

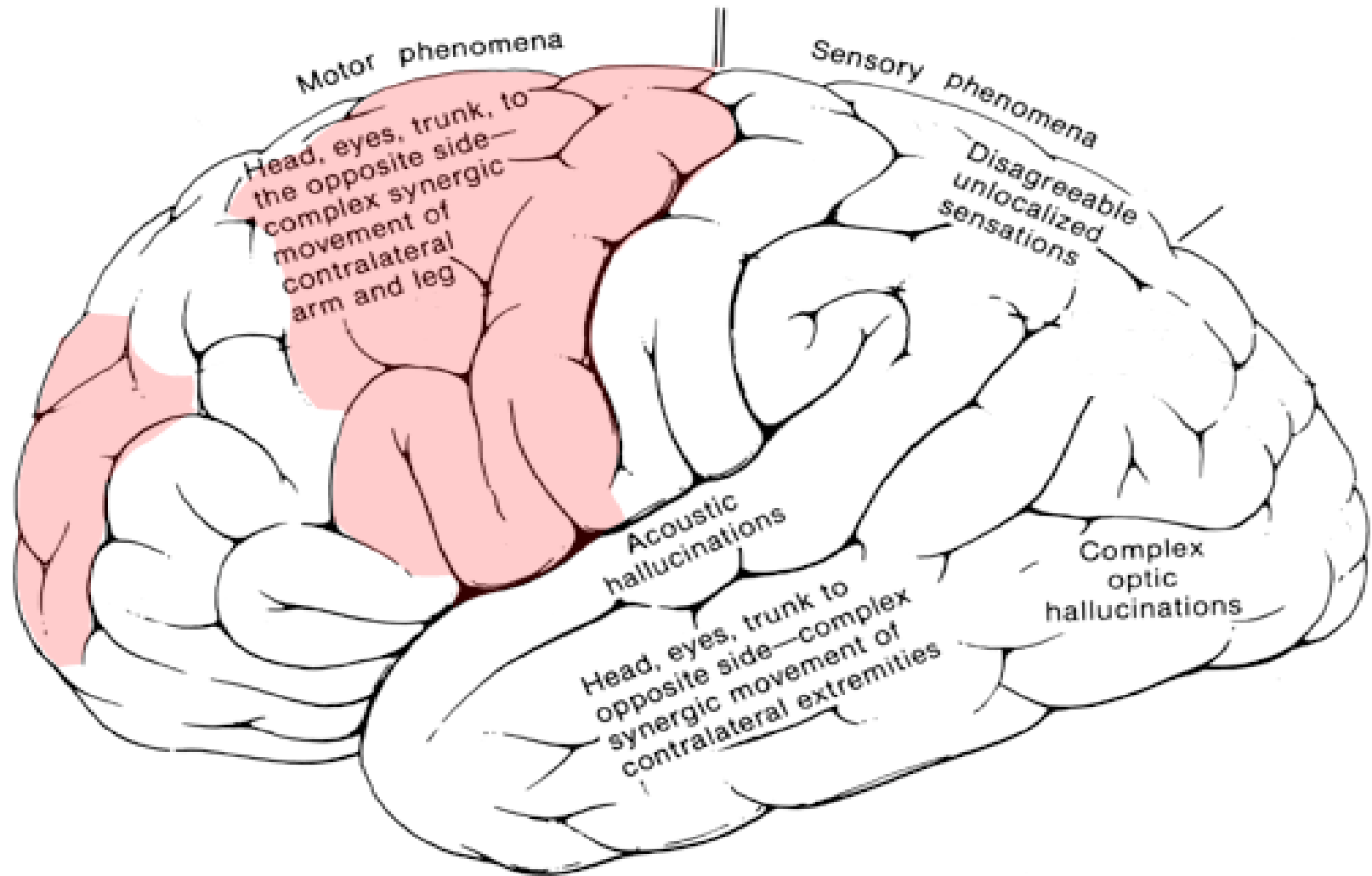
Gomel State Medical University
Chair the Neurology and Neurosurgery

Lecture

**THEME 4. CEREBRAL HEMISPHERES
AND THE BRAIN FUNCTIONS LESION**

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Topography of the basic structural components of a cerebral cortex



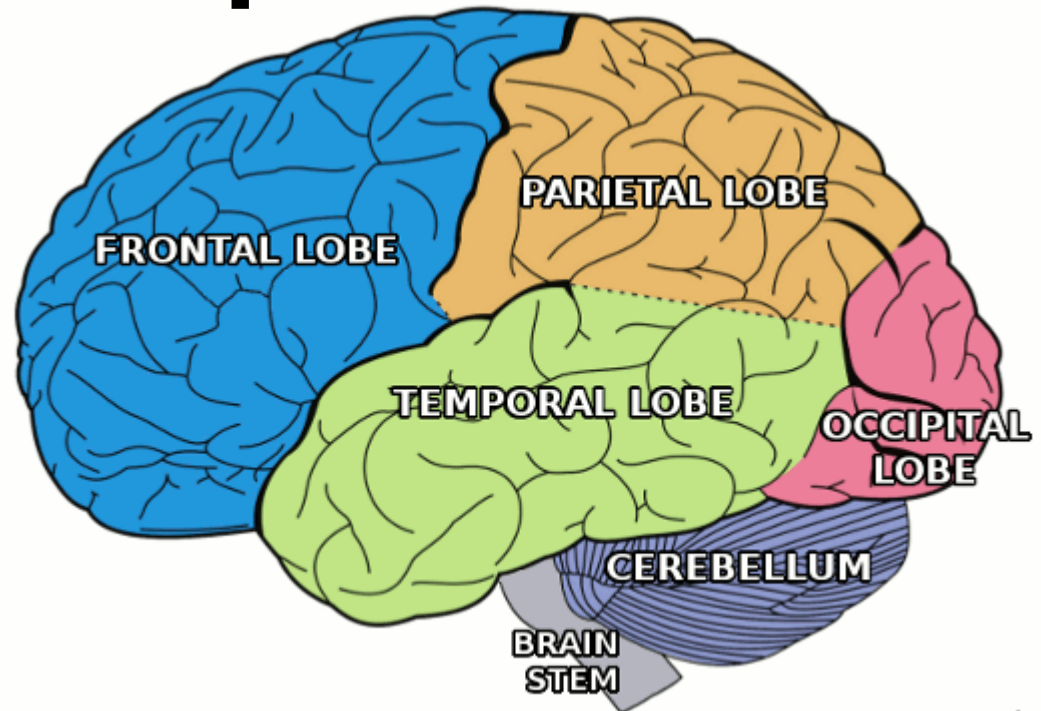
Main cerebral lobes and sulcus

Sulcus:

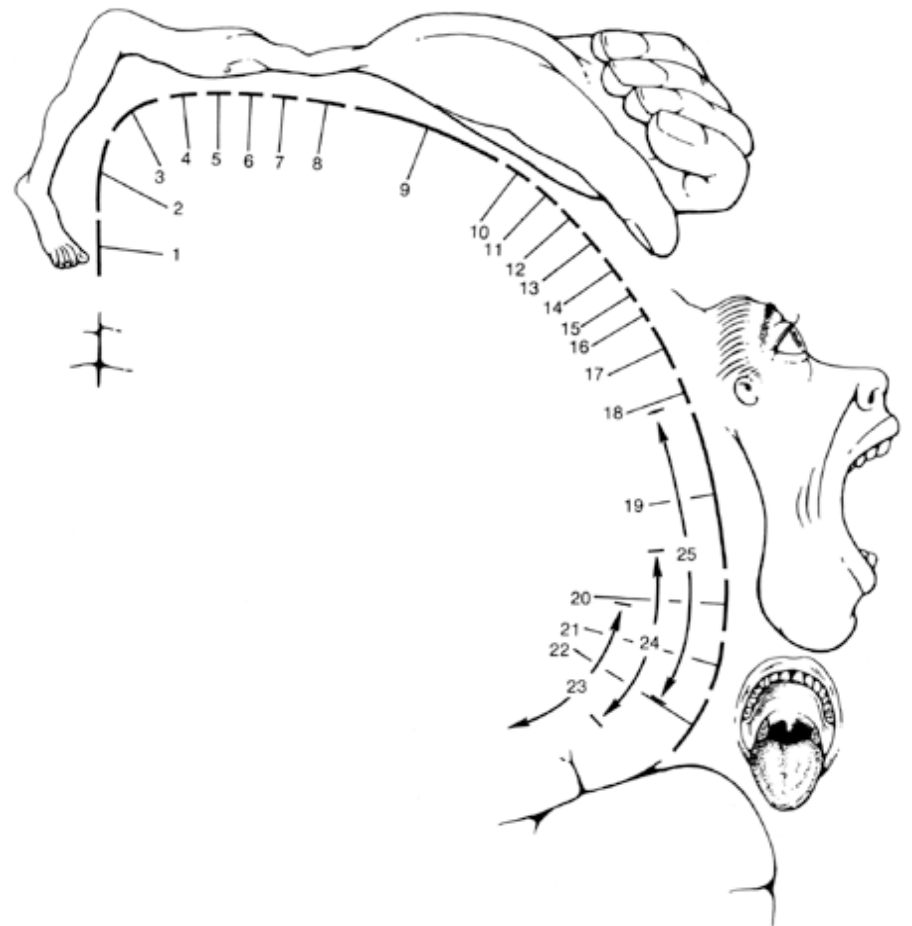
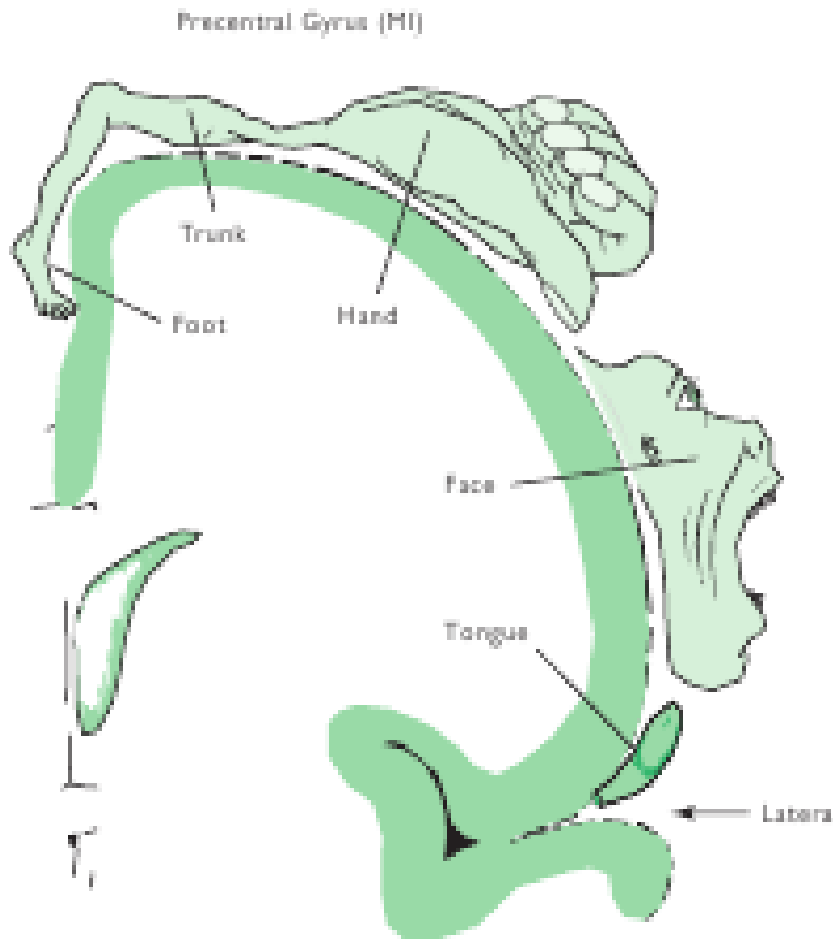
- the centralis,
- the lateralis (Roland),
- the occipito-temporalis.

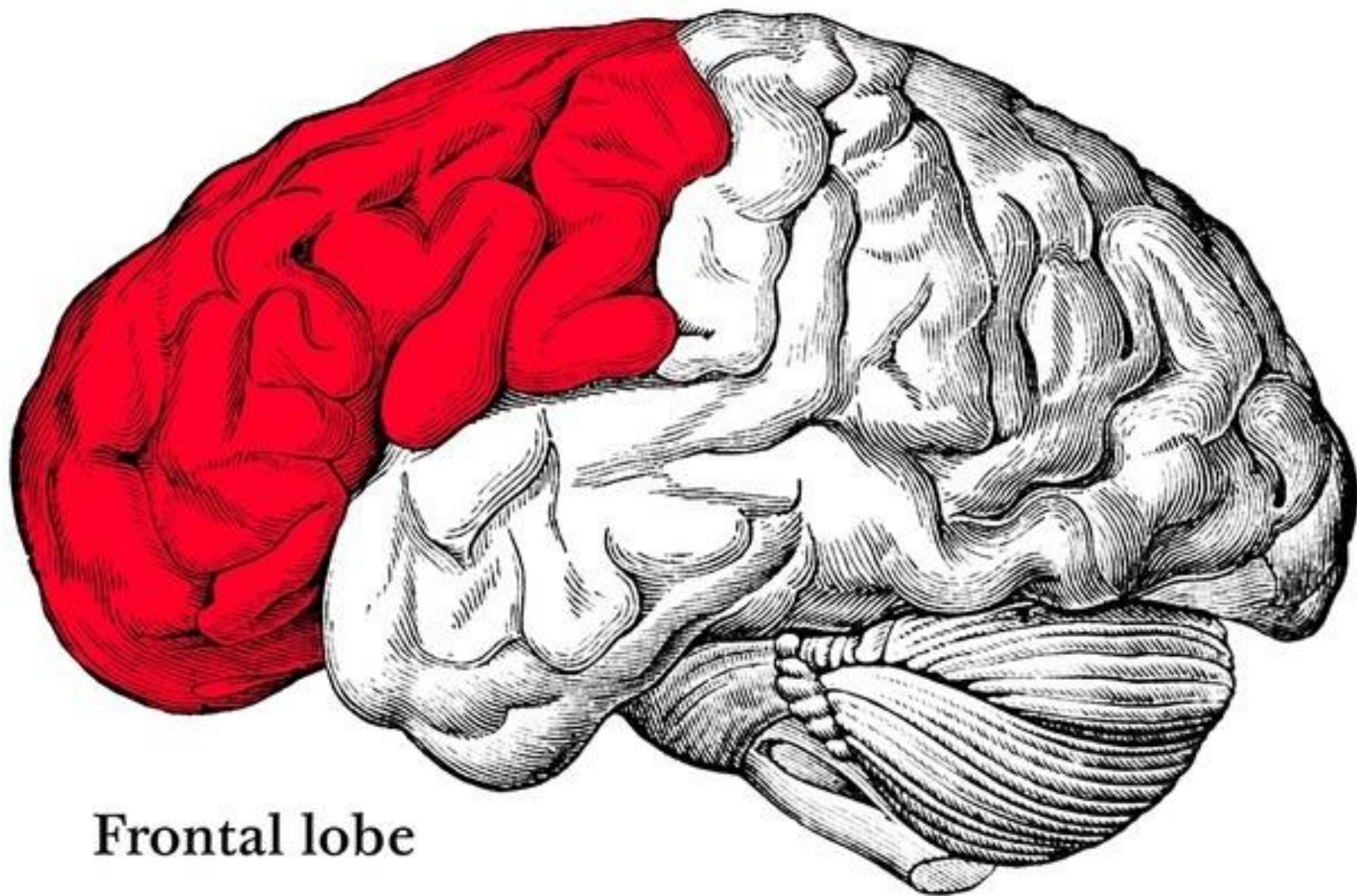
Lobes:

- frontal,
- parietal,
- temporal,
- occipital.



The motor homunculus or cortical representations of motor neuron (precentral Gyrus)





Frontal lobe

CLINICAL FEATURES OF THE FRONTAL LOBE LESION

1. Lesion of the frontal motor eye field is followed by paresis of conjugate gaze to the opposite side. Eyes are turned toward the injured side.

2. Lesion of the precentral gyrus area produce the spastic palsy or paralysis in contralateral hand or leg;

Focal epilepsy arises in case of the irritation of the precentral gyrus (Jackson's march)

3. The basal ganglion lesion is characterized by rigidity and bradykinesia or akinesia, postural instability and gait disorder

CLINICAL FEATURES OF THE FRONTAL LOBE LESION

4. **Grasping phenomenon** — the compulsion to grab things that appear before the eyes

5. **Symptoms of opposition**

6. **primitive reflexes:** palmar grasp reflex which usually signifies damage to the frontal lobe of the opposite side. The glabellar reflex or «glabellar tap»

Symptom is **hypersexuality**, the tendency to make sexual comments at inappropriate times or situations

7. **Central contralateral prosoparesis**

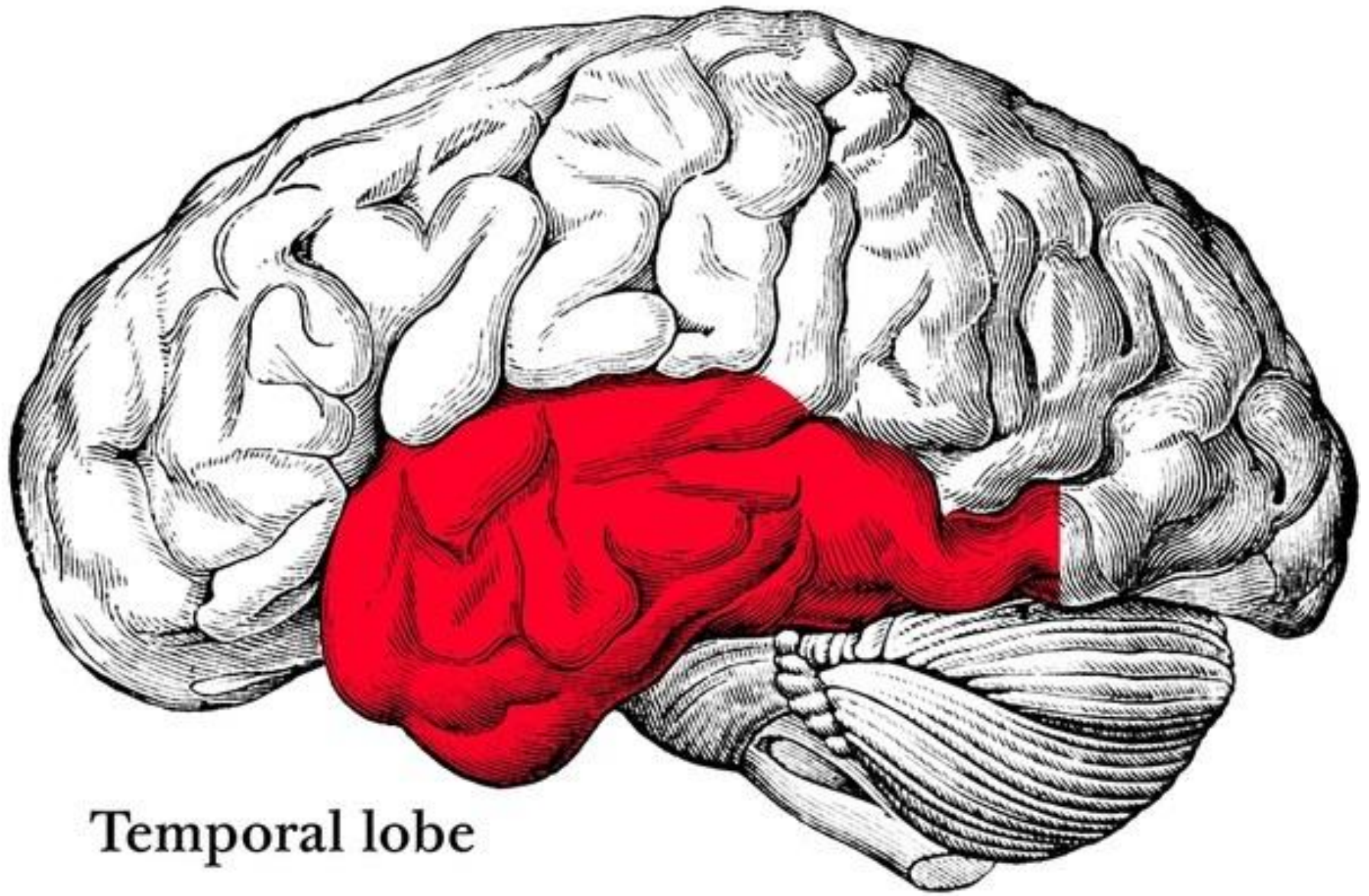
CLINICAL FEATURES OF THE FRONTAL LOBE LESION

8. Frontal lesion of the frontopontine fibers such as the corticoponto-cerebellar tract causes contralateral ataxia

9. Ideational apraxia is characterized by loss of the ability to formulate the ideational plan that is necessary for executing the several components of a complex act

11. Expressive aphasia (the motor aphasia of Broca) is characterized by a defect or loss in the power of expression by speech, writing, or gestures. It is caused by the lesion in the posterior part of the inferior frontal convolution (**Broca's area**)

12. Frontal syndrome psyche — euphoria, moria, foolish.



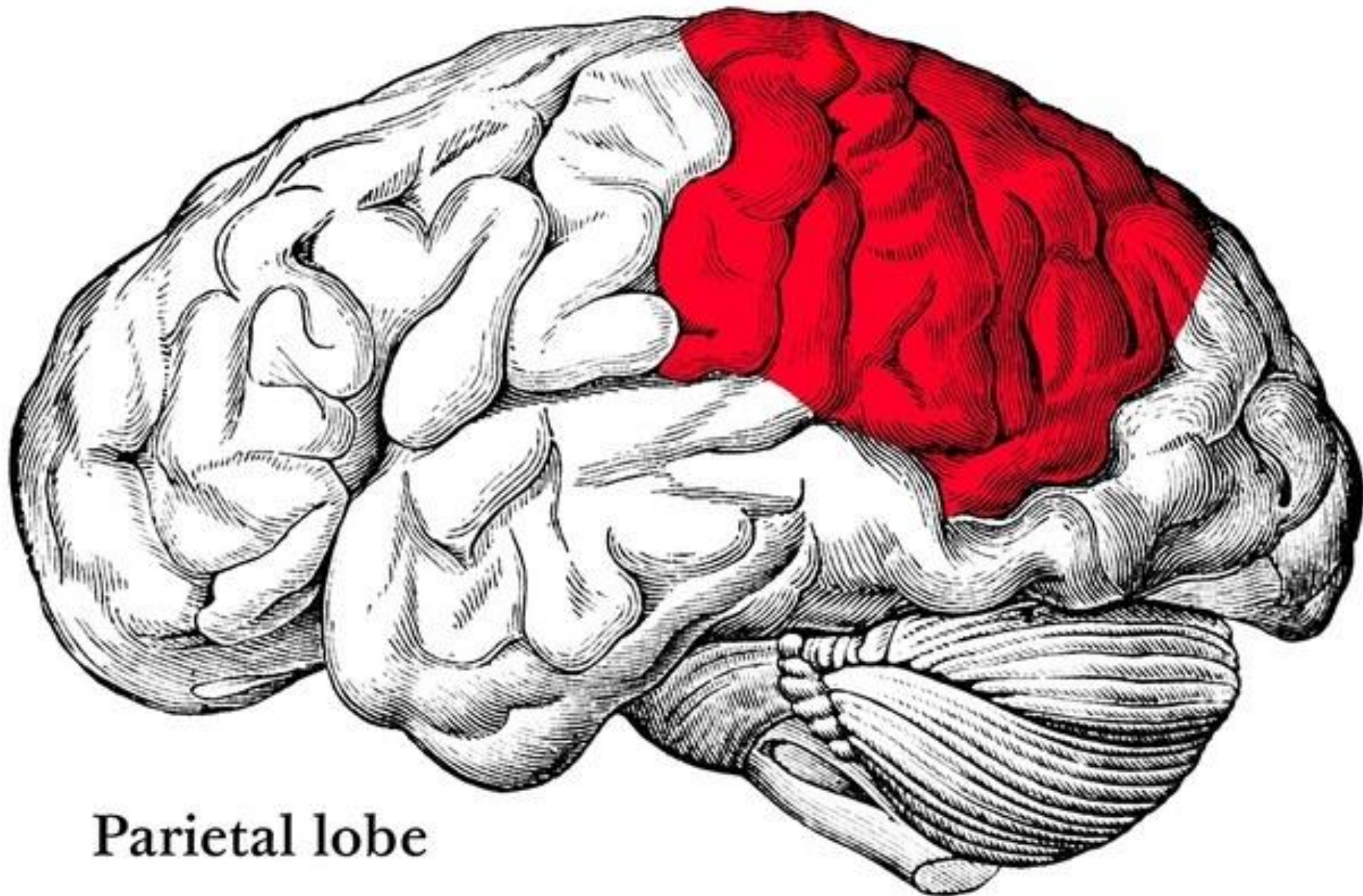
Temporal lobe

CLINICAL FEATURES OF THE TEMPORAL LOBE LESION

- 1. Encroachment of the optic radiations pass through the temporal lobe may cause either a superior quadrantic or hemianopic defect in the contralateral visual fields**
- 2. Ataxia**
- 3. The stimulation of the temporal lobe cortex gives rise to illusions of perception, olfactory, visual and gustatory hallucinations, and automatisms**
- 4. The loss of ability to comprehend spoken words (the auditory receptive aphasia) — lesion in the region of the anterior transverse temporal gyrus (Wernicke's area) on the left in right-handed persons**

CLINICAL FEATURES OF THE TEMPORAL LOBE LESION

- 5. Stimulation of the superior temporal gyrus produces vague auditory hallucinations in the form of tinnitus and sensations of roaring and buzzing, and stimulation of adjacent areas causes vertigo and a sensation of unsteadiness.**
- 6. Dreamy states and reminiscences: «deja vu», «jamais vu».**
- 7. Emotional disorders — depression, anxiety, emotional lability.**



Parietal lobe

CLINICAL FEATURES OF THE PARIETAL LOBE LESION

The functions of the parietal lobe are essentially those of **reception, correlation, analysis, synthesis, integration, interpretation, and elaboration of the primary sensory impulses** that are received from the thalamus.

- 1. Cortical complete anesthesia** on the opposite side of the body.
- 2. Astereognosis, or tactile agnosia,** is the loss of power to perceive the shape and nature of superficial contact alone, in the absence of any demonstrable sensory defect.
- 3. Sensitive ataxia.**
- 4. Autotopagnosia, or somatotopagnosia,** is loss of the power to identify or orient the body or the relation of its individual parts — a defect in body awareness.
- 5. Pseudomelia** — feeling extra limb

CLINICAL FEATURES OF THE PARIETAL LOBE LESION

6. **Anosognosia** is defined as the ignorance of the existence of disease, and the term has been used specifically to imply the imperception of hemiplegia, or a feeling of depersonalization toward or loss of perception of paralyzed parts of the body.

7. **Apraxia** is a defect in the ability to carry out purposive, useful, or skilled acts, especially if complicated; there is loss of the capacity to use objects correctly

8. **Alexia** — loss of expression by reading, **dyscalculia** — loss of expression by counting.

9. **Global amnesia**

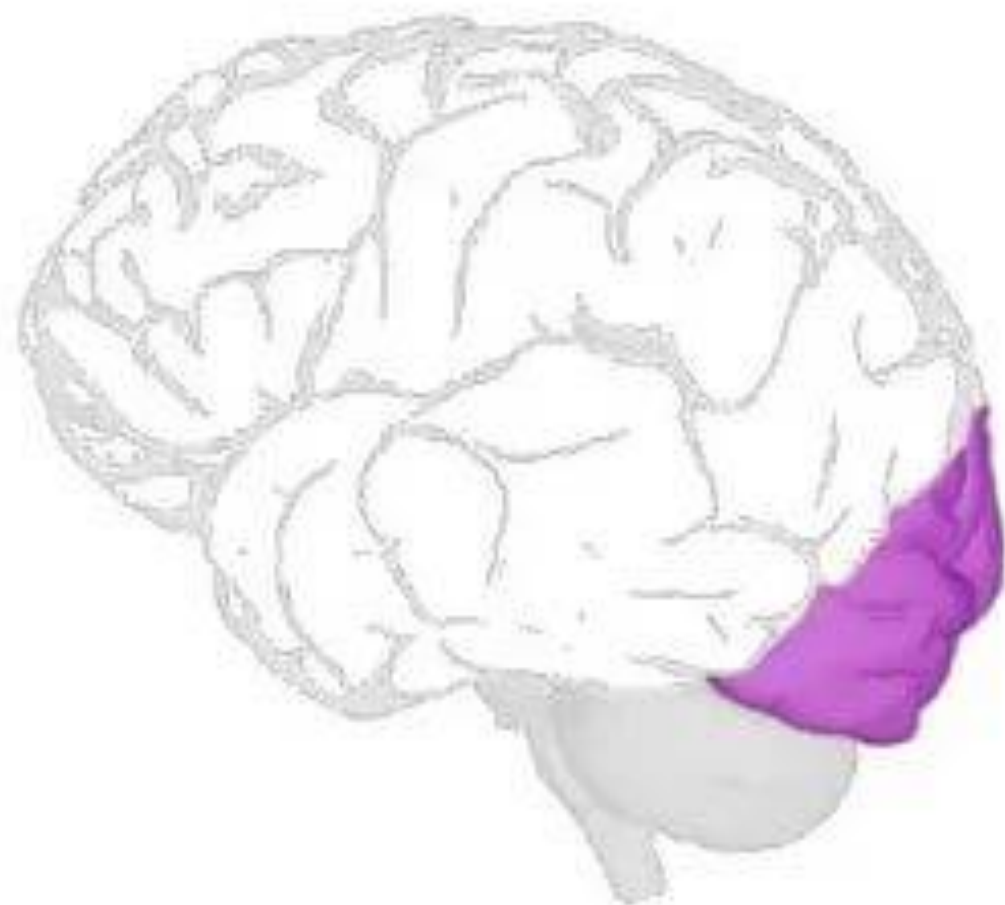
10. **Focal Jackson sensitive seizures**

Occipital Lobe

The occipital lobe is at the rear of the brain.

It controls:

- vision
- recognition



CLINICAL FEATURES OF THE OCCIPITAL LOBE LESION

- 1. Visual field defects — contralateral homonymous hemianopsia.**
- 2. Cuneus and gyrus lingualis lesion — quadrant contralateral homonymous hemianopsia.**
- 3. Color agnosia and hemichromatopsia — loss of color perception.**
- 4. Visual object agnosia — failure to recognize object by vision.**

CLINICAL FEATURES OF THE OCCIPITAL LOBE LESION

5. Stimulation, or irritation, of the calcarine cortex produces unformed visual hallucinations, such as scotomas and flashes of light, in the corresponding fields of vision.

6. Metamorphopsia — distorted perception in the form of visible objects (contours seem broken, crooked, too small — or too large micropsia — macropsia).

SPEECH AND ITS DISORDERS

Language is defined as audible, articulate human speech that is produced by the action of the tongue and vocal cords, and speech as utterance of vocal sounds that convey ideas, or the faculty of expressing thoughts by words (articulate sounds that symbolize and communicate ideas).

Speech is more than a motor activity; it is the mechanism by which one gives external expression to internal symbolization, or thinking.

SPEECH AND ITS DISORDERS

Aphasia — is the defect in (dysphasia) or loss of (aphasia) the power of expression by speech, writing, or gestures or a defect or loss in the ability to comprehend spoken or written language or to interpret gestures, secondary to brain damage:

sensor (receptive aphasia) — a defect or loss of ability to comprehend spoken or written language or to interpret gesture;

motor (expressive aphasia) — defect or loss in the power of expression by speech, writing, or gestures.

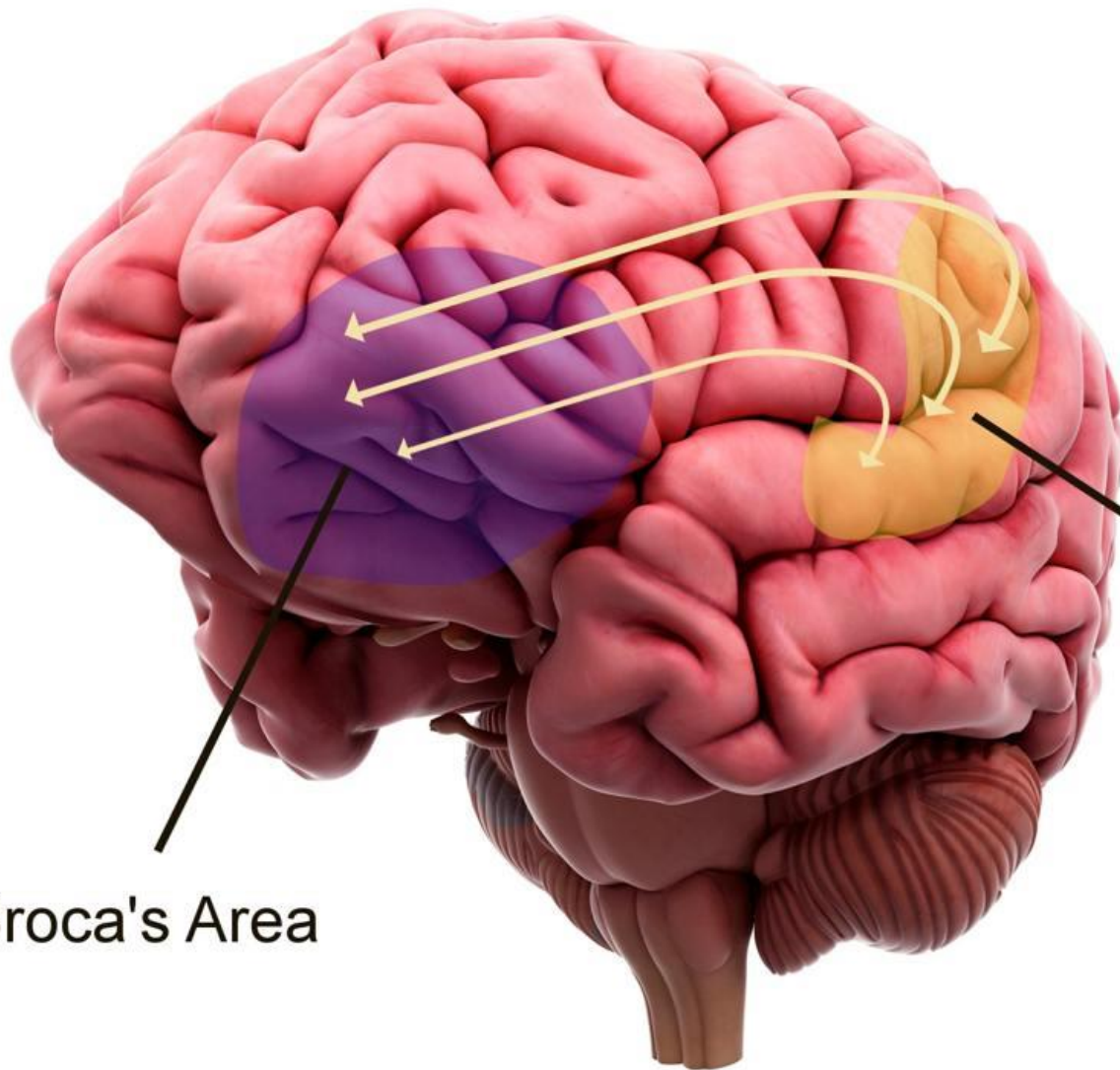
SPEECH AND ITS DISORDERS

Oral expressive aphasia (motor aphasia of Broca) — there is no loss of function of the organs of articulation, the patient is unable to form words or to combine or integrate the movements of the organs of articulation that are necessary for speech.

Patient is able to hear and understand spoken language and to read and comprehend written language but is unable to repeat what he hears and reads.

Expressive aphasia is usually caused by a lesion in the in the **posterior part of the inferior frontal convolution (Broca's area)**.

Broca's Area



Wernicke's
Area

SPEECH AND ITS DISORDERS

Auditory receptive aphasia (Wernicke's aphasia) is characterized by loss of the ability to comprehend the significance of spoken words in the absence of deafness (word deafness).

Field of lesion is localize in the transverse temporal gyri (Heschl's convolutions) on the dorsal surface of the posterior portion of the superior temporal convolution.

SPEECH AND ITS DISORDERS

Alexia — loss of expression by reading.

Loss of expression by writing is usually called **agraphia** in the absence of paralysis of the arm or hand.

They are usually in include aphasia complex, but may be isolated.

SPEECH AND ITS DISORDERS

***Dyslalia* is a disturbance of utterance in which there is no organic neurologic defect, but there is structural damage to the articulatory system. Dyslalia is divided on motor and receptive.**

SPEECH AND ITS DISORDERS

Dysarthria is the imperfect utterance of sounds or words; symbolic formulation of words is normal and phonation is preserved, but disease of the nerves to the organs of articulation or of the central regulation of the nerves interferes with clear enunciation.

GNOSIS AND ITS DISORDERS

Gnosis — is ability to recognize objects on perceptions.

Agnosia — loss of the ability to comprehend the meaning or to recognize the importance of various types of stimulation.

GNOSIS AND ITS DISORDERS

Visual object agnosia — failure to recognize object by vision.

Acoustic agnosia — loss of the ability to recognize object by verbal stimuli

GNOSIS AND ITS DISORDERS

Tactile agnosia — misrecognition nature surface of the object to the touch.

Astereognosis, or tactile agnosia, is the loss of power to perceive the shape and nature of superficial contact alone, in the absence of any demonstrable sensory defect.

PRAXIS AND ITS DISORDERS

Praxis — is ability to carry out purposive, complicated, useful, planned acts.

Apraxia is a defect in the ability to carry out purposive, useful, or skilled acts, especially if complicated; there is loss of the capacity to use objects correctly.

PRAXIS AND ITS DISORDERS

Ideokinetic (ideomotor or "classic") apraxia is caused by an interruption of the pathways between the center for formulation of an act and that for execution of the act. It has been ascribed to lesions of the supramarginal gyrus.

The ***constructional apraxia*** is characterized by loss of visual guidance, impairment of the visual image, and disturbance of revisualization.

Patient cannot guide his hand in constructing small geometric figures and in building forms with blocks.

It has been ascribed to lesions of the angular gyrus.

PRAXIS AND ITS DISORDERS

Kinetic, or motor, apraxia

There is no motor weakness and the extremity can be used for unconscious and associated movements, but not for deliberate, purposeful acts.

He cannot perform movements that he has learned, acquired, and brought to perfection.

The apraxia is usually contralateral to the lesion in in the precentral or premotor cortex.

MEMORY

In psychology, memory is the process by which information is encoded, stored, and retrieved.

From an information processing perspective there are three main stages in the formation and retrieval of memory:

Encoding or registration: receiving, processing and combining of received information.

Storage: creation of a permanent record of the encoded information.

Retrieval, recall or recollection: calling back the stored information in response to some cue for use in a process or activity.

The loss of memory is described as forgetfulness, or as a medical disorder, **amnesia**.

MEMORY IMPAIRMENT

Memory loss is referred to as amnesia — is an abnormal degree of forgetfulness and/or inability to recall past event.

Hypomnesia — memory loss. Memory loss can occur with age and / or as a result of a brain disease (atherosclerosis of cerebral vessels, epilepsy, etc.).

Hypermnesia — manifested by excessive abundance of memories that are vivid sense-like character, float with ease and cover the events as a whole and its tiniest details. Playing a logical sequence of facts violated, amplified, mainly mechanical and shape memory types. Occurs in hypomanic and manic states, in the initial stages of intoxication.

MEMORY IMPAIRMENT

Paramnesia that imply false or distorted memories, as well as the displacement of past and present, real and imaginary.

Phenomena previously seen, heard, experienced, tested narrated (***deja vu, deja entendu, deja vecu, deja eprouve, deja raconte phenomena***) and never had seen, not heard, not experienced, etc. (***jamaïs vu, jamaïs vecu, jamaïs entendu and etc.***).

Impaired consciousness are divided into change and oppression.

The change of consciousness is characterized by the disintegration of mental functions and perverted perception of the self, not usually accompanied by immobilization:

- delirium;**
- oneiric syndrome.**

Stunning defined sharp difficulty of mental activity almost constant sleepiness, interrupted occasionally episodes of motor excitation.

Verbal contact dramatically hindered.

Responses from the patient can be obtained after pressing appeals to him.

***Sopor* — deep depression of consciousness with the preservation of coordinated defense reactions and eye opening in response to pain, sound and other stimuli.**

The victim is drowsy, lying with his eyes closed, possibly removing it from this state for a short time. Localizes the pain: stretching to the point of application of the pain irritation hand.

Coma is the state of unarousable unconsciousness.

Etiology

Head injury

Medical causes of coma:

- **Cerebrovascular disease (50%).**
- **Hypoxic–ischemic injury (20%).**
- **Metabolic and infective (30%).**

LIGHT COMA (I)

Loss of voluntary movement only less unconscious spontaneous action, to painful stimuli (such as the oppression of the superior orbital margin), there are escape response and pain expression, but not answer questions or execute simple commands.

Swallowing reflex cough reflex, corneal reflex and the pupillary light reflex, tendon reflexes are still there, no significant changes in vital signs.

May be accompanied by delirium and agitation.

DEEP COMA (II)

Complete loss of consciousness, no response to various stimuli of the outside world, a variety of reflexes, muscle relaxation.

Deep Coma patients, clinical manifestations of no response to any stimulation, no spontaneous activity, body muscle relaxation, eye fixation, mydriasis, a variety of reflex, vital signs change significantly, such as irregular breathing, cardiac disorders, blood pressure fluctuations.

Coma is the state of unarousable unconsciousness. The Glasgow Coma

Scale (GCS) — see defines coma as:

Failure to open eyes in response to verbal command.

Motor response no better than weak fl exion.

Incomprehensible sounds in response to pain.

Glasgow coma scale (GCS)

Score	Eye opening	Motor response	Verbal response
1	None	None	None
2	To pain	Extension	Sounds
3	To speech	Abnormal flexion	Words
4	Spontaneously	Flexion	Confused speech
5		Localizes	Orientated
6		Obeys commands	

Prognosis GCS

- **GCS 3–5 = 80% dead or with severe disability**
- **GCS 6–8 = 30% dead or with severe disability**
- **GCS 9–13 = 15% dead or with severe disability**