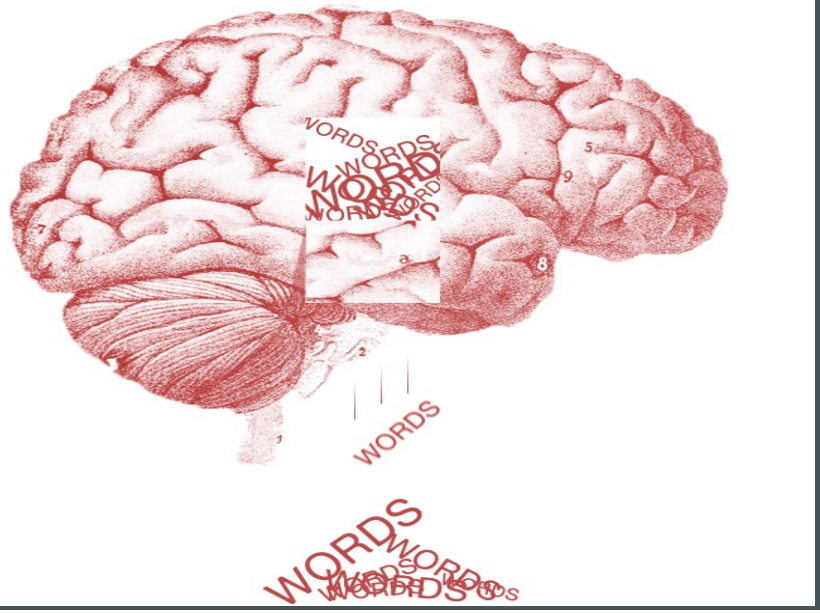
LANGUAGE AND THE BRAIN

LECTURE 10



- The anatomy and functions
- 3 issues
- Lateralization, Localization, Plasticity

BASIC STRUCTURE OF BRAIN

- **The brain is composed of three parts:**
- **Cerebrum**
- the largest part of the brain
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- **Cerebellum**
- located under the cerebrum

- **Brainstem**
- acting as a relay center connecting the cerebrum and cerebellum to the spinal cord
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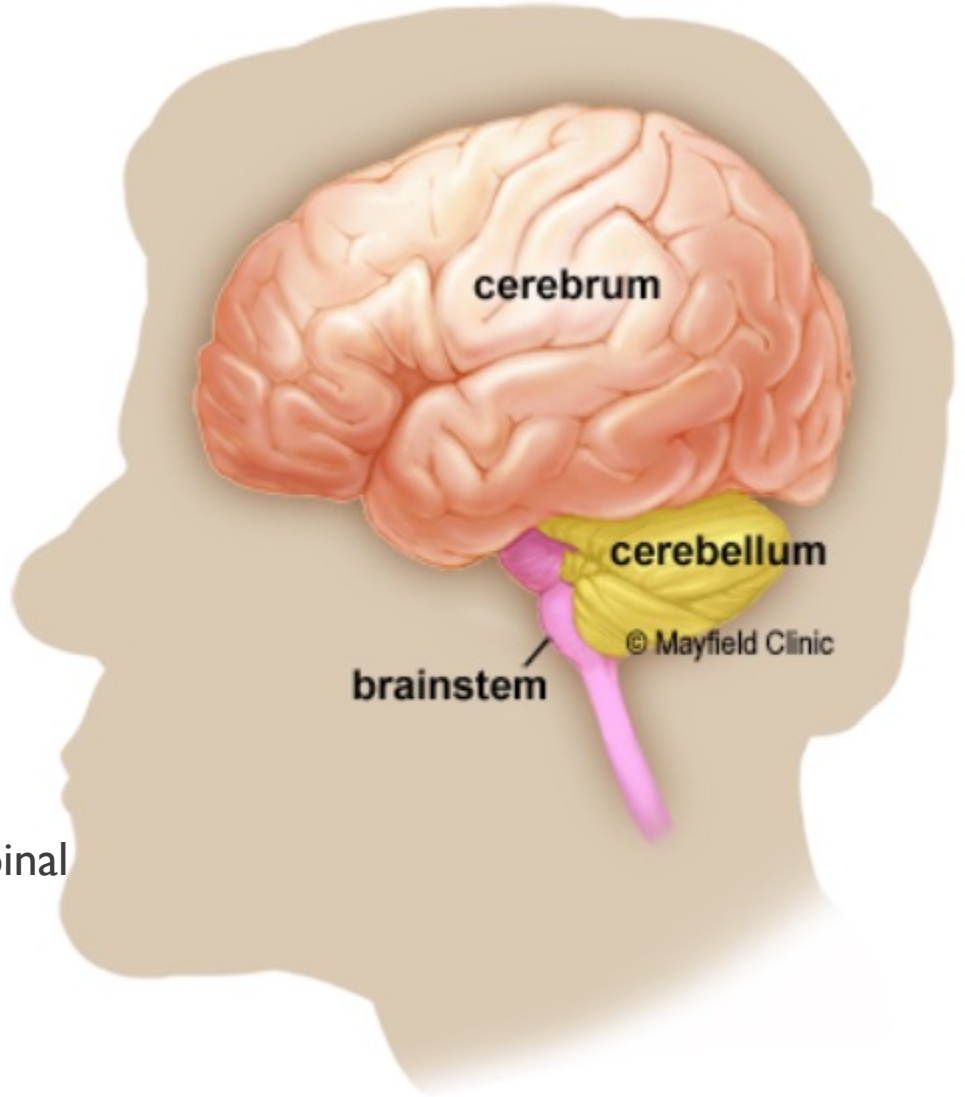
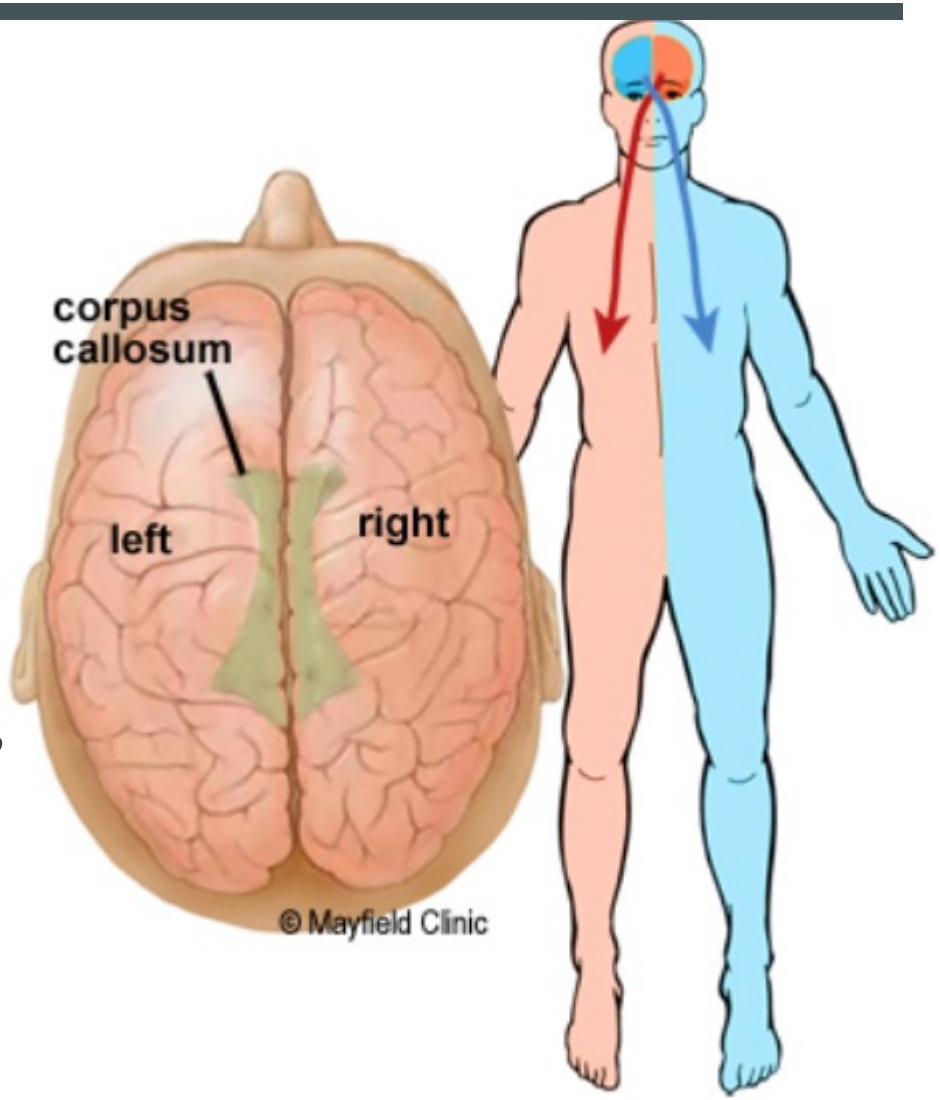


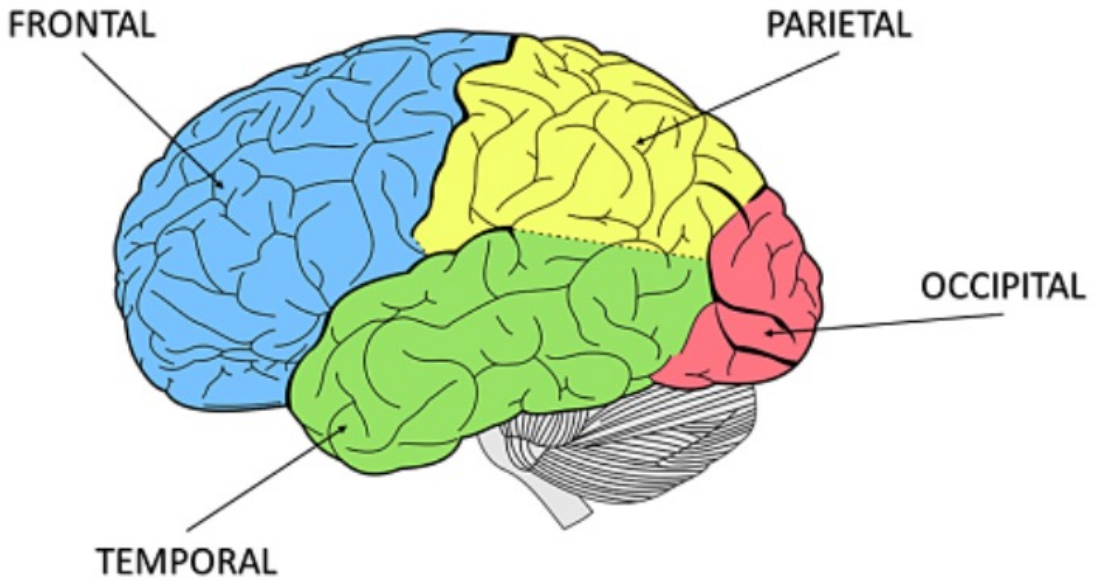
BASIC STRUCTURE OF BRAIN

- **Cerebrum**
- The left hemisphere controls speech, comprehension, arithmetic, and writing.
- The right hemisphere controls creativity, spatial ability, artistic and musical skills.
- The left hemisphere is dominant in hand use and language in about 92% of people.



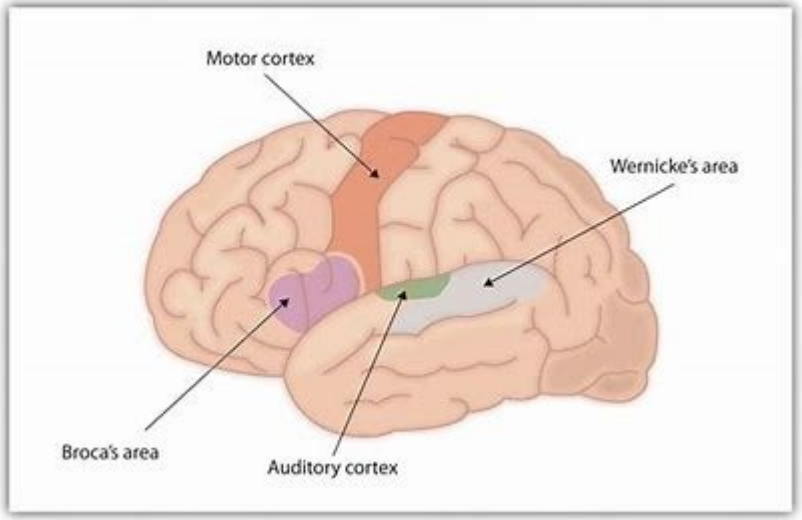
BASIC STRUCTURE OF BRAIN

- **Each hemisphere has 4 lobes:**
- Frontal lobe
- Temporal lobe
- Parietal lobe
- Occipital lobe

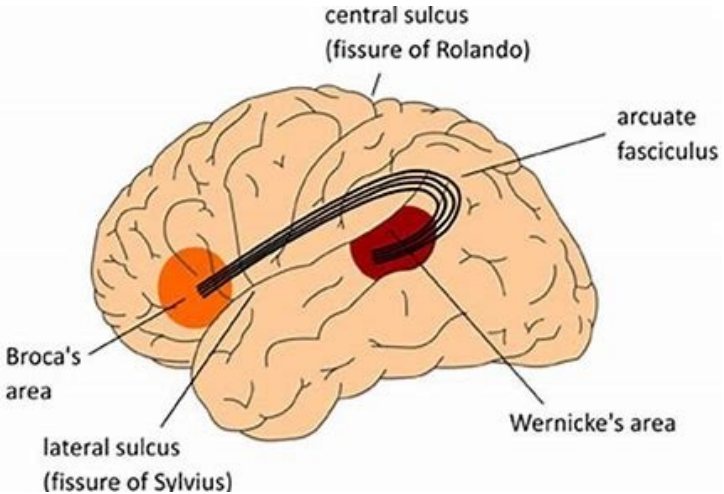


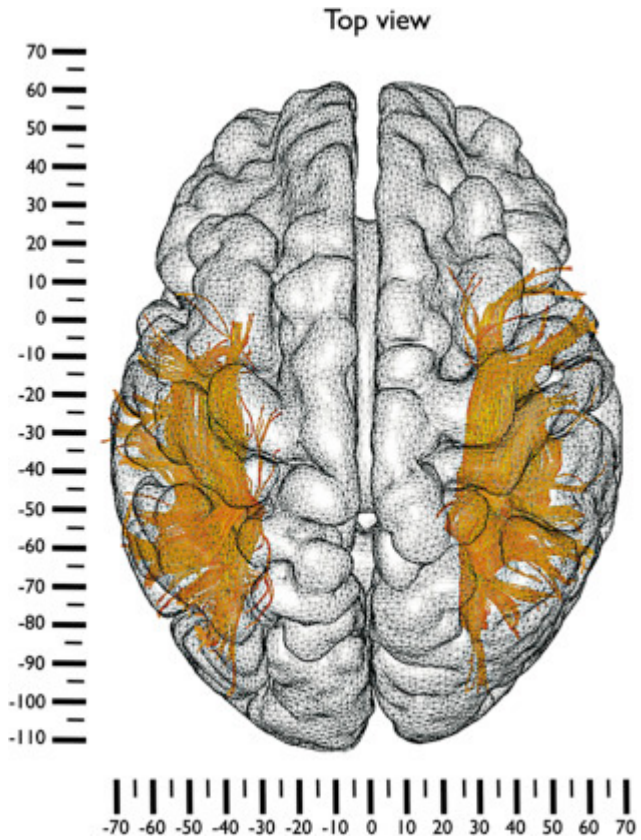
CLASSICAL LANGUAGE AREAS

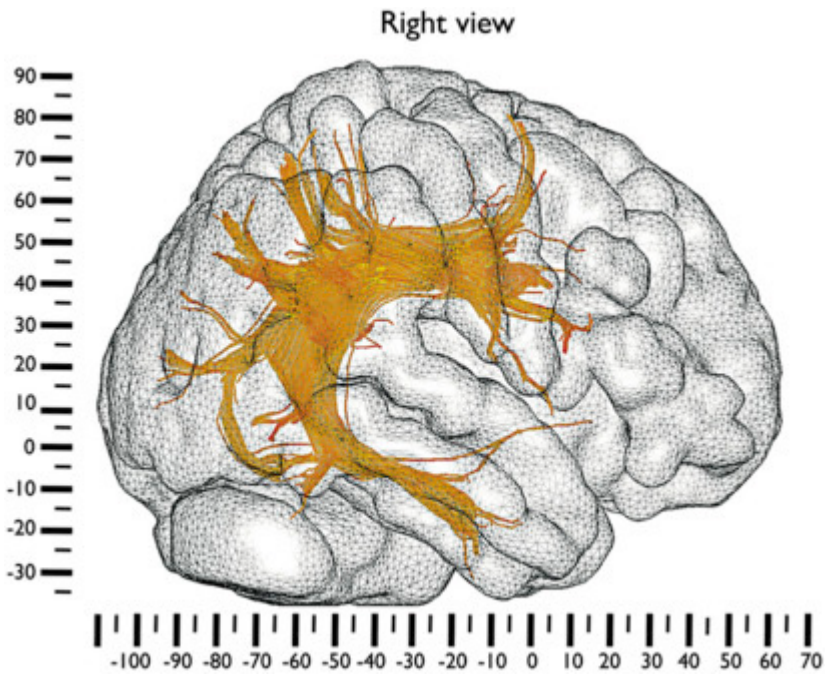
- **1. Broca's area**
- crucially involved in the generation of spoken language.
- **2. Wernicke's area**
- crucially involved in the understanding of speech



- **3. The motor cortex**
- involved in the physical articulation of speech
- **4. The arcuate fasciculus**
- forming a crucial connection between Wernicke's and Broca's areas




Top view
70 60 50 40 30 20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110
-70 -60 -50 -40 -30 -20 -10 0 10 20 30 40 50 60 70


Right view
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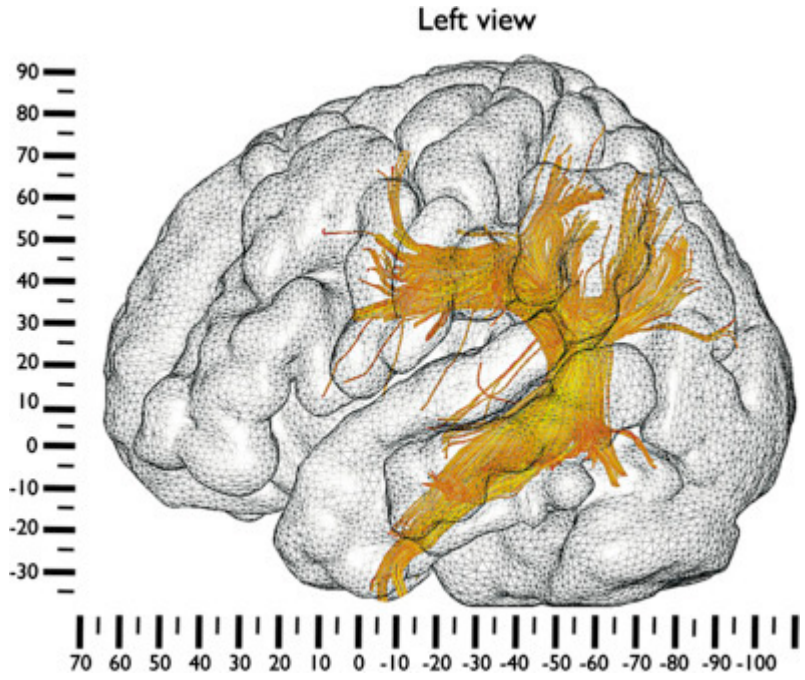
-100 -90 -80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30 40 50 60 70


Left view
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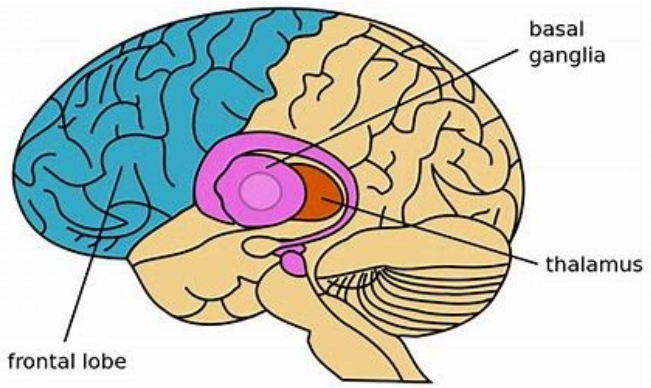
70 60 50 40 30 20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100



- In addition to these classical language areas, language depends critically on a large number of areas and circuits in the brain.
- **the prefrontal cortex**
- appears to be involved in a variety of linguistic tasks, including various semantic aspects of language, syntax, and higher level linguistic processing, such as understanding the reasoning underlying a conversation.
- **the temporal lobe** (connecting words to concepts, decoding speech information)
- **Basal Ganglia**
- appears to play a role not only in language production and but also in language comprehension
- **Cerebellum**
- appears to play a role in speech production and perception, as well as both semantic and grammatical processing