COLUMBIA UNIVERSITY
IN THE CITY OF NEW YORK

Science of Psychology

PSYW1001 Section 2 MW
8:40-9:55 Fall 2012

Friday, October 26

Language and Thought
(Make-up Lecture)

Announcements

- Pick up your exam today if you haven't already.

- Questions from last lecture?

Language

- How do we learn to communicate?

- Language versus communication
  - Is it the same thing?

Language and Communication

- Language
- The complex structure of human language
  - Phoneme
    - smallest unit of sound
    - Phonological rules
      - Rules for combinations
  - Morpheme
    - Smallest unit of meaning
  - Grammar
    - Rules for meaning
      - Morphological rules
        - » How morphemes can become words
          - » Cat vs. -ed
      - Syntactical rules
        - » How words form phrases

Language and Communication

- Deep structure vs. surface structure
  - surface = wording
    - Grammatical construction
      - The boy jumped over the dog
  - deep = meaning
    - Numerous structures can convey the same meaning
      - The boy jumped over the dog
      - The dog was jumped over by the boy
      - The boy, seeing the dog, jumped over it
      - The dog found itself being jumped over by the boy

Language Milestones

- Video

- Fast mapping
- Telegraphic speech
- Overgeneralize
  - "you eated"

Theories of Language Development

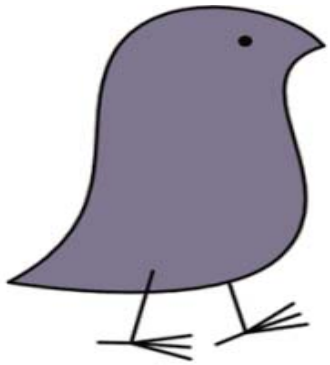
- Behaviorist explanations
  - principles of operant conditioning
  - learn to talk through reinforcement, shaping, and extinction
  - limits:
    (1) parents don't spend much time teaching grammar,
    (2) children generate more grammatical sentences than they hear,
    (3) errors children make do not duplicate what they hear

Theories of Language Development

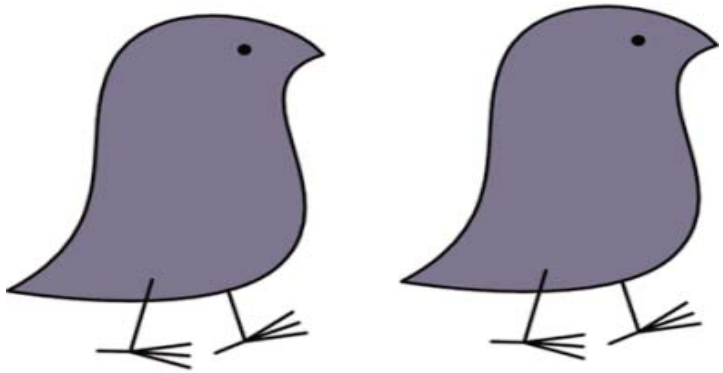
- Nativist explanations
  - language acquisition device (LAD)
  - "wired" to learn grammar
  - genetic dysphasia

    cannot grasp grammar

    "wug" test



This is a wug.



Now there is another one.
There are two of them.
There are two _____.

Theories of Language Development

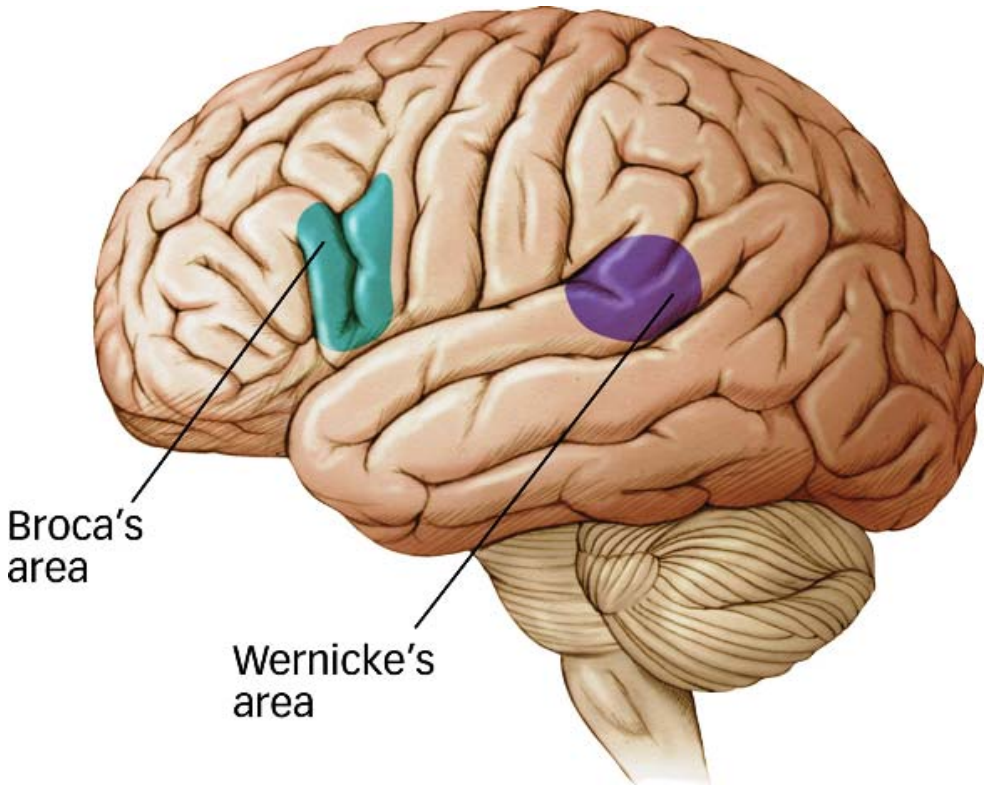
- Interactionist explanations
  - how does innate, biological capacity for language combine with environmental experience?
  - parents tailor verbal interactions with children in ways that simplify language acquisition
  - deaf children NOT taught sign language often develop own system of hand signals
    - Nicaraguan sign language

Theories of Language Development

- Can other species learn human language?
- Washoe taught sign language
  - learned 160 words
  - could construct simple sentences
  - novel constructions
  - can learn signs for concepts they understand (not abstract)

Theories of Language Development

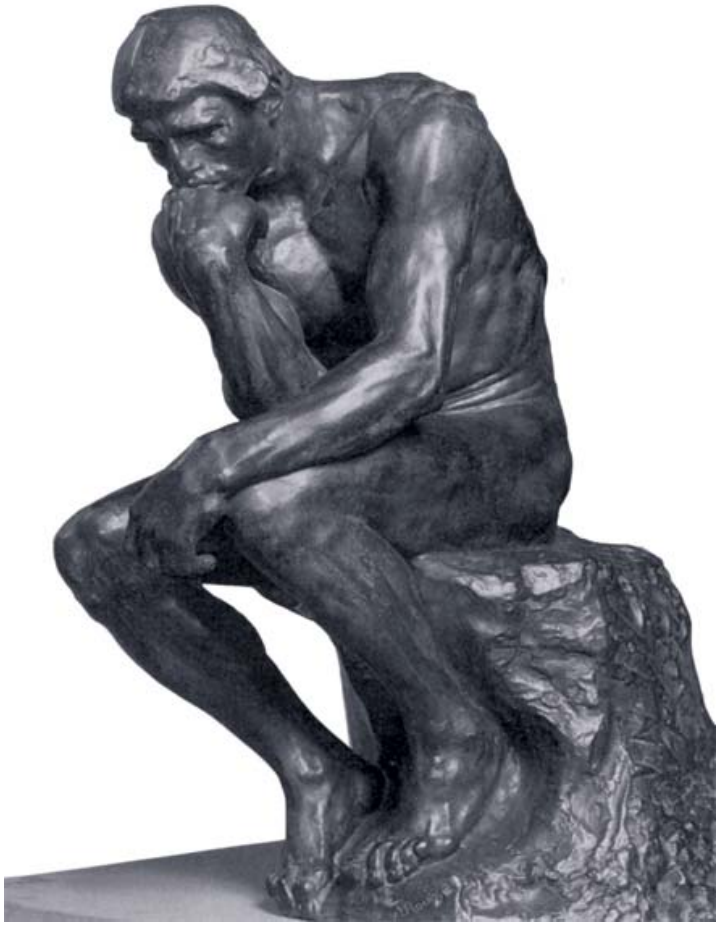
- Neurological specialization
  - Broca's area (involved in language production)
  - Wernicke's area (involved in language comprehension)
  - Aphasia



Language and Thought: How Are They Related?

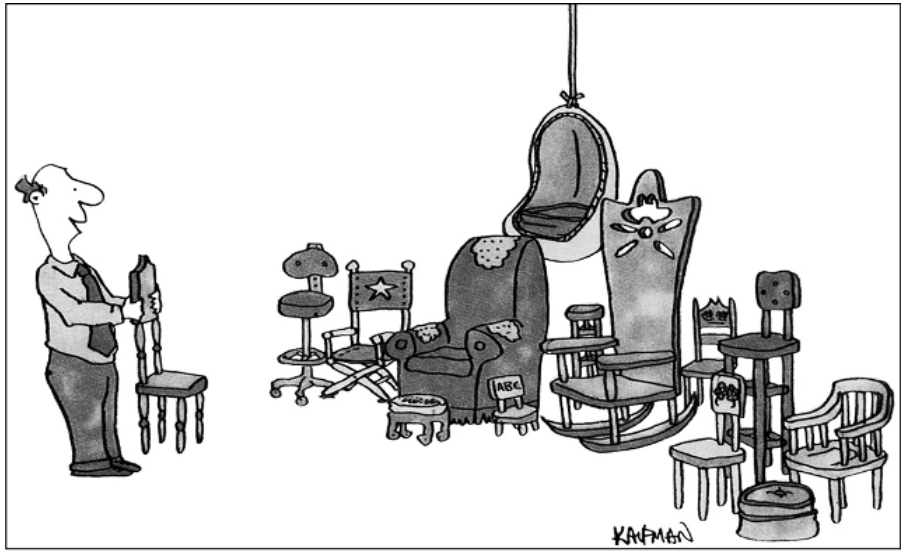
- Linguistic relativity hypothesis
  - Whorf
    - Language shapes the nature of thought
    - Newer studies cast doubt on theory.
- Perception of variations in color
  - differences between languages.
- Perception of time
  - show that spatial displays affect language and thought
  - forward and backward (time is horizontal)
  - up and down (time is vertical)

Cogito ergo sum

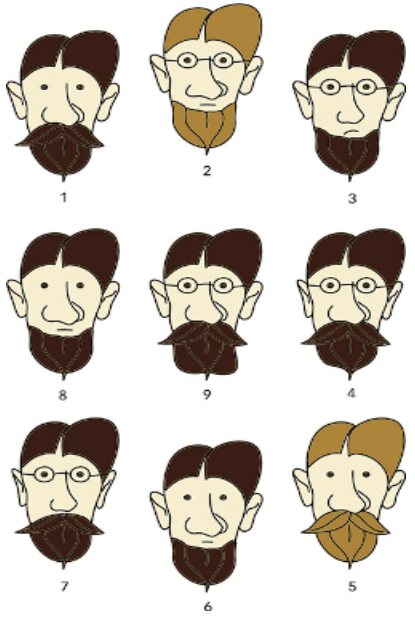


Concepts and Categories

- Nature of human concepts
- Early theories focused on rules
- Later theories focused on "family resemblance"

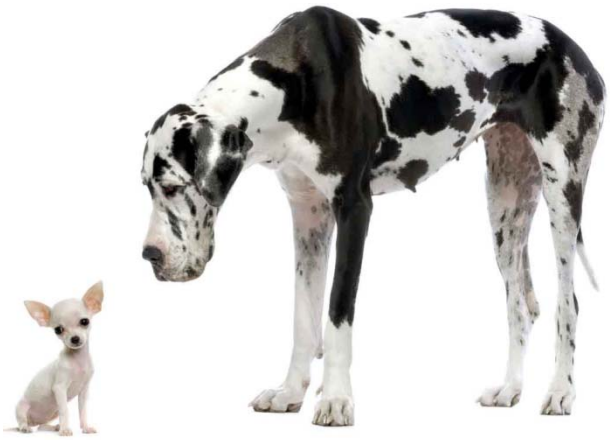


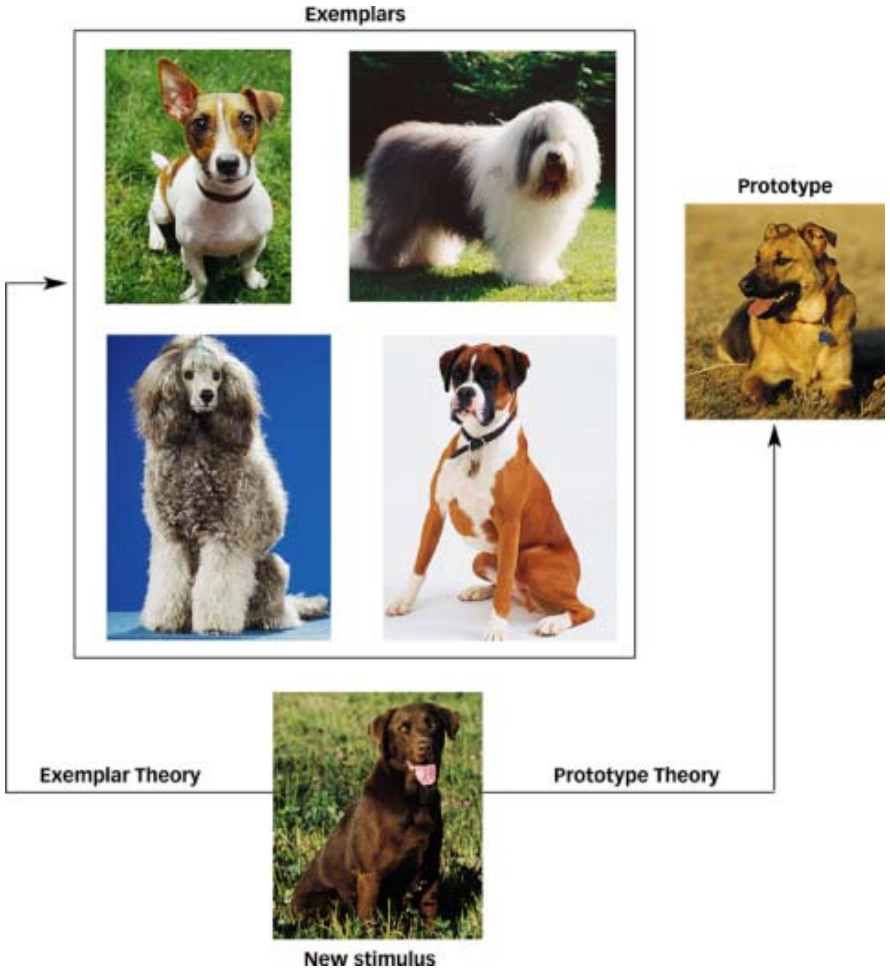
"Attention, everyone! I'd like to introduce the newest member of our family."



Concepts and Categories

- Prototype theory
  - "best" example
- Exemplar theory
  - "specific" example





Concepts and Categories

- Concept
  - fundamental to our ability to think
- Category-specific deficits
  - damage to front part of left temporal lobe—difficulty identifying humans
  - damage to lower left temporal lobe—trouble identifying animals
  - damage where temporal and occipital lobes meet — trouble naming tools

In-Class Demonstration

Think of a number from 1-9.

Subtract five from that number

(this new number could be zero or negative)

Multiply the new number by three.

Square this number.

If you don't have a single digit number, add the digits of this new number until you get a one digit number.

(If you had the number 46, you'd add 4 + 6 to get 10 then add 1 + 0 to get 1)

If this number is less than five, add five, otherwise subtract four.

Multiply by two.

Subtract six.

Map the digit to a letter in the alphabet.

1 = A, 2 = B, 3 = C, etc.

Pick a name of a country that begins with that letter.

Take the second letter of that country's name and think of a mammal that begins with that letter.

Think of the color of that animal.

Availability Heuristic

There are no grey elephants in Denmark!

What would you do?

- Are you a rational person?
  - Consistent in your decisions
  - Make decisions based on conscious evaluation of circumstances
  - Keep to your evaluations in all contexts
  - Make decisions that are immune to whim?

Yeah, sure……

Are we rational?

- We are easily engaged in and led by …
  - framing and other factors
  - confirmation biases
  - "short cuts" in reasoning (e.g., use of heuristics)
- Perhaps being truly rational = making certain trade-offs
  - May in turn cause us to contradict ourselves, be inconsistent, etc.
  - We pay that price because in the long run, it works

What's the trick?

- Denmark is an available "D" country – it easily comes to mind.
- Elephant is an easy "E" mammal – it easily comes to mind.
- And gray elephants are more representative than other-colored pachyderms.

Heuristics

- Heuristic:
  - a 'rule of thumb' for judgment and decision-making
  - it takes into account only a portion of the available evidence
  - it allows for fast and efficient decision-making, but it is vulnerable to error.
- Algorithm:
  - guarantees the correct answer
  - inefficient (computationally expensive)

Availability Heuristic

- A mental shortcut – Items that are more readily available in memory are judged as having occurred more frequently
- According to Tversky and Kahneman (1984):

  "A person is said to employ the availability heuristic whenever he estimates frequency or probability by the ease with which instances or associations could be brought to mind."

Availability Heuristic

- Availability is influenced by many factors
  - Frequency: More frequent = more available.
  - Familiarity: More familiar = more available.
  - Vividness: More vivid = more available.
  - Recency: More recent = more available.
- Are there more words that start with *t* or more words that start with *k*?

Question 1:

- Which causes more deaths in the United States?
  - (A) Shark attack
  - (B) Getting hit by falling airplane parts
- Typically, more people select option (a) over option (b)
- Actual data, however, suggest that one is 30 times more likely to die from being hit by falling airplane parts.

What influenced your choice?

- "I can recall more shark deaths."
- "I read in the newspaper about a terrible shark attack."
- Shark Week!!
- "I cannot recall any instances of a person getting hit by falling airplane parts."
- "I can easily imagine going swimming and getting attacked by a shark."

Availability Heuristic

- Why is it useful?
  - Frequent events are easily brought to mind

- Why is it sometimes misleading?

  Factors other than frequency can affect ease of remembering:
  - Ease of Retrieval (shark vs. airplane parts)
  - Recency of the example (advertisement, news)
  - Familiarity

Representative Heuristic

- Classifying something based on how similar you perceive it to be to the typical case or category
- A mental shortcut that involves making a probability judgment by comparing an object or event to a prototype.
- What is more similar, or more representative, to the object or category is the correct answer

Representative heuristic

- Example -- Where is this guy from?
  - Texas
  - Canada
  - NYC
  - Boston

Representative Heuristic

- Categories are a great way to make sense of things. When it comes to strangers, your first instinct is to fit them into archetypes to quickly determine their value or threat.
- But…some implications of representativeness:
  - Stereotypes. If something you see is representative of a stereotype you are more likely to notice it and add it as evidence

Representative Heuristic

- People ignore the probability of an event, basing their judgments on similarities to categories.
- Which is a more likely outcome of flipping a fair coin six times in a row:
  - H H H T T T
  - H H T H T T
- Most people pick the second because it looks more random. Of course, they're equal.

Anchoring Heuristic

Half the class

Q1. Was Leonardo da Vinci born before or after 1698 AD?

Q2. What year was Leonardo da Vinci born?

Half the class

Q1. Was Leonardo da Vinci born before or after 1391 AD?

Q2. What year was Leonardo da Vinci born?

Anchoring Effect

- Group 1:

  Q1. Was Leonardo da Vinci born before or after 1698 AD?

- Group 2:

  Q1. Was Leonardo da Vinci born before or after 1391 AD?

Anchoring and Adjustment

- A mental shortcut – using a rough estimation as a starting point, and then adjusting this estimate to take into account unique characteristics of the current situation.
- People tend to start from the first part of the problem (the anchor) and then adjust from there.
- Practical application: price bargaining, pay more if price is initially high and is brought down than starting at a lower price and trying to move up.

Framing the Epidemic

Imagine that the United States is preparing for the outbreak of an unusual Asian disease, which is expected to kill **600** people. Two alternative programs to combat the disease have been proposed. The exact scientific estimates of the consequences of the programs are as follows:

Which program do you favor?

*Imagine that the United States is preparing for the outbreak of an unusual Asian disease, which is expected to kill **600** people. Two alternative programs to combat the disease have been proposed. The exact scientific estimates of the consequences of the programs are as follows:*

- **Program A**: 400 people will die.
- **Program B**: There is a 1/3 probability that nobody will die and a 2/3 probability that 600 people will die.

Which program do you favor?

*Imagine that the United States is preparing for the outbreak of an unusual Asian disease, which is expected to kill **600** people. Two alternative programs to combat the disease have been proposed. The exact scientific estimates of the consequences of the programs are as follows:*

- **Program A**: 200 people will be saved.
- **Program B**: There is a 1/3 probability that 600 people will be saved and a 2/3 probability that no one will be saved.

Which program do you favor?

- Group 1
  - Program A: 400 people will die.
  - Program B: there is a 1/3 probability that nobody will die and a 2/3 probability that 600 people will die.
- Group 2
  - Program A: 200 people will be saved.
  - Program B: there is a one-third probability that 600 people will be saved and a two-thirds probability that no people will be saved.

So what's going on here?

- Group 1
  - Program A: 400 people will die.
  - Program B: there is a 1/3 probability that nobody will die and a 2/3 probability that 600 people will die.
- Group 2
  - Program A: 200 people will be saved.
  - Program B: there is a one-third probability that 600 people will be saved and a two-thirds probability that no people will be saved.

So what's going on here?

- Group 1 **(LOSS FRAME)**
  - Program A: 400 people will die.
  - Program B: there is a 1/3 probability that nobody will die and a 2/3 probability that 600 people will die.
- Group 2 **(GAIN FRAME)**
  - Program A: 200 people will be saved.
  - Program B: there is a one-third probability that 600 people will be saved and a two-thirds probability that no people will be saved.

So what's going on here?

- Framing Effect: When people give different answers to the same problem depending on how the problem is phrased (or framed)
- On a scale of 1 - 7 (one is not dangerous), rate how dangerous each is:
  - 10% of the people who eat a new kind of sushi will die.
  - 90% of the people who eat a new kind of sushi will live.
  - In Decision 1, Program A necessarily involves a loss, so worth gambling on Program B

Framing effects

- Risk aversion: When presented with gain options (pick small but certain gain over large but uncertain one)
- Risk seeking: When presented with potential losses (choose large, uncertain loss rather than smaller, certain loss.

Sunk Cost Fallacy:

- People make decisions about a current situation based on what they have previously invested in the situation.

Imagine you go to a play and the first act is terrible. You paid $80 for a pair of tickets and waited in line for 2 hours to get them. Do you leave at intermission?

Imagine you go to a play and the first act is terrible. Your mother gave you the tickets after discovering that she and your father couldn't make it to the show that night. Do you leave at intermission?

Expected Utility

- Would you bet $2 that a coin toss will be heads, or would you rather have .90c without a coin toss?
  - What about betting $20,000 on heads, or getting a guaranteed $9,000?
  - Depends on your wealth
    - If you have an annual income of $50,000,000 then $20K might not seem like that big of a deal
    - (I'll take the $9K!!)
- Utility
  - What's it worth to you?

Study Questions

- What is the difference between language and communication? Give examples that differentiate these two concepts.
- Describe the structure of human language. Include things like morpheme, phonemes, grammar and syntax, as well as anything else you can think of.
- What is the difference between deep and surface structure of language? Give an example of each.
- From the video in class: what does Pinker use as support for his nativist view of language development?
- Define and explain some of the characteristics of language development including fast-mapping, over-generalization, and telegraphic speech.
- How would a behaviorist explain why and how we learn language? Give evidence for an against this theory.
- How would a nativist explain why and how we learn language? Give evidence for and against this theory.
- Explain how the interactionist theory combines elements from the two previous theories.
- Can non-human animals learn language?
- What is a concept? Explain how category-specific deficits supports the theory of concepts.
- Explain how you would recognize a dog according to the prototype theory and according to the exemplar theory.
- There are several biases associated with the decision-making process. These include cognitive heuristics, such as availability, and representativeness Describe each of these, including how they operate and how they can sometimes lead us astray.
- Are there any cognitive advantages associated with these biases? What are they?
- Using an example, describe how the framing effect influences decision-making.
- Why is the sunk-cost fallacy considered an example of the framing effect? Give an example.
- Describe the anchoring effect. What are some practical implications of the anchoring effect?
- Generally speaking, humans excel on cognitive tasks that involve frequency, but perform poorly on cognitive tasks that involve probability. Use the examples from lecture to describe this phenomenon.