PSYCHOLINGUISTICS

5TH LECTURE

LANGUAGE IN BRAIN

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- The localization of language in brain remained an issue for years as there were different opinions regarding the existence of language in brain. A common man might not have admitted that language spoken with vocal organs, have any link with brain or controlled by it. Since mature efforts have been made, researchers have studied human anatomy in detail and biological science has progressed a lot, it is admitted that language is located in the brain.

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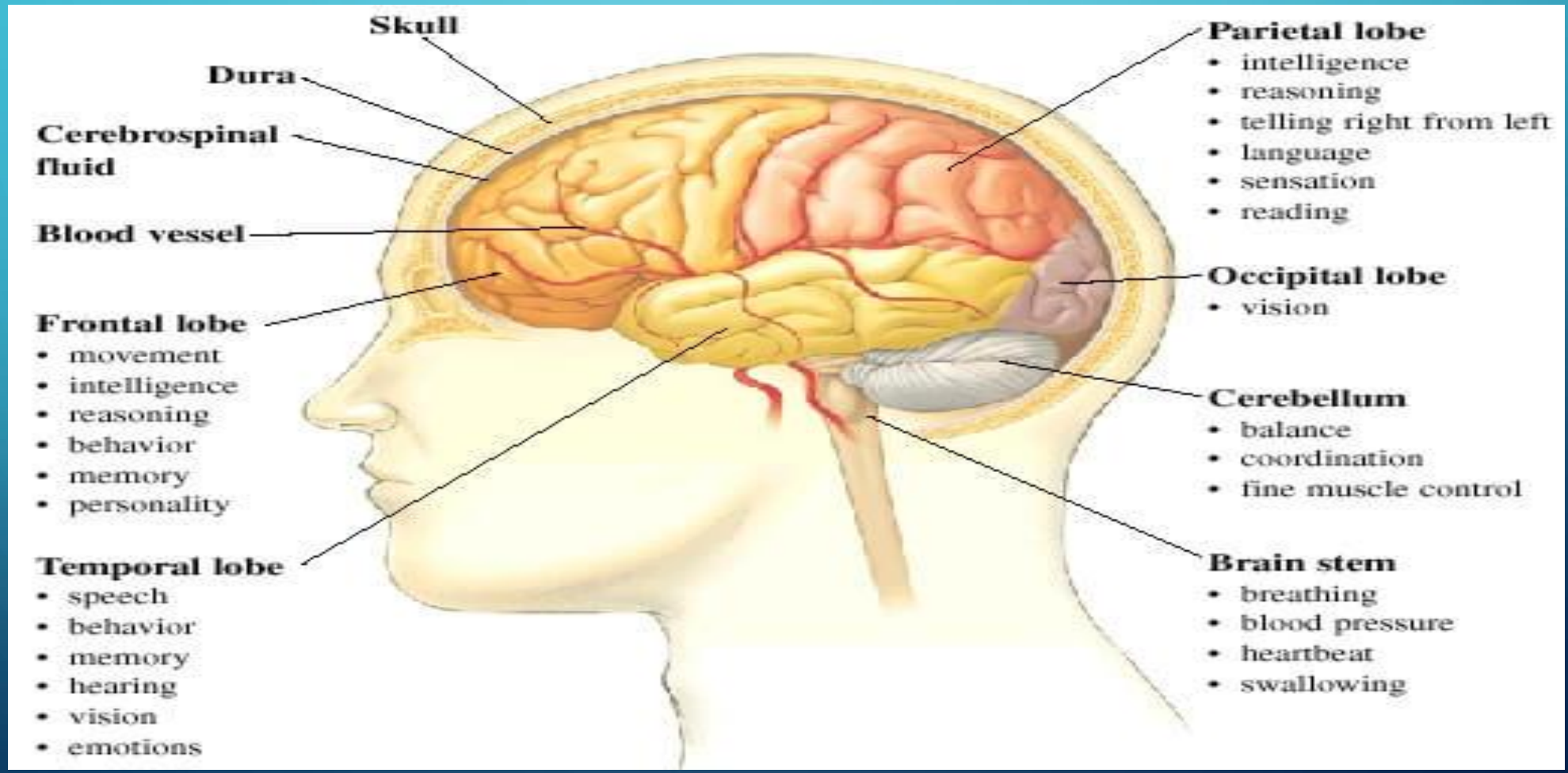
- Even a common fellow admits the relation of brain and language knowing the fact that akin to other body action, language is processed in brain and controlled duly controlled by it.
- For instance, a stimulus received via ears, is processed in brain and it consciously generates a reply in a grammatical construction according to the context. However, sometimes the reply may express emotion, requests, suggestions etc. In some cases the listeners remain silent.

CONT…

- It was another issue as to which part of the brain controls language and how the entire process of communication takes place. This enquiry needed man to study the biology of brain and its anatomy in detail.
- In fact, language does exist in human brain and is duly controlled by a complex system of human brain.
- Any damage to the language related areas of brain will result a damage to human language.

LANGUAGE IN BRAIN



LANGUAGE IN BRAIN

- In the image, given in the previous slide, it can be seen that language is located in different parts of brain which control and regulate it.
- For example:
- Hearing is seen in the temporal lobe of the left hemisphere.
- The over all language is placed in the parietal lobe of the left hemisphere.

CONT…

- A point worth mentioning is that language locates in the left hemisphere of human brain.
- The two areas that control language are the Broca area and the Wernick area after discovered by Brocan and Wernick respectively.
- See the image in the previous slide.

THE LOCALIZATION OF LANGUAGE IN BRAIN

- The theory of localization of *language in brain* was proposed by FRANZ JOSEPH GILL in the early nineteenth century.
- This theory argues that different human abilities and behavior are localized in specific parts of the brain (see the picture in slide 03).
- Gill proposed that language is located in the Frontal lobes (see the picture in slide 03) of the brain.
- It was a burning issue and opened a discussion of a serious concern until Broca's claim for localization in frontal lobe of left hemisphere.

PAUL BROCA

- Broca was a French surgeon who proposed that language is located in the left hemisphere of the brain, especially, to the front of left hemisphere which is now called Broca area.
- **Broca area**, also called **convolution of Broca**, region of the brain that contains neurons involved in speech function. This area is located in the frontal part of the left hemisphere of the brain. It was discovered in 1861 by French surgeon Paul Broca, who found that it serves a vital role in the generation of articulate speech

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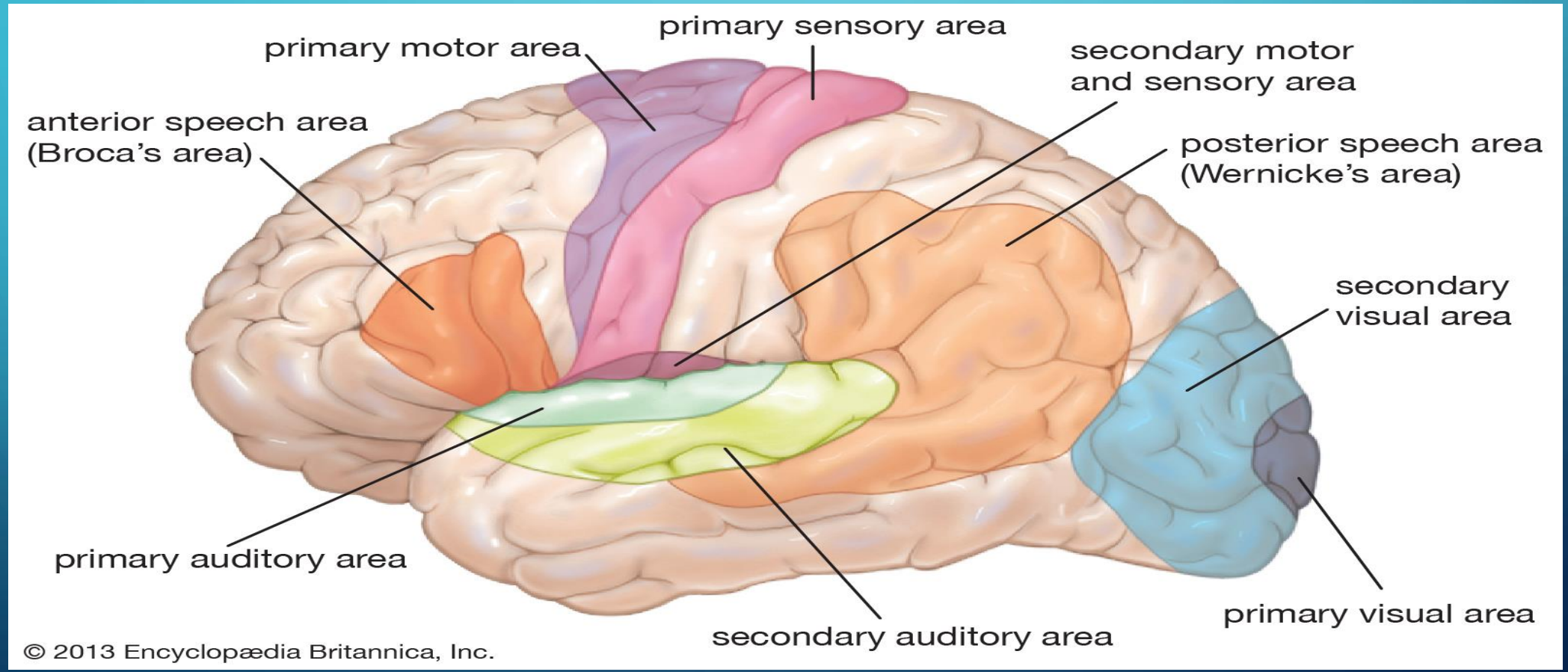
- Broca's claim was based on the experimental study of his patient who suffered injury to the left hemisphere of his brain. The patient had a language disorder after receiving injury to the left part of brain and, hence, Broca concluded that language is located and is covered by an area located in frontal lobe of the left hemisphere.
- See the image in the coming slide for Broca area.

DIFFERENT AREAS OF BRAIN



CARL WERNICK'S (PRONOUNCED: VER-NIKK)

- **13 years after Broca's discovery, Wernick (a German Neurologist) proposed another area (now called Wernick area) via aphasia that occurred among patients who had Lesion (injury to a part of brain) to the area of left hemisphere in the Temporal lobe.**
- **Wernick added that language is located in a region located in the temporal lobe on the left side of the brain.**

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- **It was an additional information that not only Broca area but also Wernick area has association with language.**
- **Wernicke's area** is the **region** of the brain that is important for language development. It is located in the temporal lobe on the left side of the brain and is responsible for the comprehension of speech, while Broca's **area** is related to the production of speech.

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- It lies at the junction of the visual and auditory cortices and is involved in transforming the visual impression of letters (**graphemes**) into mental representations of speech sounds.
- It is therefore important for speech comprehension and reading.
- (see the picture in the previous slide)

CONT…

- The non-dominant homologue of Wernicke's area is involved in understanding intonation and emphasis (the ‘music’ of speech) which can alter the meaning of words considerably.
- Some patients with non-dominant temporal lobe lesions may therefore have monotone, ‘robotic’ speech or fail to grasp nuances of intonation (termed **aprosodia**).

THE MOTOR CORTEX OR PRIMARY MOTOR AREA

- As shown in the picture primary motor area is located in the upper portion. It controls the body moments. Since motor organ such as tongue, lips, lynx and sound box are linked and controlled by motor cortex, it has association with language and any damage to motor area will damage language.

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- In September 1848 Phinaes Gage, a foreman of a road gang, met an accident when an explosion drove a meter long-rod through his head.
- The rod caused a tunnel in his brain. Though Gage received serious injuries and suffered a lot, he could still speak and listen well.

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- Later on Doctors at University of Lowa School of Medicine studied the skull of Gage and reported that the rod had neither damaged Motor area nor language area (Broca and Wernick). Consequently, Gage' language was saved.
- This discovery strengthened Broca and Wrenick's claims in the following two way:

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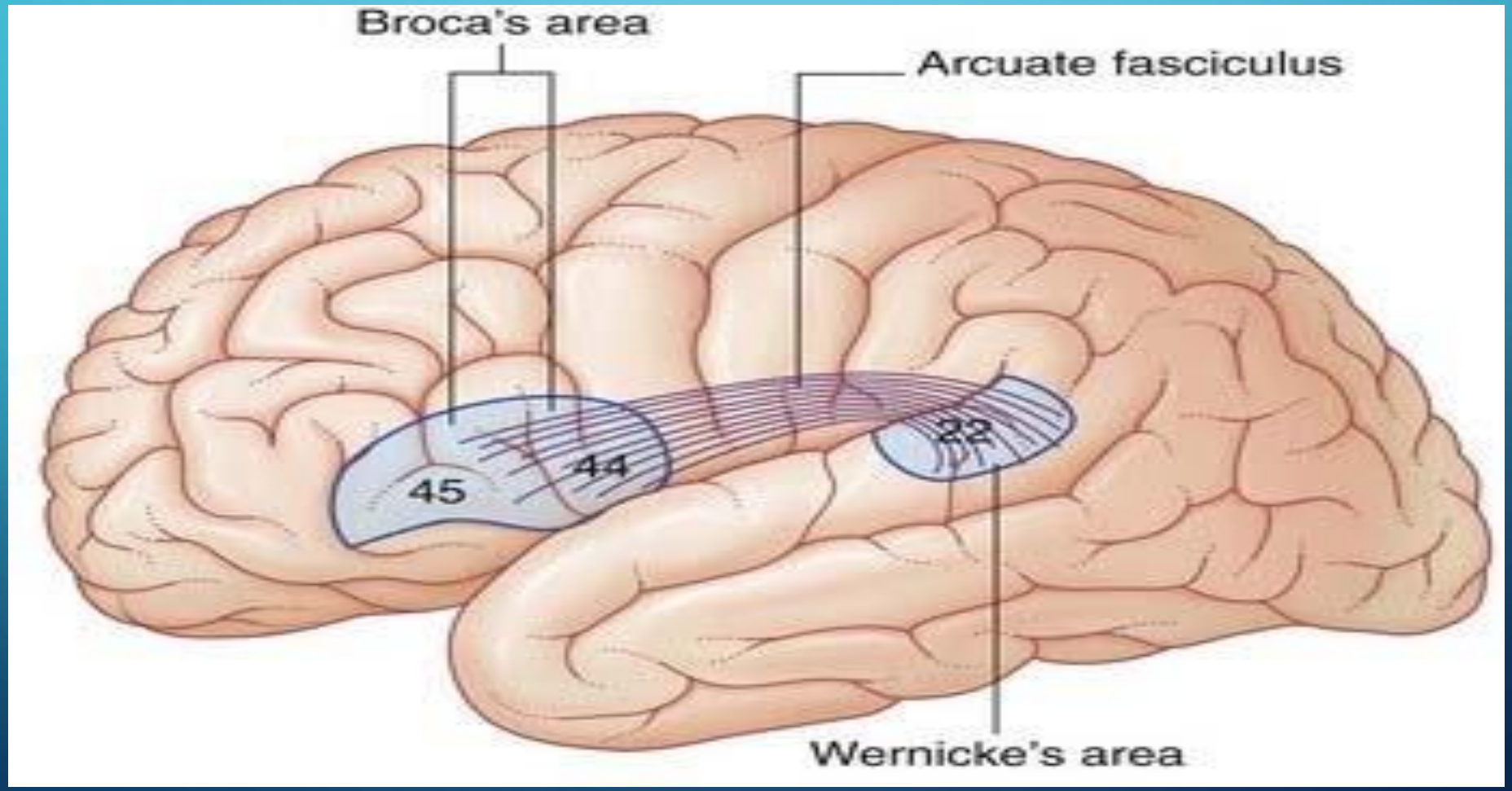
- 1) It assured the researchers that Language exists in Broca and Wernick's areas.
- 2) It indicated that the remaining parts of the brain may not have link with language.
- Broca and Wernick areas are termed as LANGUAGE CENTER because language is located in them and that they control it. Theses two areas are connected by arcuate fasciculus.

THE ARCUATE FASCIULUS

- The arcuate fasciculus is a bundle of nerve fibers that connect the Broca area with Wernick area. It is a sort of link between the two regions which would have been disconnected otherwise.
- The arcuate fasciculus is a white-matter fiber tract that links lateral temporal cortex Wernick area with frontal cortex (Broca area). Lesion studies indicate that this pathway is critically involved with human language.

THE ARCUATE FASCICULUS



CONT…

- The arcuate fasciculus, an expanded pathway in humans, may support the transmission of word-meaning information stored in other parts of brain to Broca's area and surrounding cortex for both sentence comprehension and sentence construction during spontaneous speech.