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Class Meets: Weekdays 1:30-4:00pm @ 9B114

SKKU ISS3147

Myths and Mysteries of Human Learning and Memory

Amnesia

7 Jul 2016

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Overview

1. Basic neuroanatomy
2. Amnesia
3. Famous cases
4. Theoretical implications
5. Other memory disorders
6. Videoclips of patient K.C.

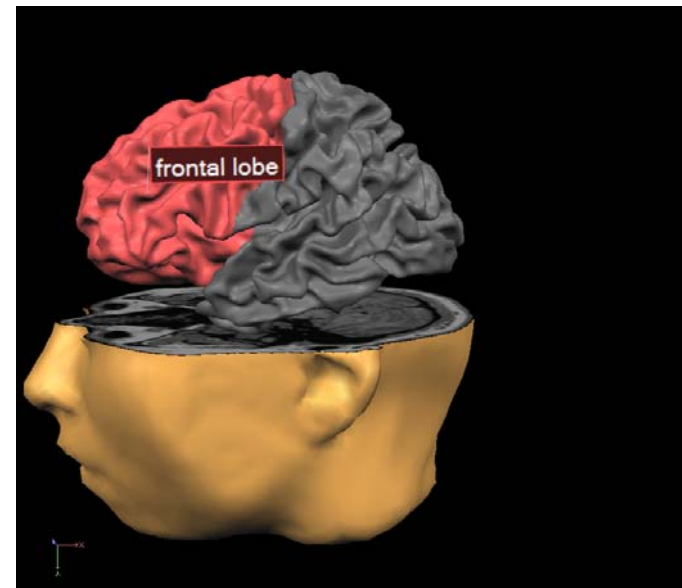
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The Brain



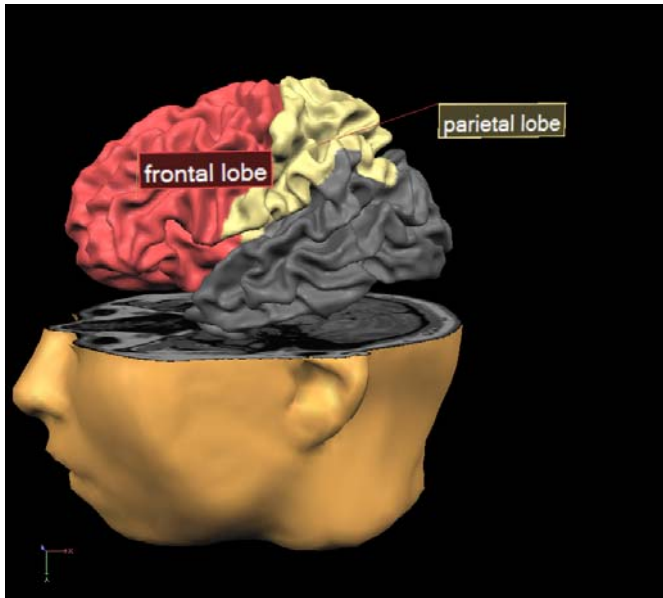
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The Brain



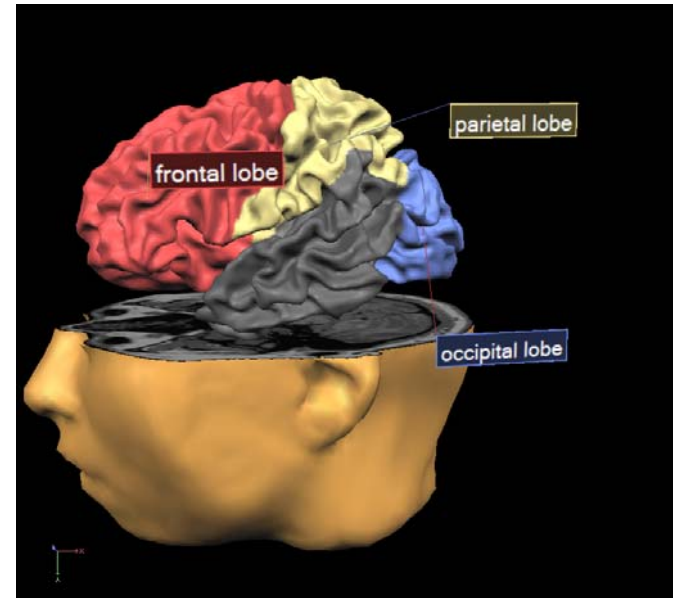
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The Brain



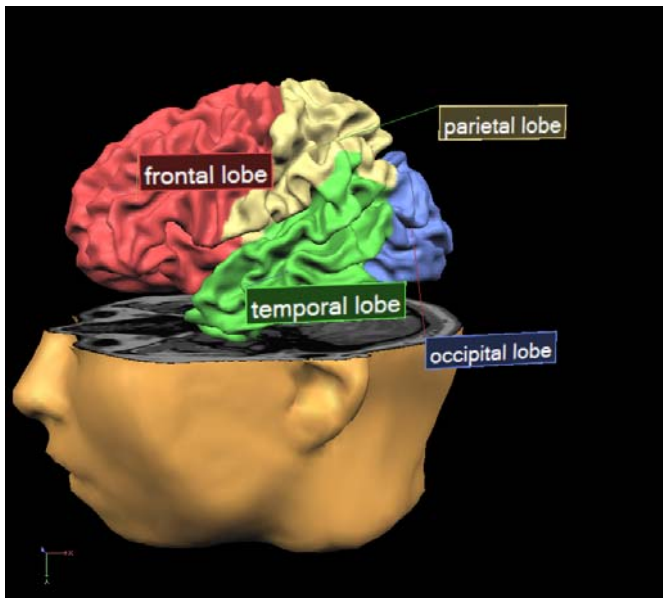
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The Brain



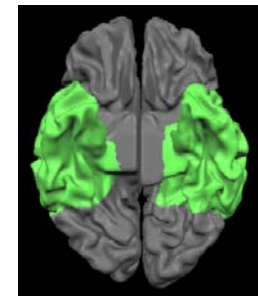
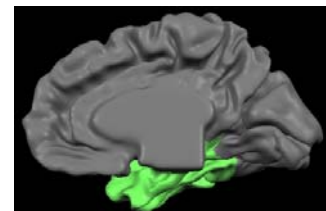
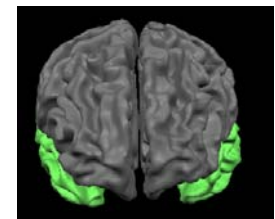
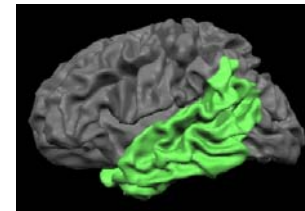
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The Brain

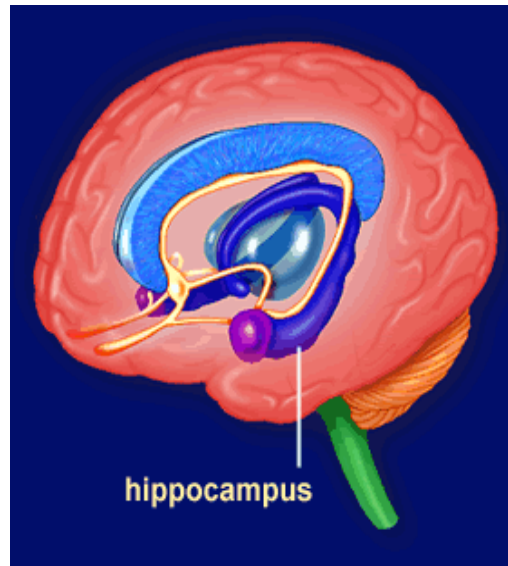
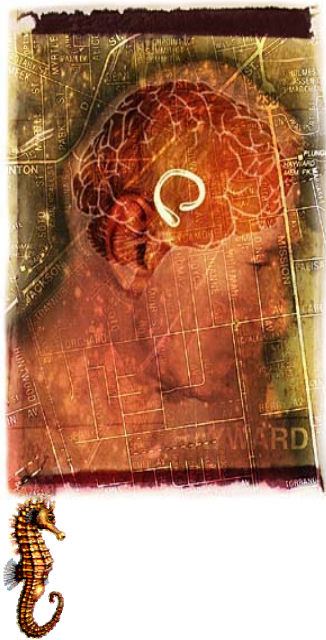


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Temporal Lobe



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Amnesia

- Studying patients with profound memory deficits can help inform understanding of normal/healthy memory function
- Anterograde amnesia
- Retrograde amnesia
 - Temporal gradient
- Electro-convulsive shock treatment (ECT) for severe depression
 - Side effect: retrograde amnesia

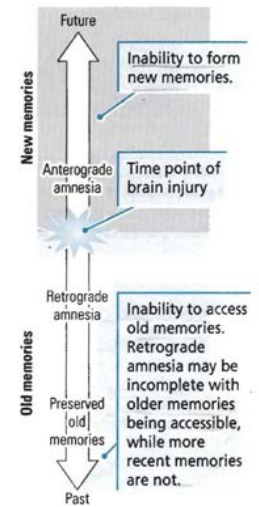


Figure 18.1 Possible consequences of brain injury on old and new memories. Note that retrograde amnesia may be incomplete, with older memories being more preserved than newer memories.

Patient H.M.

- Late 1940s – early 1950s, neurological and psychiatric diseases sometimes treated with neurosurgery.
 - Prefrontal lobotomy
 - Temporal lobe resection
- Inadvertently led to cognitive impairments
- Patient H.M. suffered epileptic seizures starting at age 16, condition progressively worsened (medication ineffective), had to stop working at 27.
- In 1953, neurosurgeon William Scoville performed bilateral temporal lobe resection



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Patient H.M.

“Bilateral resection... has resulted in **no marked physiologic or behavioural changes with the one exception of a very grave, recent memory loss**, so severe as to prevent the patient from remembering the locations of the rooms in which he lives, the names of his close associates, or even the way to the toilet...” (Scoville, 1954)

- After surgery, H.M.'s remote memories remained intact, but had difficulty retrieving more recent memories (< 10 yrs before the operation) – retrograde amnesia
- Inability to form new (episodic) memories – anterograde amnesia
- Functions spared: IQ, perceptual, motor, short-term memory, reasoning.

(Scoville & Milner, 1957)



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Patient H.M.

“Every day is alone in itself, whatever enjoyment I’ve had, and whatever sorrow I’ve had... 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.”

(Milner, 1970)



Henry Molaison (H.M.)

Patient H.M.

Some evidence for new semantic learning:

In 2000, H.M. was tested on his ability to identify famous faces.

He was presented with photos from 1920s – 1980s, asked to name each individual, the decade when each was famous, and the reason for his/her fame.

He was worse than normal controls for faces from 1950s onwards. The only 2 he could identify were JFK and Ronald Reagan.

When given more cues, he could name 18 more (out of 36) individuals:



Suzanne
Corkin

Phonemic cue	H.M.'s response	Phonemic cue	H.M.'s response
M.T.	Mao Tse-Tung	Woody A.	Woody Allen
Martin L. K.	Martin Luther King, Jr	Jimmy C.	Jimmy Carter
Bea	The Beatles	Henry Kiss	Henry Kissinger
L.B.J.	Lyndon B. Johnson	Gerald F.	Gerald Ford
Pablo P.	Pablo Picasso	Mother	Mother Theresa
Nelson Man	Nelson Mandela	Margaret Tha	Margaret Thatcher
Julie And	Julie Andrews	Nancy Rea	Nancy Reagan
Prince Ch	Prince Charles	G.B.	George Bush
Bob Dy	Bob Dylan	Michael Du	Michael Dukakis

(Kensinger & Corkin, 2000)

Brain of world's best-known amnesiac mapped

By Elizabeth Landau, CNN
December 3, 2009 7:21 p.m. EST

H.M. died at age 82 on Dec 2, 2008. Lived the last 28 yrs of his life in a nursing home.



Henry Molaison, seen here in front of his family's home in 1958, suffered amnesia after an operation.

(CNN) -- Henry Molaison, known as H.M. in scientific literature, was perhaps the most famous patient in all of brain science in the 20th century.

"My daddy's family came from the South and moved North, they came from Thibodaux Louisiana, and moved north," Molaison would say. "My mother's family came from the North and moved South." Within 15 minutes he might repeat this exact statement twice more, unable to remember that he'd already said it.

Scientists studied him for most of his adult life.

STORY HIGHLIGHTS

Thousands of people are watching a video of a brain being dissected

The brain belonged to H.M., who had amnesia after surgery in 1953

Researchers have spent the last year preparing for the process of slicing this brain

This week, researchers are dissecting his brain to figure out exactly which structures contributed to his amnesia, which he suffered for more than 50 years.

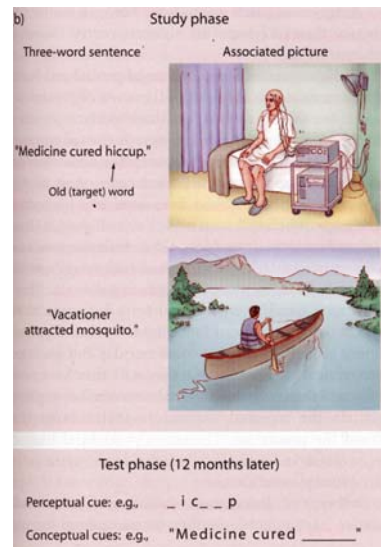
At the Brain Observatory at the University of California, San Diego, researchers began slicing H.M.'s brain Wednesday afternoon and streaming the procedure live to the world on their Web site. Watch it live

Patient K.C.

- In 1981, K.C. at age 30 had an accident while riding his motorcycle.
- Damage to the medial temporal lobes (but also diffuse damage to other brain regions)
- Dense retrograde and anterograde amnesia
 - Unable to recall a single episode from his past that was distinct in time and place (no episodic memory)
 - Unable to acquire new episodic memories; regardless of whether materials are verbal or nonverbal, memory performance at floor/chance when tested after a delay
- Semantic memory relatively spared
 - Able to answer general knowledge questions, provide word definitions, remember facts about his past

Patient K.C.

- Able to learn new semantic information
 - K.C. studied and was tested on 64 sentence-picture pairs over 22 sessions
 - 1 year after the last session, K.C. received a final test
 - Robust perceptual priming (word fragment identification), which remained unchanged over the 1-yr retention interval
 - From 0 performance at the start, cued recall performance was 39% after the 1-yr interval
- Able to recognise new famous names and vocab words



(Tulving et al., 1991)

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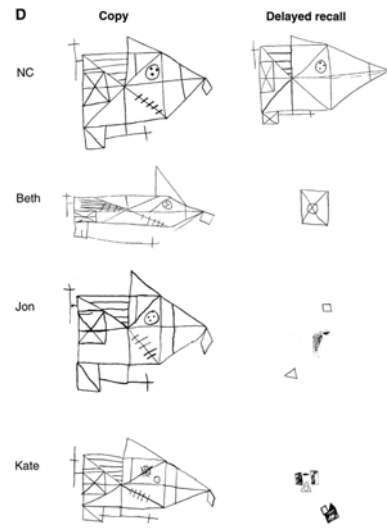


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Other cases

Amnesia of developmental origin

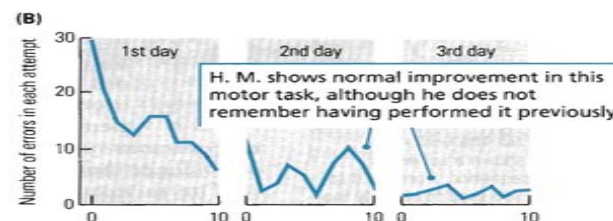
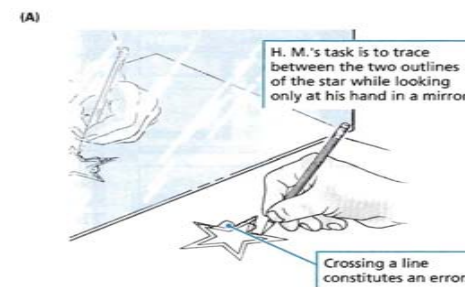
- Hypoxic injury to the hippocampus, sustained either during birth or childhood
- Severe anterograde amnesia
- Failure to remember the events of daily life
- Particularly noteworthy: all 3 have fared well in mainstream schools.
- Preserved semantic learning



(Vargha-Khadem et al., 1997)

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What do amnesics tell us about memory?



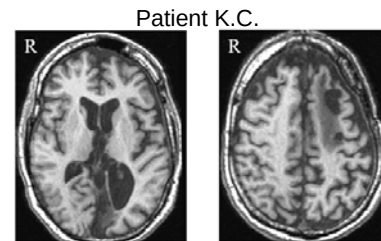
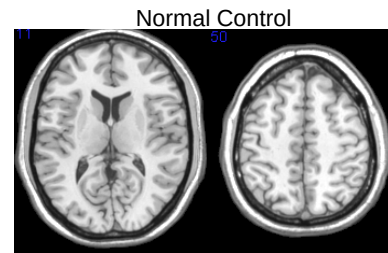
That memory comes in different forms/types, and likely depend on different neural substrates

- Explicit vs. Implicit memory
 - Implicit memory/learning intact in amnesics
 - Perceptual priming comparable to normal controls (Warrington & Weiskrantz, 1970)
 - Mirror-drawing task

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What do amnesics tell us about memory?

- Explicit memory can be subdivided into:
 - Semantic vs. Episodic memory (Tulving, 1972, 1983)
 - Episodic memory
 - Personal re-experiencing of an episode from the past
 - Semantic memory
 - General world knowledge
- Crucial role of hippocampi (and adjacent cortices) in episodic memory
 - Human cases rarely present with “clean” lesions to specific regions only, so it is difficult to conclusively ascribe precise cognitive functions to particular brain regions based solely on patient data

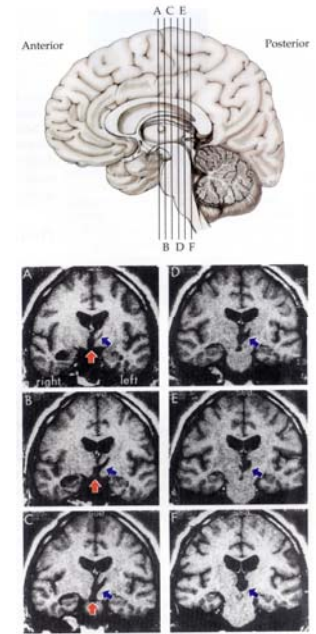


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Other memory disorders

1. Korsakoff's syndrome

- Chronic alcoholics prone to thiamine deficiency
- Leads to damage to the mammillary bodies and dorsomedial thalamus
- Severe anterograde and retrograde amnesia
- Lack of insight
- Confabulation

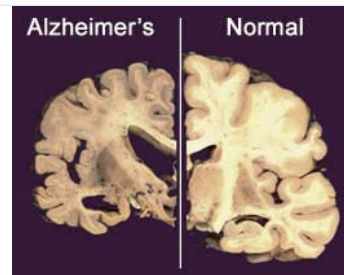
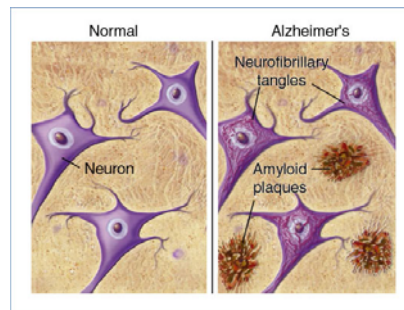


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Other memory disorders

2. Alzheimer's disease

- Autopsy of AD patients reveal amyloid plaques
- Neuronal abnormalities: neurofibrillary tangles
- Present in diffuse areas of the brain
- Often first noticed as a loss of memory for recent events
- Progressive decline in cognitive functioning



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Other memory disorders

3. Transient global amnesia

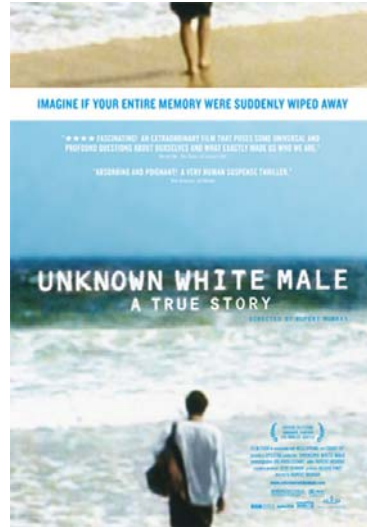
- Memory deficits that are similar to dense amnesics (although temporary)
- Thought to be caused by transient ischemia (reduced blood flow in the medial temporal lobes) that does not result in permanent damage to the brain tissue
- In time, brain tissue recovers and so does patient's memory

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Other memory disorders

4. Dissociative fugue state

- Psychogenic
- Retrograde amnesia for past episodes
- Loss of one's identity
- Usually brought on by a stressful life event/trauma



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Mystery teen in New York identified as Kitsap County resident

By Jennifer Sullivan and Nick Perry
Seattle Times staff reporters



Kacie Peterson was found two weeks ago in New York City.

An 18-year-old who turned up in the heart of New York City two weeks ago with apparent amnesia is a Kitsap County woman who was reported missing Oct. 2, according to the Kitsap County Sheriff's Office.

Kacie Peterson, who was reported missing from Hansville, north of Kingston, was picked up by New York City police outside a shelter near Times Square on Oct. 9, authorities said. It's unclear how Peterson wound up in New York, said sheriff's spokesman Scott Wilson.

Over the past several hours, New York police and Kitsap County sheriff's investigators have identified Peterson as the memory-impaired woman, Wilson said. Peterson's family has flown to New York to bring her home.

New York City's Administration for Children's Services has been housing Peterson, but officials there declined to comment.

The New York Post reported Saturday that the break in the case came in a call to the NYPD tip hotline from an as-yet-unidentified caller.

Wilson said there have been multiple confirmations that the young woman in custody in New York is indeed the woman person from the Kingston-area.

When Peterson was found in New York she was wearing tattered clothing and was without any identification.

"I just want to know who I am," Children's Services quoted the young woman as saying last week. "I want to know who I am and what happened to me."

Authorities said the 18-year-old told them she had no memories of her name, home or family. Police experts and psychiatrists believe her.