Types of Memory

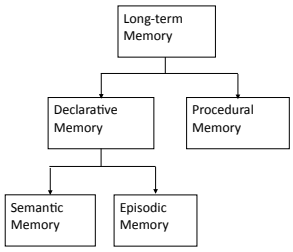
Review Session
Wednesday, 5/14 at 5:00
in PCYNH 106

This will **not** be on Midterm 2.
(It **will** be on the final.)

Distinctions in memory

- (And by memory, here, we mean long-term memory)

Distinctions in memory



Episodic and Semantic

- Knowledge you can state
- Episodic: *particular events*
  - H.s. graduation dinner
  - Text message you received last night
- Semantic: *general information*
  - What typically constitutes a dinner
  - What a dog is like (category information)

Semantic memory

- Categories, event schemas
- Concepts that are related activate each other (e.g. Meyer & Schvaneveldt 1971)
  - Lexical decision task
  - Prime is related or unrelated word

frang

fish

lamp

shoss

cup

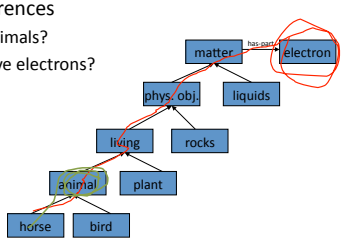
bowl

Semantic memory

- Categories, event schemas
- Concepts that are related activate each other (e.g. Meyer & Schvaneveldt 1971)
  - Lexical decision task
  - Prime is related or unrelated word
    - Fish->lamp (LD to lamp is normal)
    - Cup->bowl (LD to bowl is faster/"facilitated")

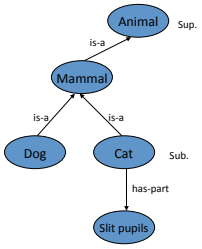
Semantic memory

- Categories
  - Can make inferences
    - Are horses animals?
    - Do horses have electrons?



Semantic memory

- Collins & Quillian: **hierarchical model**
  - Nodes (bird, fish, animal)
    - *Concepts*, not word-forms
  - Links
    - Labeled
    - Directed
  - Activation tags



Semantic memory

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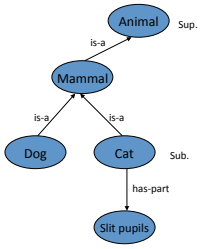
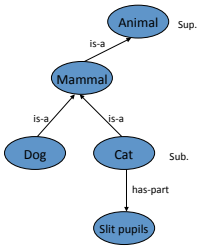
  - Activation tags



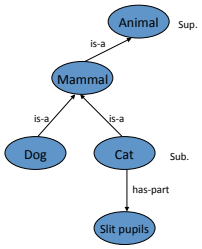
Semantic memory

- Collins & Quillian: **hierarchical model**
  - Nodes
  - Links
  - Activation tags
  - Superordinate/subordinate



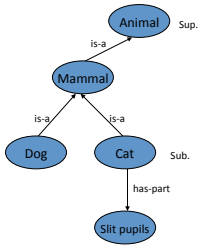
Semantic memory

- Collins & Quillian: **hierarchical model**
  - Nodes
  - Links
  - Activation tags
  - Superordinate/subordinate
  - Sentence verification
    - A cat has slit pupils. (faster)
    - A cat is an animal. (slower)



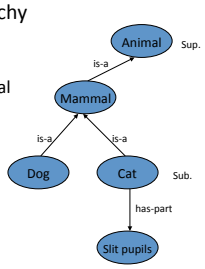
Semantic memory

- Collins & Quillian: **hierarchical model**
  - Problem 1: **typicality effect**
    - A penguin is a bird
    - A robin is a bird (FASTER)
    - Ok, stronger link for robin



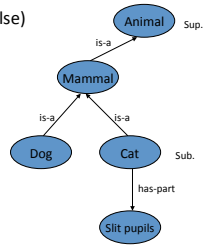
Semantic memory

- Collins & Quillian: **hierarchical model**
  - Problem 2: Violations of hierarchy
    - A chicken is a bird
    - A chicken is an animal (FASTER)
    - Add another link: chicken->animal
      - But violates hierarchy!



Semantic memory

- Collins & Quillian: **hierarchical model**
  - Problem 3: false responses
    - A bat is a bird (SLOWER to say false)
    - A bat is a plant
    - "Relatedness effect"
      - Spurious bat/bird similarities



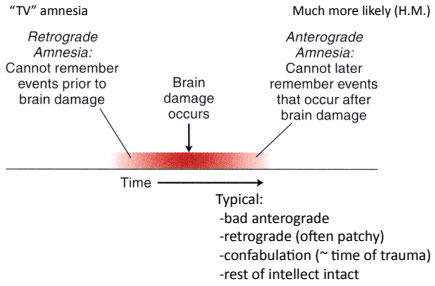
Episodic memory

- Lots of **details**
- **Temporally** specific
  - Remember things in the order they happen
- Memory for **source**
- Truth determined by **individual**
  - Not by group consensus, like what "table" refers to

Episodic memory

- Separate from semantic?
- Evidence from amnesia

Amnesia

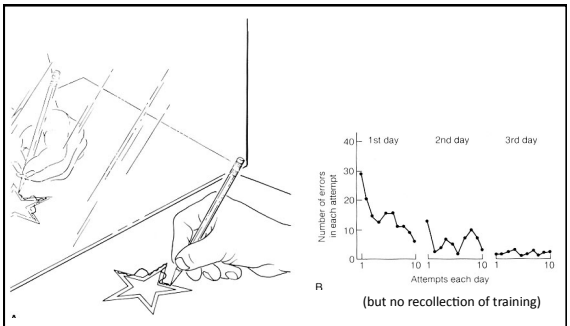


Amnesia

- Anterograde: H.M.
  - Surgery for temporal lobe epilepsy: 1953
  - IQ: normal (better than pre-op)
  - Died in 2008; lab at UCSD sectioned and preserved his brain http://thebrainobservatory.ucsd.edu/hm

Amnesia

- Anterograde: H.M.
  - Memory after surgery
    - Couldn't learn new **people, events**
    - Few new facts
    - Couldn't improve on maze-solving task, find house
    - *Could* draw detailed floor plan of post-surgery house
    - Few new words since 1950's
  - **Preserved**: procedural learning



(but no recollection of training)

Mirror tracing (Milner, 1965)

Retrograde amnesia

- Korsakoff's syndrome
  - Usu. due to long-term alcoholism
  - Severe anterograde (no new memories)
  - Some **retrograde**
    - Seems to have temporal gradient
      - TV shows
      - Famous people
      - Famous events
    - Prob with gradient: alcohol causes anterograde

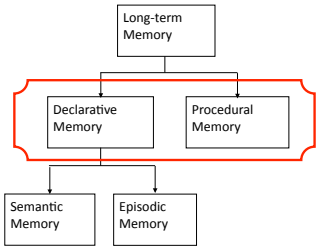
Retrograde amnesia

- Korsakoff's syndrome
  - P.Z. (Butters & Czernak, 1984)
  - Onset at 65; famous scientist
  - Tested memory of his own autobiography
    - Facts: temporal gradient
    - Events: temporal gradient
  - Supports temporal gradient
  - Suggests episodic and semantic not separate
    - Both affected by syndrome

Episodic/Semantic

- Amnesia research doesn't support distinction
  - Definitely memory for episodes, but
  - Anterograde: Hard to teach new semantic knowledge
  - Also, if episodes add up to semantics, you can't knock out one without the other

Distinctions in memory



Procedural/Declarative

- Declarative: knowing **that**
  - Last night you had cheesy poofs for dinner
  - Cheesy poofs are not a good dinner
- Procedural: knowing **how**
  - How do you open a bag of cheesy poofs?
  - Hard to verbalize, easy to act out
  - Skills: driving, reading, bow-hunting
  - H.M. could do it--separate

Implicit/Explicit

- Explicit: conscious awareness
  - You know that you know
  - Recall
  - Recognition
- Implicit: no conscious awareness
  - You don't know you know (may think you're guessing)
  - Stem completion (gar___)
  - Read rapidly-flashed word
  - Type of repetition priming
    - Previous exposure affects subsequent processing

Implicit/Explicit

- Jacoby & Dallas (1981)
  - Present list of 60 words
  - Process meaning, rhyme, letters (depth)
  - Test: 80 words
    - **Recognize** presented words
    - ID with brief appearance (35-ms)--80% vs. 65%
    - Just bias?
      - Nope--recognition (explicit) showed depth of processing effects, ID didn't (implicit)

Implicit/Explicit

- Some manipulations affect implicit but not explicit:
  - Change to physical characteristics
- Even *opposite* effects (Jacoby, 1983)

	Exp.	**Imp.**
– Antonym task		
– Hot-___ (generate)	.78	.07
– Hot-COLD (context)	.72	.16
– COLD (no context)	.56	.22

Implicit/Explicit

- Criticisms
  - Ratcliff & McKoon: not different type of memory, but *bias*
    - Normal stem completion: "absent" … ABS___
    - Tricky stem completion: "absent" … ABST___
      - Not absent, but close
      - Stem completion is **slower** if exposed to "absent"
  - Roediger: task demands aren't equated
    - Explicit: driven by concepts
    - Implicit: driven by data/perception

Models of memory

Adaptive Control of Thought

- "ACT" theory (John R. Anderson, '76, '83, '91)
- Extension of hierarchical model
  - But better!
- Attempts to explain
  - Learning
  - Memory
  - Language
  - Reasoning
  - Problem solving

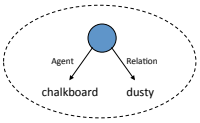
ACT model

Proposition: smallest unit of meaning that can be falsified

Not proposition ~~Dusty.~~

Proposition **T** The chalkboard is dusty.

Proposition **F** The professor is dusty.

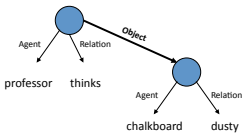


A single proposition

ACT model

Proposition: Kind of like a sentence, but **one** sentence can contain **multiple** propositions

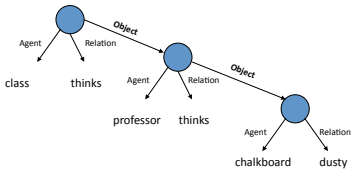
[The professor thinks [the chalkboard is dusty]]



ACT model

Proposition: Kind of like a sentence, but **one** sentence can contain **multiple** propositions

[The class knows [The professor thinks [the chalkboard is dusty]]]



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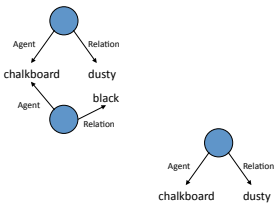
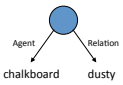


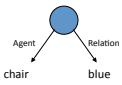
ACT model



ACT model

Another issue: what about *particular* instances?

Not really what we mean.



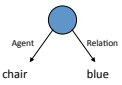
ACT model

Another issue: what about *particular* instances?

Type-token distinction:
A type is just a class of objects/things; a token is a particular instance of that class.

Compare to semantic vs. episodic.

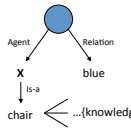
token



type

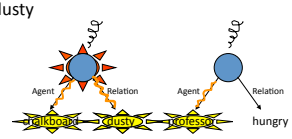
type

token



ACT model

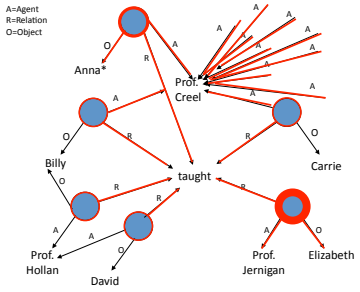
- Spreading activation
  - Nodes activate, intersect if connected to same proposition
  - Have you seen this sentence?
    - The chalkboard is dusty
    - The professor is dusty



ACT model

- The evidence
  - Getting the "gist"
    - Jim told Ed about the fun exam
    - = Jim and Ed talked about the fun test
    - ≠ Jim told Ed about the bad exam
  - Nurse primes doctor
  - *Fan effects*

Fan effects

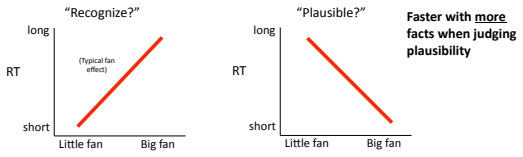


* All student names have been changed to protect anonymity.

So the more facts you know, the harder it is to access one.
But aren't we faster to recall more about what we know a lot about?
If based on *plausibility,* more facts leads to **faster** response.

Fan effects & plausibility

- Reder & Ross (1983)
  - Learn facts with different fan sizes
  - Then test either
    - **Strict recognition** or
    - **Plausibility**



One more model…

Parallel Distributed Processing (PDP)

- E.g. McClelland & Rumelhart (1986)
- Very different approach than ACT
  - Representations
    - Localist (ACT) vs. distributed (PDP)
  - Combines episodic and semantic
    - Episodes "add up to" semantics
  - Brain-inspired
    - Nodes and links (≈ neurons & their connections)

Parallel Distributed Processing (PDP)

- Localist (ACT) vs. distributed (PDP) representations: why?
  - "grandmother cell"
  - Store many patterns in one network

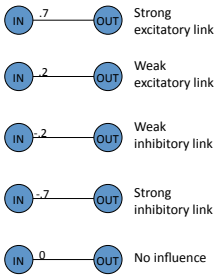
Parallel Distributed Processing (PDP)

- Combining episodic and semantic
  - Episodes "add up to" semantics
    - Multiple encodings of same/similar events strengthen memory, form a generalization (semantic memory)
  - Embodies idea that all remembering occurs in the context of every other memory
  - Remembering is being given partial information and "filling in" the rest (pattern completion)

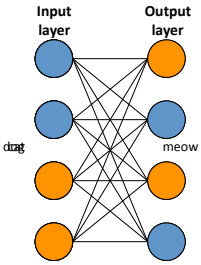
Parallel Distributed Processing (PDP)

- Brain-inspired
  - (Not quite like a real brain, but…)
  - Nodes ≈ neurons
  - Connections ≈ synapses
  - A little like IA model, but that was localist too
  - Excitatory (+) & inhibitory (-) connections
  - Goal: map inputs to outputs
  - Both inputs and outputs are *patterns of node activations*-- i.e., distributed

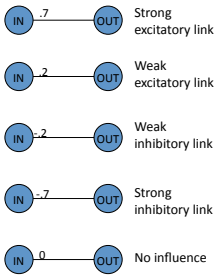
Sign: excite/inhibit
Magnitude: how strong an effect



PDP model of memory



Localist: 4 options (4 1-to-1 mappings)
Distributed: 4 x 3 options (or more)



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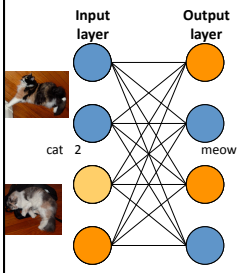
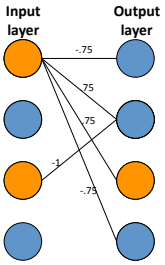


Localist: 4 options (4 1-to-1 mappings)
Distributed: 4 x 3 options (or more)

- Nodes: 0-1
- How do we map inputs to outputs?
  - What changes?
- The **connection weights**
  - Like synapses
  - No need to add nodes (new neuron if grandpa remarries?)

PDP model of memory



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