Today

- Intro to Psycholinguistics
- Language and the brain
- Aphasia

What is psycholinguistics?

- The study of language and the brain
- Seeks to understand how language is represented and processed using experimental methods

The Brain

The Brain

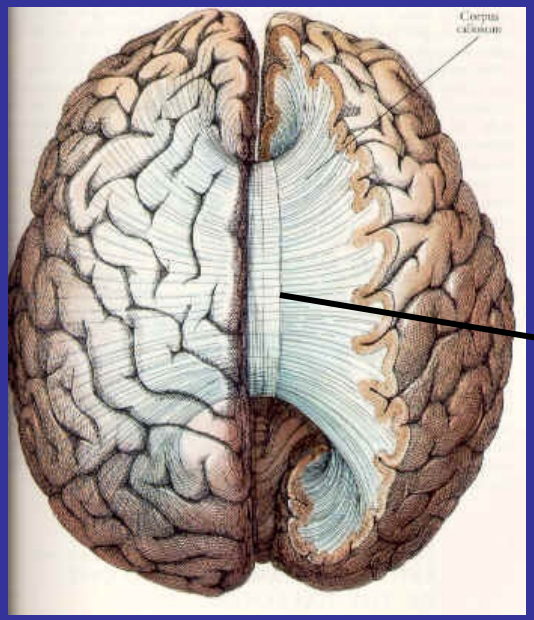
- Divided into two hemispheres: the **left** and **right hemispheres**

Front

Left hemi

Right hemi

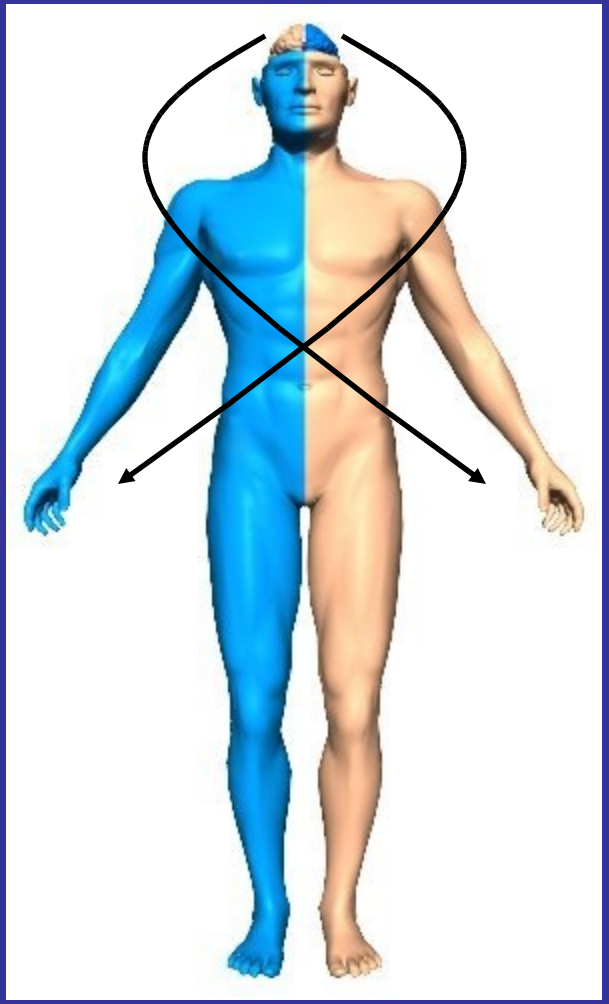
- The hemispheres are connected by bundle of nerve fibers: the **corpus callosum**



Corpus callosum

The Brain

- **<u>Contralateral control</u>**: Each hemisphere controls opposite side of body
  - Left hemisphere controls right side of body
  - Right hemisphere controls left side of body



The Brain

- **Lateralization**: the brain is asymmetrical such that each hemisphere is specialized for certain cognitive functions

Lateralization

- **Left hemisphere**:
  - Analytical processing (analyzing information)
  - **Language**, speech sounds
  - Mathematics
  - Temporal relations
  - Intellectual reasoning

Lateralization

- **Right hemisphere**:
  - Holistic processing (recognizing overall patterns, e.g., face recognition)
  - Nonspeech sounds
  - Music (in musically naïve individuals)
  - Visual-spatial skills
  - Emotional reactions

- How do we know this?

Experimental evidence

Split-Brain patients

- Corpus callosum is severed (used to treat cases of epilepsy)
- Two hemispheres cannot communicate with each other

Clip from "*Pieces of Mind: The Man with Two Brains*"

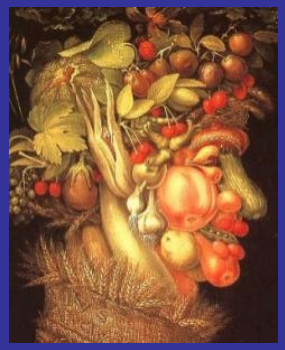
Transcript available at:
http://www.pbs.org/saf/transcripts/transcript703.htm

Split-Brain patients

Left Right

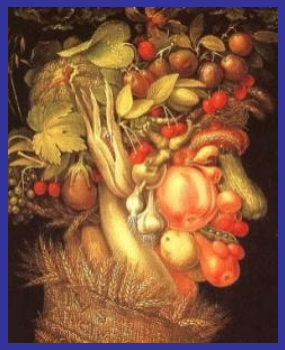
corpus callosum

Hemisphere Hemisphere



‘face’

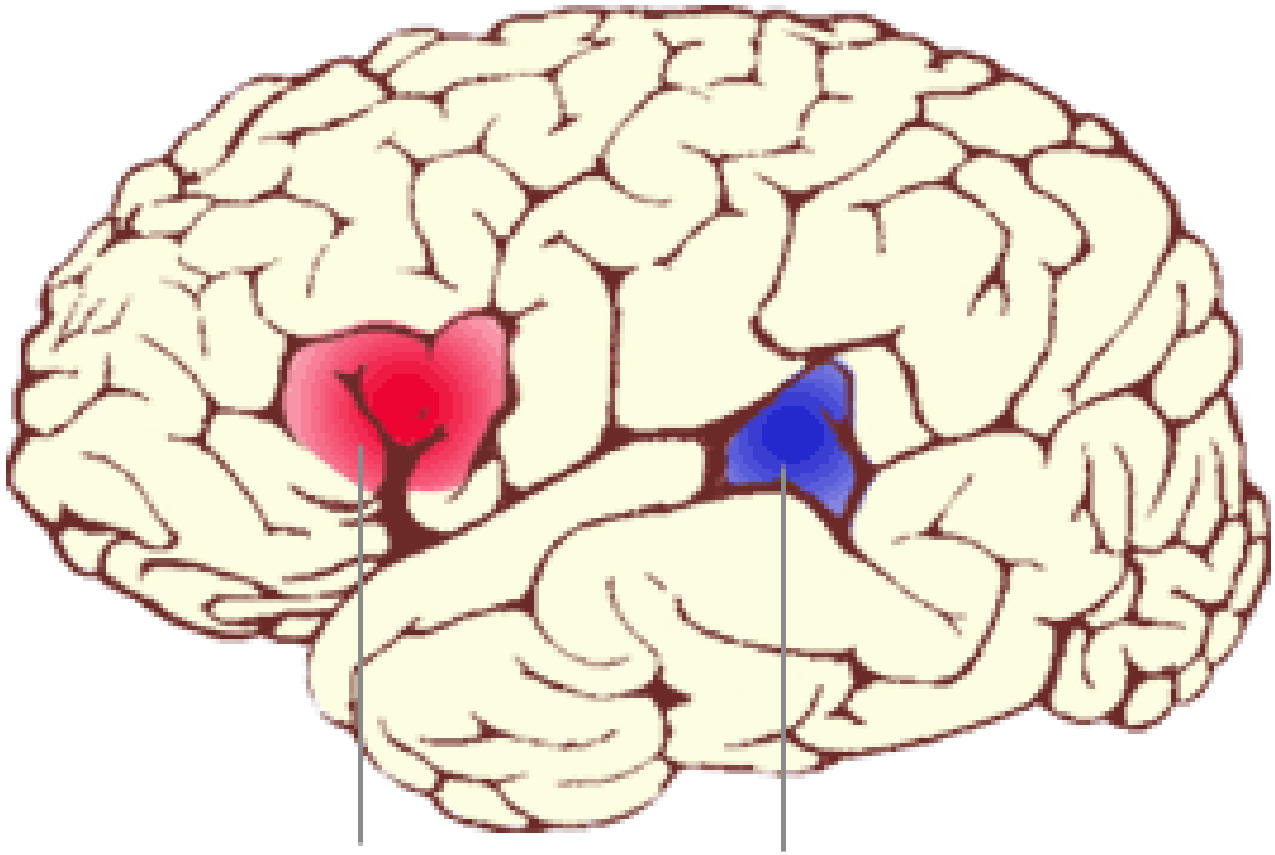
Eye Eye



‘fruit’

Left hemisphere: Language

- **Aphasia**:
  - Any language deficit caused by damage to the brain (e.g., bullet, stroke, infection, etc.)
  - Aphasia almost *always* caused by **left hemisphere** damage



Broca's area Wernicke's area

Left hemisphere: Language

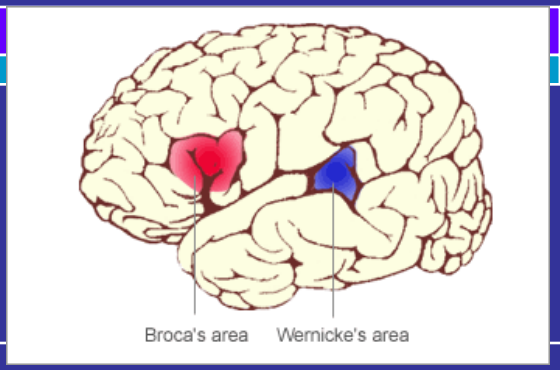
- **Broca's area**:

  organizes articulatory patterns of language; also controls use of inflectional, function morphemes

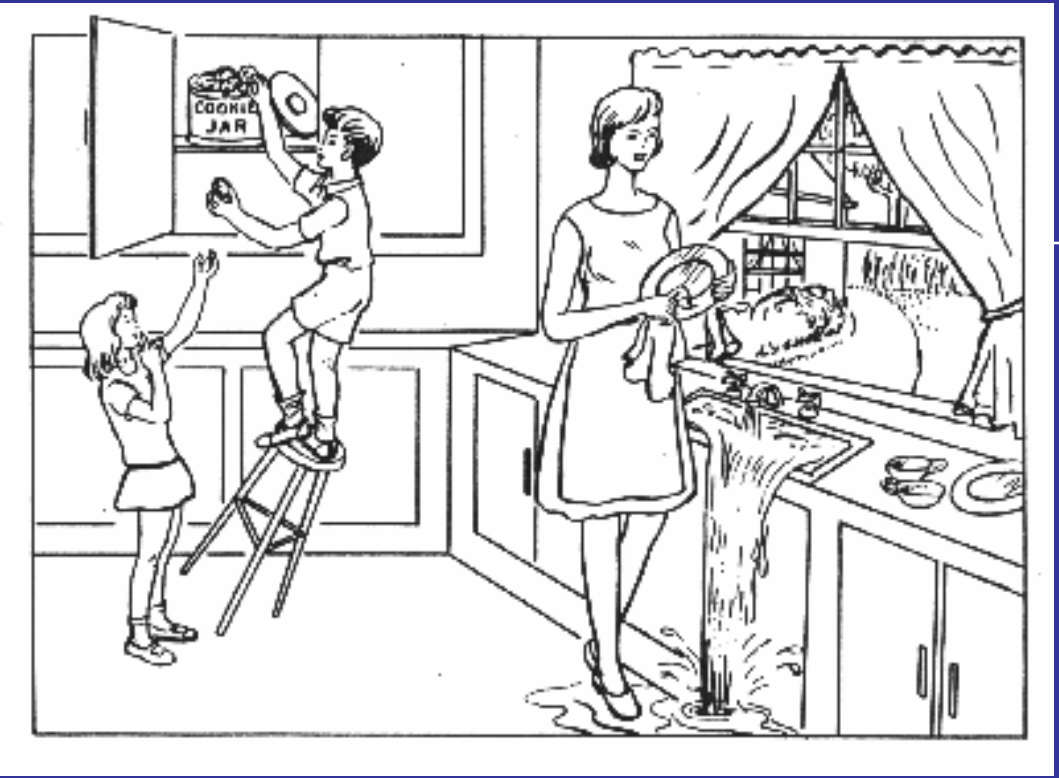
- **Wernicke's area**:

  involved in comprehension and selection of words from mental lexicon

Broca's aphasia

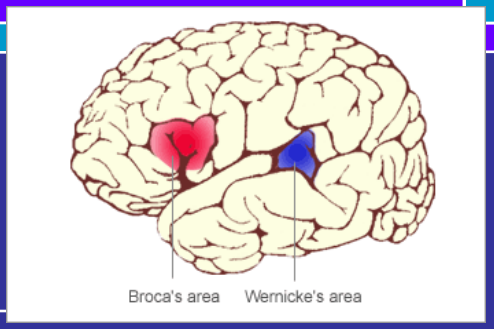


- Labored, halting speech
- Lack of inflections and function morphemes
- Comprehension is generally good

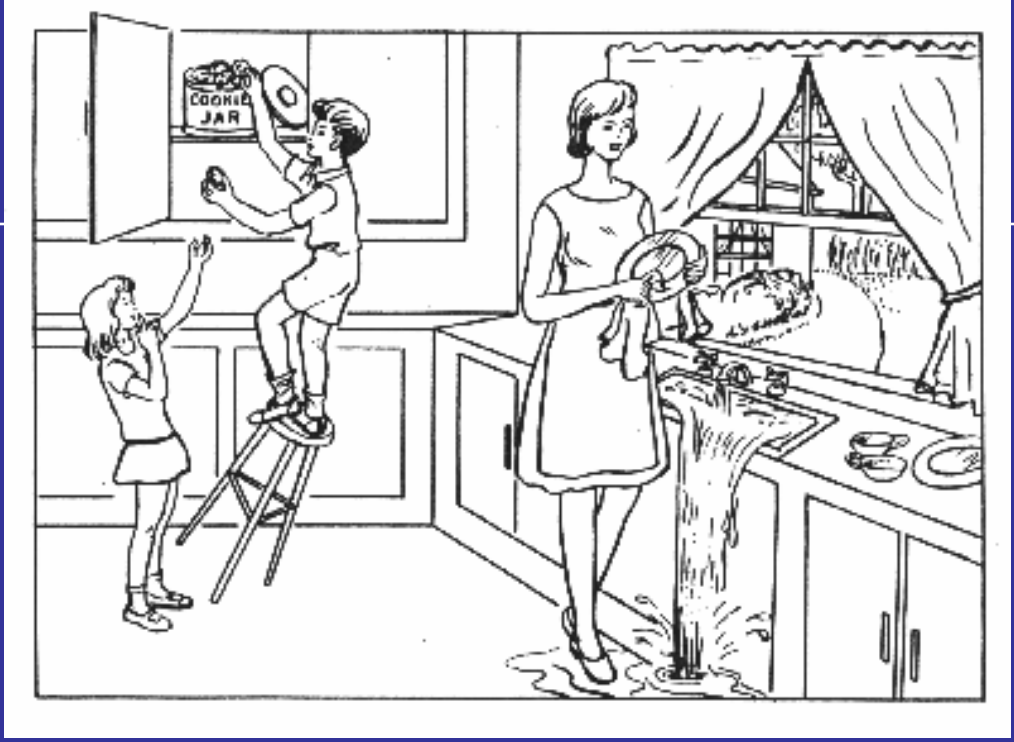


"Cookie jar… over … chair… water… empty…ov…ov…[Examiner: 'overflow'?] Yeah."

Wernicke's aphasia



- Speech is fluent (i.e., can use function words, inflections) but semantically incoherent
- Lexical errors, nonsense words, circumlocutions
- Comprehension is poor



“Well, this is…mother is away here working out o’here to get her better, but when she’s working, the two kids looking in the other part. One their small tile into her time here. She’s working another time because she’s getting, too.”

(trying to name a ‘knife’):

“That’s a resh. Sometimes I get one around here that I can cut a couple of regs. There’s no rugs around here and nothing cut right. But that’s a rug, and I had some nice rekebz. I wish I had one now. Say how Wishi idaw, uh windy, look how windy. It’s really window, isn’t it?”

Aphasia in ASL users

- Broca's: sign slowly, omit inflections
- Wernicke's: sign fluently but confusingly, show comprehension problems

More on aphasias:

http://en.wikipedia.org/wiki/Aphasia#Types_of_aphasia

Lateralization and Modality

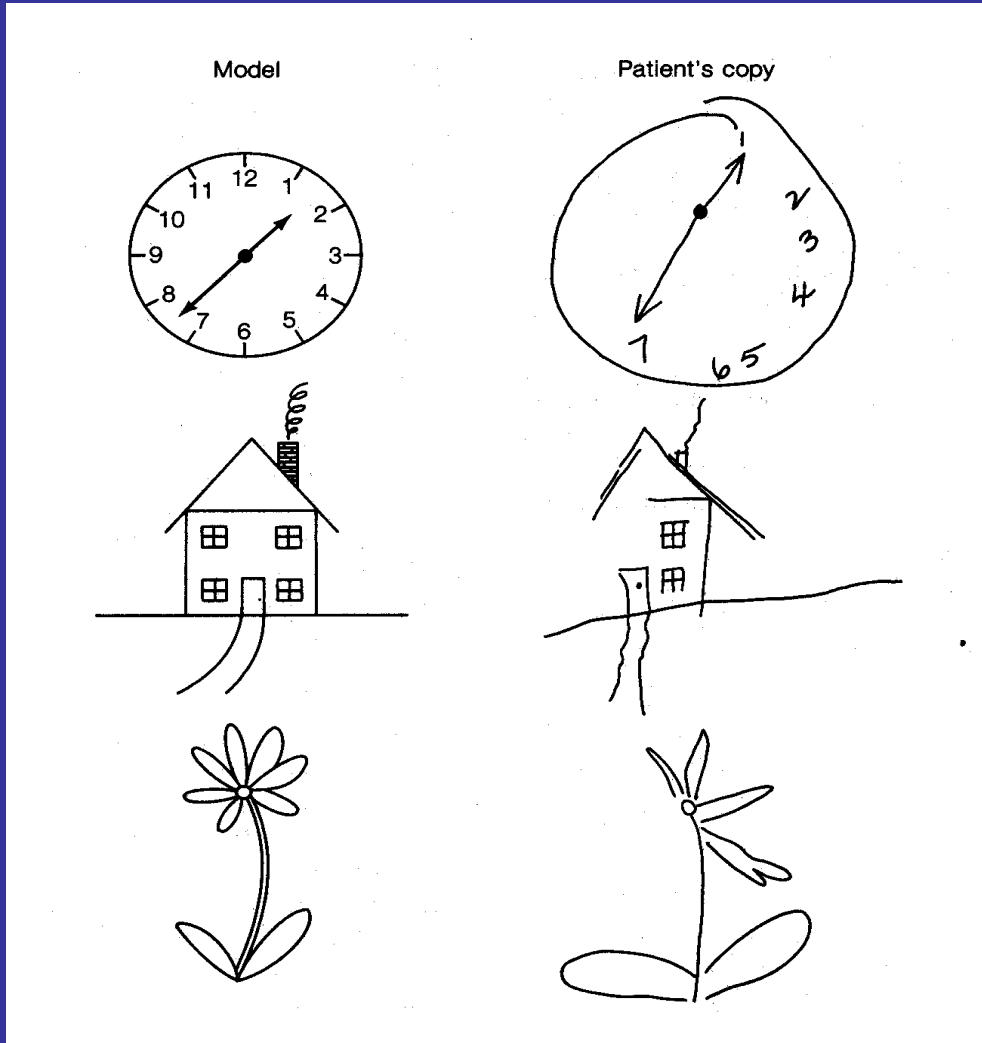
- Left hemisphere specialization for language *independent of modality used to communicate*

What happens with right hemisphere damage?

Left Neglect

- Results from right hemisphere damage
- Affected patients neglect left side of visual field, of body
- Impaired spatial understanding and recognition/use of facial expressions

Left Neglect



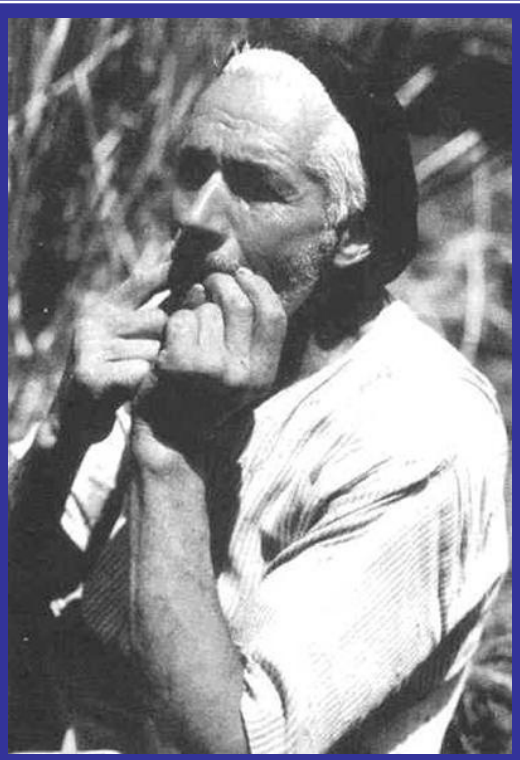
ASL and Left Neglect

- ASL users with left neglect can use left side of body and use facial expressions *solely for signing ASL syntax*

- Demonstrates abstractness of language and its independence from the modality in which it is expressed.

Whistling language

- Silbo Gomero (Spanish) in Canary Islands
- Used to communicate over long distances



http://admin.urel.washington.edu/uweek/archives/issue/uweek_story_sn

Domingo está enfermo.

‘Domingo is sick.’

Juan ordéñame las cabras.

‘John milks the goats.’

- Hey, Servando! 
- What?
- Look, go tell Julio to bring the castanets.
- OK.
- Hey, Julio!
- What?
- Lili says you should go get the kids and have them bring the castanets for the party.
- OK.OK.OK.

- ¡Servando!
- ¿Qué?
- Mira, dile a Julio que vaya y que traiga las chácaras.
- Ya voy.
- ¡Julio!
- ¿Qué?
- Que dice Lili que avises a los muchachos y que traigan las chácaras para la fiesta.
- Bueno, bueno, bueno.

http://www.agulo.net/silbo/silbo.mp3

- Whistled speech activates left hemisphere
  - See also Drum languages, Tone languages
- Demonstrates abstractness of language and its independence from the modality in which it is expressed.