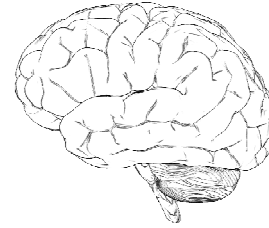
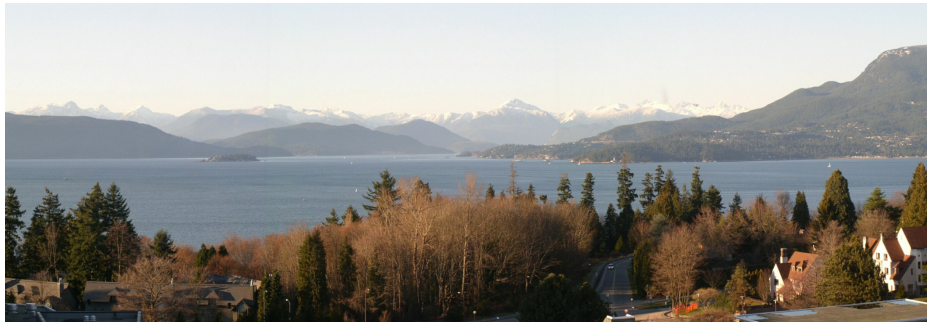


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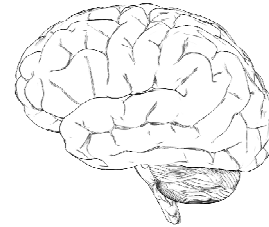


**Lecture 06a (28 May 2012)**  
Finish Lecture 05

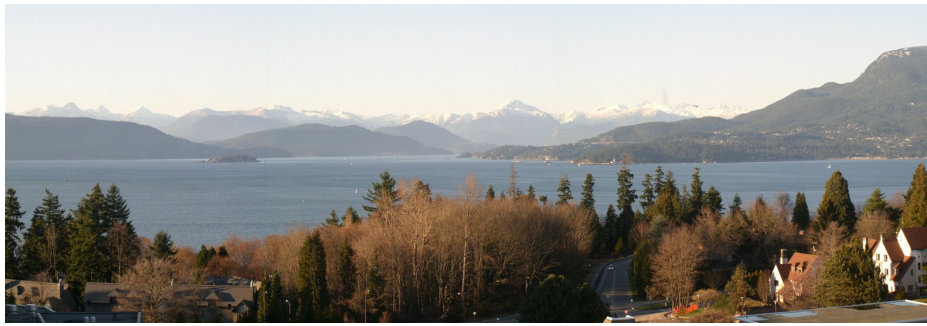


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**Lecture 06b (28 May 2012)**  
Classical and operant conditioning



## The basics of learning

### Associative learning

#### Stimuli and valences

Evolutionary significance of learning?



Picture: From Schacter's Psychology (2<sup>nd</sup> ed)

3

## Forms of learning

### Classical conditioning

Neutral stimulus gains significance

### Operant conditioning

Shaping an individual's behavior

### Observational learning

Monkey see, monkey do



"Perhaps, Dr. Pavlov, he could be taught to seal envelopes."

Picture: From Schacter's Psychology (2<sup>nd</sup> ed)

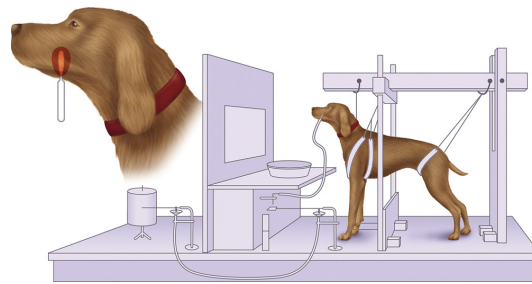
4

## Classical conditioning

**Ivan Pavlov (1849-1936)**

Digestion and salivation

Nobel Prize in Medicine (1904)

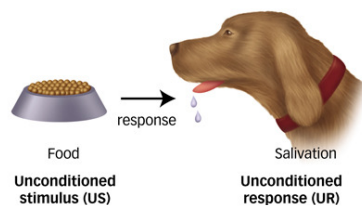


Picture: From Schacter's Psychology (2<sup>nd</sup> ed)

5

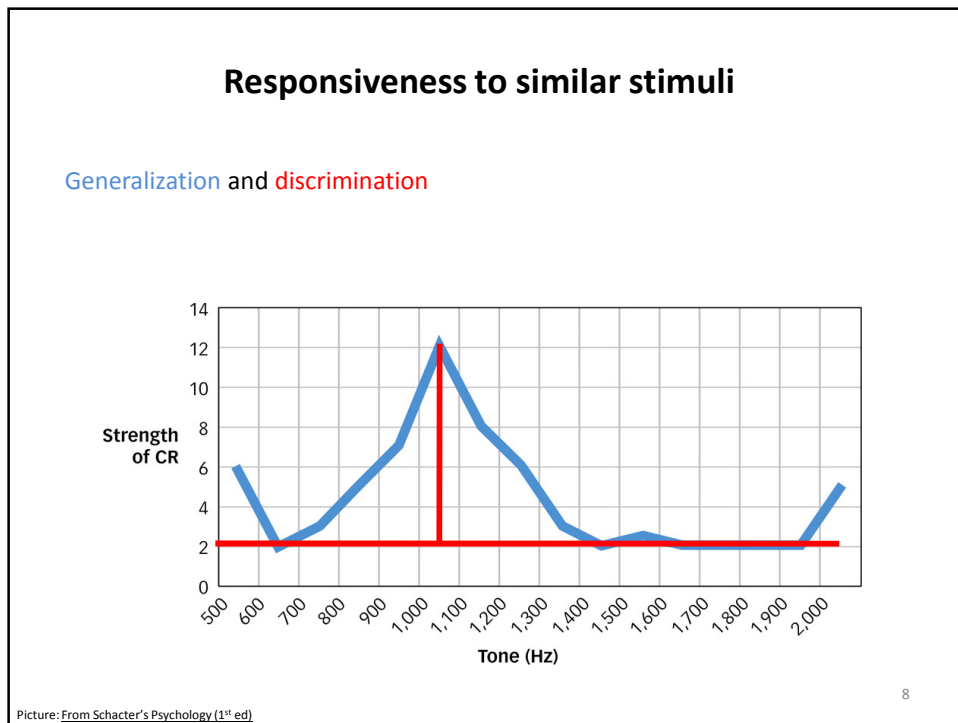
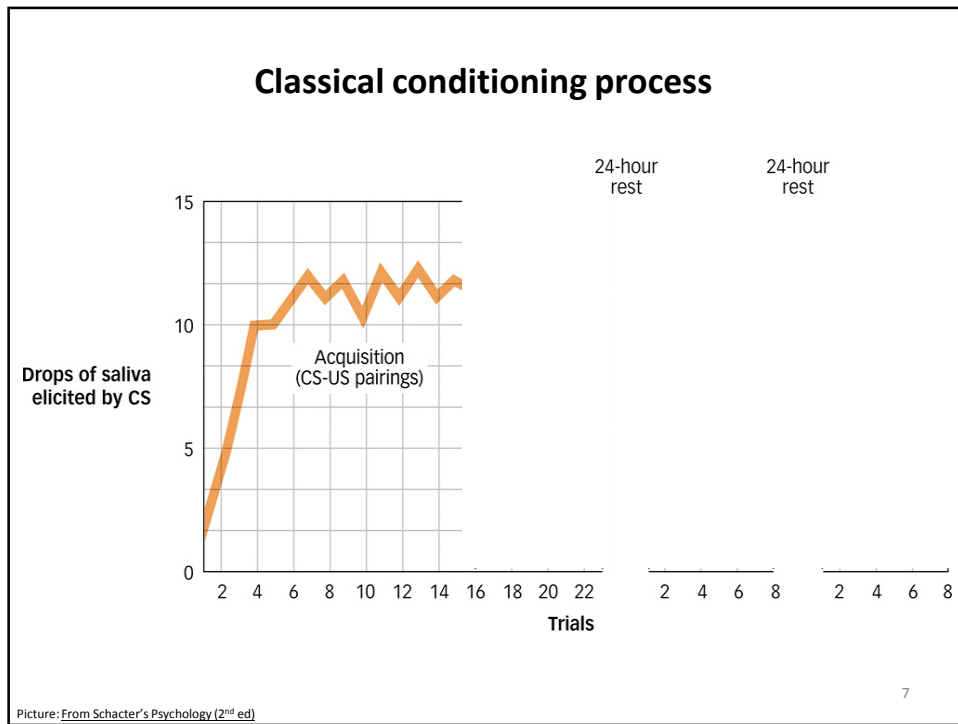
## Steps for classical conditioning

1. Before conditioning



Picture: From Schacter's Psychology (2<sup>nd</sup> ed)

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## Classical conditioning and phobias

### Phobias

Types and basis

### Eliminating a phobia?

Behavioral approach

Exposure therapy



Picture: <http://en.wikipedia.org/wiki/Spider>

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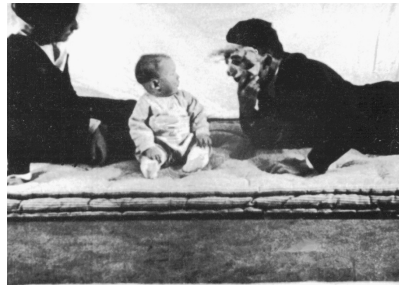
## Little Albert (1920)

### John Watson (1878-1958)

A given person's potential

Complex behaviors (emotions)

Fear conditioning and the amygdala



Picture: From Schacter's Psychology (2<sup>nd</sup> ed)

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## Operant conditioning

**Edward Thorndike (1874-1949)**

Law of effect

**B.F. Skinner (1904-1990)**

Operant behavior

**Reinforcement vs. punishment**

**Positive vs. negative**

**Table 6.1** Reinforcement and Punishment

	Increases the Likelihood of Behavior	Decreases the Likelihood of Behavior
Stimulus is presented	Positive reinforcement	Positive punishment
Stimulus is removed	Negative reinforcement	Negative punishment

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Picture: From Schacter's Psychology (1<sup>st</sup> ed)

## Real-life examples of operant conditioning

Positive reinforcement

Negative reinforcement

Positive punishment

Negative punishment



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Picture: <http://mynameislaurie.com/2011/12/christmas-bonus/>

## Using the Skinner Box



Picture: From Schacter's Psychology (2<sup>nd</sup> ed)

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## Schedules of reinforcement

### Two levels to consider:

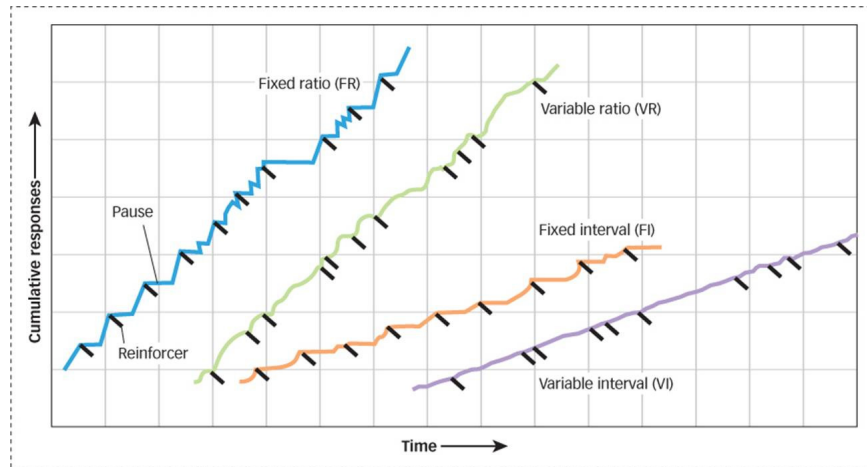
- Interval and ratio
- Fixed and variable



Picture: From Schacter's Psychology (2<sup>nd</sup> ed)

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## Response patterns for reinforcement schedules



Picture: From Schacter's Psychology (2<sup>nd</sup> ed)

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## Features of reinforcers

**Primary reinforcers**

**Secondary reinforcers**

**Overjustification effect**

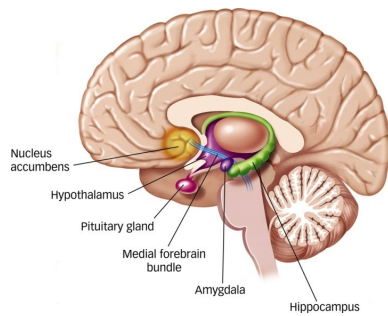


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## Reinforcement and the nucleus accumbens (NA)

**Olds & Milner (1954)**

Electrode in the NA



Picture: From Schacter's Psychology (2<sup>nd</sup> ed) and [http://en.wikipedia.org/wiki/Electrical\\_brain\\_stimulation](http://en.wikipedia.org/wiki/Electrical_brain_stimulation)

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## Observational learning

**Albert Bandura (1925-present)**

Social learning theory

Ubiquitous type of learning

Appropriate models?

Cognitive aspects



Picture: From Schacter's Psychology (2<sup>nd</sup> ed)

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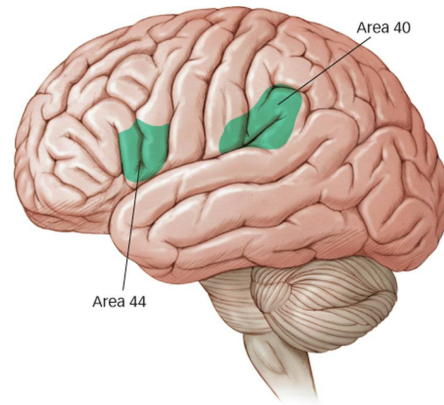
## Neural basis for observational learning?

**Giacomo Rizzolatti (1937-)**

Mirror neuron theory

“Monkey see, monkey do”

Neural response properties



Picture: From Schacter's Psychology (2<sup>nd</sup> ed)

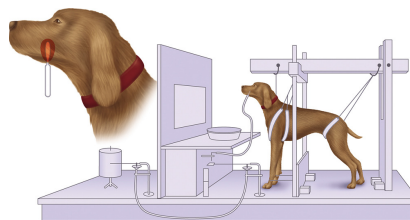
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## Interim lecture summary

Classical conditioning allows a neutral stimulus to gain significance and meaning through learning

Operant conditioning allows us to shape an individual's behavior. Different schedules may be used to this end

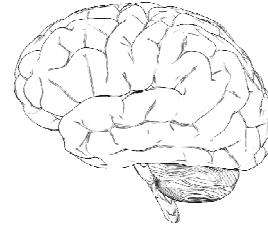
Humans are visual creatures and we learn much by observation. The mirror neuron system appears to support this ability



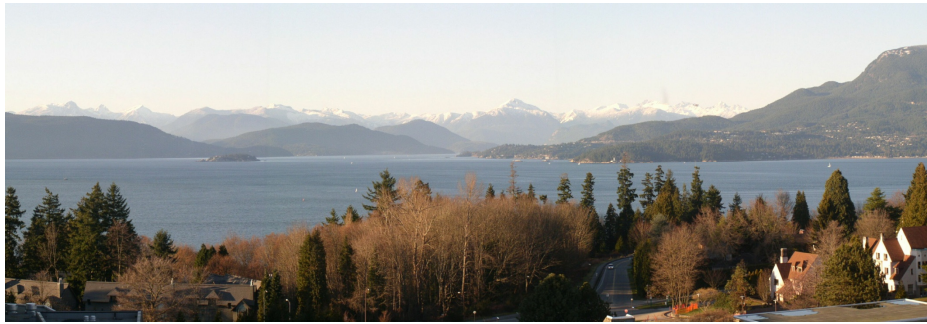
20

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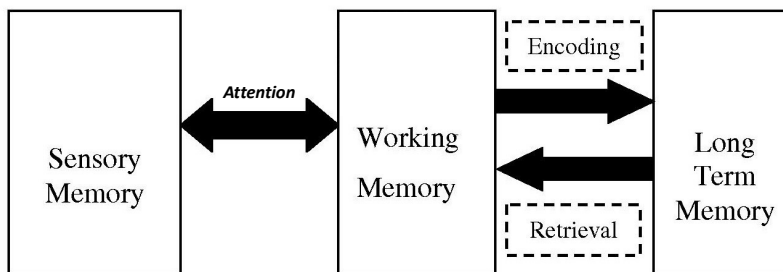
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## Lecture 06c (28 May 2012) Memory stores and processes



### The modal model of memory



Atkinson & Shiffrin (1968), *Psych Learn Motiv*, 2, 89-195

Picture: <http://blog.uny.ac.id/endahretnowati/2008/07/11/the-modal-model/>

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## Sensory memory



**Brief, fleeting visual or auditory sensory store**

### Forms of sensory memory

- Iconic memory
- Echoic memory

**Capacity? Duration?**



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Picture: [http://www.cartoonstock.com/directory/e/eating\\_breakfast.asp](http://www.cartoonstock.com/directory/e/eating_breakfast.asp)

## Baddeley's model of WM

### Visuospatial sketchpad

Mental imagery

### Phonological loop

Internal dialogue

### Central executive

"The boss"

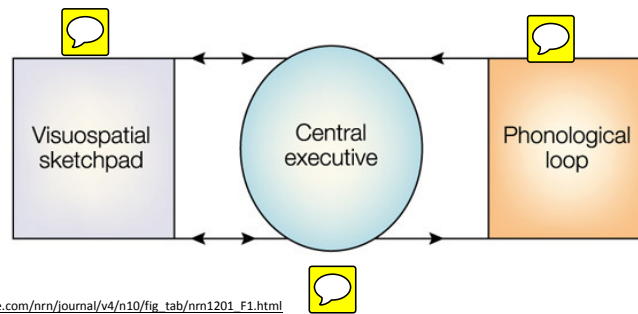


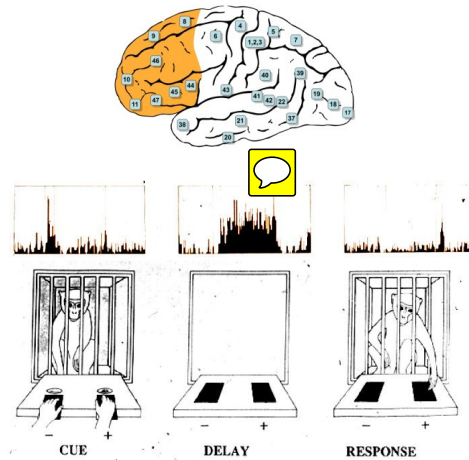
Image: [http://www.nature.com/nrn/journal/v4/n10/fig\\_tab/nrn1201\\_F1.html](http://www.nature.com/nrn/journal/v4/n10/fig_tab/nrn1201_F1.html)

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## Prefrontal cortex supports WM

### Work with monkeys

- Delayed match-to-sample task
- Cooling PFC
- Dopamine infusions



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Image: Courtesy of M. D'Esposito and [http://en.wikipedia.org/wiki/Prefrontal\\_cortex](http://en.wikipedia.org/wiki/Prefrontal_cortex)

## Quality processing in WM

### Rote rehearsal

More rehearsal, better memory  
(Rundus, 1971)

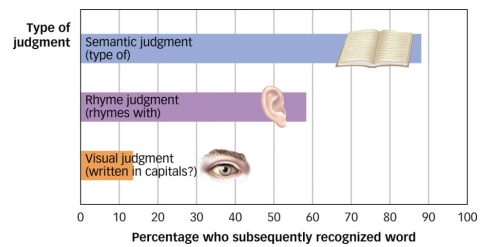
Rehearsal time does not always help  
(Glenberg, Smith and Green, 1977)

### Craik & Lockhart (1972)

Levels of processing (LoP)

### Kapur et al. (1994)

Deeper processing and left prefrontal cortex



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Image: Schacter's *Psychology* (2<sup>nd</sup> ed)

## Long-term memory

**'Permanent' store of knowledge that can be accessed at will**

Knowledge modality?

Capacity?

Duration?



Image: <http://l-shapedcomputerdesk.org/hon-file-cabinets/>

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## Retrieval

**Activation of LTMs, placed into WM for conscious consideration**

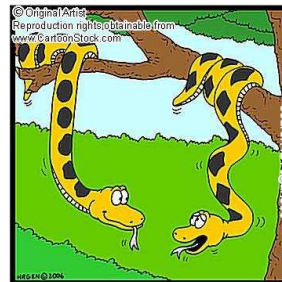
**Improving retrieval?**

State-dependent retrieval

Transfer-appropriate processing

**Retrieval failure?**

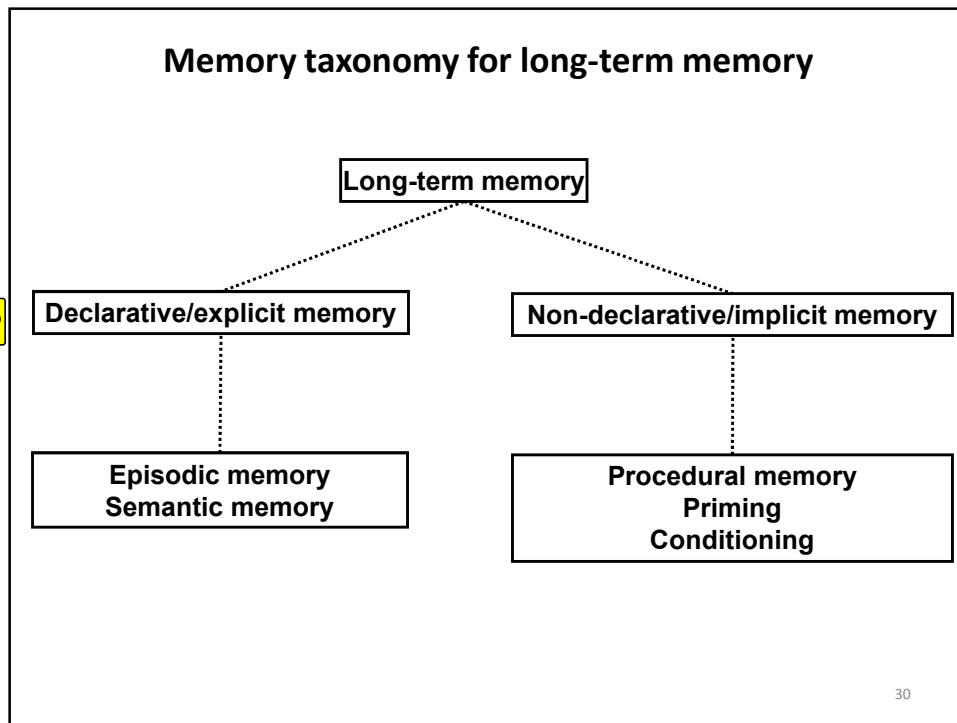
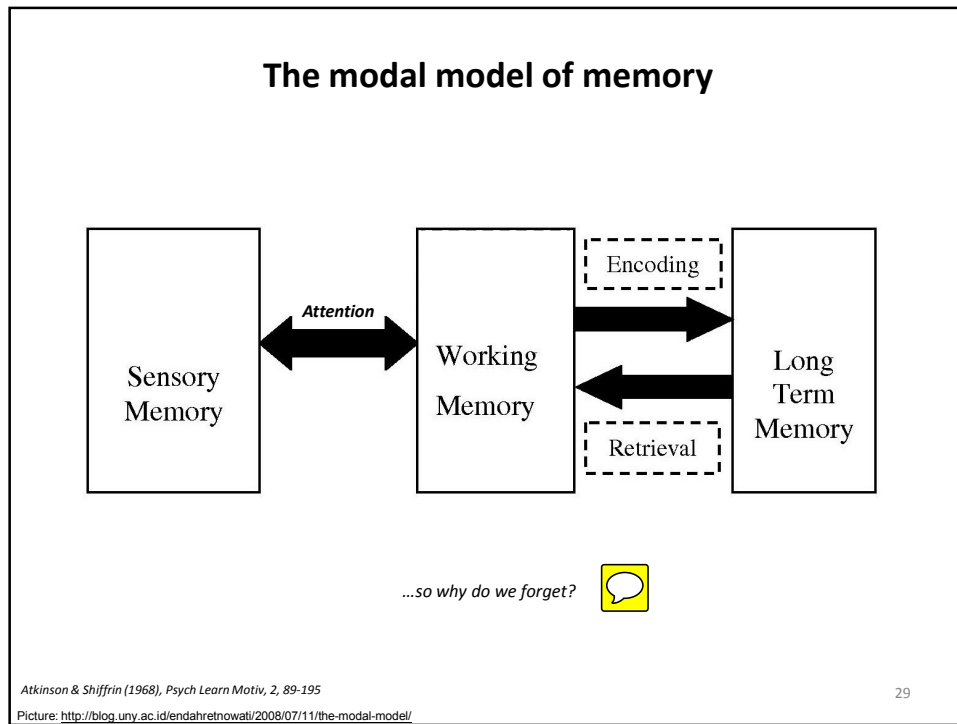
Tip of the tongue phenomenon



I can't remember it right now, but it's on the tips of my tongue...


Image: [http://www.cartoonstock.com/directory/f/forked\\_tongue.asp](http://www.cartoonstock.com/directory/f/forked_tongue.asp)

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## Declarative/explicit memory

- Episodic memory**  
 Flashbulb memories
- Semantic memory**




Picture: <http://travel.nationalgeographic.com/travel/city-guides/las-vegas-nevada/>

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## Non-declarative/implicit memory

- Procedural memory**
- Priming**  
 Stereotypes  
  
 Conditioning (associative learning)



**AVOCADO**      O\_T\_P\_\_

**MYSTERY**

**CLIMATE**      \_L\_M\_TE

**OCTOPUS**

**ASSASSIN**    CH\_\_PI\_N

Picture: <http://www.lolhome.com/funny-picture-9979528220.html>

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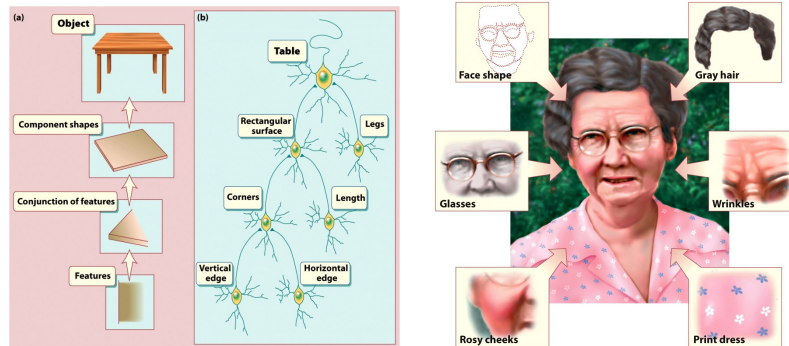
## Representing complex objects at the neural level



**Gnostic hypothesis**  
"Grandmother cells"



**Ensemble coding hypothesis**



Picture: Gazzaniga's Cog Neuro (3<sup>rd</sup> ed)

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## Section summary

There is a well-organized taxonomy of memory and there appears to be distinct brain regions responsible for each type

Strong encoding improves the likelihood that a durable memory will be formed and subsequently retrieved

Long-term memories can be categorized as declarative (episodic and semantic) or non-declarative (procedural, priming and conditioning)



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Next class: Learning and memory (con't)