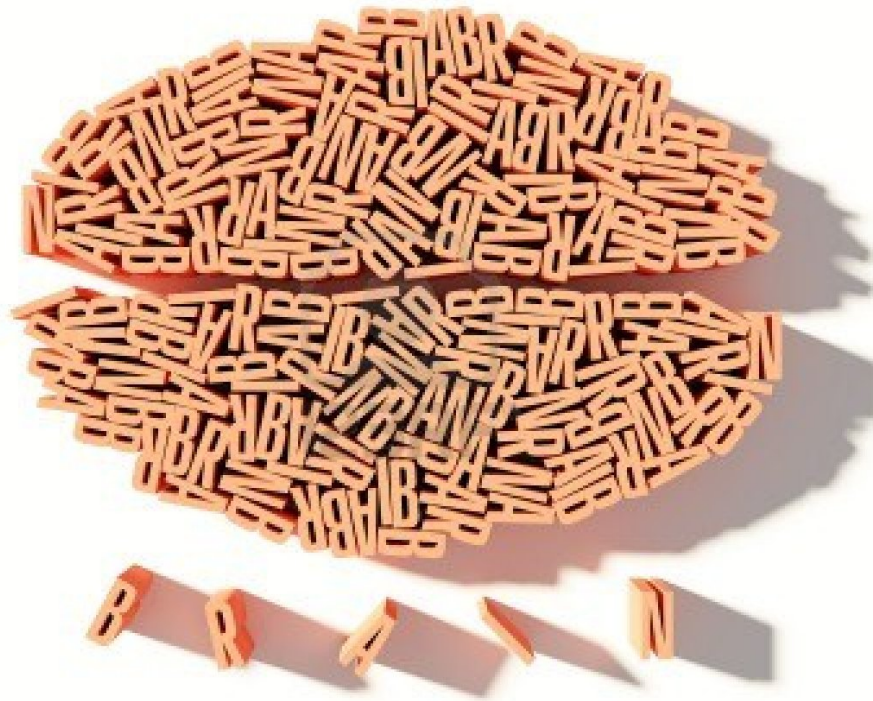





Language and the Brain


Neurolinguistics






“If the human mind were simple enough for us to understand, we would be too simple-minded to understand it.”

Anonymous

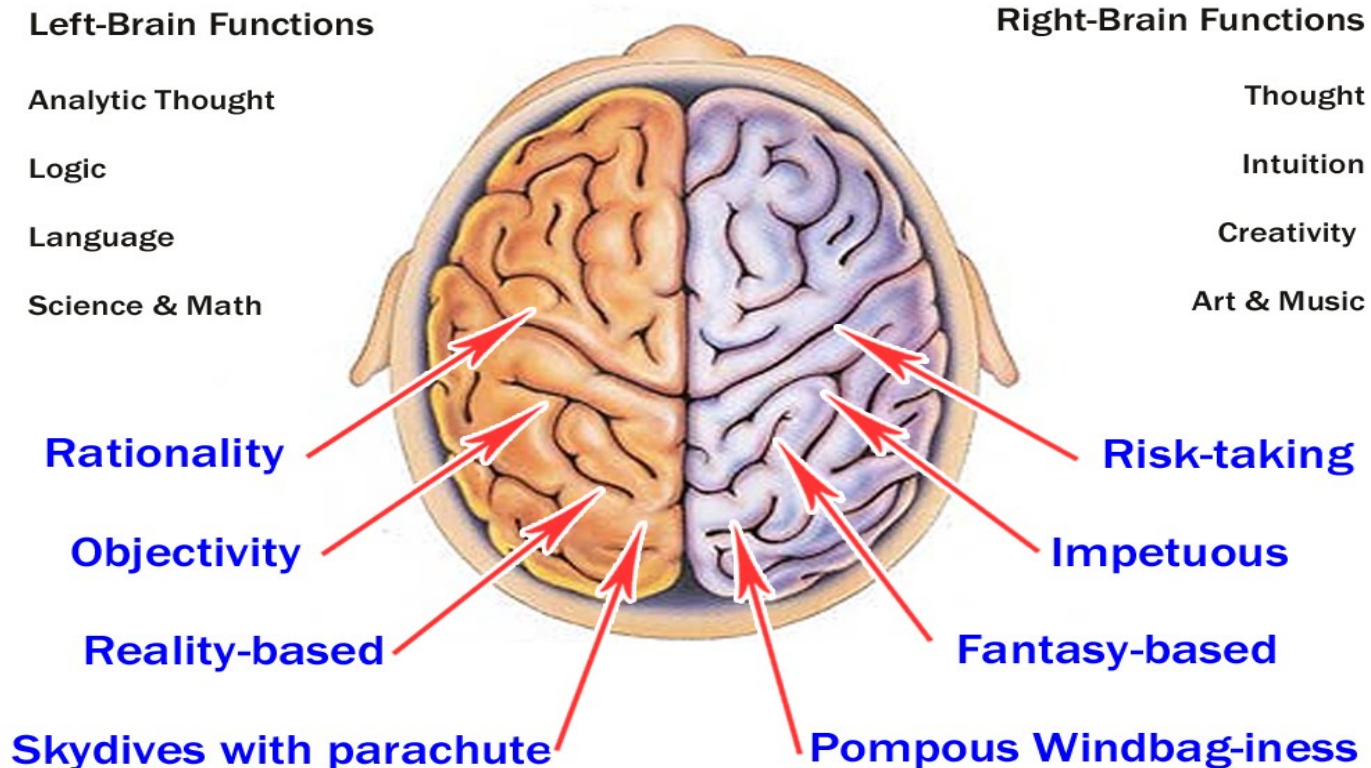
- 
- Neurolinguistics is the study of the relationship between language and the brain

- 
- Many discoveries were made about the specific parts of the brain that are related to language functions.

Left hemisphere

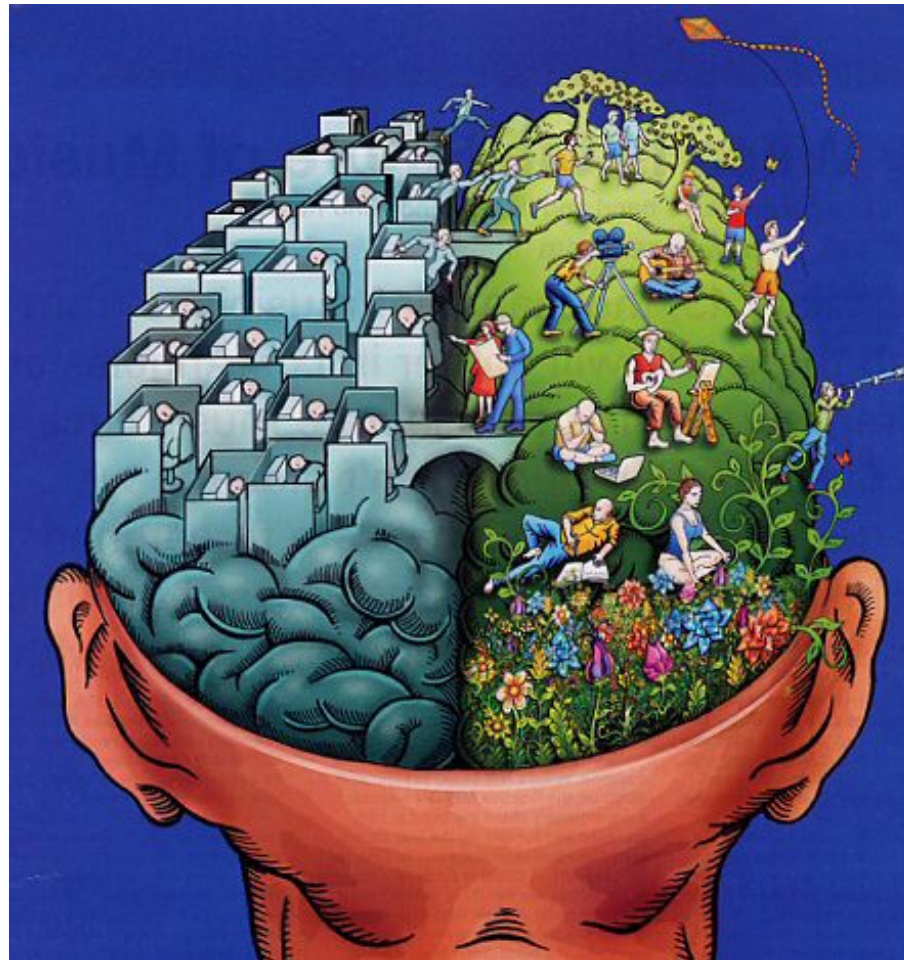
Right Hemisphere

Left and Right Brain Functions

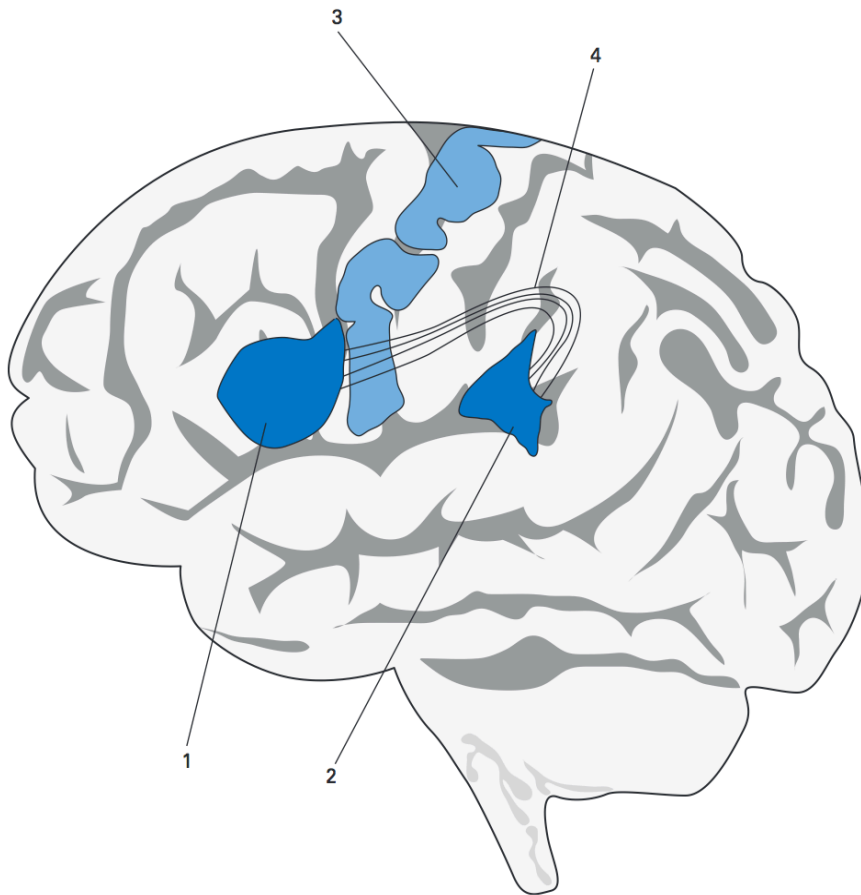


Left hemisphere

Right Hemisphere



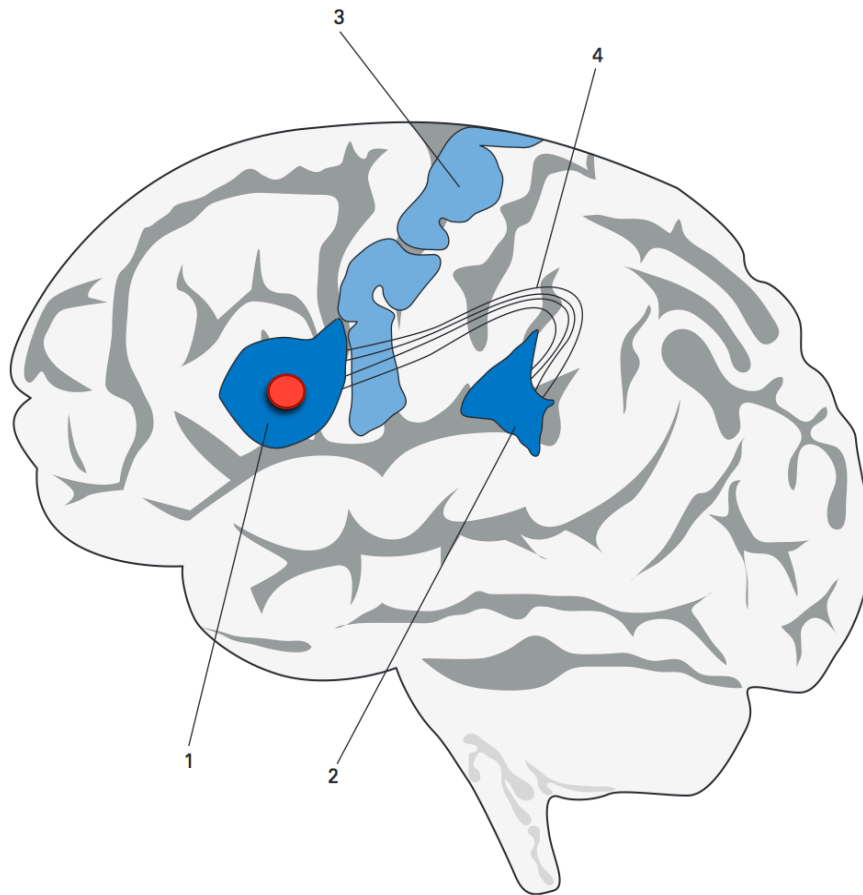
Left hemisphere



The General locations of those language functions involved in speaking and listening

Figure 12.1

Broca's Area



- Anterior speech cortex
- Paul Broca reported in the 1860s that damage to this specific “left” part of the brain was related to extreme difficulty in producing speech.

Figure 12.1

Wernick's Area

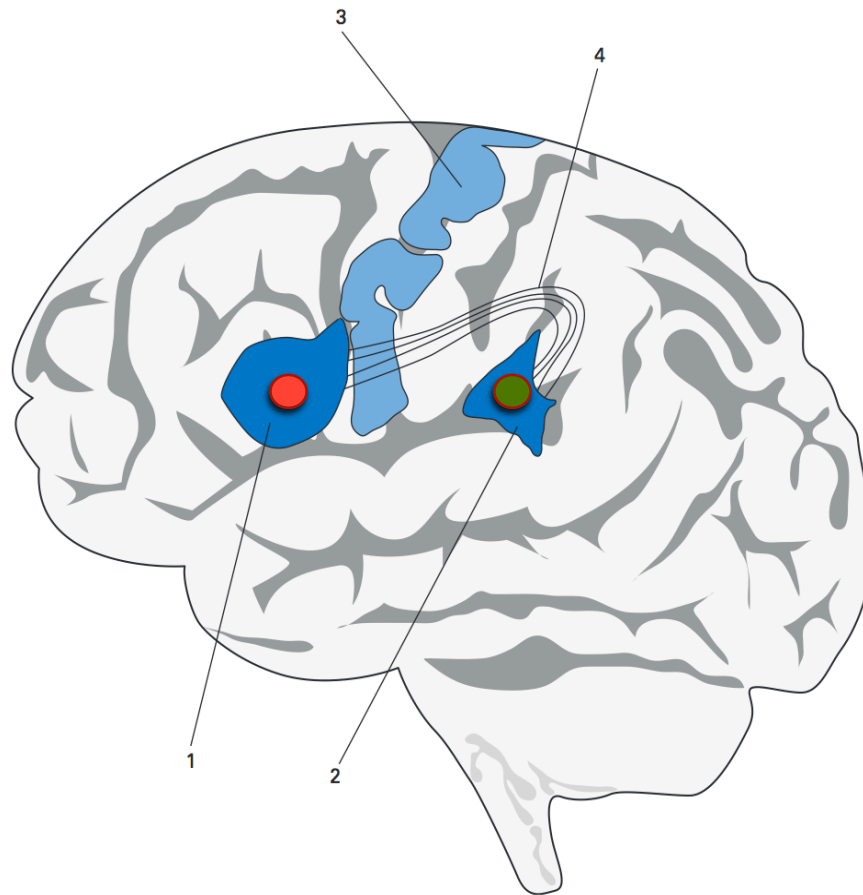
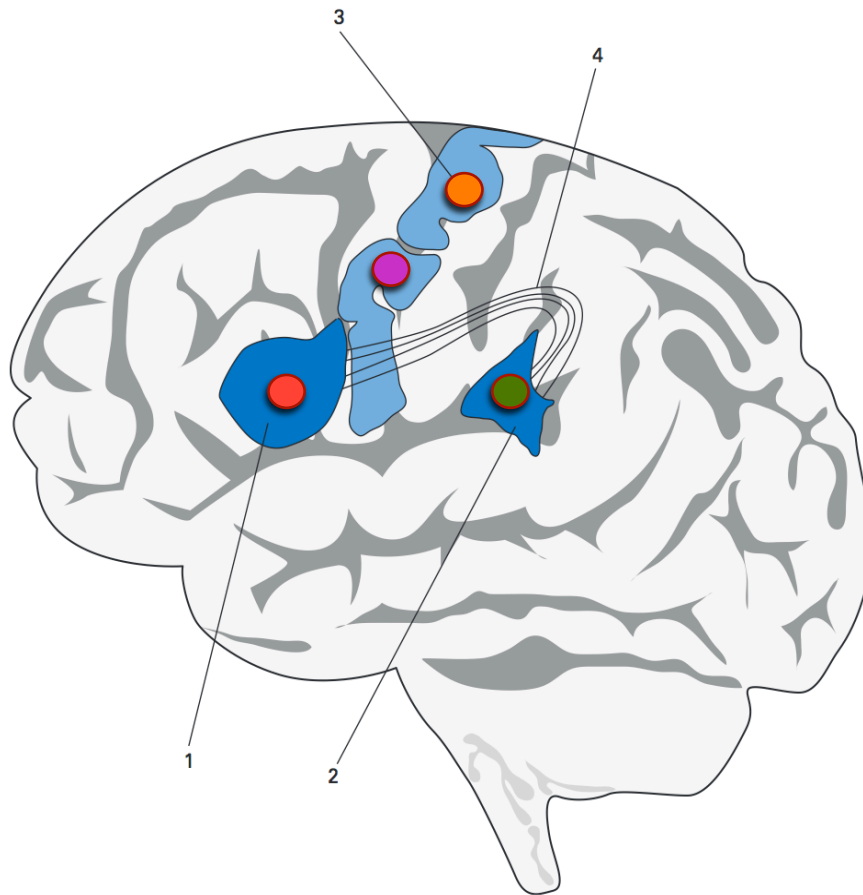


Figure 12.1

- Posterior speech cortex
- Carl Wernick reported in the 1870s that damage to this specific part of the brain was found among patients who had speech comprehension difficulties.

The motor Cortex

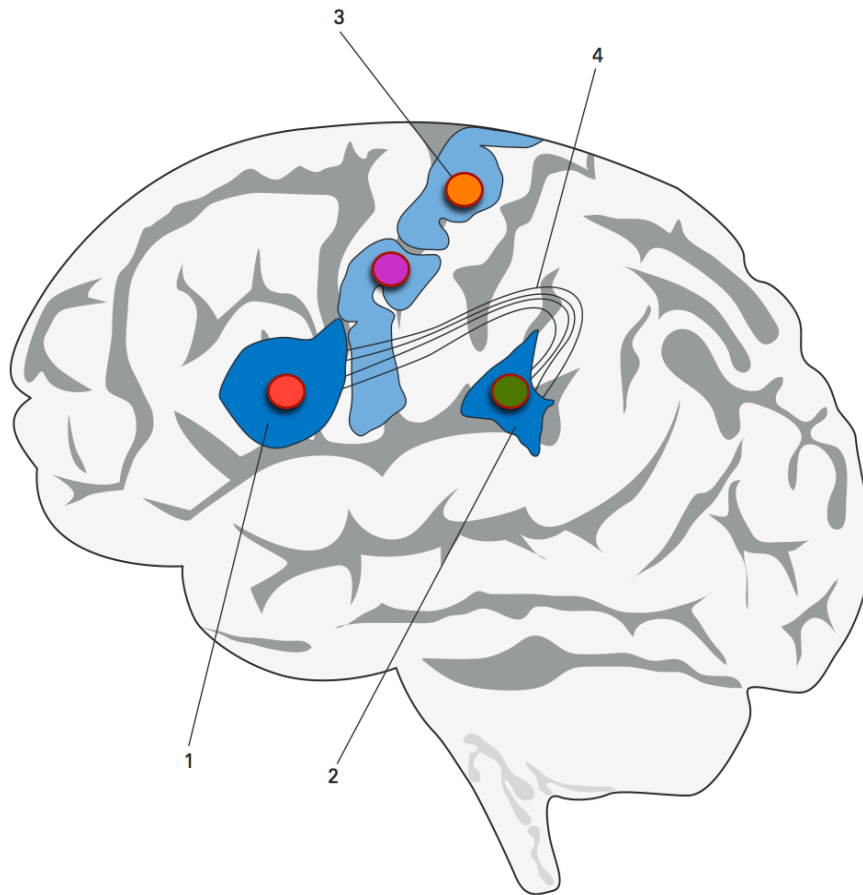


➔ Motor cortex: an area that controls movements of the muscles (hands, feet, arms, etc.)

➔ Motor cortex: an area that controls the articulatory muscles (face, jaw, tongue, and larynx)

Figure 12.1

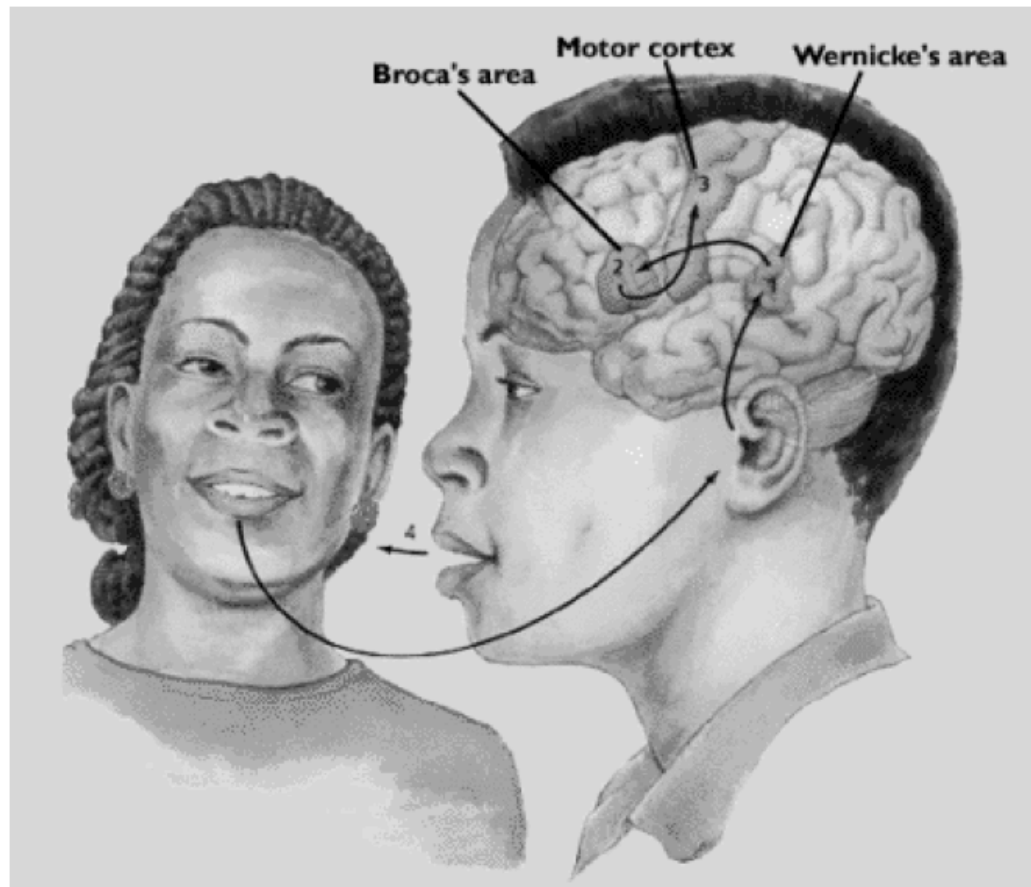
The arcuate fasciculus



- A number of nerve fibers
- They form the connection between Wernick's and Broca's areas

Figure 12.1

The localization view



The localization view

Specific aspects of language ability can be accorded to specific locations in the brain

The localization view

The brain activity involved in

Hearing the word → understanding
it → saying it

Would follow a definite pattern

The localization view

1 Wernicke's area →

2 arcuate fasciculus →

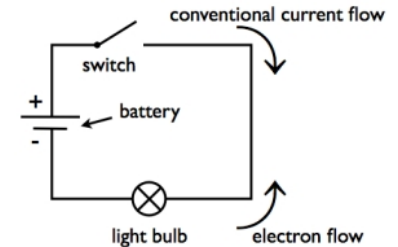
3 Broca's area →

4 motor cortex

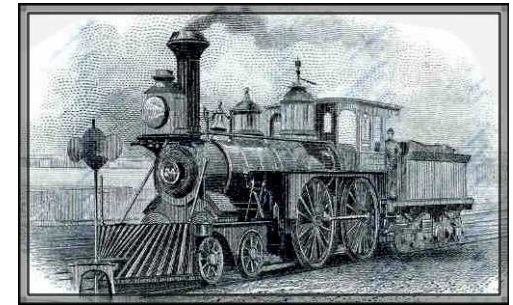
Oversimplified
version of
what may
actually
take place

It is best to think of processing as a some form of **metaphor**:

1- **The pathway metaphor**: the process of sending signals through electronic circuits.



2- **The steam engine metaphor**: by Sigmund Freud
The effect of repression of “building the pressure”
to the point of “sudden release”



3- **Cold sponge metaphor** by Aristotle:

The brain functioned to keep the blood cool

Why metaphors?

How could they obtain direct physical evidence of linguistic processes in the brain?

They
couldn't!

There is no direct access

We generally have to rely on what we can discover through indirect methods

Where clues picked up when the system has problems.

What are these indirect methods?

Minor production difficulties are possible clues!

1. Tip of the tongue
2. Slips of the tongue and ear
3. Aphasia
4. Dichotic listening
5. The critical period

1. The tip of the tongue phenomenon

- ◆ When we feel that some words are eluding us, we know the word but it just won't come out
- ◆ Speakers generally know (Initial sound + number of syllables= accurate phonological information of the word)
- Result: 'Word storage' system maybe partially organized on some phonological basis where some words are easier to retrieve than others.

1. The tip of the tongue phenomenon

A malapropism is the incorrect use of a word by substituting a similar-sounding word with different meaning, usually with comic effect.

- "Eastern and Specific Time." (i.e. "Pacific")
- "So guys, bring your wives on down to Furniture Factory Outbreak (i.e. "Furniture Factory Outlet")
- "I resemble that remark!" (i.e. resent)
- "Yeah, I super-size with you." (i.e. sympathize)
- "I want to be effluent mum!" "You are effluent Kimi..." (i.e. affluent)

2. Slips of the tongue

- Spoonerisms: the interchange of two sounds. Named after William Spooner.
 - ☐ 'You have hissed all my mystery lessons.'
 - ☐ Use the door to open the key
 - ☐ A long shory stort (a long story short)
 - ☐ A fifty-pound dog of bag food
 - ☐ Black bloxes
 - ☐ Tup of tea
 - ☐ Stick neff (stiff neck)
- indicate the existence of different stages of linguistic expression
 - Not random

2. Slips of the ear

- How the brain makes sense of auditory signals it receives.
- great ape instead grey tape

3. Aphasia


- People who suffer from different types of language disorders.
- An impairment of language function because of localized brain damage
- Leads to difficulty in understanding and /or producing linguistic forms.
- Caused by a stroke or accident.

Classification of different types of aphasia

➔ Based on the primary symptoms of someone having difficulties with language.

A. Broca's aphasia – motor aphasia

- Reduced amount of speech
- Distorted articulation
- In Broca's aphasia comprehension is better than production.
- What is said:
 - consists of lexical morphemes (noun and verbs).
 - Lack of lexical morphemes (articles and prepositions) and inflections(plural s, past tense,

- 
- I eggs and eat and drink coffee breakfast
 - Ah ... Monday ... ah, Dad and Paul Haney [himself] and Dad ... hospital. Two ... ah, doctors ... and ah ... thirty minutes ... and yes ... ah ... hospital. And, er, Wednesday ... nine o'clock. And er Thursday, ten o'clock ... doctors. Two doctors ... and ah ... teeth. Yeah, ... fine.
 - M.E. Cinderella ... poor ... um 'dopted her ... scrubbed floor, um, tidy ... poor, um ... 'dopted ... Si-sisters and mother ... ball. Ball, prince um, shoe ...
 - Examiner. Keep going.
 - M.E. Scrubbed and uh washed and un...tidy, uh, sisters and mother, prince, no, prince, yes. Cinderella hooked prince. (Laughs.) Um, um, shoes, um, twelve o'clock ball, finished.

Wernicke's aphasia - sensory aphasia

- It results in difficulties in auditory comprehension, but sometimes fluent speech
- Characteristics:
- General terms are used even in response to specific requests for information. (example
- Difficulty in finding correct content words, especially nouns (anomia) (example)

Conduction Aphasia

- Caused by damage to the arcuate fasciculus.
- Characteristics:
- Mispronounce words
- Fluent, but may have disrupted rhyme because of pauses and hesitations.
- Comprehension is good, but repeating words is a difficulty.

Dichotic Listening

➤ Dichotic listening test :

1- This technique uses the generally established fact that anything experienced on the right-hand side of the body is processed in the left hemisphere..... anything experienced on the left-hand side of the body is processed in the right hemisphere.

2- Flaherty's (2004) description : a stroke in the right hemisphere resulted in paralysis of the left leg.

So, a basic assumption: a signal coming in the right ear will go to the left hemisphere and : a signal coming in the left ear will go to the right hemisphere

The right ear advantage


➤ Page 164..

Dichotic listening

- The right hemisphere:
- non-verbal sounds (music, coughs, traffic noises, bird singing) and all non-language sounds (among other things)
- Holistic processing
- The left hemisphere
- language sounds
- Analytical processing (recognizing sounds, words, and sentences)

The critical period

- Lateralization:
- The specialization of the left hemisphere for language is described as lateral dominance or lateralization (one-sidedness)
- The lateralization process begins in early childhood (first language acquisition).
- There is a period during childhood when the human brain is most ready to receive input and learn a particular language.
- This “ sensitive period” for language acquisition is more generally known as “ the critical period”
- It lasts from birth to puberty

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- https://aaalmohammadi.kau.edu.sa/Files/0006268/files/16238_12Language%20and%20the%20Brain.pdf
 - <http://prezi.com/76fbg2xymuit/neurolinguistics-and-language-loss/>