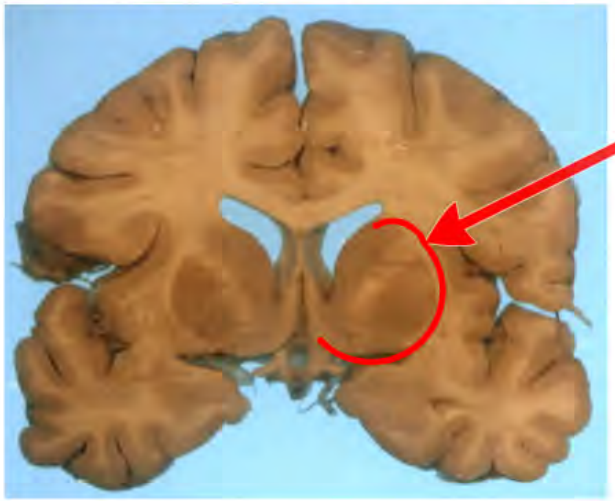
The hippocampus consolidates it, puts it somewhere and keeps a map of where it went

Long term memories may be stored in temporal association cortex

THAT'S HOW DECLARATIVE MEMORY MAY WORK

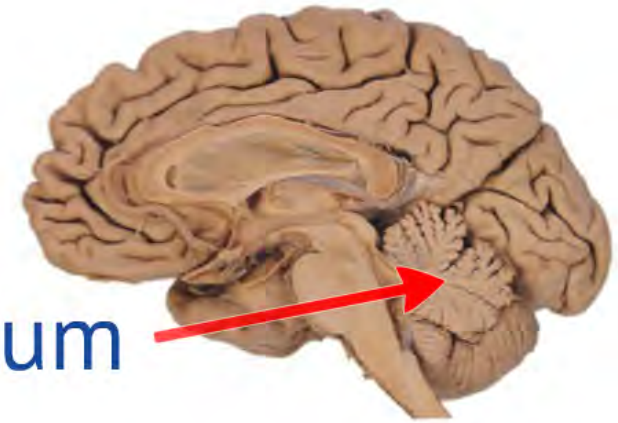
But HM could learn new motor skills without his hippocampus

Long term PROCEDURAL (motor) MEMORY is different



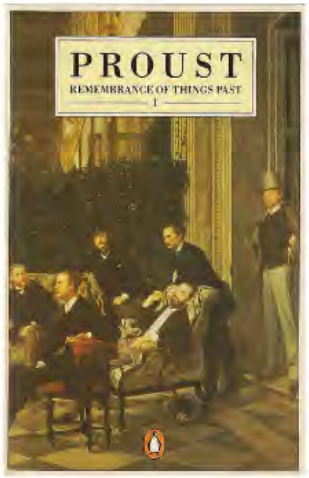
Your basal ganglia learn how to ride a bicycle

And store this kind of learning in your cerebellum



AUTOBIOGRAPHICAL MEMORY IS DIFFERENT THAN MEMORY FOR FACTS

Episodic (autobiographical) memories are stronger due to emotional valence



The memory of relationships
is more autobiographical
than factual

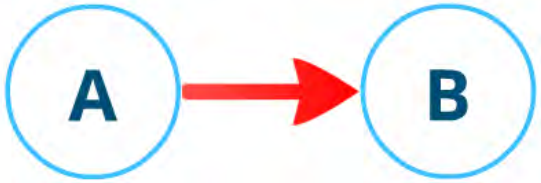
AJ has incredible autobiographical memory but her memory is only average for other things

Parker et al, Neurocase 2006


60
MINUTES

MEMORIES CHANGE NEURONS

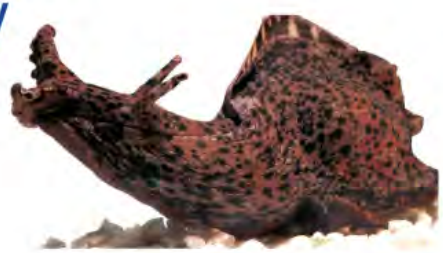
Experience may be encoded in memory by LONG TERM POTENTIATION



The more neuron A stimulates neuron B, the more efficient neuron B becomes

Neuron B can become sensitized for many years, thought to be the basis of long term memory

Eric Kandel demonstrated dendritic spine growth with learned behavior in aplysia



MEMORY CAN CHANGE OUR BRAINS

THE KNOWLEDGE

Every street within 6 miles of Charring Cross

25000 streets

20000 landmarks

Posterior hippocampus grows in those who pass The Knowledge & shrinks to normal when they retire (not in bus drivers or mnemonists)

Woolett & Maguire Current Biol 21 (2011) 2109

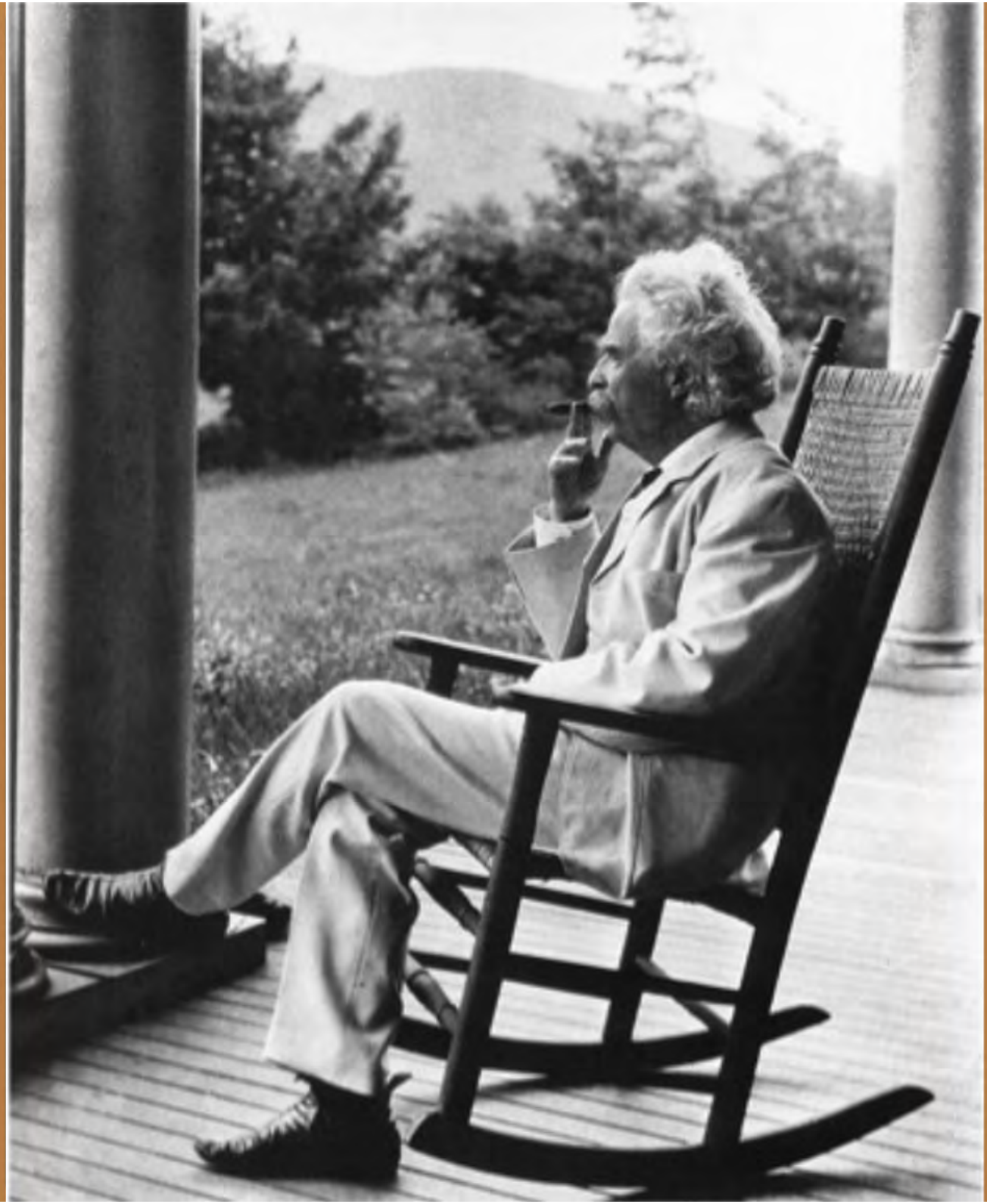
REMEMBERING CAN BE PAINFUL

Trauma memory can be intense & long-lasting

Memory may be inaccurate but feel true: FALSE MEMORY SYNDROME

Recall reconsolidates (and changes) a memory

Don't believe everything you think (Gabbard)



FEAR MEMORY CAN BE MANIPULATED

Memories can be implanted

Loftus E Sci Amer 277 (1997) 70

allstate.com

Emotional Valence can be changed in an Optogenetic Mouse Model

HC dentate neurons encode memory
BLAmyg neurons encode valence (fear vs reward)
Mice habituated to positive or negative valence memories could have valence switched!

Redondo RL et al, Nature 513 (2014) 426

NOT REMEMBERING CAN BE PAINFUL

But HM did not appear pained by his amnesia

Amnesia after traumatic brain injury is typically painful

And word finding issues of normal aging drive us to distraction

THE FEELING OF FAMILIARITY (emotional valence) MAY BE ALL THAT REMAINS

Eventually the not remembering no longer seems to be painful to the person with Alzheimer Disease

Photo: Alex ten Napel
Huff Post 10/2014


(HALF FULL)

AGING-RELATED MEMORY LOSS MAY BE REVERSIBLE

eLIFE elifesciences.org

RESEARCH ARTICLE

CREB overexpression in dorsal CA1 ameliorates long-term memory deficits in aged rats

Xiao-Wen Yu[1], Daniel M Curlik II[1,2], M Matthew Oh[1], Jerry CP Yin[3], John F Disterhoft[1]*

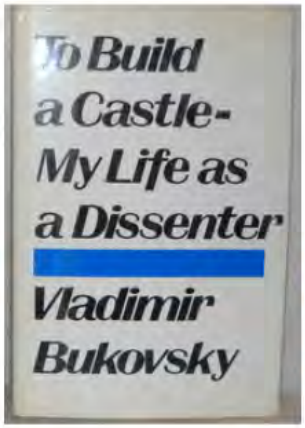
[1]Department of Physiology, Northwestern University,Feinberg School of Medicine, Chicago, United States; [2]Department of Behavioral Sciences, Psychology Program, York College of Pennsylvania, York, United States; [3]Departments of Genetics and Neurology, University of Wisconsin-Madison, Madison, United States

1/4/2017

Abstract The molecular mechanisms underlying age-related cognitive deficits are not yet fully

MEMORY CAN BE THERAPEUTIC

We judge ourselves by comparison with remembered figures



Memory can help us through hard times

Our collective memory can help us NOT repeat the past

Many psychotherapies utilize memory as a therapeutic tool

Mechanism: ? reconsolidation

BUT DON'T UNDERESTIMATE THE VALUE OF FORGETTING

Is Jean Valjean entitled to rehabilitation?

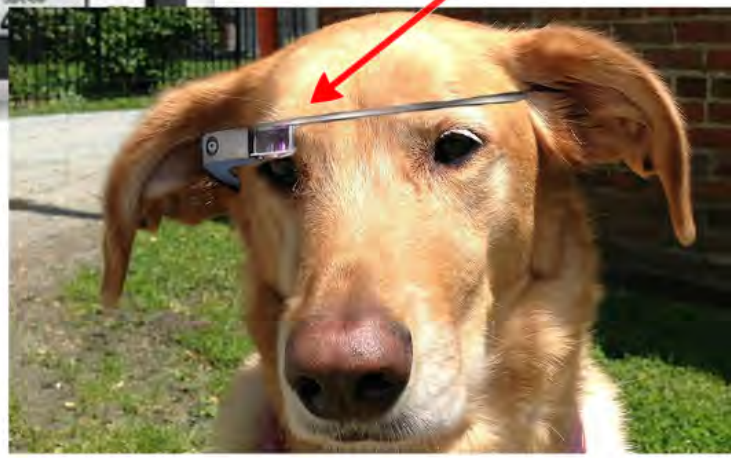
Does the internet prevent us from reinventing ourselves?

IS MEMORY BECOMING VESTIGIAL?

iPhone 10

The tallest iPhone yet.

Google Glass



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All your photos, videos, and docs anywhere

SUMMARY

WE ARE DEFINED BY OUR MEMORIES

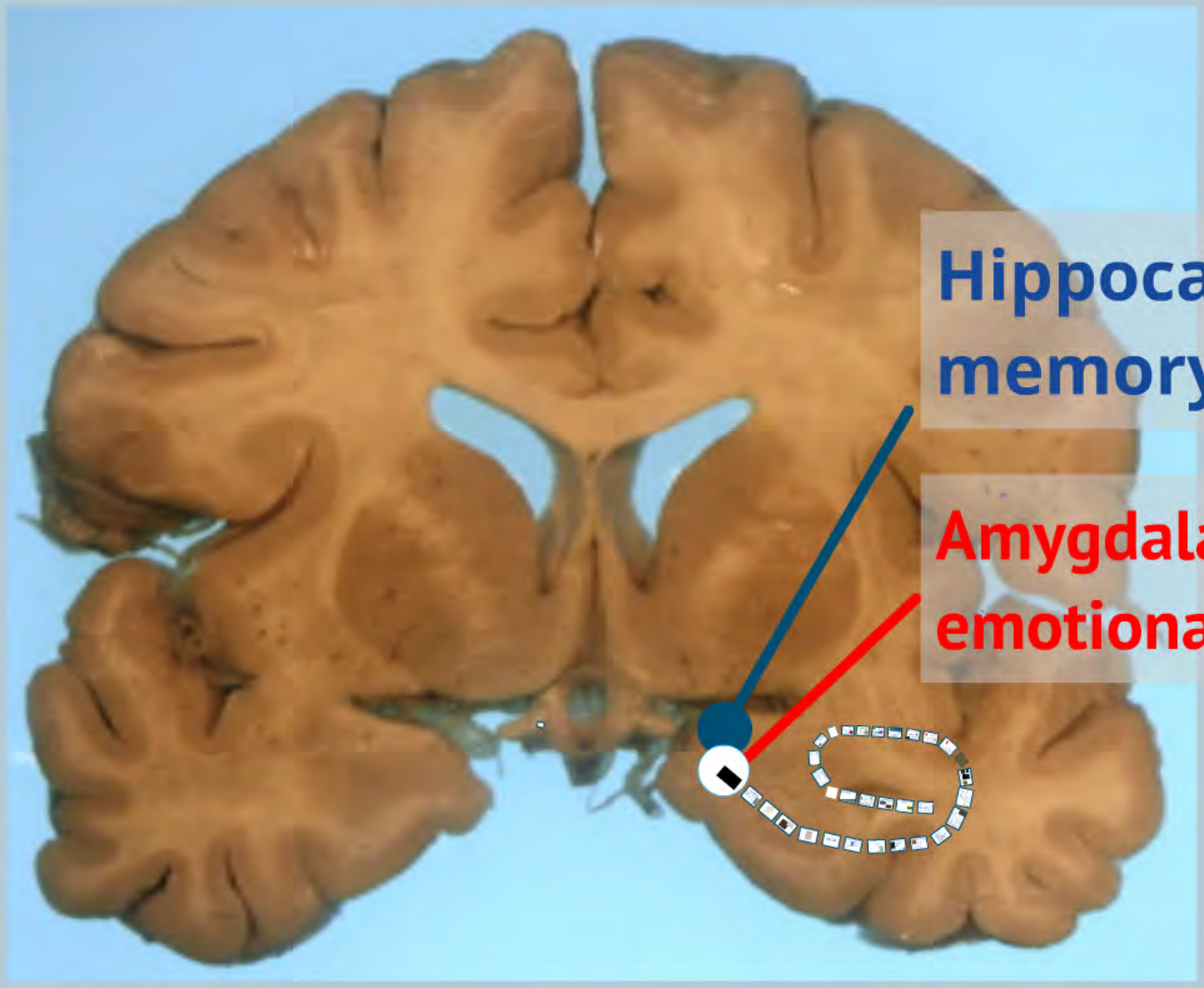
WISH FOR A GOOD BUT NOT A PERFECT MEMORY

MEMORY HELPS US ENDURE DIFFICULT TIMES

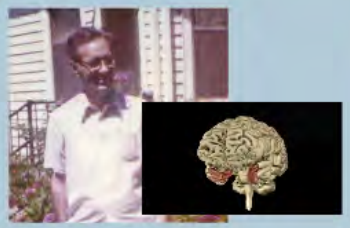
MEMORY RECONSOLIDATION MAY BE HOW SOME PSYCHOTHERAPIES WORK

MEMORY CHANGES OUR BRAINS

EMOTIONAL CONNECTION EMBEDS A MEMORY MOST FIRMLY

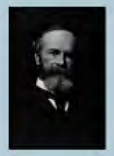

Hippocampus:
memory map
Amygdala:
emotional valence

Forgetting to Remember
Remembering to Forget















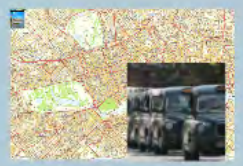


Sheldon Benjamin

THANK YOU








A trip down memory lane