



Y. Waszul (2007)

Introduction to Learning and Memory

Psychology 45

Anthony Wagner (Instructor)

T/TH 9:00-10:20

Outline

- **What is memory?**
- **Multiple memory systems**
- **Memory errors and other phenomena**
- **Syllabus, logistics, & other opportunities**

Reflections on Memory

Memory is a way of holding onto the things you love, the things you are, the things you never want to lose.

The Wonder Years

Memory is a monster; you forget—it doesn't. It simply files things away. It keeps things from you, or hides things from you—and summons them to your recall with a will of its own.

John Irving

What is Memory?

Memory proper...is the knowledge of a former state of mind after it has already once dropped from consciousness; or rather it is the knowledge of an event, or fact, of which meantime we have not been thinking, with the additional consciousness that we have thought or experienced it before.

William James (1892)
Principles of Psychology

Memory for Events



Events are multi-dimensional

- e.g., the who, what, where, and when etc

Episodic Memory: Conscious memory of past experiences

- ‘mental time travel’
(Tulving)

The Centrality of Episodic Memory: Clive Wearing & the Amnesic Syndrome



<http://www.youtube.com/watch?v=OmkiMlvLKto>

H.M. & the Amnesic Syndrome: Impaired Episodic and Semantic Learning

Henry Molaison (H.M.)

- | | |
|------|--|
| 1942 | first major seizure (age 16) |
| 1953 | bilateral medial-temporal lobe
resection (hippocampus & nearby
structures) |
| 1955 | first published report of pervasive
and profound anterograde
amnesia |

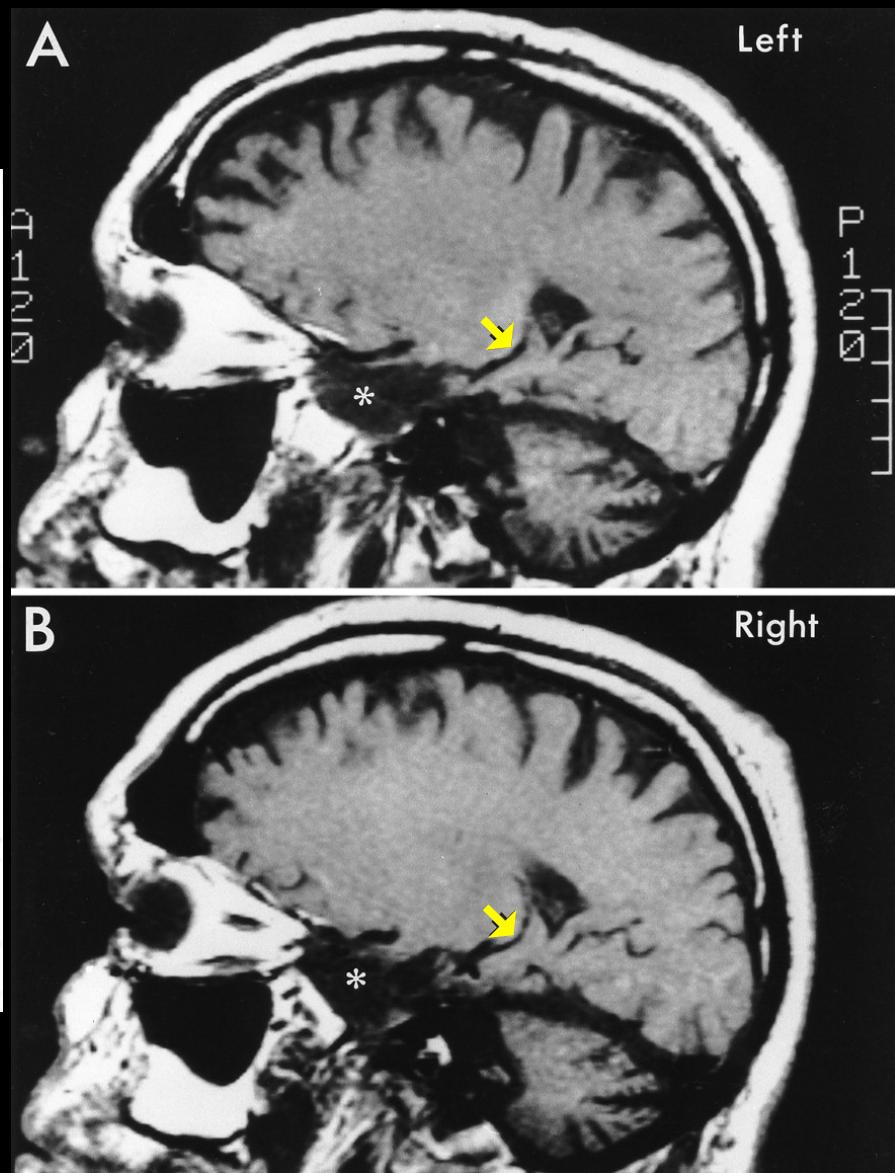
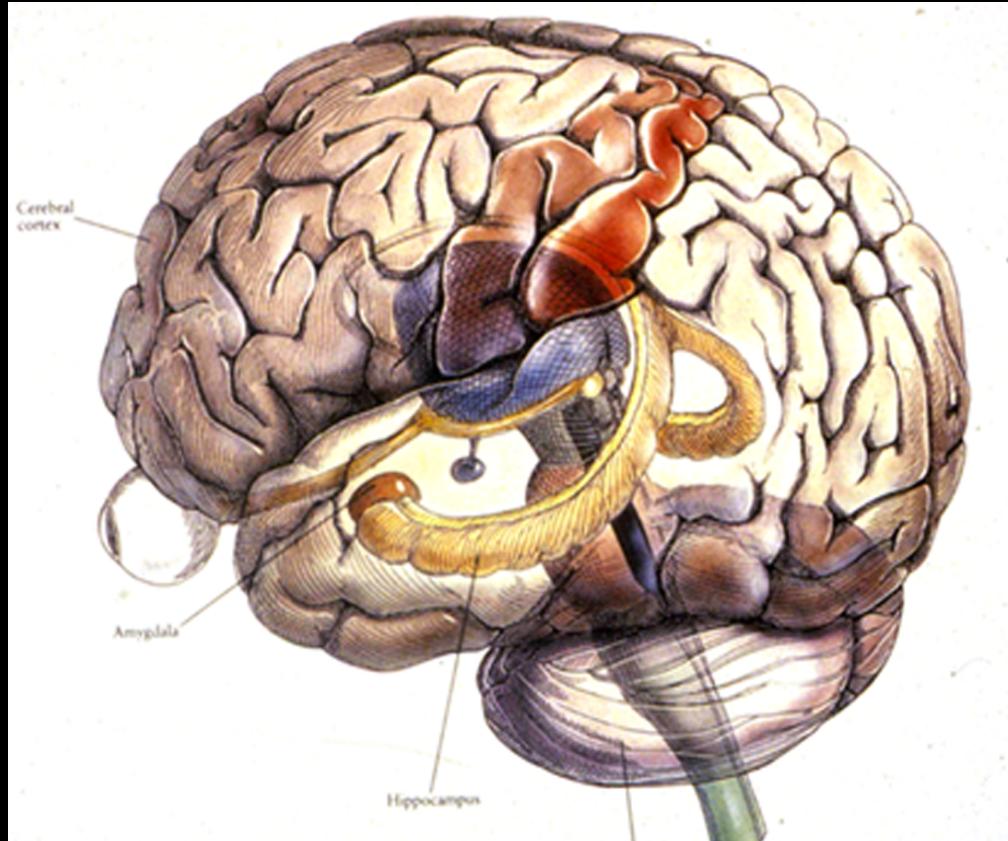


(1926-2008)

Right now, I'm wondering. Have I done or said anything amiss? You see, at this moment everything looks clear to me, but what happened just before? That's what worries me. It's like waking from a dream; I just don't remember.

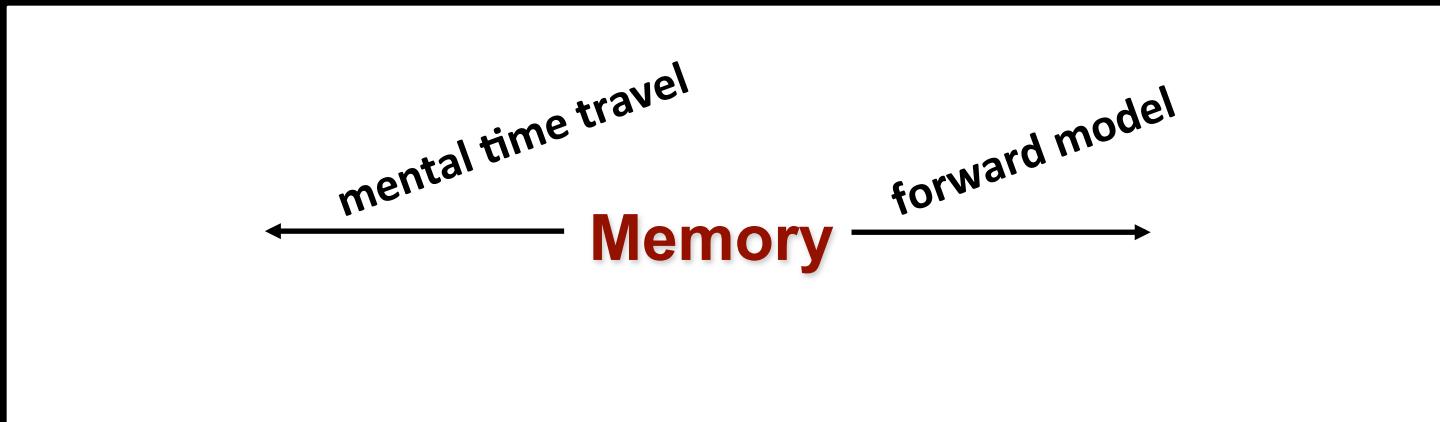
– H.M.

Memory and the Medial Temporal Lobe



[Corkin et al (1997)]

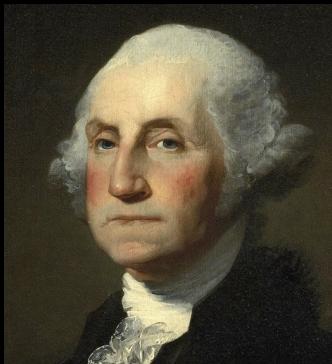
Memory as Prospection



Memory-based simulations of future (prospection) can enable novel goal-directed behavior

Semantic Memory

- Conscious knowledge of facts and concepts
- New semantic learning is impaired in amnesia



Patient EP

(brain damage due to viral encephalitis)



Reflections on Memory

Right now, I'm wondering. Have I done or said anything amiss? You see, at this moment everything looks clear to me, but what happened just before? That's what worries me. It's like waking from a dream; I just don't remember.

– H.M.

Most people consider forgetting stuff to be a normal part of living. However, I see it as a huge problem; in a way, there's nothing I fear more. The strength of your memory dictates the size of your reality.

– Chuck Klosterman (2004), *Sex, Drugs, and Cocoa Puffs*

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Working Memory: Transient Memory

- conscious memory for the remote portion of the present
 - Clive Wearings ‘ keeping track of a conversation for a brief period of time
- ability to keep information active in mind over a delay
 - waiter remembering a food order until reaching the kitchen

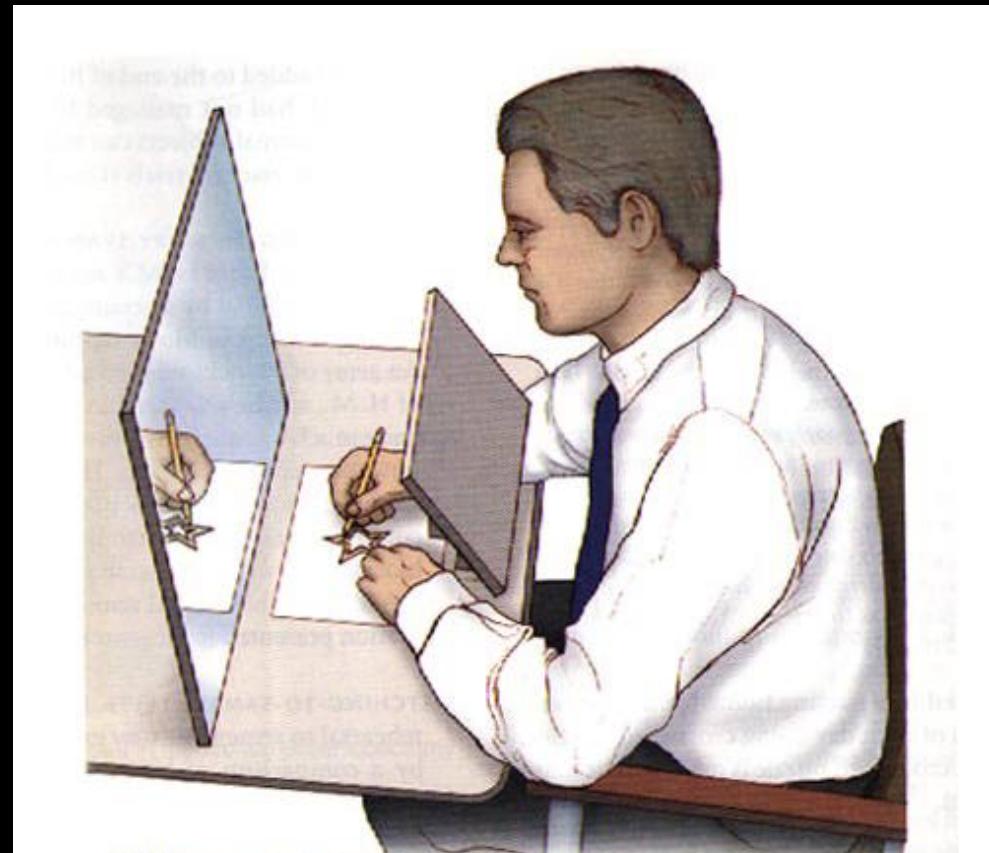
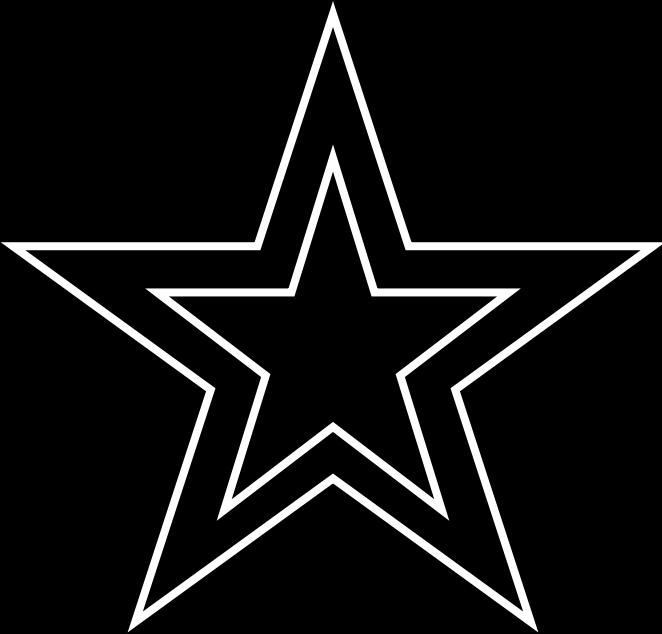
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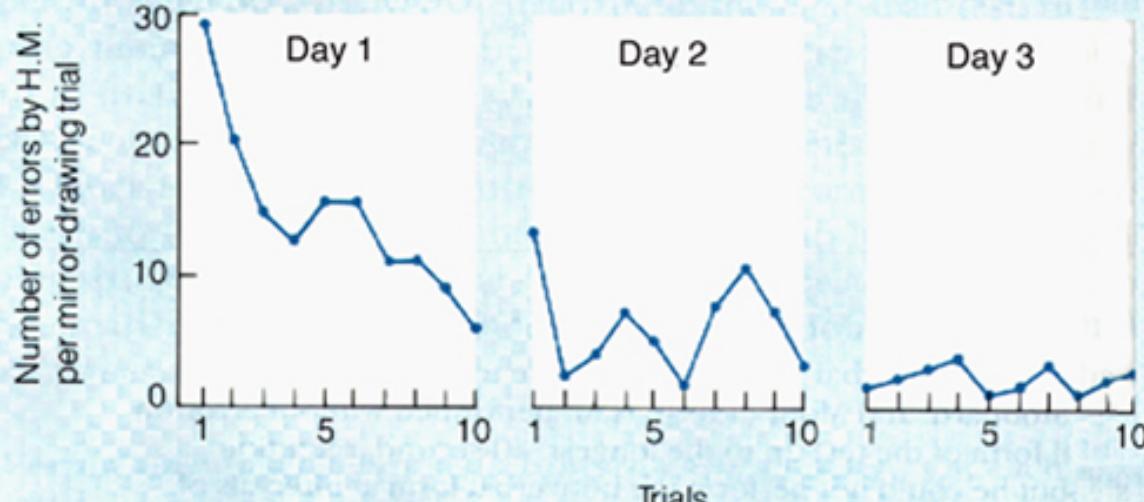
Non-conscious Forms of Memory: Skill Learning

Mirror Tracing Task



- Improved performance with practice on a motor, perceptual, or cognitive task

Non-conscious Forms of Memory: Skill Learning

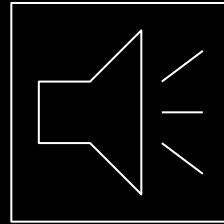
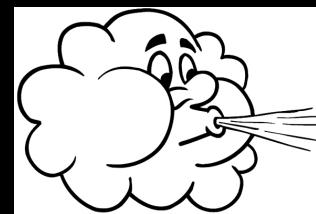
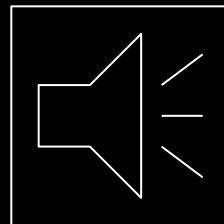
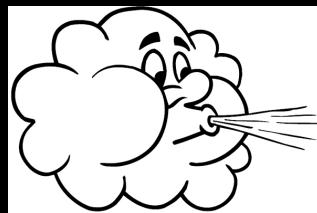


**Retention of the
mirror-drawing task by H.M.
(Adapted from Milner, 1965.)**

Skill Learning

- Can occur without conscious memory
- Intact in amnesic patients

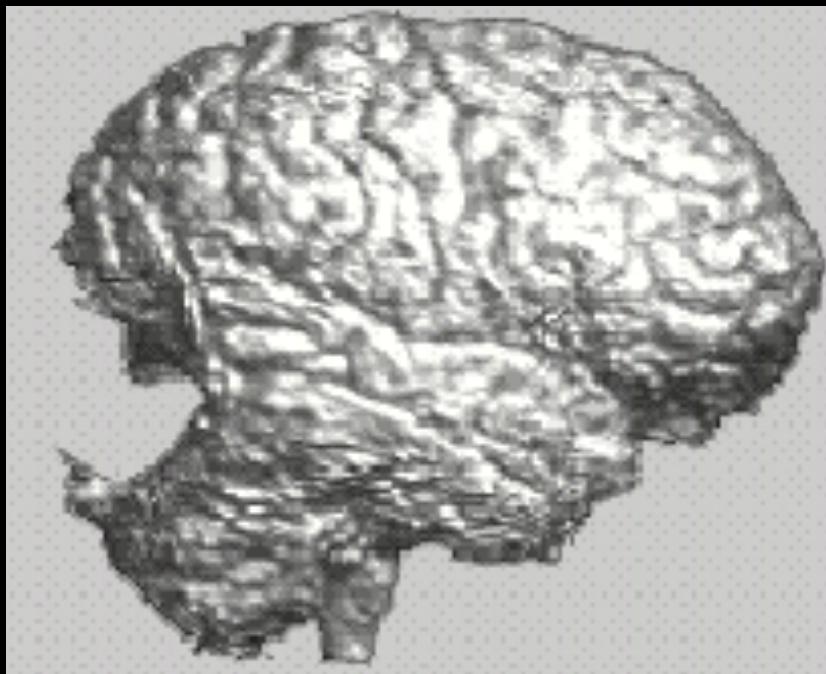
Non-conscious Forms of Memory: Conditioning



- Learning simple predictive relationships between stimuli
 - Can occur without conscious memory
 - Some forms are intact in amnesic patients

Non-conscious Forms of Memory: Priming

Change in performance (accuracy, speed) with a stimulus (e.g., word or picture) due to prior processing of that stimulus or a related stimulus



Patient M.S.

- Right occipital lobe resection
- Impaired visual priming

Patient H.M.

- Priming intact

What is Memory?

A change in the system, brought about by experience,
that influences subsequent processing and behavior

Multiple Memory Systems

WORKING
MEMORY

LONG-TERM
MEMORY

Declarative / Explicit

Non-declarative / Implicit

Events
(episodic)

Facts
(semantic)

Skill Learning

Priming

Conditioning

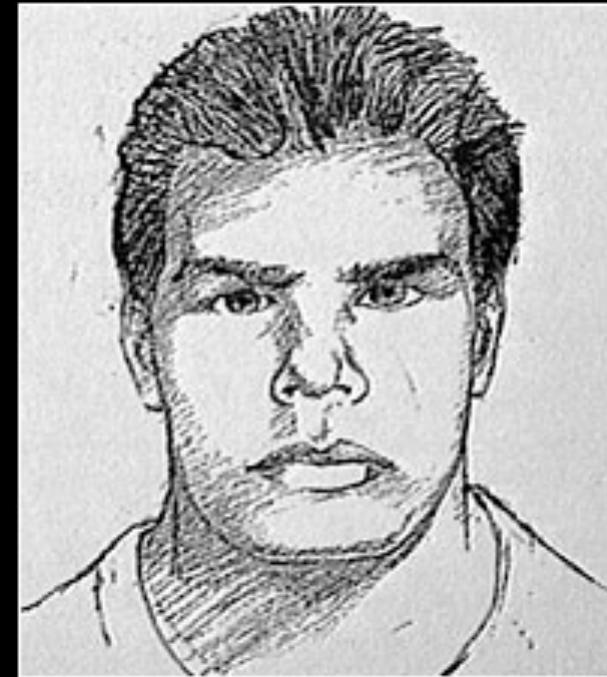
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False Memories beyond the Lab



Rick Wilking / Reuters



(Trial Evidence)

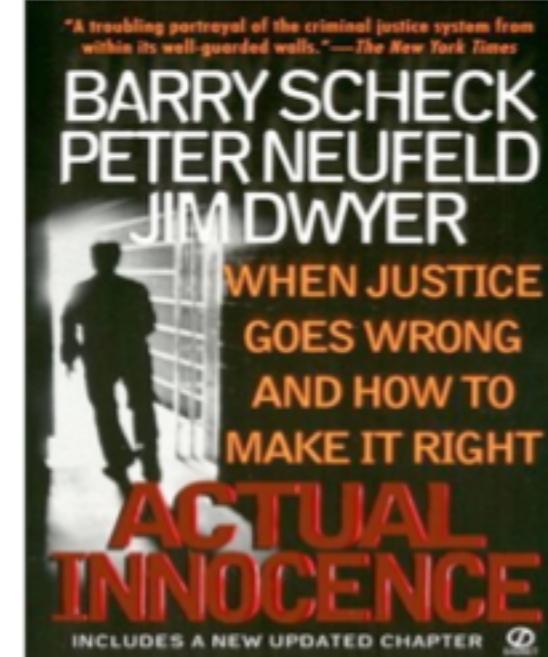
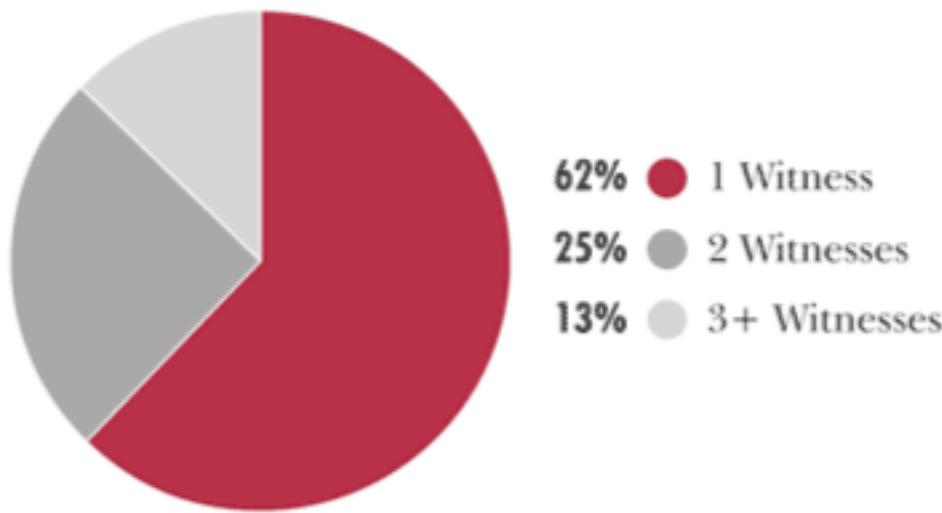
Oklahoma City bombing, 1995
John Doe #2: Product of a memory error

Prevalence & Consequences of False Memories

DNA exonerations & Eyewitness Testimony

Number of witnesses misidentifying
the same innocent defendant

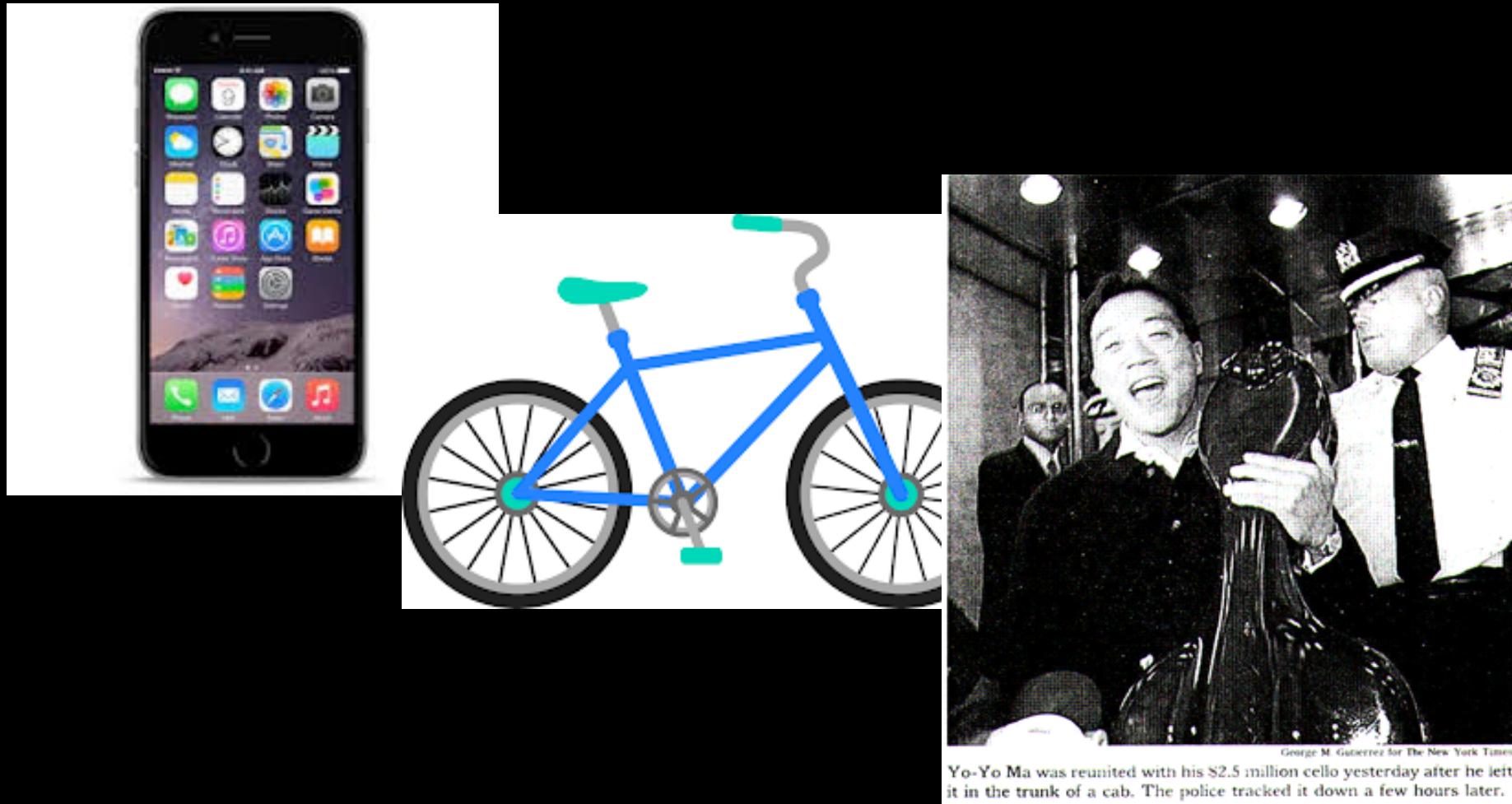
(based on 175 eyewitness misidentification cases
in the first 239 DNA exonerations)



Latest #s:

- 337 post-conviction DNA exonerations; 20 were on death row; avg=14 yrs
- Eyewitness misidentification is single greatest cause of wrongful convictions, playing a role in > 70% of convictions overturned – The Innocence Project

Forgetting as a Window onto Memory



“Memory is like a net; one finds it full of fish when he takes it from the brook; but a dozen miles of water have run through it without sticking.” – Oliver Wendell Holmes, Sr. 1858

Emotion, Memory, and Forgetting



Donnie Moore
October 12, 1986
California Angels vs.
Boston Red Sox

SPORTS OF THE TIMES; Donnie Moore and the Burdens of Baseball

Published: Sunday, July 30, 1989

Donnie Ray Moore, the former California Angel relief pitcher, who shot his wife and then killed himself 12 days ago, was being discussed recently by a few sportswriters at Shea Stadium. And the memory of perhaps the central moment in his life came back, the image of him on the mound in Anaheim Stadium, in that playoff game in 1986, the television camera zeroing in on his face, sweat-beaded, and his eyes in grim concentration.

Moore, who was 35 years old when he died, was obsessed, according to some friends, with the failure of not recording the third strike that would have won the pennant for the Angels in the 1986 playoffs. Instead, Moore gave up a two-out two-run homer to Dave Henderson in the ninth inning and the Red Sox went on to win that game, the next two games and the American League championship.

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“Not the power to remember, but its very opposite, the power to forget, is a necessary condition for our existence.”

– Sholem Asch

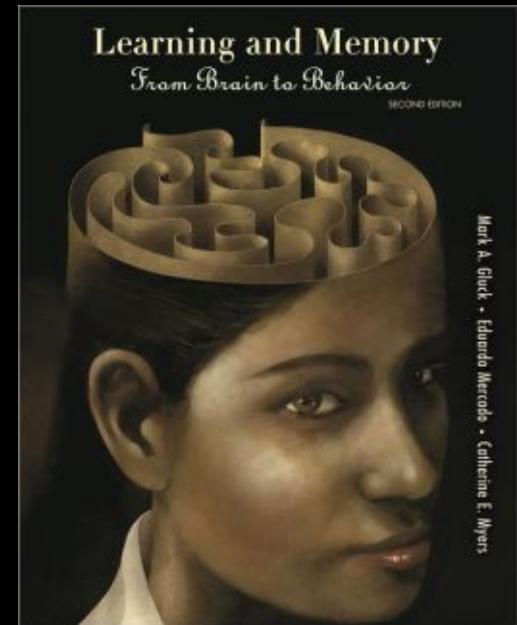
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Mar 29	Introduction to memory		Ch. 1
Mar 31	Experimental methods • From behavior to brain imaging		Ch. 2
Apr 4	Working memory I		Ch. 9
Apr 7	Working memory II		MiA #1: N-back
Apr 12	Cognitive control and memory I		Optional: Memory at the Movies I <i>Eternal Sunshine – 7pm</i>
Apr 14	Cognitive control and memory II		MiA #2: Stroop
Apr 19	Midterm I		
Apr 21	Episodic memory: Encoding I • How do we learn?		Ch. 7
Apr 26	Episodic memory: Encoding II • Neural mechanisms		Squire (2009)
Apr 28	Episodic memory: Retrieval I • How do we remember?		
May 3	Episodic memory: Retrieval II • What do we remember?		Optional: Memory at the Movies II <i>Inside Out – 7pm</i>
May 5	Semantic memory and statistical learning	[Ian Ballard]	Review relevant sections of Ch. 7 MiA #3: Semantic memory
May 10	Midterm II		
May 12	Multiple memory systems • Declarative vs. nondeclarative memory		Ch. 8 Memory at the Movies III <i>Memento – 7pm</i>
May 17	Nonconscious forms of memory • Conditioning		Ch. 4 and 5 Memory at the Movies III <i>Memento – 7pm</i>
May 19	Emotion and memory		Ch. 10 MiA #4: Emotion & memory
May 24	Why do we forget?	[Kevin Mickey]	Kuhl & Wagner (2009)
May 26	False memories		Schacter (1999) MiA #5: False memory Paper Due
May 31	Aging and memory	[Stephanie Gagnon]	Ch. 12
Jun 2	Review session		
Jun 6 8:30-11:30am	Final Exam		Location TBD

Textbook & Readings

- Learning and Memory: From Brain to Behavior, 2nd edition
 - Gluck, Mercado & Myers
- Three additional readings listed on syllabus
- Both are fair game for exams!



Graded Components

- Two midterms (25% each)
- Final exam (25%)
- Paper assignment (15%)
 - Memory in *Memento* (see syllabus for details)
- Participation Prompts (5%)
 - During lecture, we will pose questions that prompt reflection on the material. Your brief written response will be handed in at the end of the class. Over the term, there will be 7 such prompts, and you will be asked to turn in 5. *There will be no opportunities for make-ups.*
- Memory in Action (5%)
 - On-line demos will illustrate a fundamental memory phenomenon & may generate data from the class that we can discuss during lecture. For each demo, we will also pose a question or two, to which we ask that you provide brief responses. *MiA Demos should be completed 24hrs prior to the date/lecture specified on the syllabus.*

Other Opportunities

- Extra credit: Peer Assistance on Piazza
 - Students who consistently provide accurate, thoughtful replies
 - Potential for 2-point bonus
- Memory at the Movies I & II
 - *Eternal Sunshine of the Spotless Mind*
 - *Inside Out*
 - see syllabus for dates
- Be the DJ

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Online Resources

- **Class Website**
 - <http://stanford.edu/class/psych45/>
- **Canvas**
 - Lecture slides
 - Announcements
- **Piazza**
 - Interactive Q&A with your fellow students and TAs
 - Sign-ups for Memory at the Movies – Let us know you're coming
 - Be the DJ
 - Other logistics

Other Logistics

- Waitlist
- Emergency Evacuation Plan

Teaching Assistants



Stephanie Gagnon
(Head TA)



Ian Ballard



Kyle MacDonald
(Alternate Exams TA)



Kevin Mickey

Next time...

- **Tips for getting the most out of the class**
- **How do we study Learning and Memory?**
 - Historical perspective
 - Types of experimental evidence

“If any one faculty of our nature may be called more wonderful than the rest, I do think it is memory. There seems something more speakingly incomprehensible in the powers, the failures, the inequalities of memory, than in any other of our intelligences. The memory is sometimes so retentive, so serviceable, so obedient; at others, so bewildered and so weak; and at others again, so tyrannic, so beyond control! We are, to be sure, a miracle every way; but our powers of recollecting and of forgetting do seem peculiarly past finding out.”

– Jane Austin, *Mansfield Park*