9.00 Introduction to Psychology
Prof. Steven Pinker
Week 2, Lecture 2: Major Approaches to the Mind III, Cognitive Neuroscience

Major Approaches to the Mind, Part III

The Cognitive Neuroscience Approach

Can There be a Science of Mind?

- The indispensibility of the mental causes of behavior ("folk psychology")

One Solution: Dualism

- Descartes: Two kinds of stuff in the universe: matter & mind (souls)
- Animals & human bodies = machines; mind = something else
- "The ghost in the machine."
- The soul:
  - Immaterial entity
  - Injected into the fertilized ovum at conception
  - Causes behavior without being caused by anything
  - Leaks out after death

Problems for Dualism

- Two problems for the soul:
  - 1. How does it interact with matter?

Problems for Dualism, cont.

- 2. Why is it so tightly tied to the physical details of the brain?
  - Electrical
  - Chemical
  - Surgery
  - Stroke
  - Life and death of body = life and death of soul
  - Complexity

Components of the Cognitive Neuroscience Approach

- 1. The Brain.
- 2. Computation.
- 3. Evolution.

1. The Brain

- The mind is what the brain does.
- How can you study *human* brains?
- An example: language in the left hemisphere.

Ways of Showing that Language is in the Left Hemisphere

- (*The Language Instinct*, pp. 299-302)
  1. Neuropsychological syndromes (e.g., aphasia)

Ways of Showing that Language is in the Left Hemisphere, cont.

1. Neuropsychological syndromes (e.g., aphasia)
2. Dichoptic and Dichotic presentation

grape + lamp

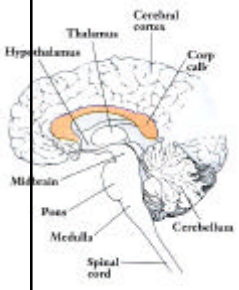
Ways of Showing that Language is in the Left Hemisphere, cont.

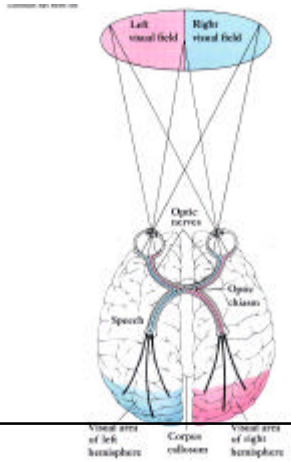
1. Neuropsychological syndromes (e.g., aphasia)
2. Dichoptic and Dichotic presentation
3. Dual-task interference (shadowing & tapping)

If a person is asked to shadow someone else's speech (repeat it as the talker is talking), and also asked to tap a finger of the right or the left hand, the person has a harder time tapping with the right finger than with the left, because the right finger competes with language for the resources of the left hemisphere.

Ways of Showing that Language is in the Left Hemisphere, cont.

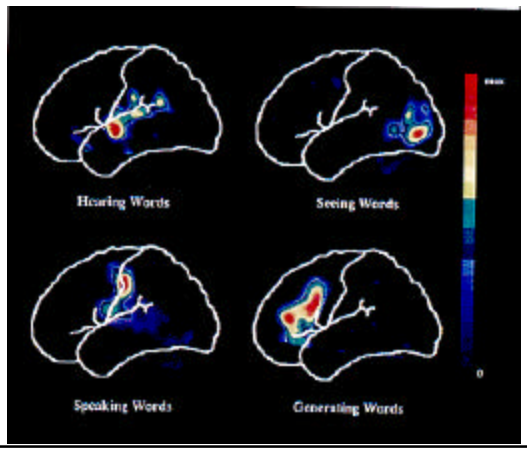
1. Neuropsychological syndromes (e.g., aphasia)
2. Dichoptic and Dichotic presentation
3. Dual-task interference (shadowing & tapping)
4. Split-brain patients





Ways of Showing that Language is in the Left Hemisphere, cont.

1. Neuropsychological syndromes (e.g., aphasia)
2. Dichoptic and Dichotic presentation
3. Dual-task interference (shadowing & tapping)
4. Split-brain patients
5. Sodium amytal
6. Disruptive electrical stimulation
7. Neuroimaging: PET (Positron Emission Tomography) & fMri (Functional MRI)



2. Cognition as Neural Computation

- Thinking is computation (in the case of humans, by neurons).
- Cognition (language, memory, thinking, perception) is a form of neural *information-processing* or *computation.*
- Beliefs are data structures; desires are feedback loops.
- Computational theory of mind does not equal "Computer metaphor."

How Can You Study Mental Computation?

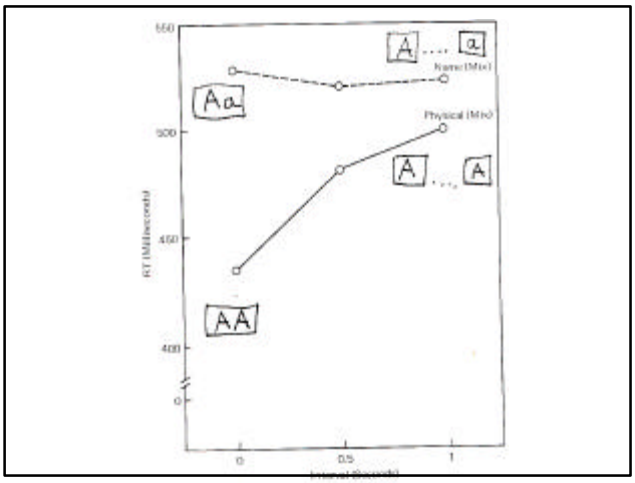
- A study of the mind's data structures (*How the Mind Works*, p. 89.):
  - Michael Posner's experiment on "mental codes."

b + A

A + a

A + A

Design of Posner's Experiment:

- Same (both *a*) or Different (*a* and *b*)
- Same physically (A A) or same name (A a)
- Simultaneous or successive (delay)

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