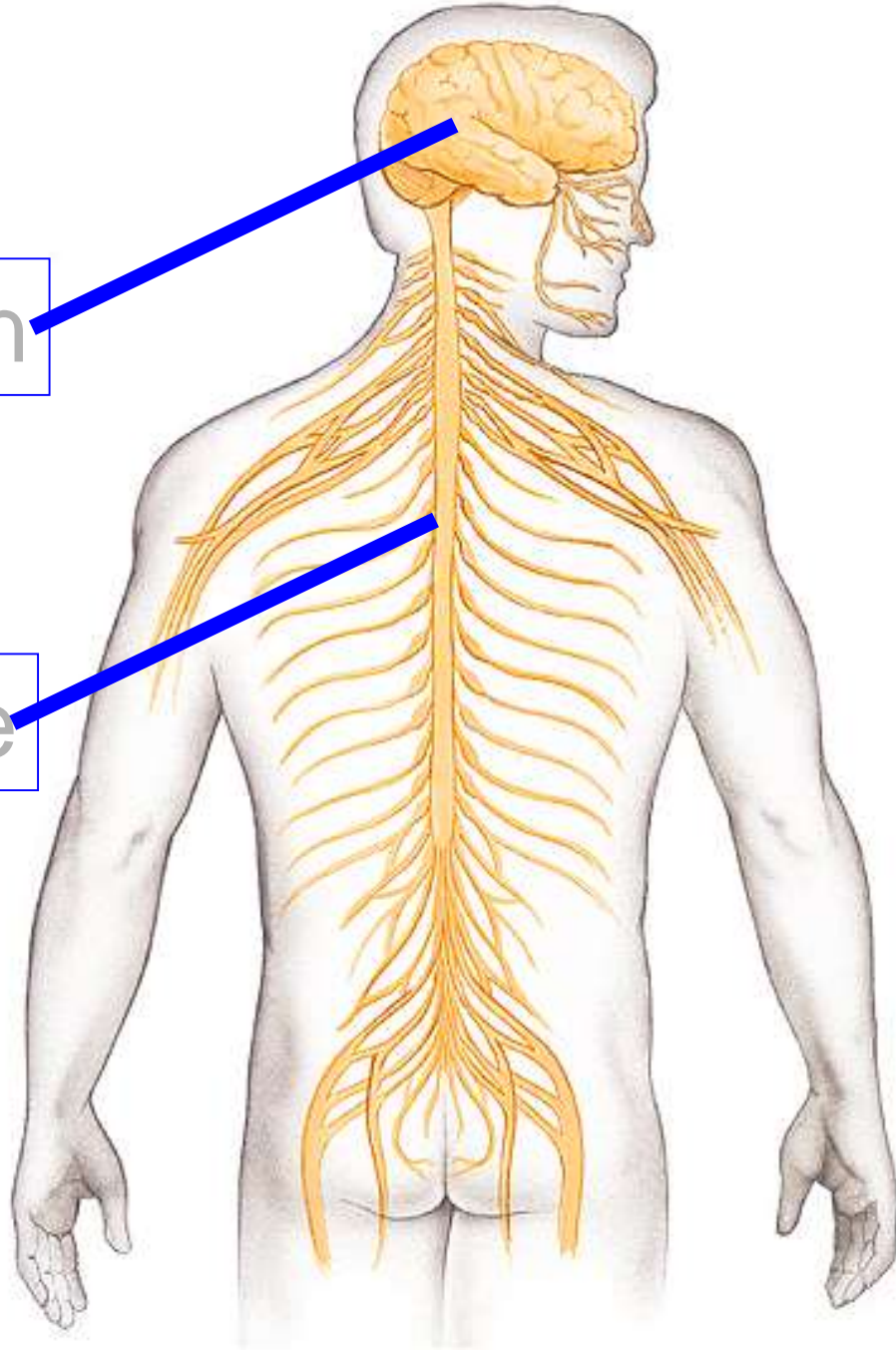


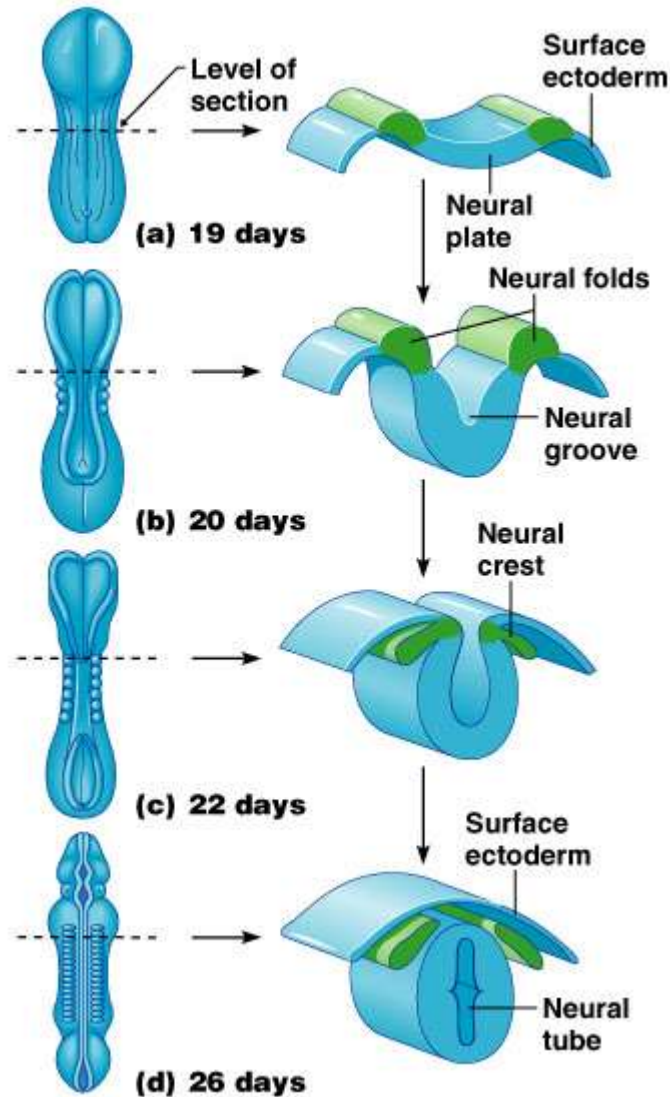
brain

spine


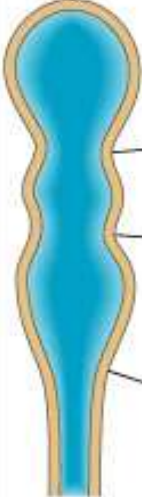



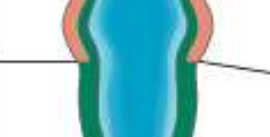
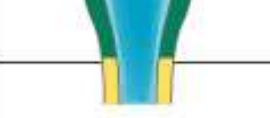


Development of the neural tube from embryonic ectoderm

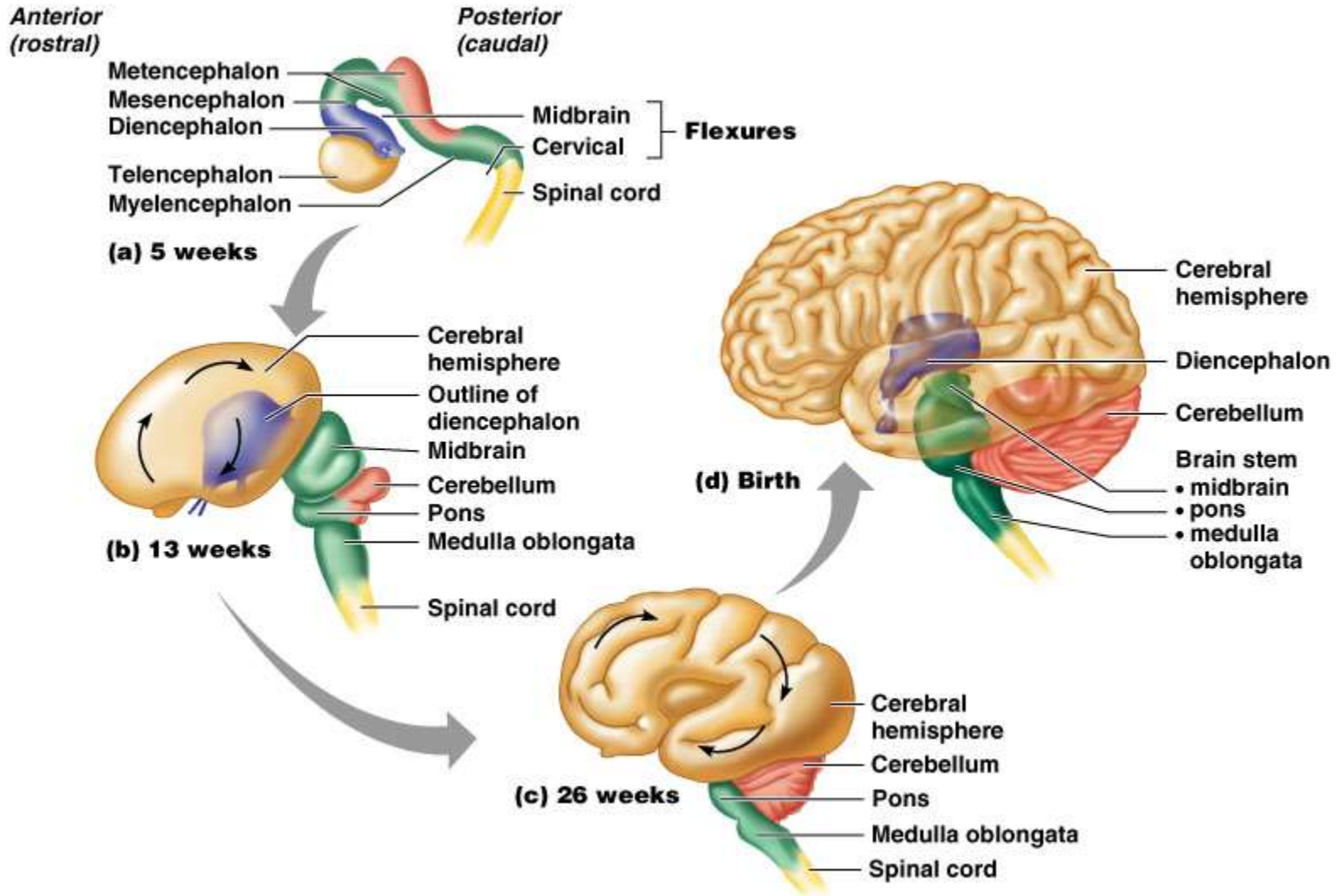
Anterior (rostral) end



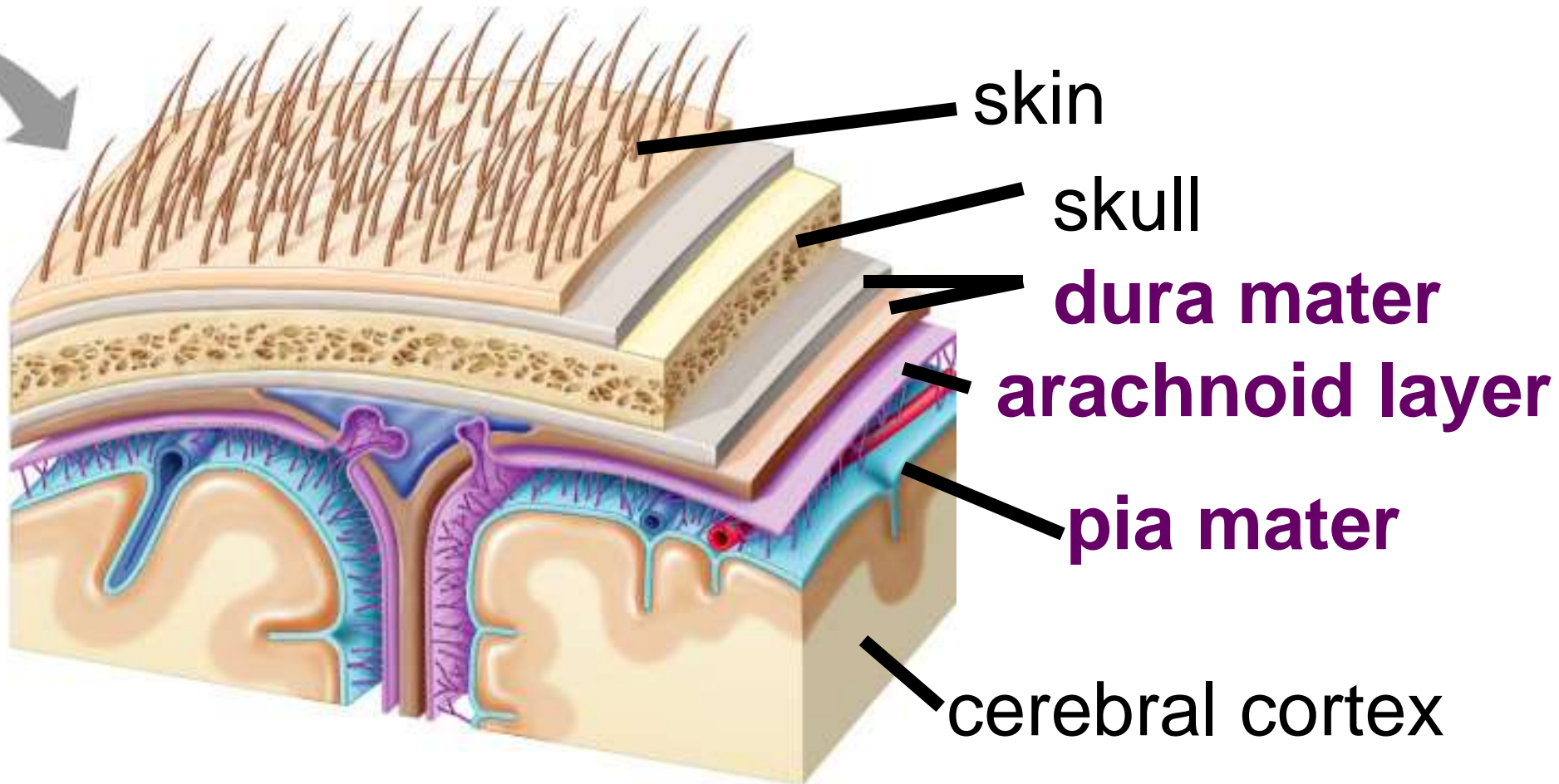
Embryonic Development

(a) Neural tube	(b) Primary brain vesicles	(c) Secondary brain vesicles	(d) Adult brain structures	(e) Adult neural canal regions
<p>Anterior (rostral)</p>  <p>Posterior (caudal)</p>	 <p>Prosencephalon (forebrain)</p> <p>Mesencephalon (midbrain)</p> <p>Rhombencephalon (hindbrain)</p>	 <p>Telencephalon</p>	<p>Cerebrum: Cerebral hemispheres (cortex, white matter, basal nuclei)</p>	<p>Lateral ventricles</p>
		 <p>Diencephalon</p>	<p>Diencephalon (thalamus, hypothalamus, epithalamus)</p>	<p>Third ventricle</p>
		 <p>Mesencephalon</p>	<p>Brain stem: midbrain</p>	<p>Cerebral aqueduct</p>
		 <p>Metencephalon</p>	<p>Brain stem: pons</p>	<p>Fourth ventricle</p>
		 <p>Myelencephalon</p>	<p>Cerebellum</p> <p>Brain stem: medulla oblongata</p>	
<p>Spinal cord</p>	<p>Central canal</p>			

Brain Development



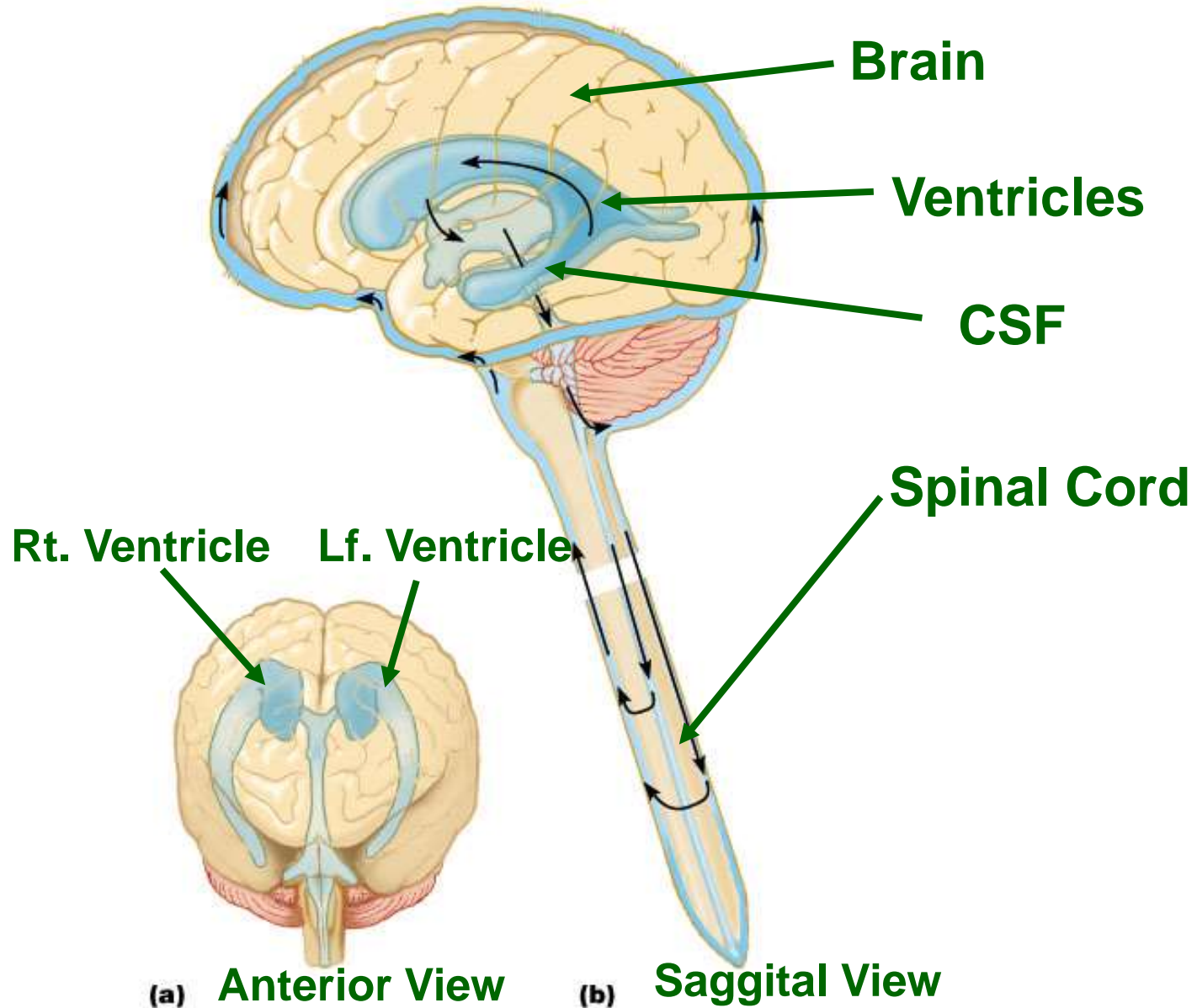
Coverings of the Brain- Meninges



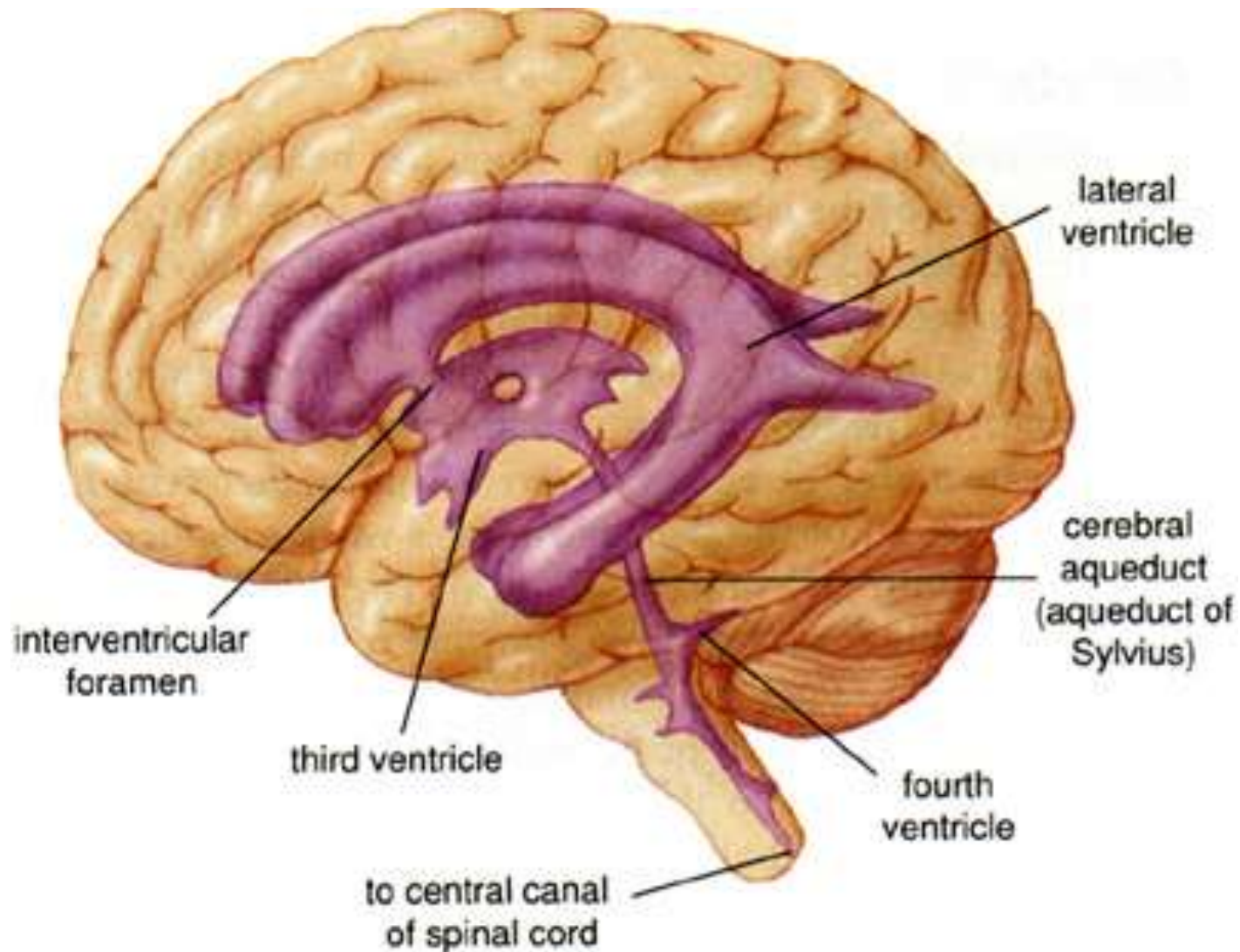
Meninges:

1. Covers and protects CNS
2. Protects blood vessels and encloses venous sinuses
3. Contains CSF
4. Forms partition within the skull

Cerebruspal Fluid



Ventricles

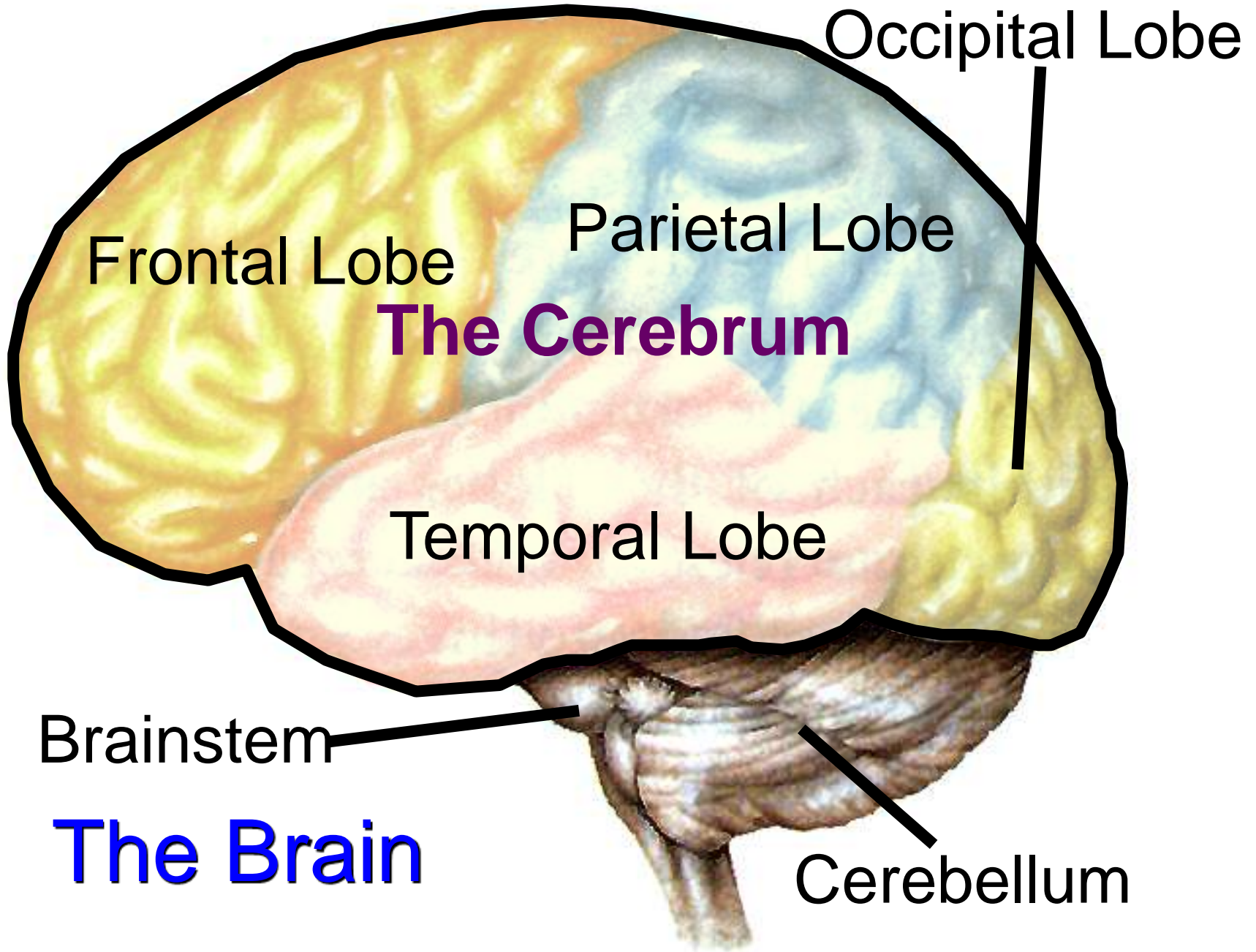


CSF

- 150 ml in adult
- contains: glucose, proteins, lactic acid, urea, cations, anions, WBC

Functions:

1. Reduces wt. of brain by 97%
2. Prevents head injury
3. Supplies brain with nutrition
4. Transports hormones along ventricular channels



Frontal Lobe

Parietal Lobe

Occipital Lobe

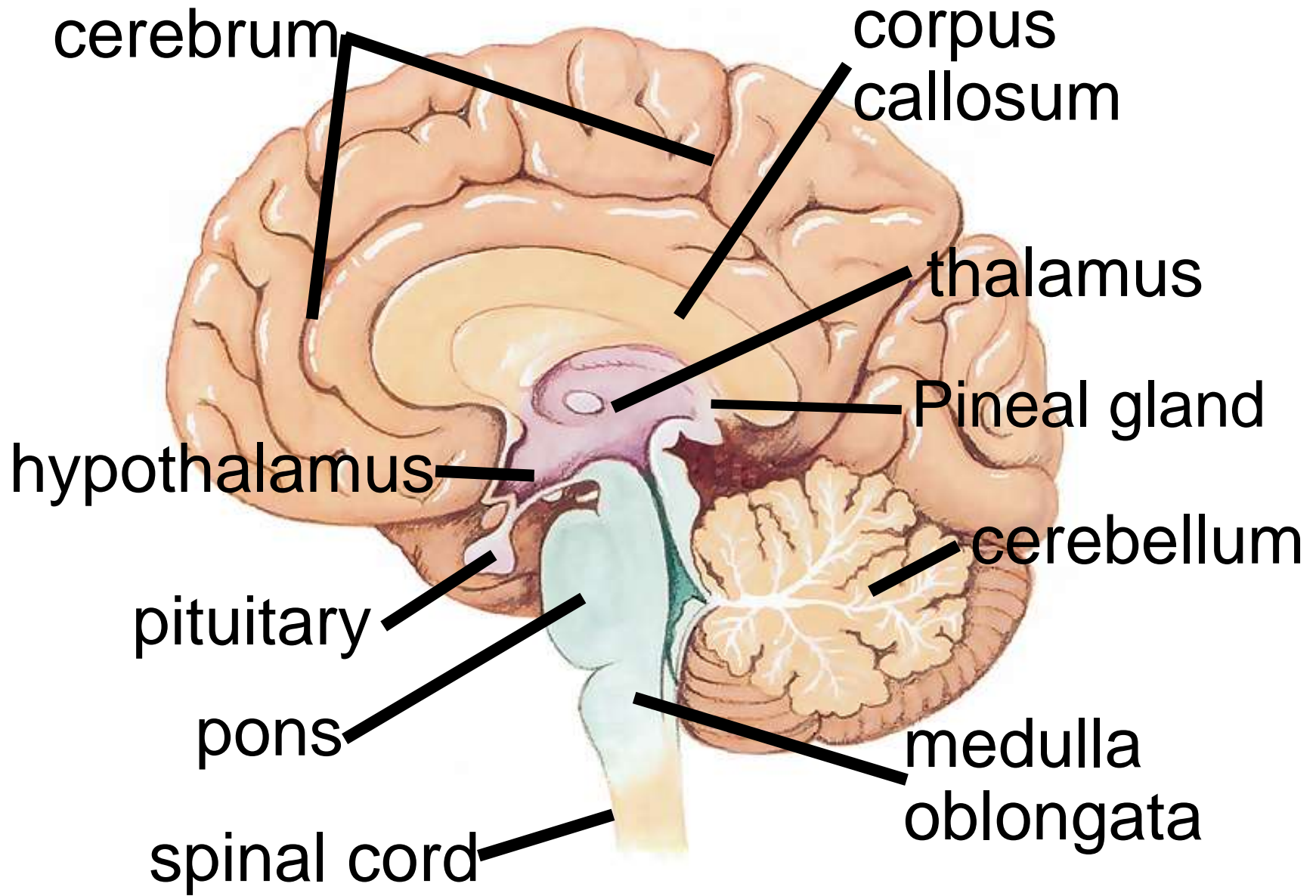
The Cerebrum

Temporal Lobe

Brainstem

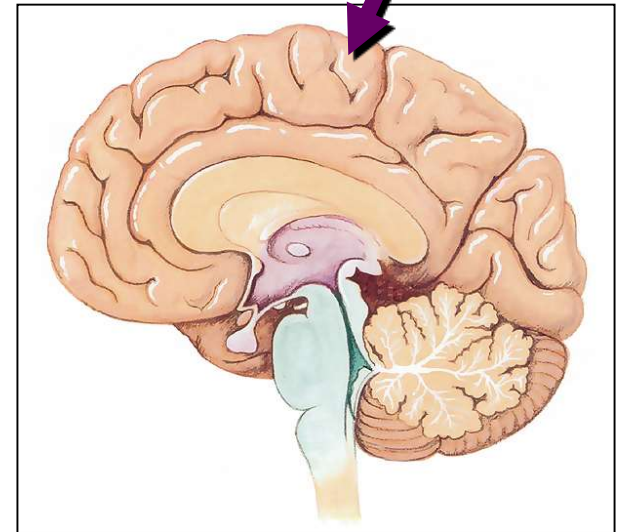
The Brain

Cerebellum

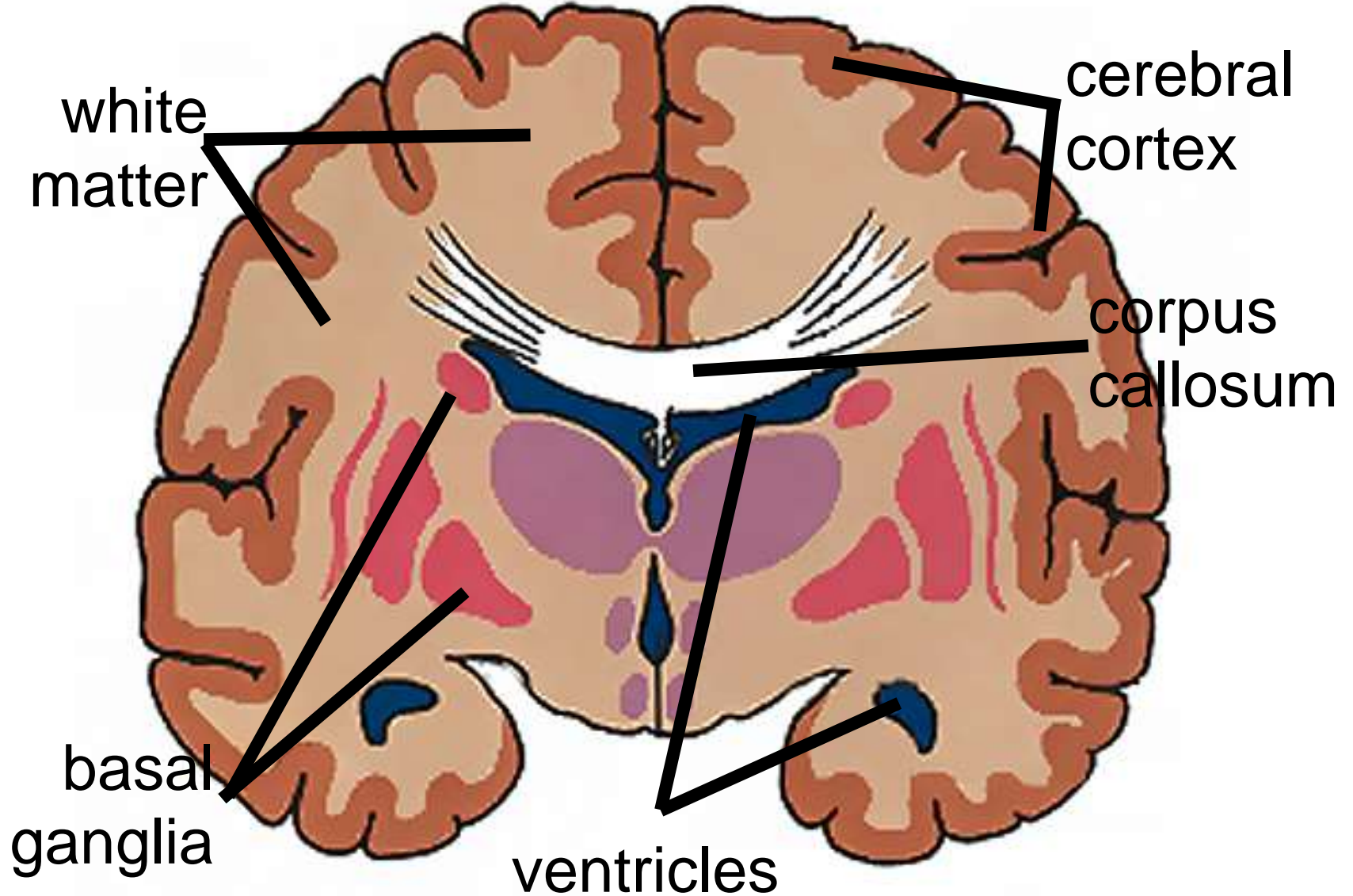


Cerebrum

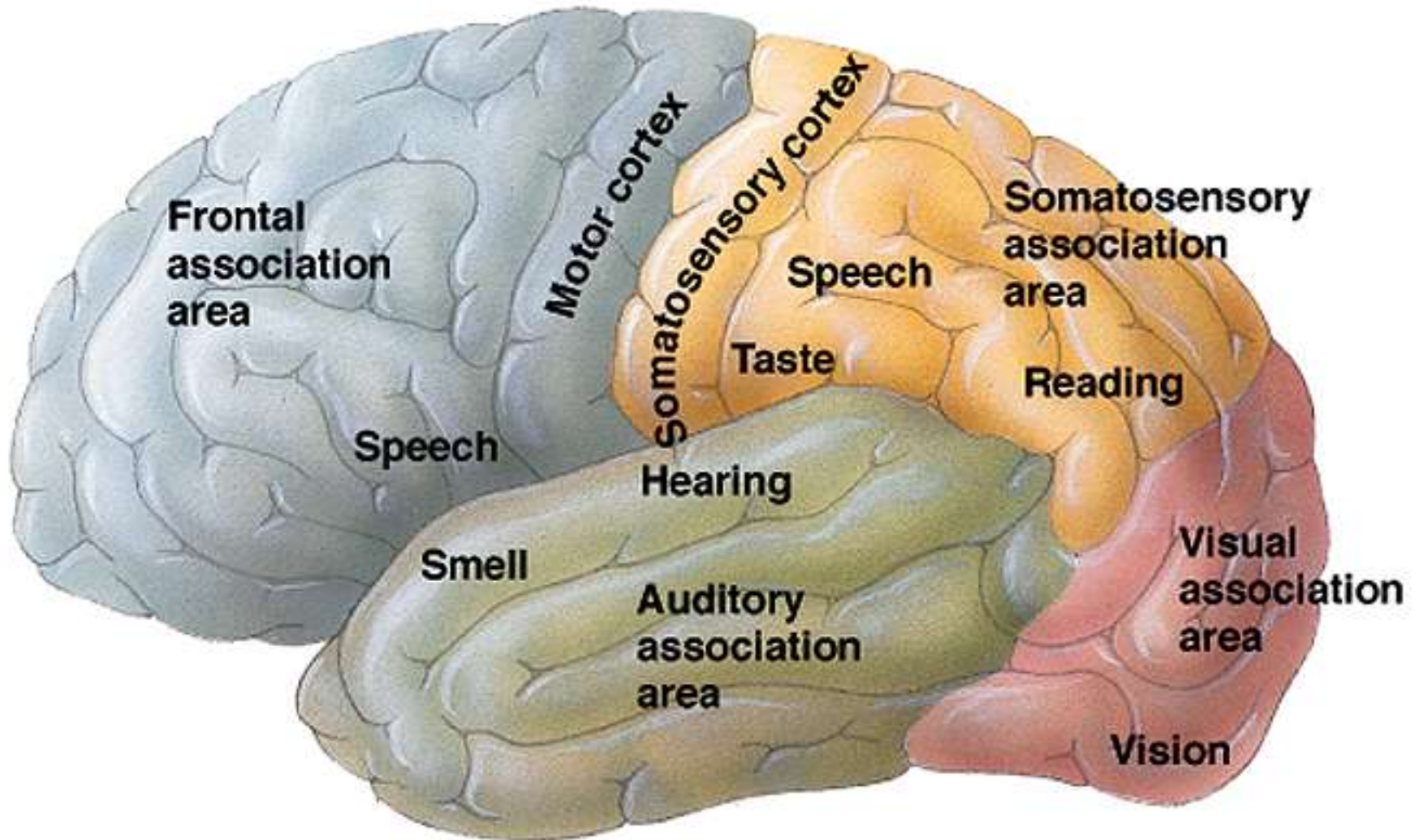
- Involved with higher brain functions.
- Processes sensory information.
- Initiates motor functions.
- Integrates information.



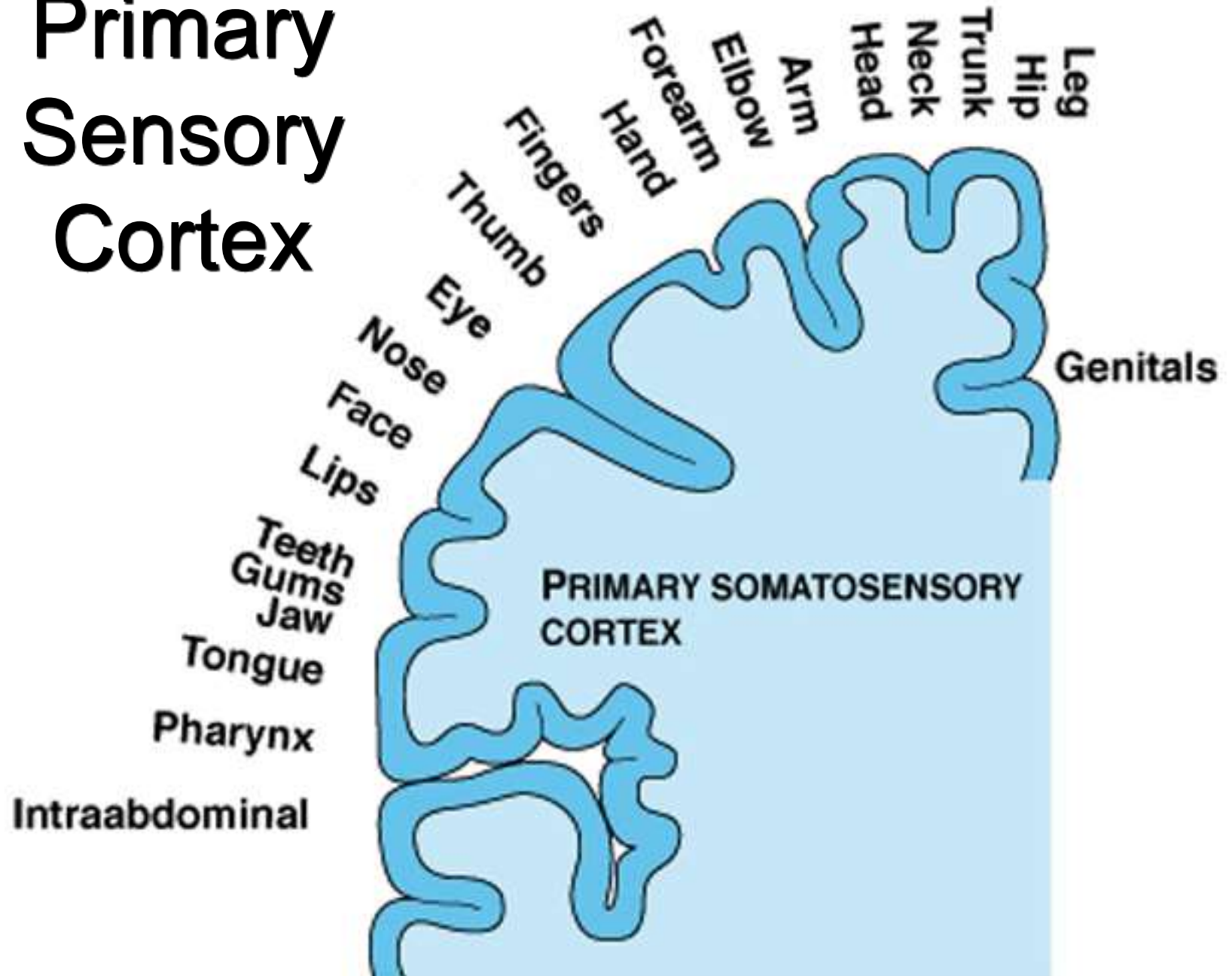
Cerebrum Cross-Section



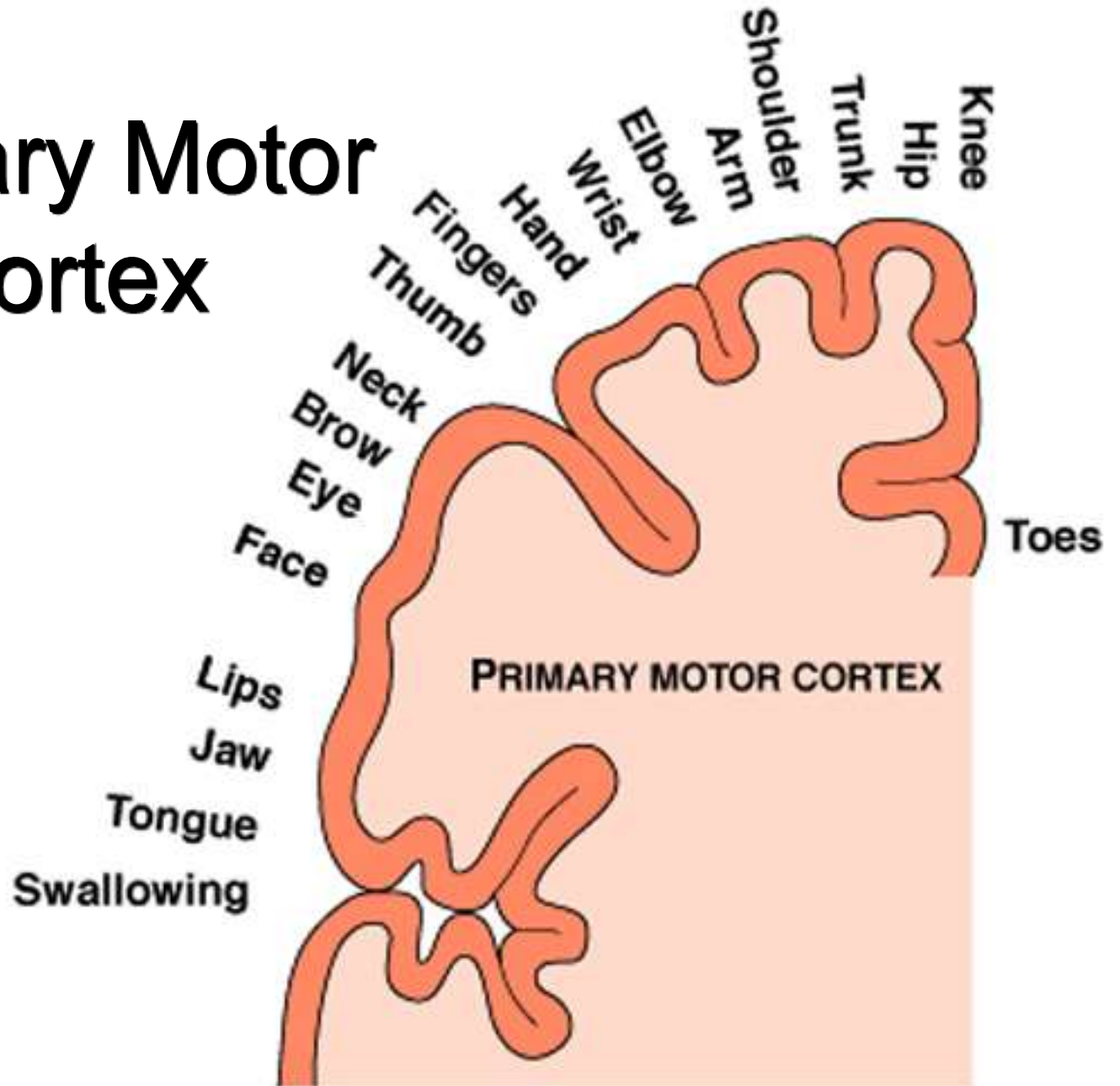
Motor, Sensory & Association Cortex



Primary Sensory Cortex



Primary Motor Cortex



Right-Left Specialization of the Cerebrum

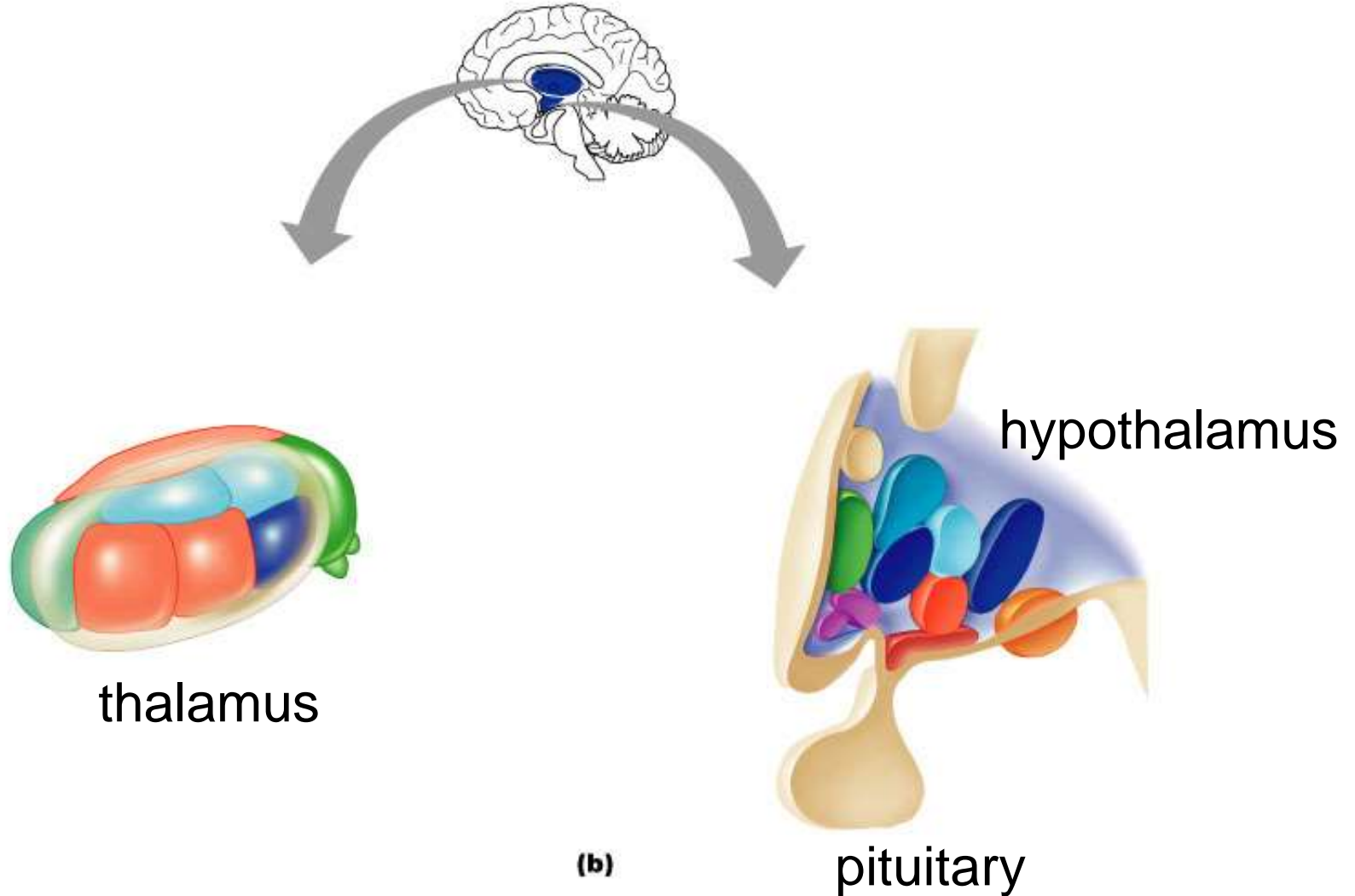
left side

- language development
- mathematical & learning capabilities
- sequential thought processes

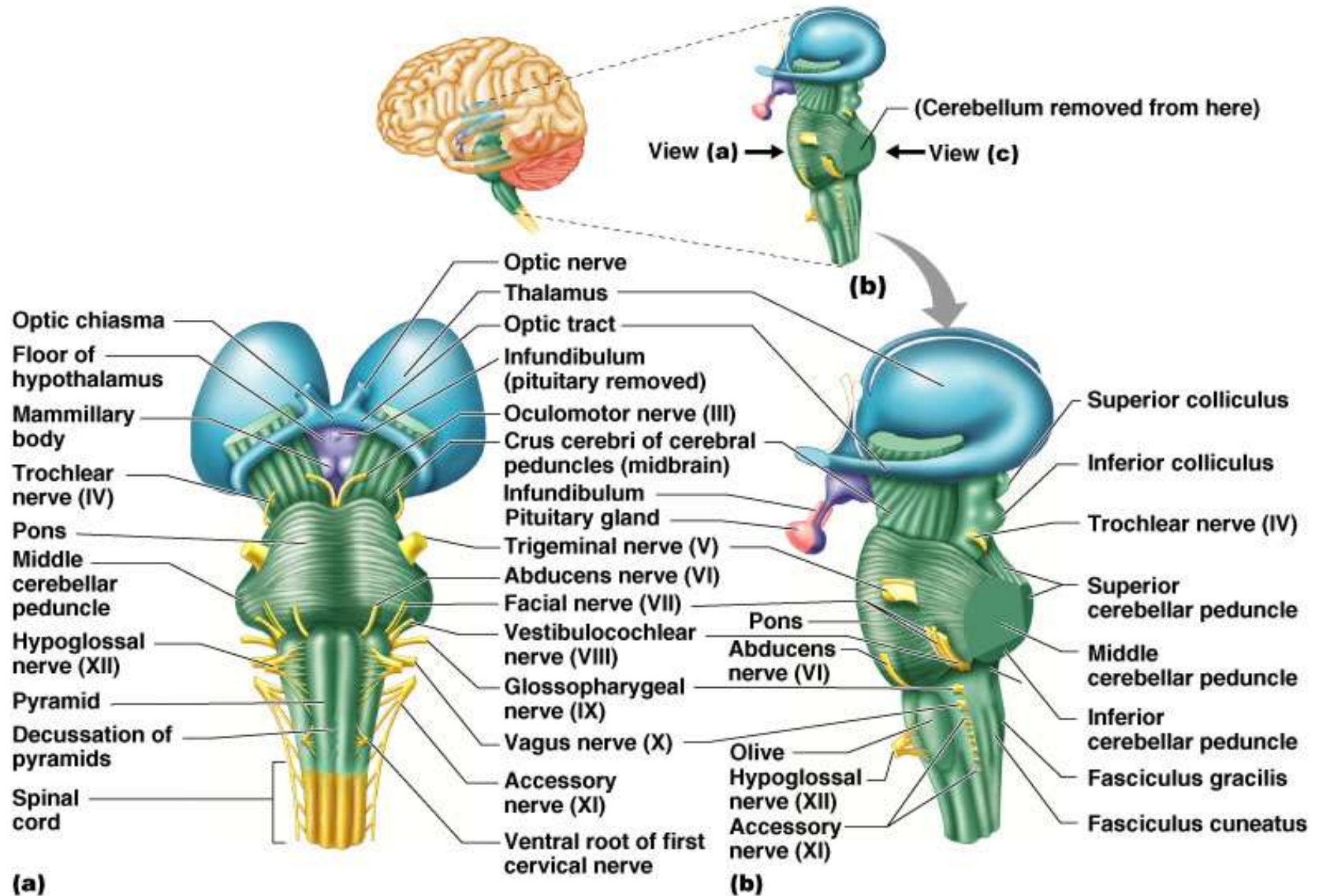
right side

- visual spatial skills
- musical and artistic activities
- intuitive abilities

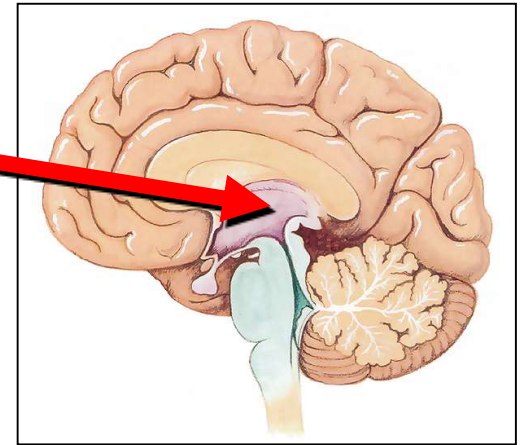
Diencephalon



Diencephalon

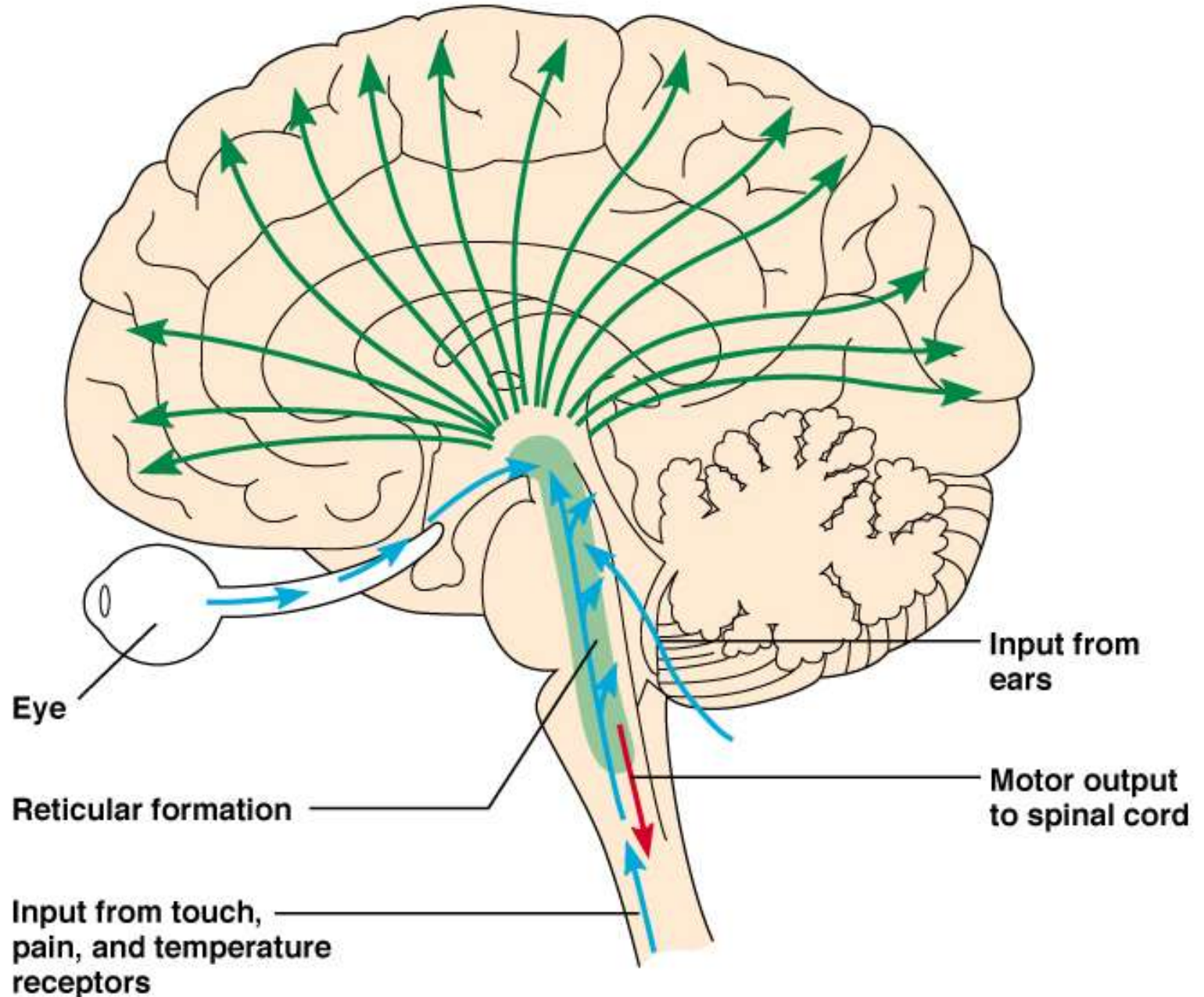


Thalamus



- Relay center for sensory tracts from the spinal cord to the cerebrum.
- Contains centers for sensation of pain, temperature, and touch.
- Involved with emotions and alerting or arousal mechanisms.

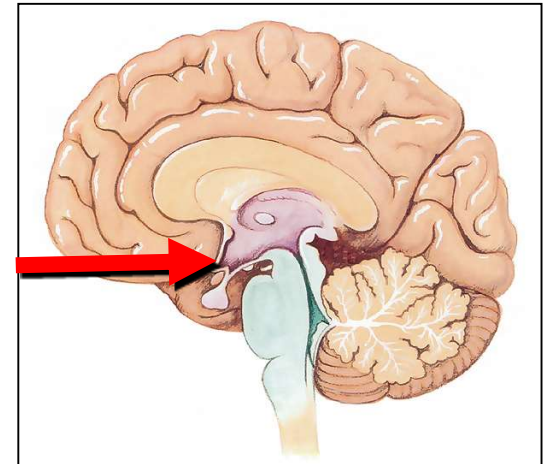
The Reticular Formation



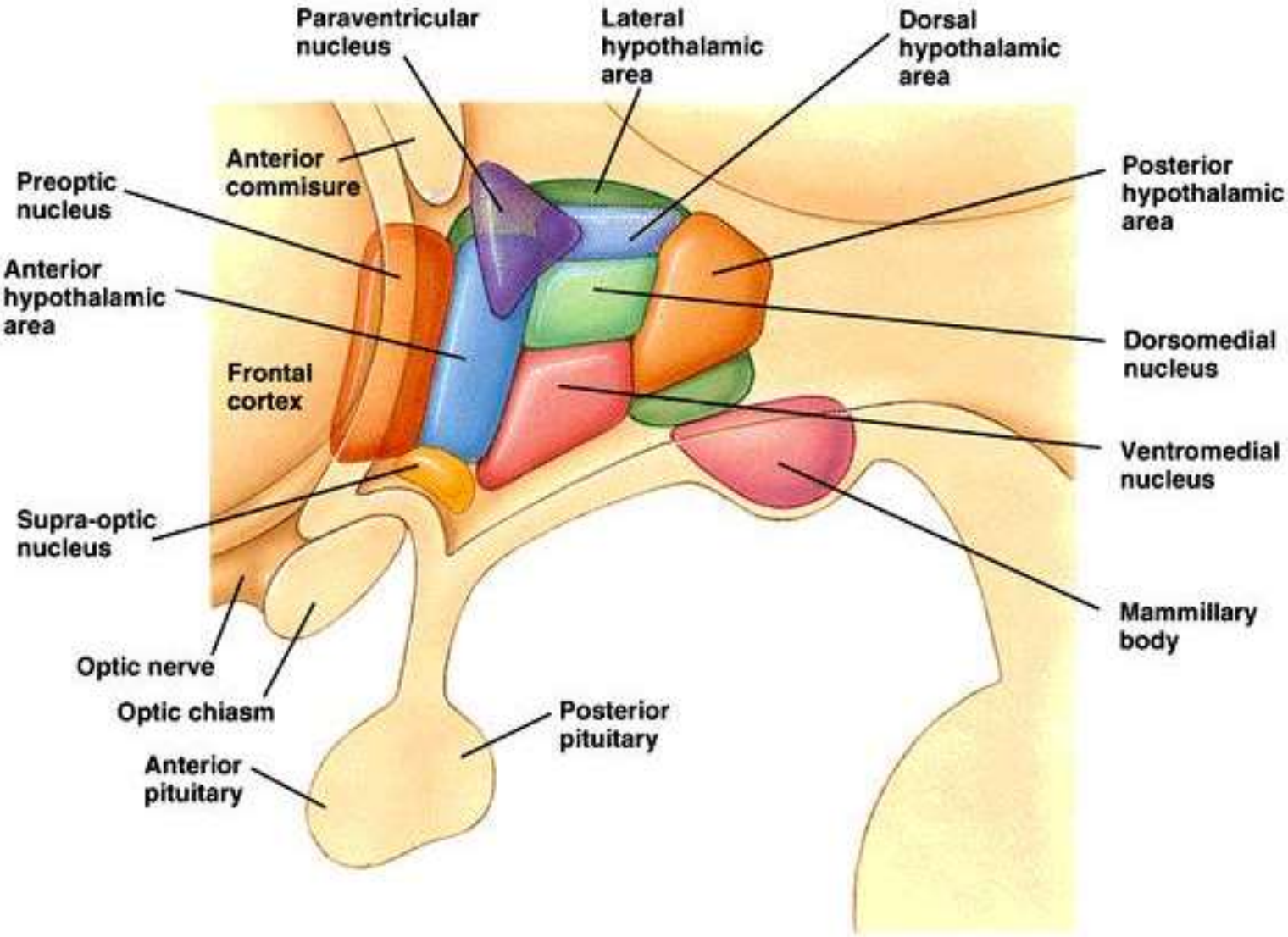
Hypothalamus

Regulates:

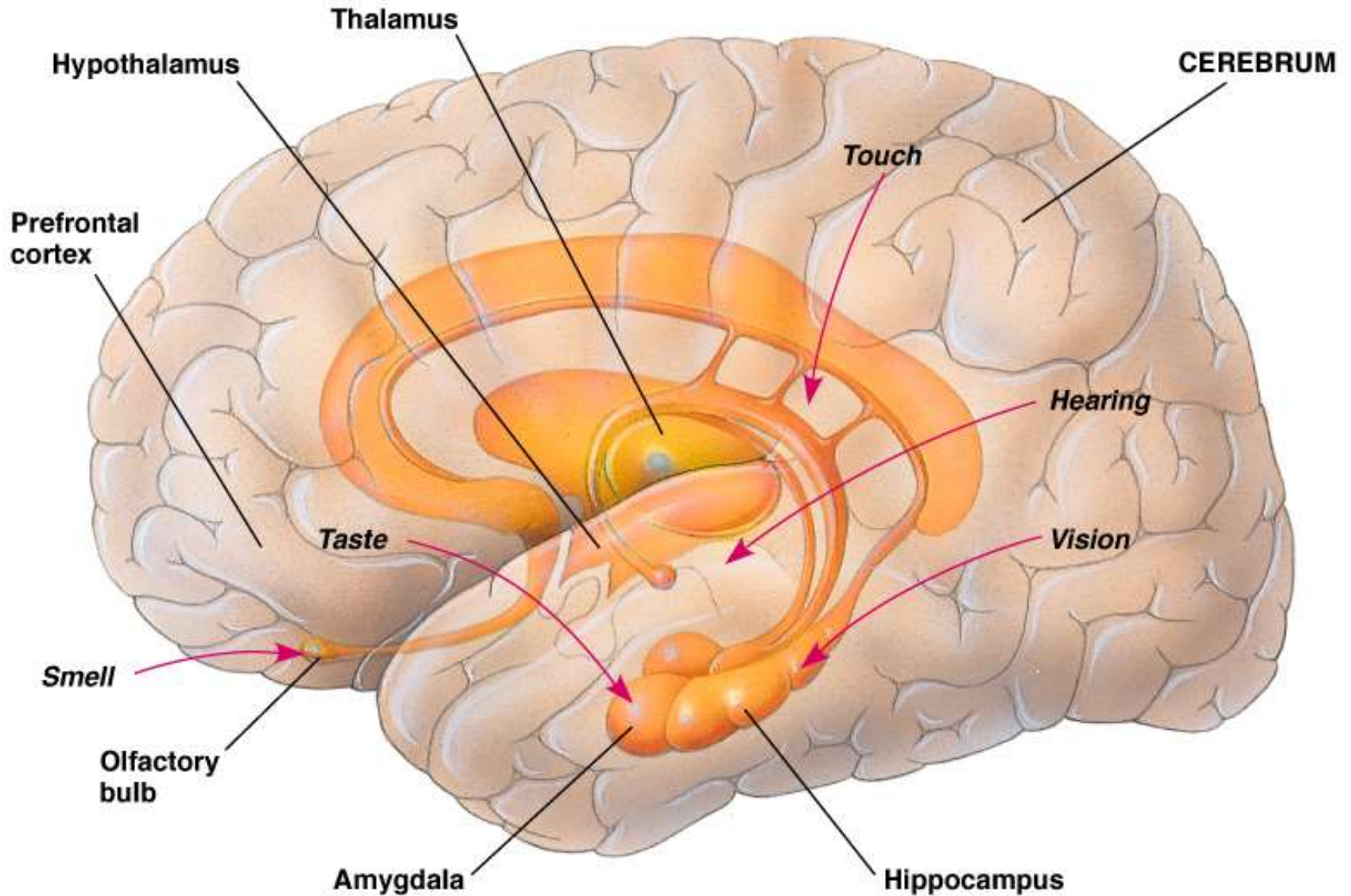
- autonomic control center- blood pressure, rate and force of heart contraction, center for emotional response and behavior
- body temperature
- water balance and thirst
- sleep/wake cycles
- appetite
- sexual arousal
- control of endocrine functioning:
Acts on the pituitary gland through the release of neurosecretions.



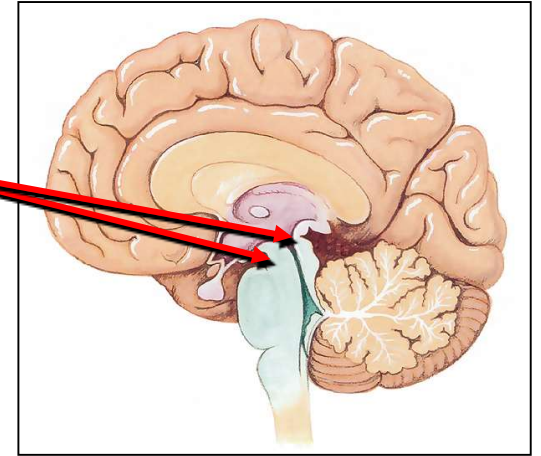
Hypothalamus



The Limbic System



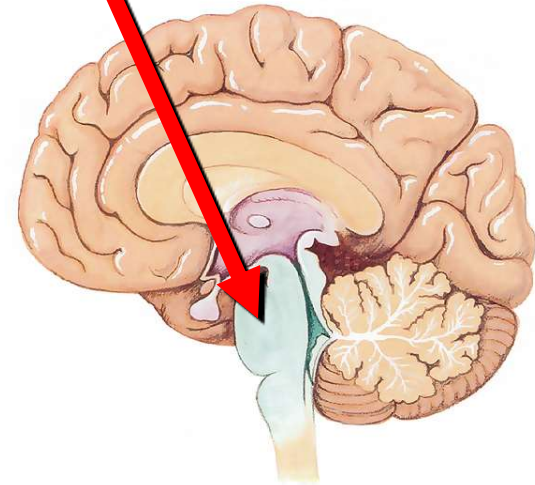
Midbrain



- Contains ascending and descending tracts to the cerebrum and thalamus.
- Reflex center for eye muscles.
- Also involved with processing visual and auditory information (connects head movements with visual and auditory stimuli).

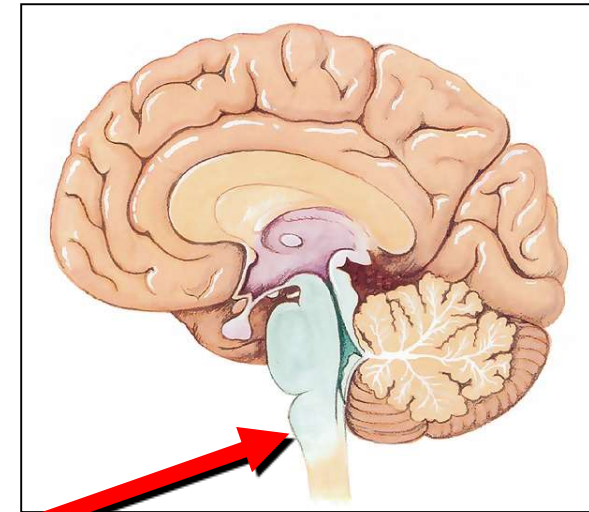
Pons

- Connects the two halves of the cerebellum.
- Regulates breathing.



Medulla Oblongata

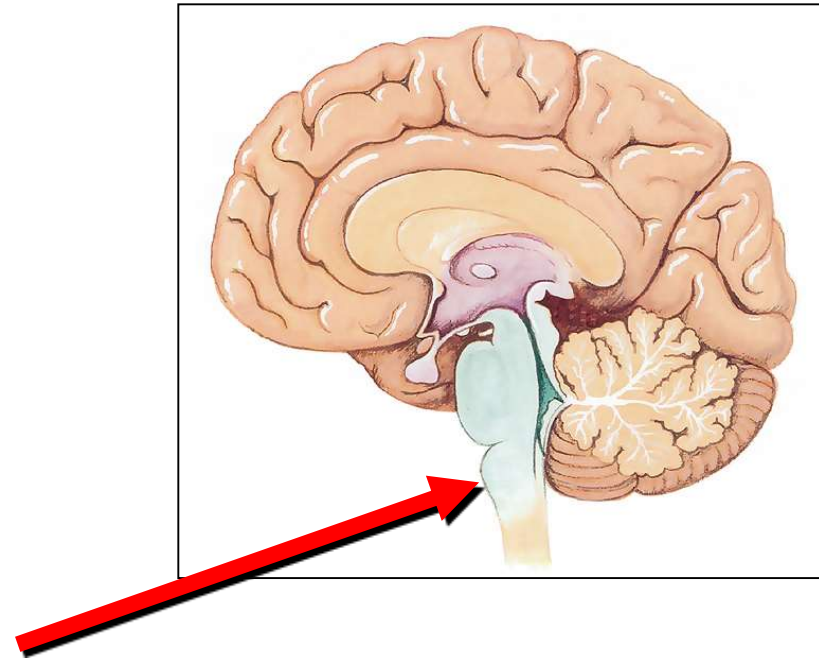
- Composed of nerve tracts to and from the brain (these tracts cross over left to right and right to left)
- May be regarded as an extension of the spinal cord
- Almost all of the cranial nerves arise from this region



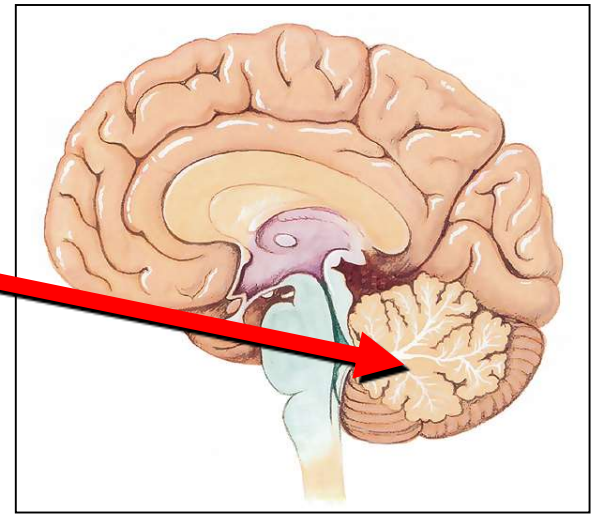
Medulla Oblongata

Contains control centers for many subconscious activities

- Respiratory rate
- Heart rate
- Arteriole constriction
- Swallowing
- Hiccupping
- Coughing
- Sneezing



Cerebellum



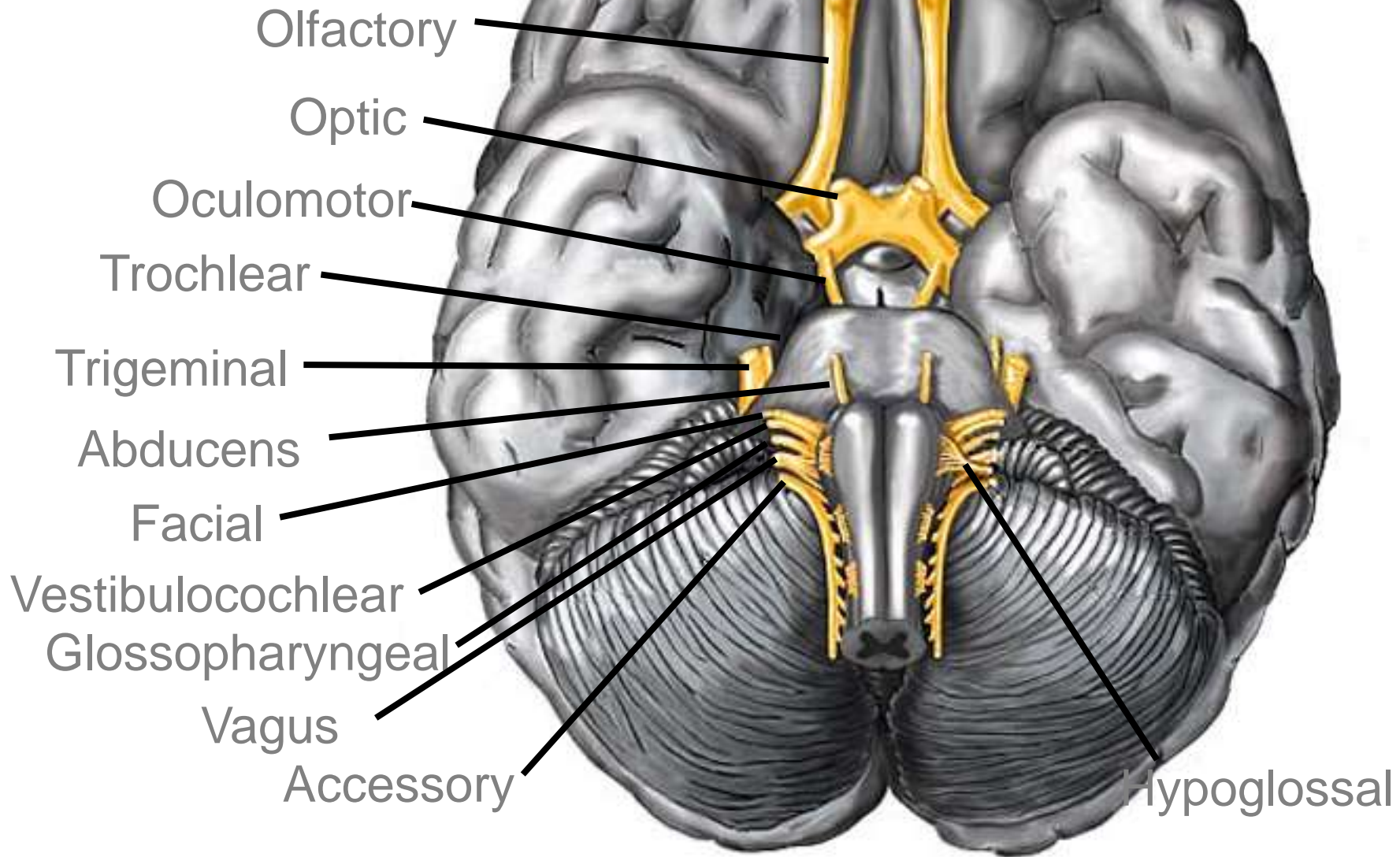
- Controls and coordinates muscular activity.
- Important in equilibrium, posture and movement.

Cranial Nerves

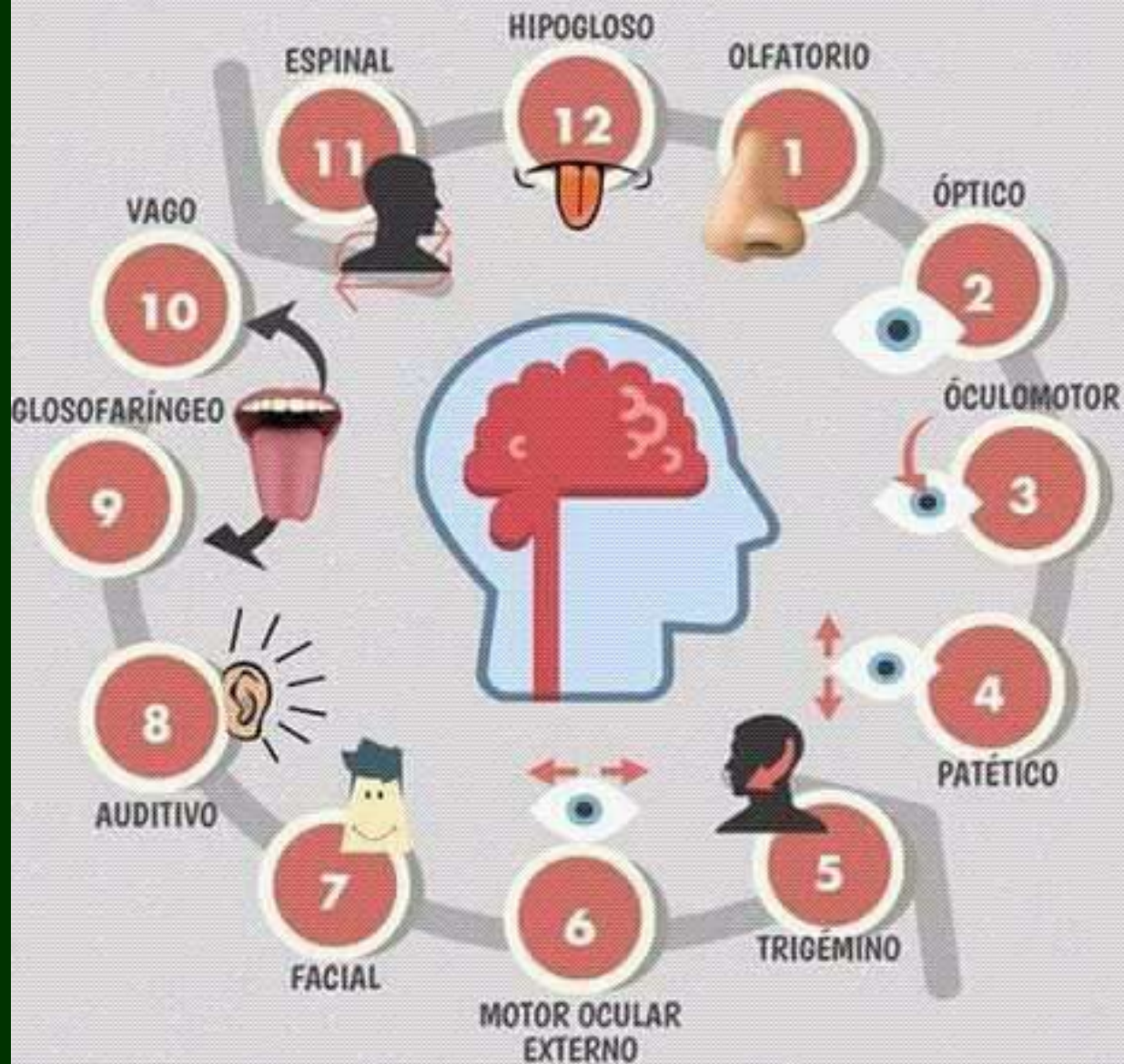
On Old Olympus Towering Tops A Fat Voracious German Viewed A Hop

1. **Olfactory**- smell
2. **Optic**- vision
3. **Oculomotor**- 4 of the 6 extrinsic eye muscles
4. **Trochlear**- extrinsic eye muscles
5. **Trigeminal**- sensory fibers to the face and motor fibers to the chewing muscles
6. **Abducens**- controls eye muscles that turn the eye laterally
7. **Facial**- facial expression
8. **Vestibulocochlear**- hearing and balance
9. **Glossopharyngeal**- tongue and pharynx
10. **Vagus**- from medulla- acetylcholine slows heart & breathing
11. **Accessory**- accessory part of vagus nerve
12. **Hypoglossal**- moves muscles under tongue

Cranial Nerves



Nervios Craneales



CRANIAL NERVES

1. OLFACTORY

2. OPTIC

3. OCULOMOTOR

4. TROCHLEAR

5. TRIGEMINAL

6. ABDUCENS

7. FACIAL

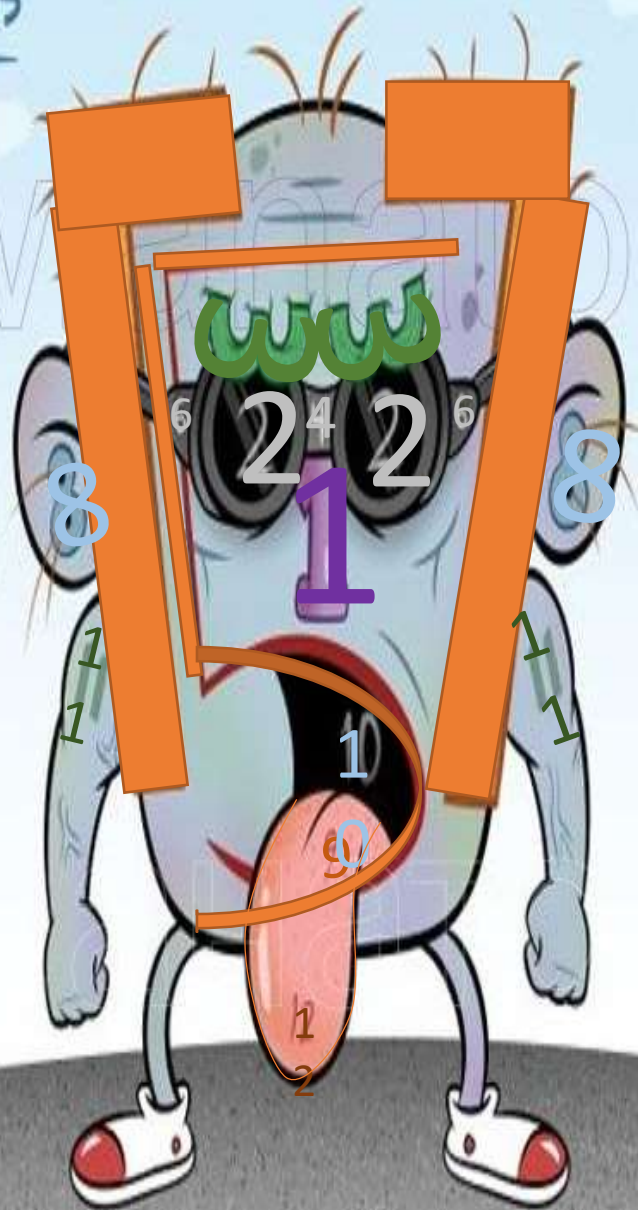
8. ACOUSTIC

9. GLOSSOPHARYNGEAL

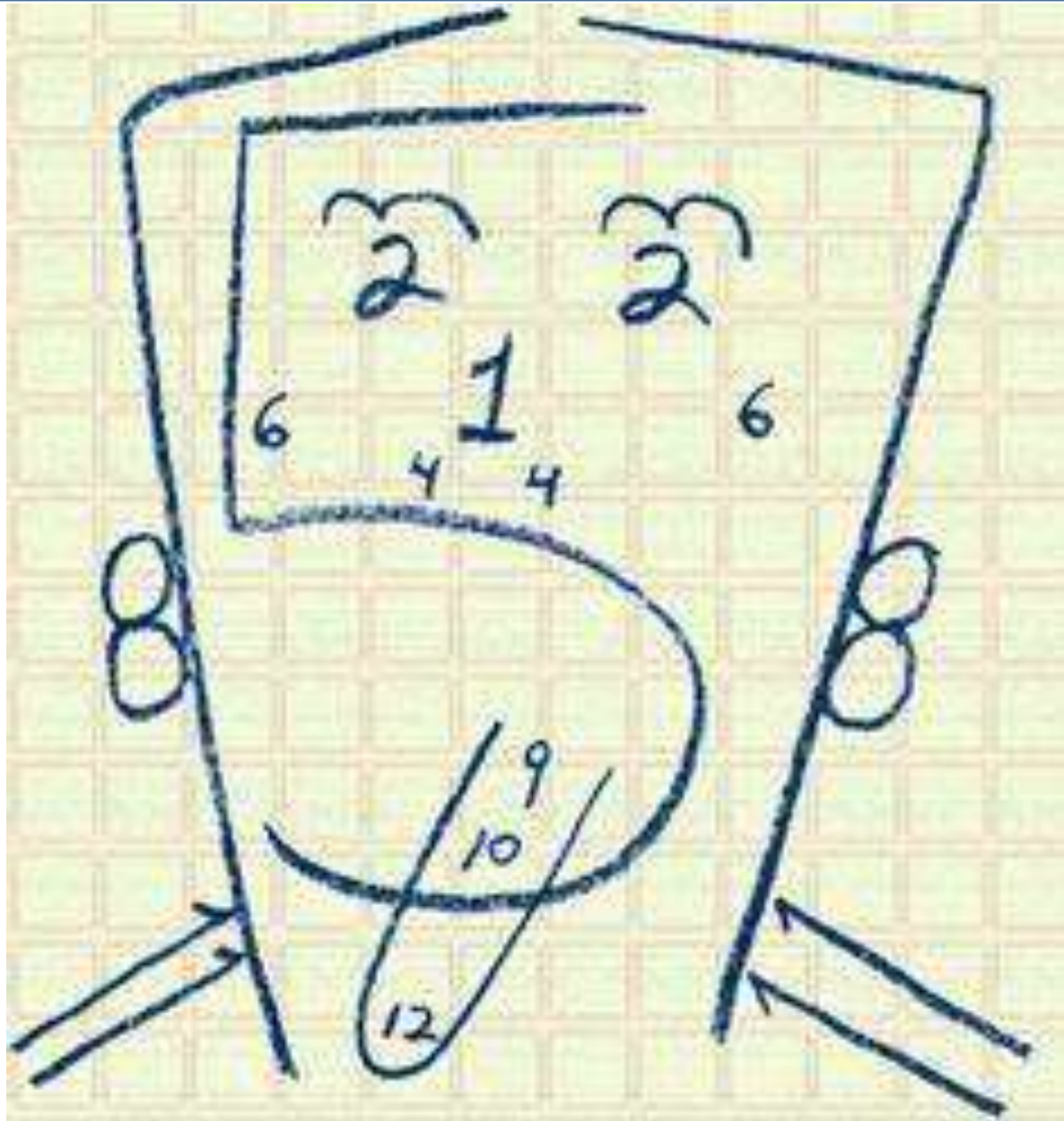
10. VAGUS

11. ACCESSORY

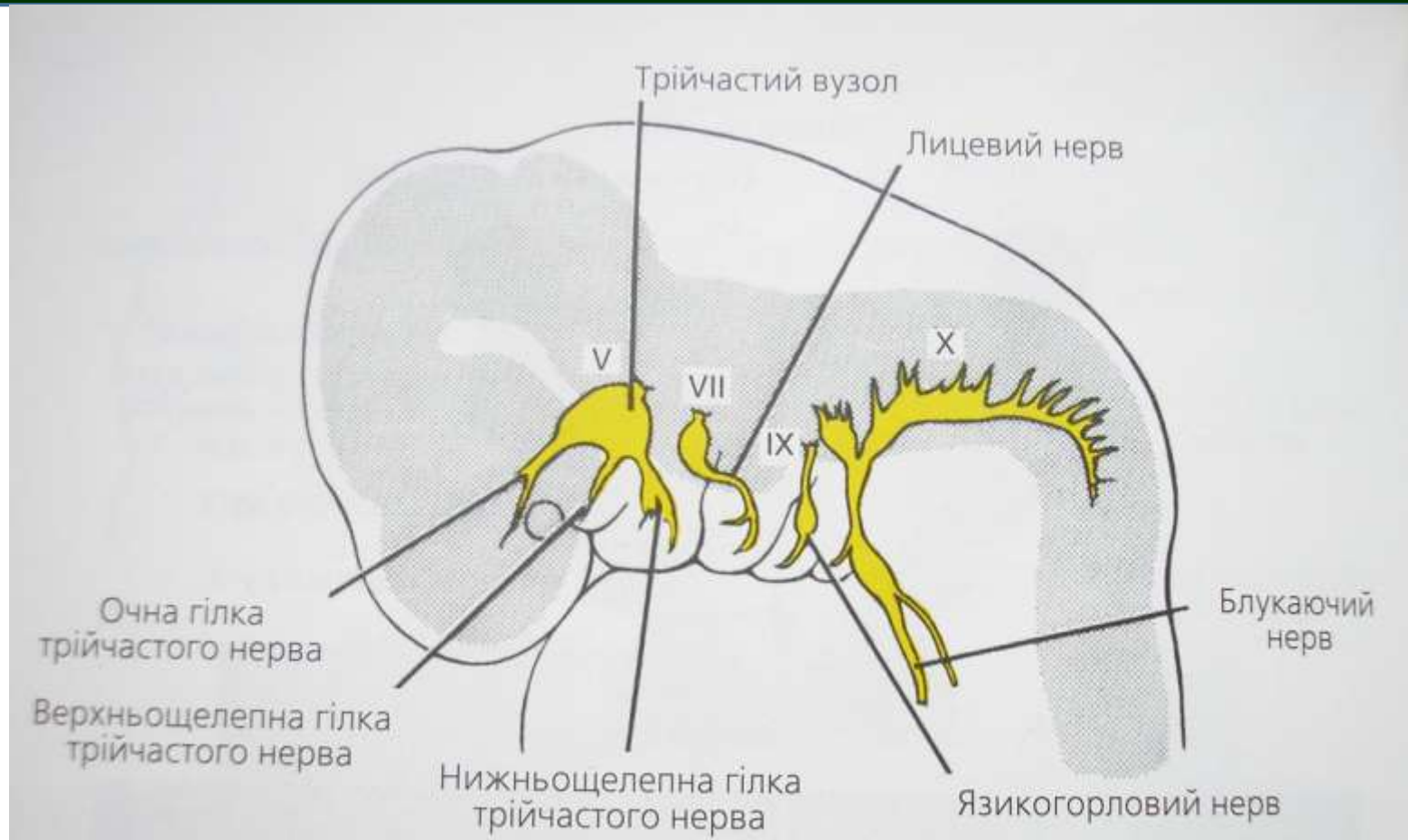
12. HYPOGLOSSAL



NERVI CRANIALES

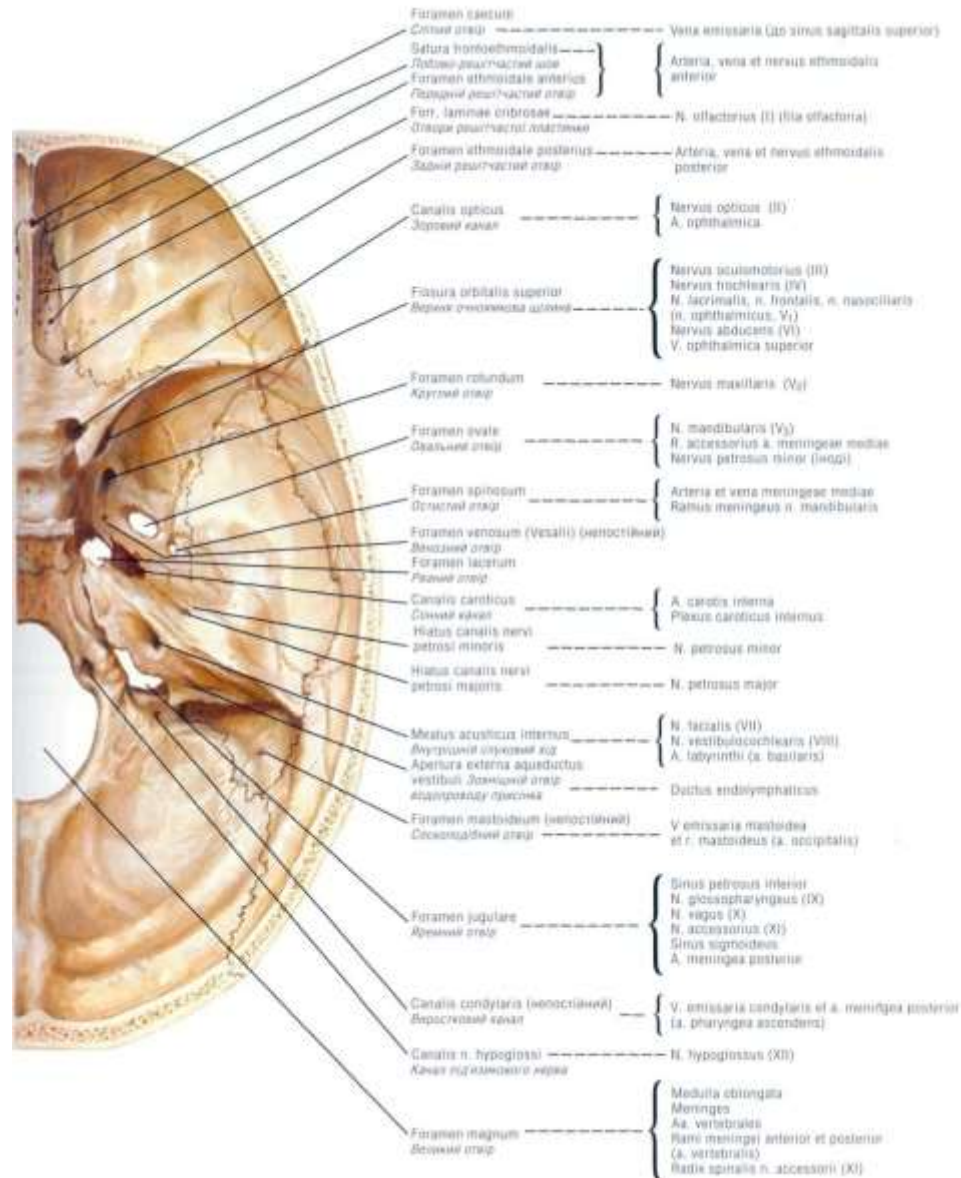


NERVI CRANIALES

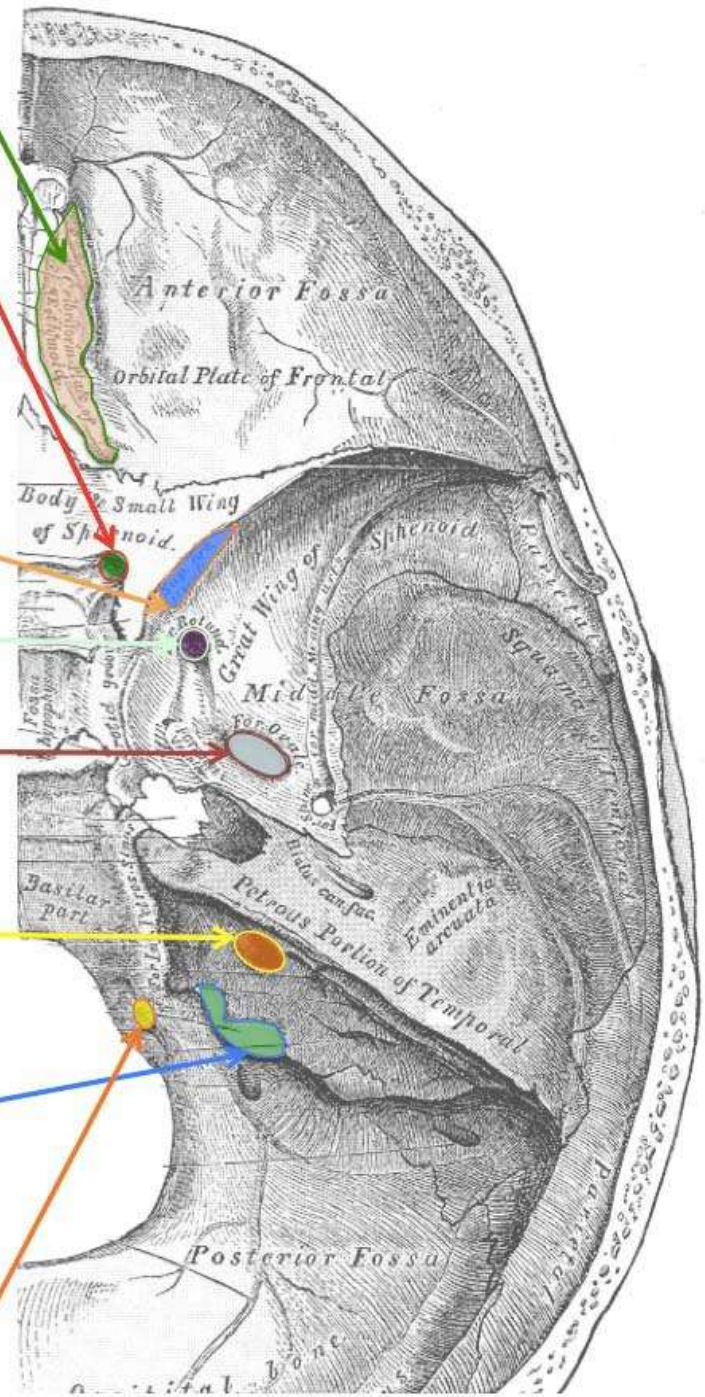


Кожна горлова дуга іннервується своїм власним черепним нервом. Трійчастий нерв, що іннервує першу горлову дугу, має три гілки: очну, верхньощелепну і нижньощелепну. Нервом другої дуги є лицевий нерв; нервом третьої дуги – язиковорловий нерв. Мускулатура четвертої дуги іннервується верхньою гортанною гілкою блукаючого нерва, а шосту дугу іннервує зворотна гілка блукаючого нерва.

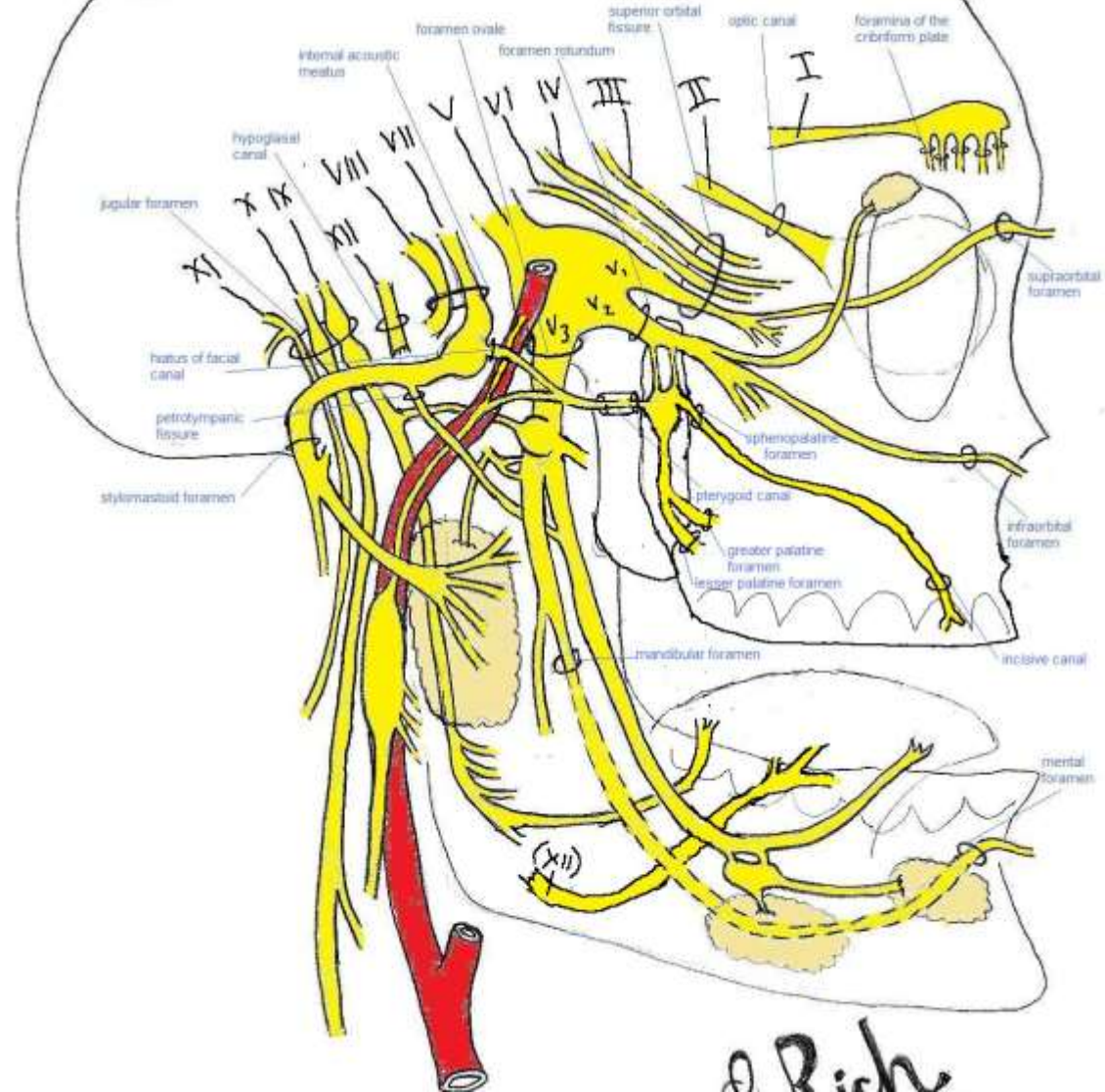
NERVI CRANIALES



- Cribriform plate*
Olfactory n (CNI)
- Optic canal*
Optic n (CNII)
- Superior orbital fissure*
Oculomotor n (CNIII)
Trochlear n (CNIV)
Ophthalmic n (CNV₁)
Abducens n (CNVI)
- Foramen rotundum*
Maxillary n (CNV₂)
- Foramen Ovale*
Mandibular n (CNV₃)
- Internal acoustic meatus*
Facial n (CNVII)
Vestibulocochlear n (CNVIII)
- Jugular foramen*
Glosopharyngeal n (CNIX)
Vagus n (CNX)
Accessory n (CNXI)
- Hypoglossal canal*
Hypoglossal n (CNXII)



Cranial Nerves

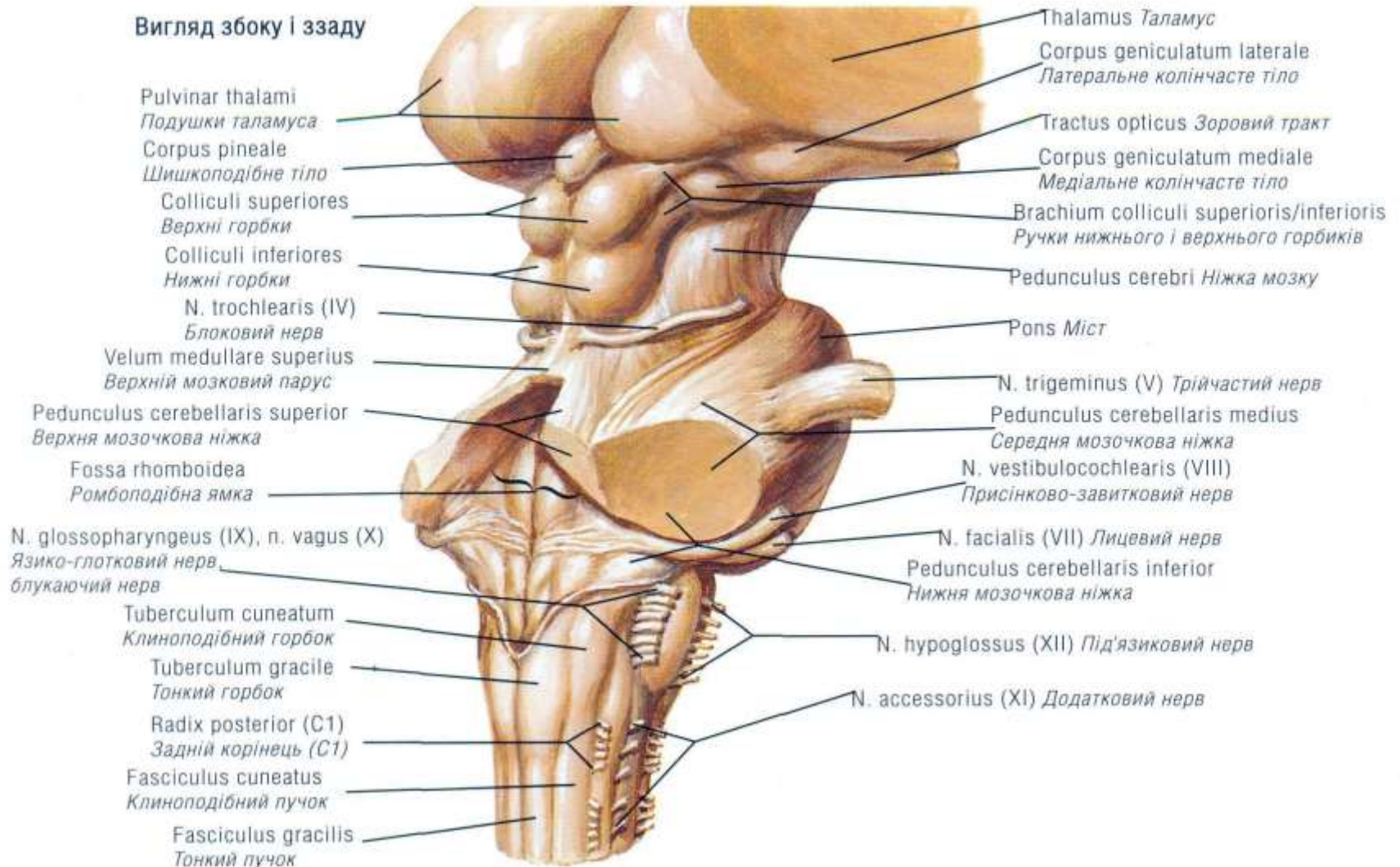


Rich

NERVI CRANIALES

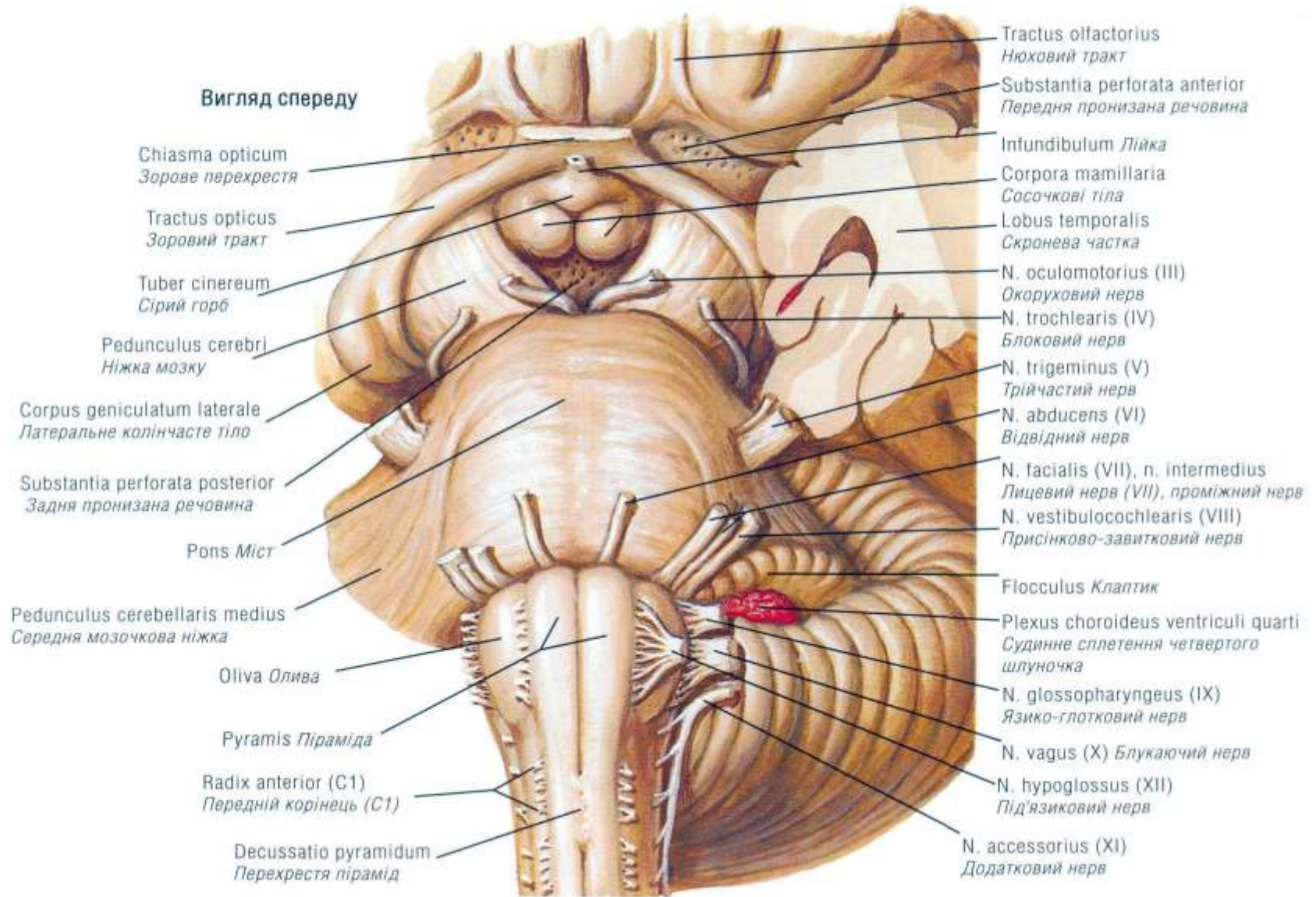
Стовбур головного мозку (*truncus encephali*)

Вигляд збоку і ззаду

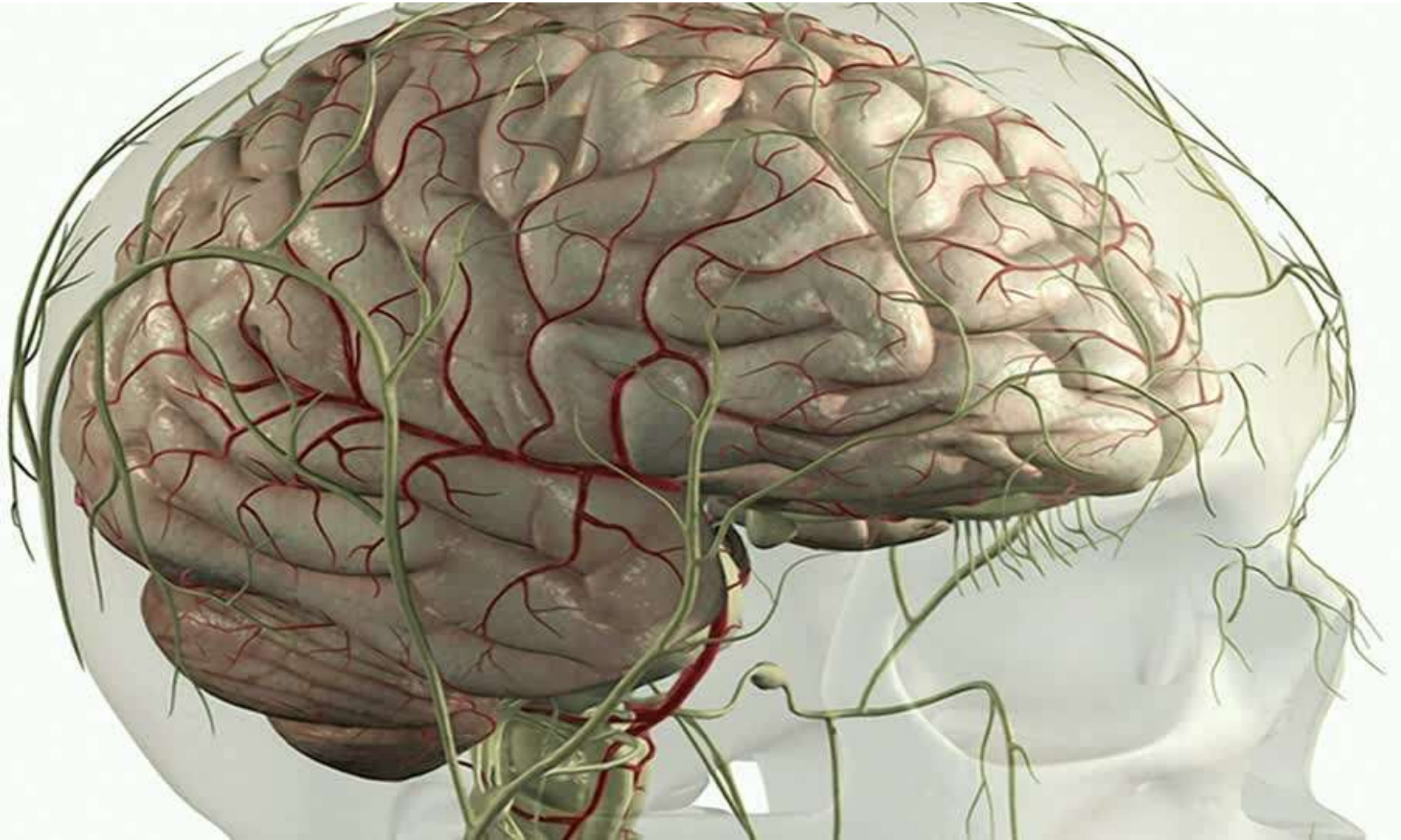


NERVI CRANIALES

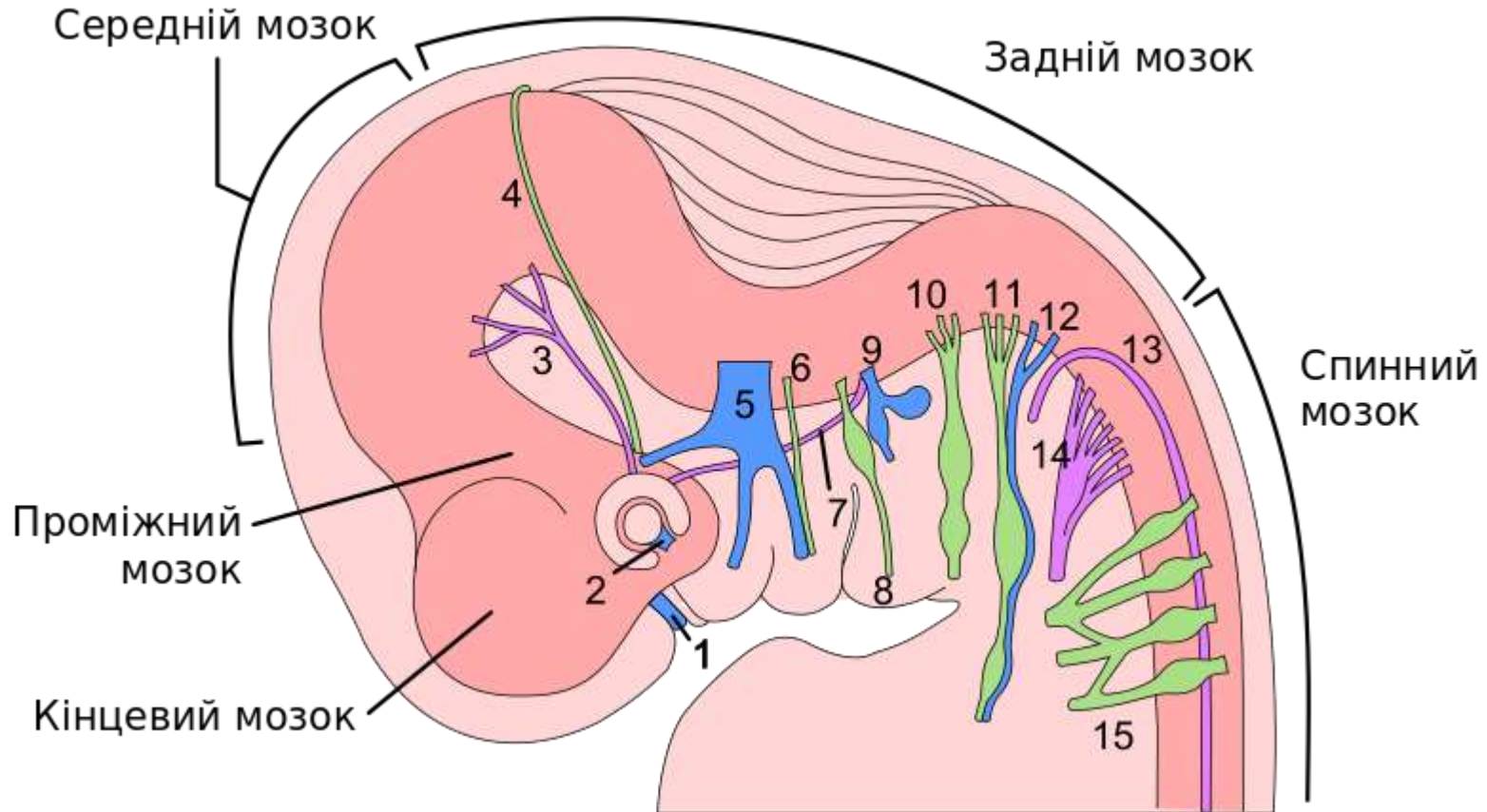
Стовбур головного мозку (truncus encephali)



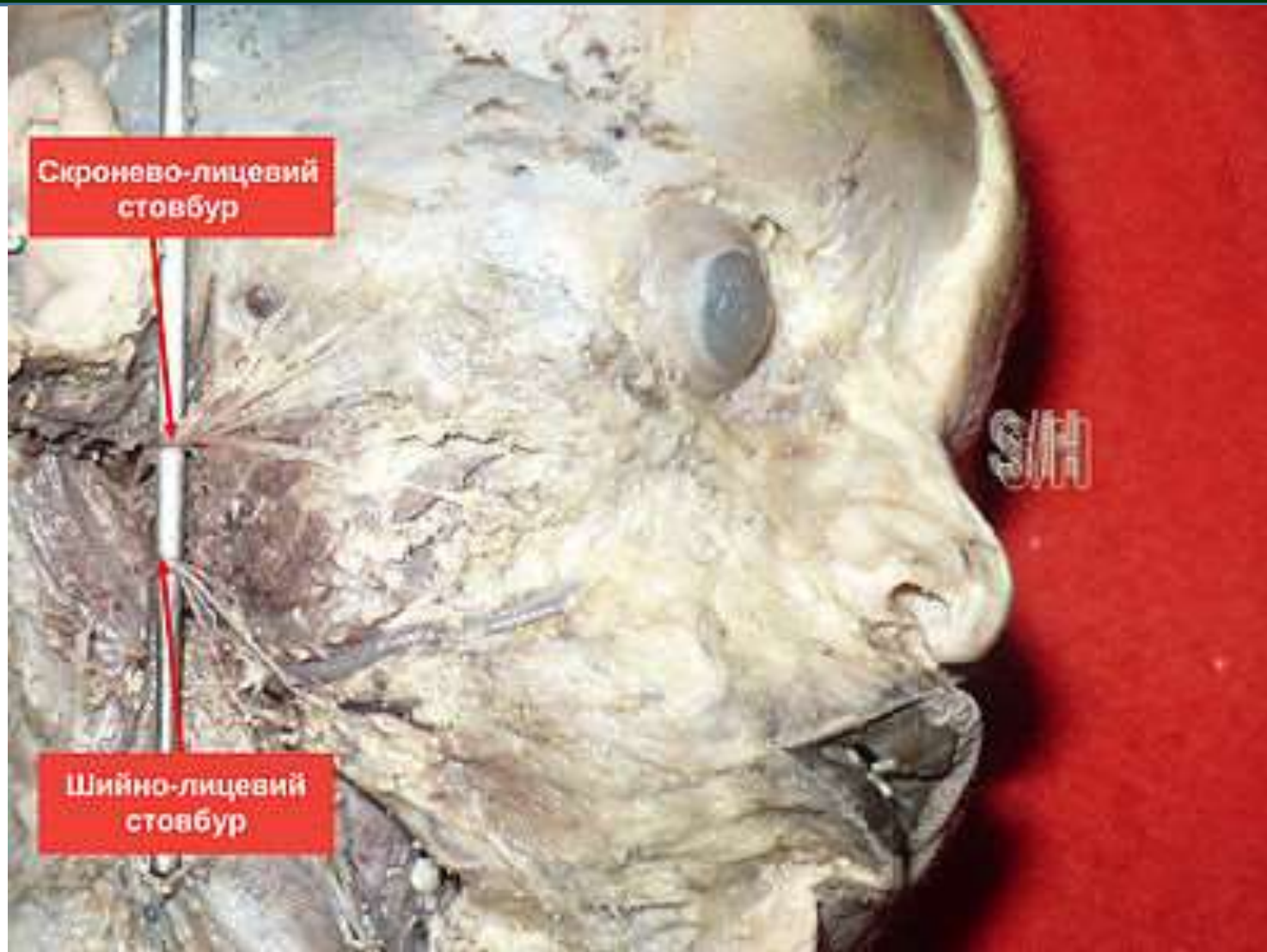
NERVI CRANIALES



NERVI CRANIALES



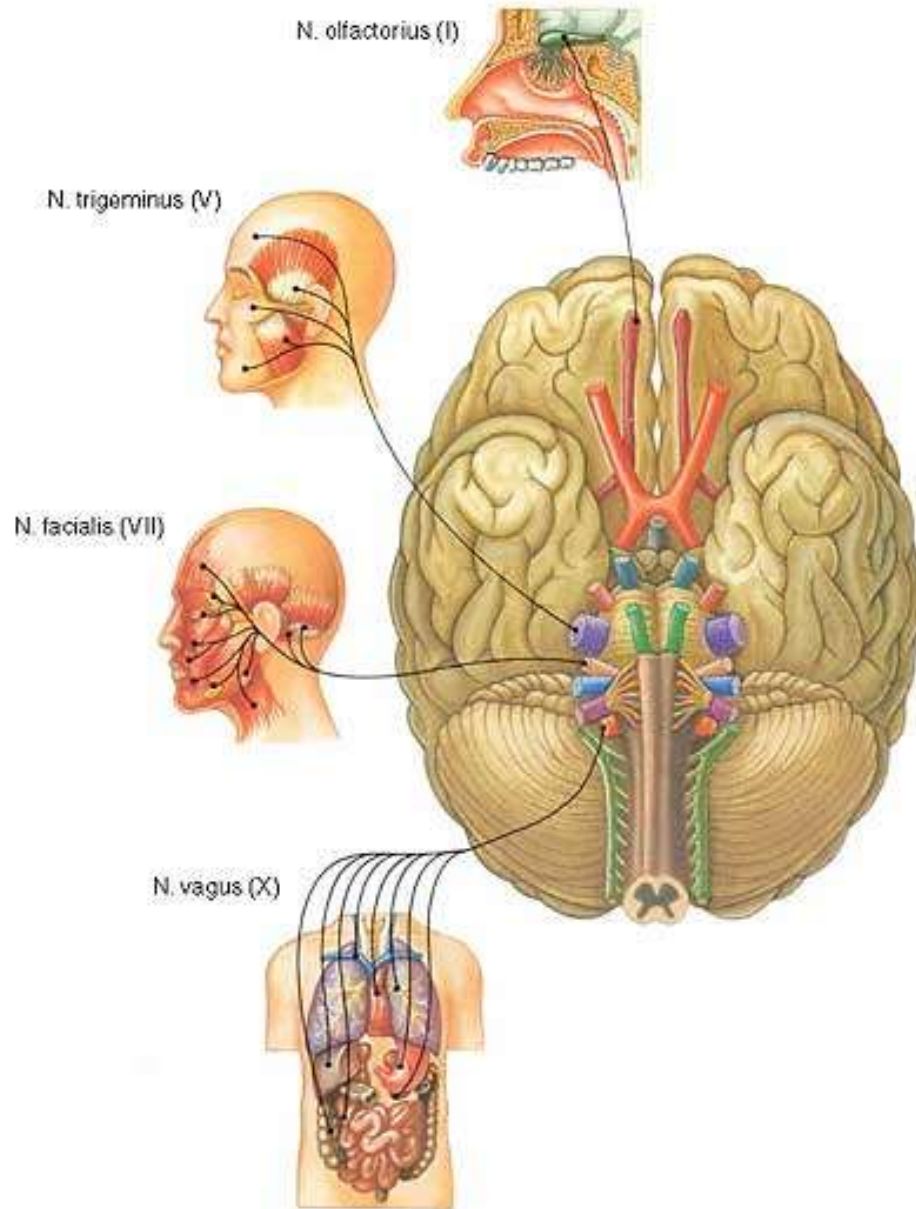
Черепні нерви шеститижневого ембріона (лицевий нерв позначено під восьмим номером)



РОЗВИТОК ПЕРИФЕРИЧНИХ ГІЛОК У ПЛОДА

NERVI CRANIALES

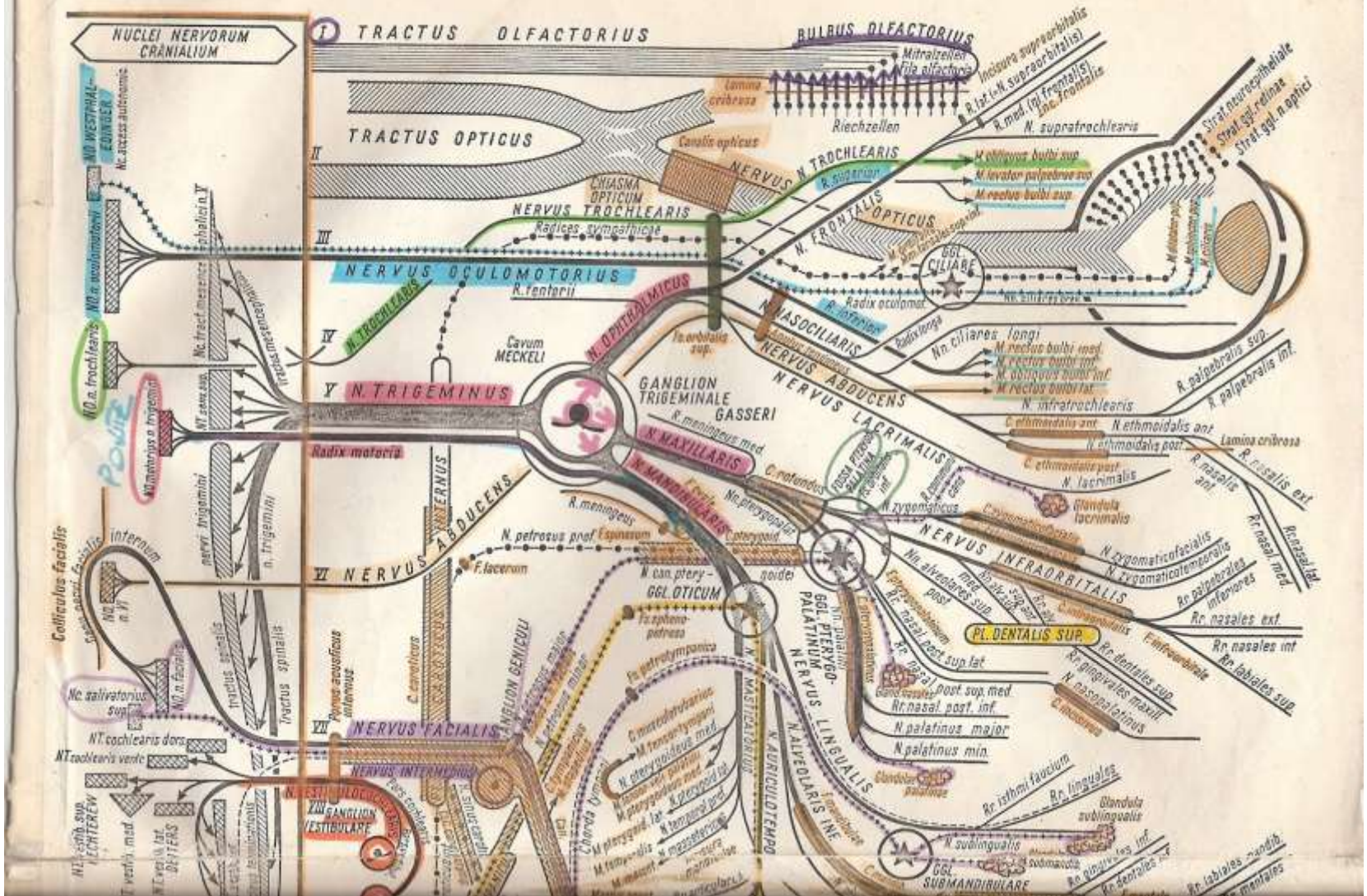
NERVI CRANIALES



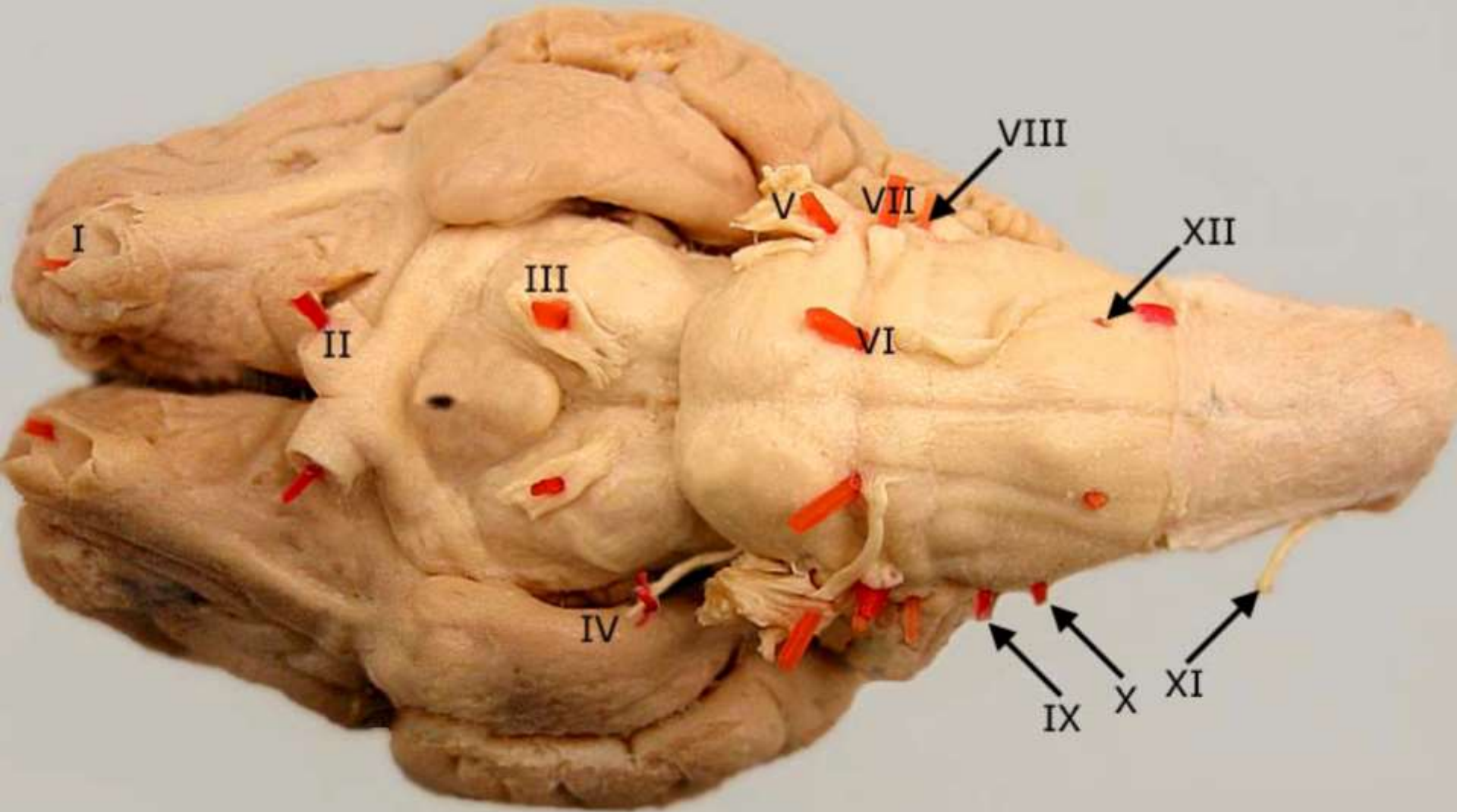
NERVI CRANIALES

E. M. W. Weber:
Schemata der Leitungsbahnen des Menschen

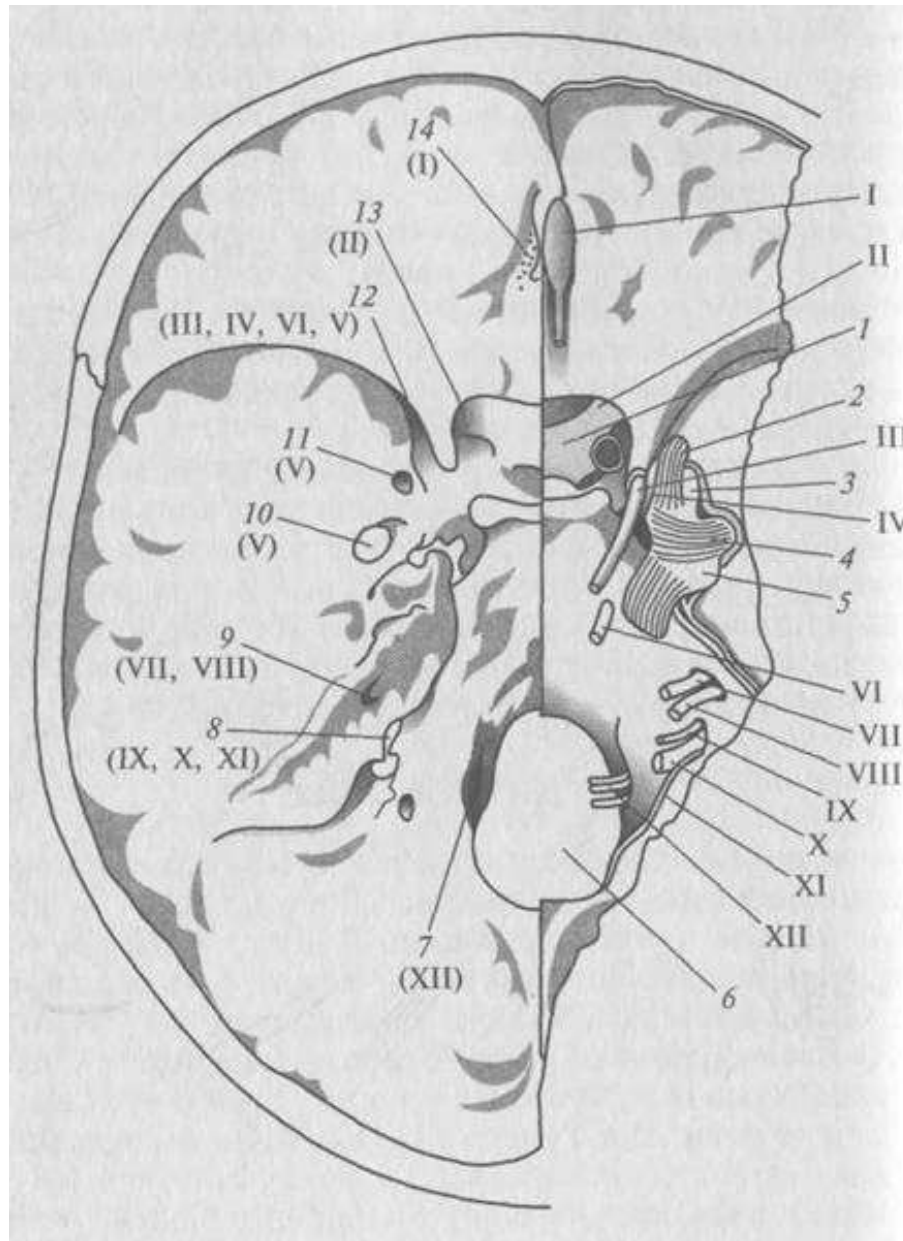
Springer-Verlag Berlin Heidelberg New York



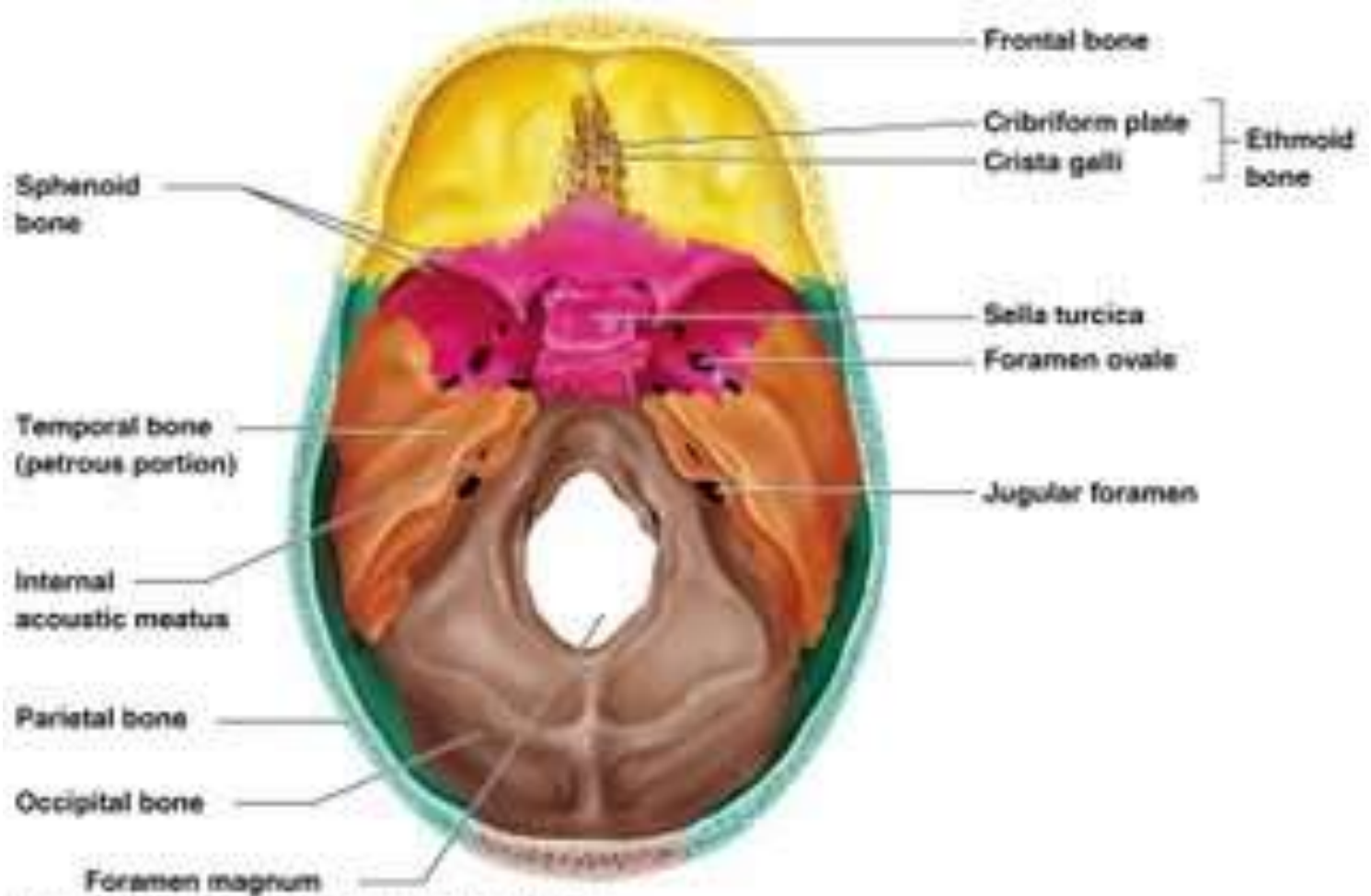
NERVI CRANIALES



NERVI CRANIALES

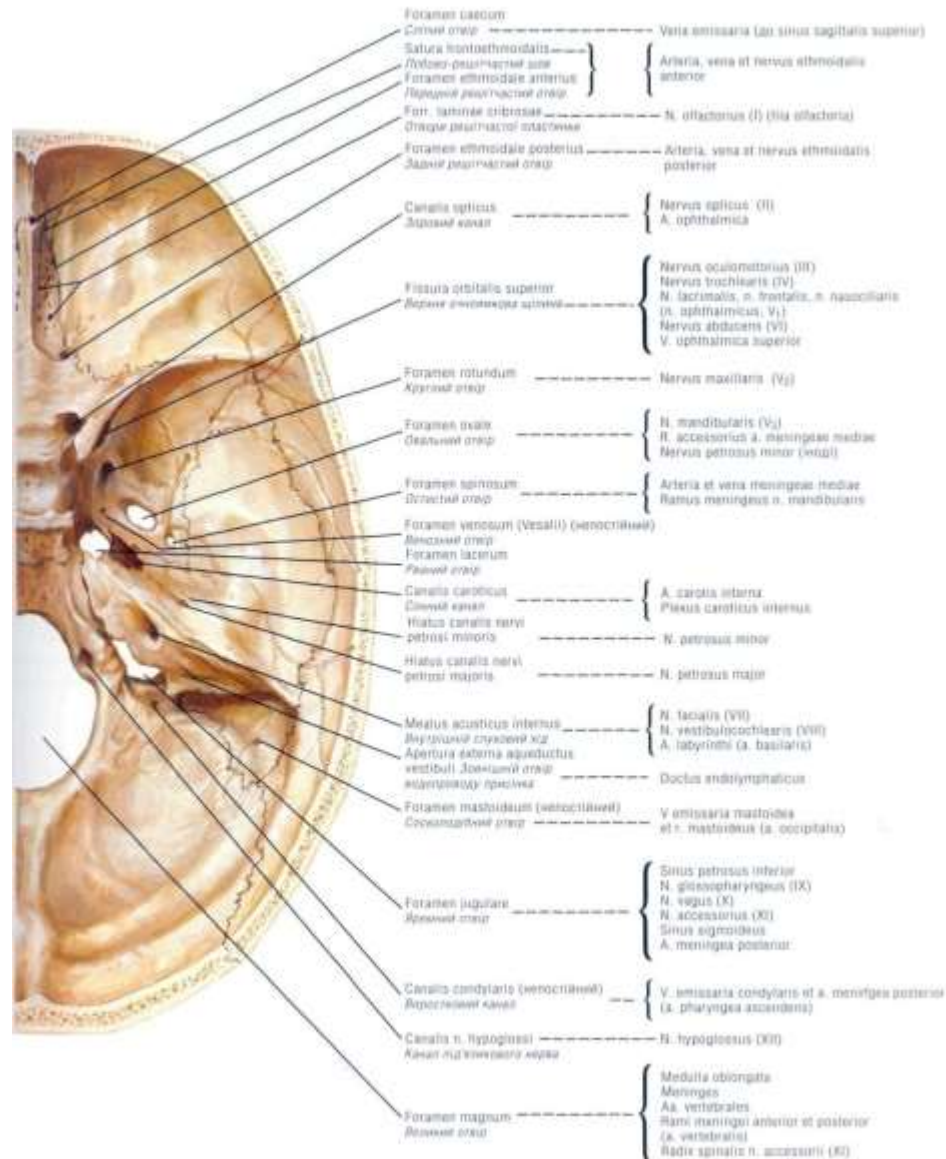


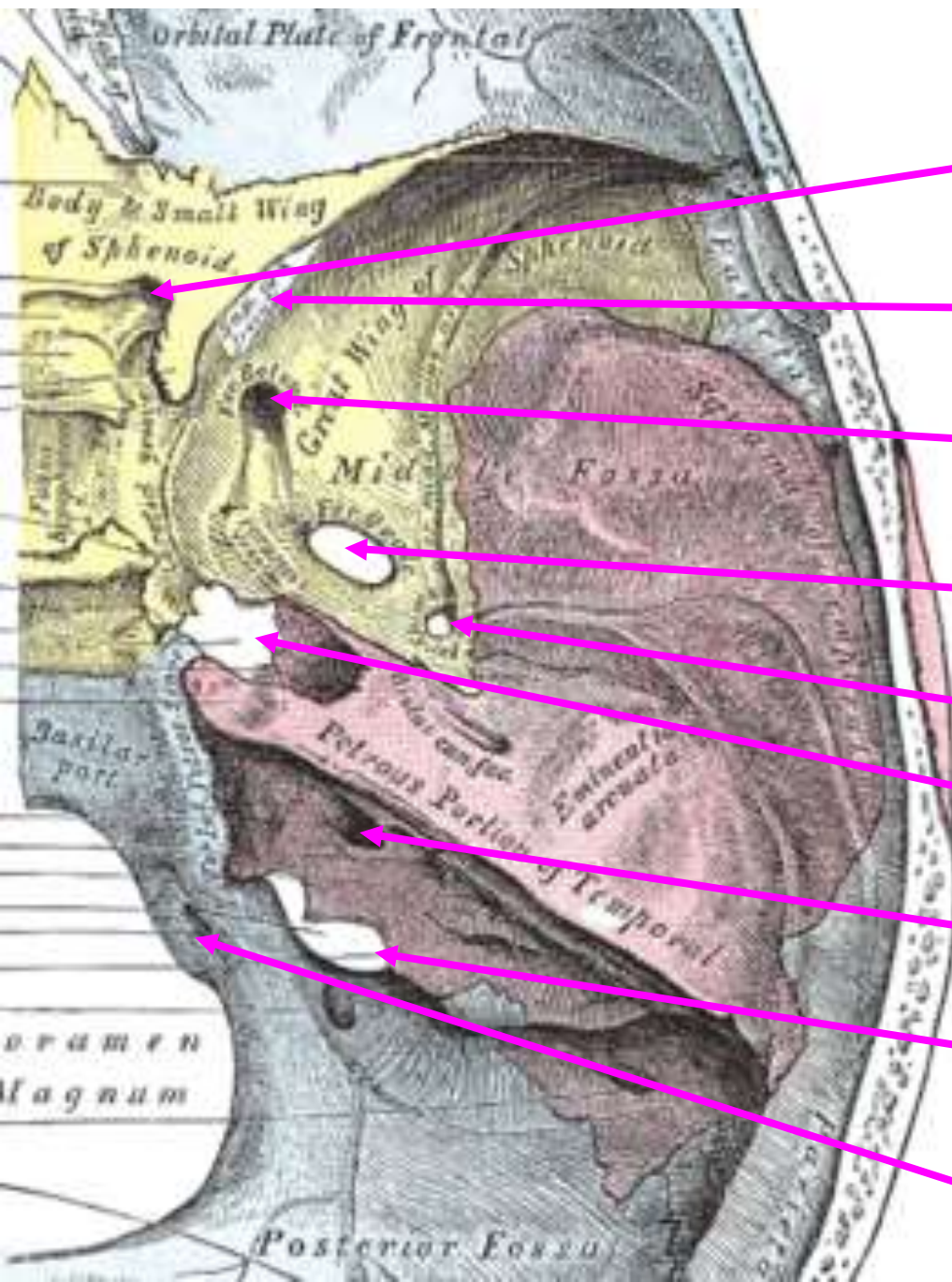
NERVI CRANIALES



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NERVI CRANIALES





Optic canal
(II)

Superior orbital fissure
(III, IV, V₁, VI)

Foramen rotundum
(V₂)

Foramen ovale
(V₃)

Foramen spinosum
(V₃)

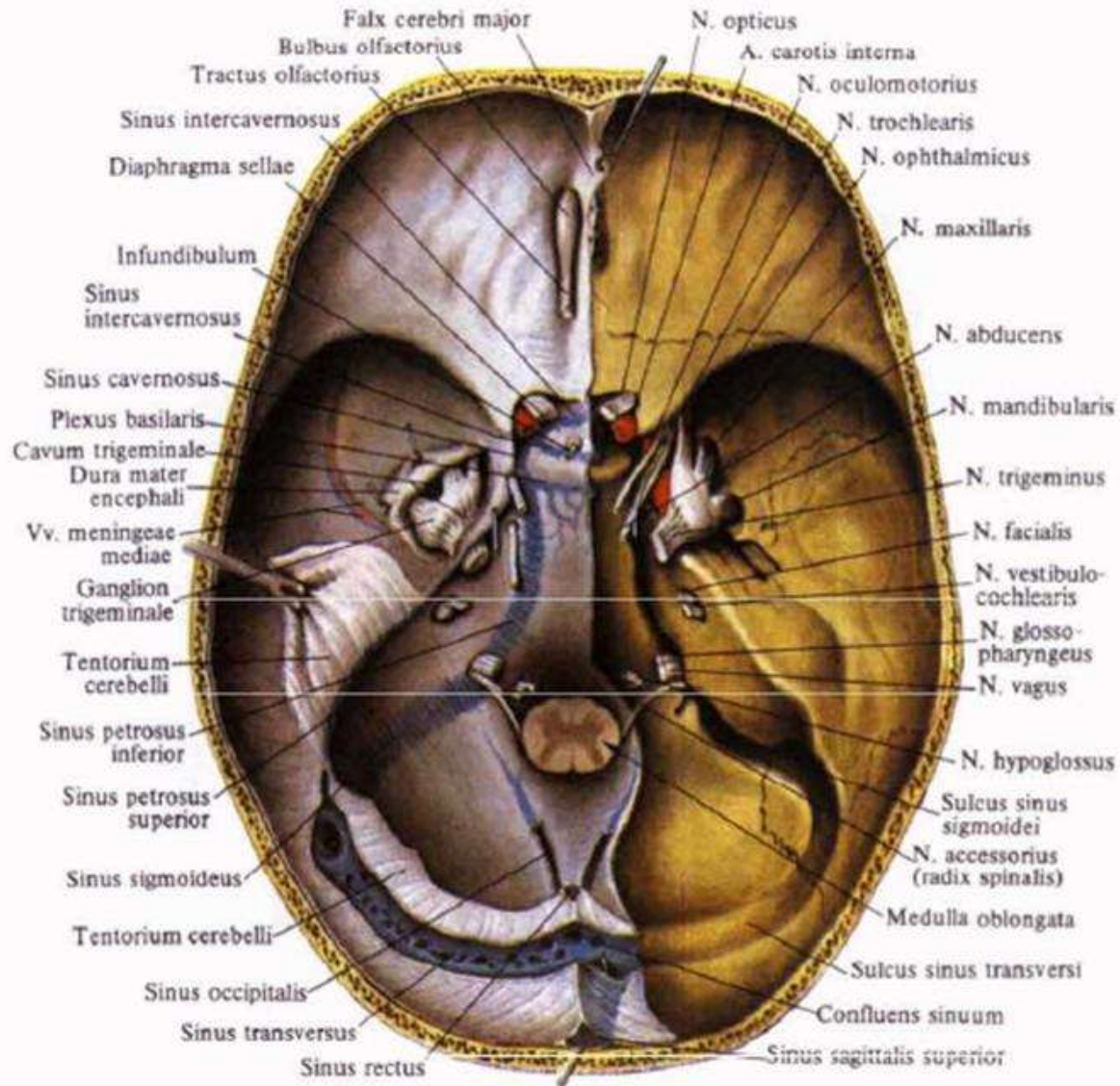
Foramen lacerum
(V₃)

Internal acoustic meatus
(VII, VIII)

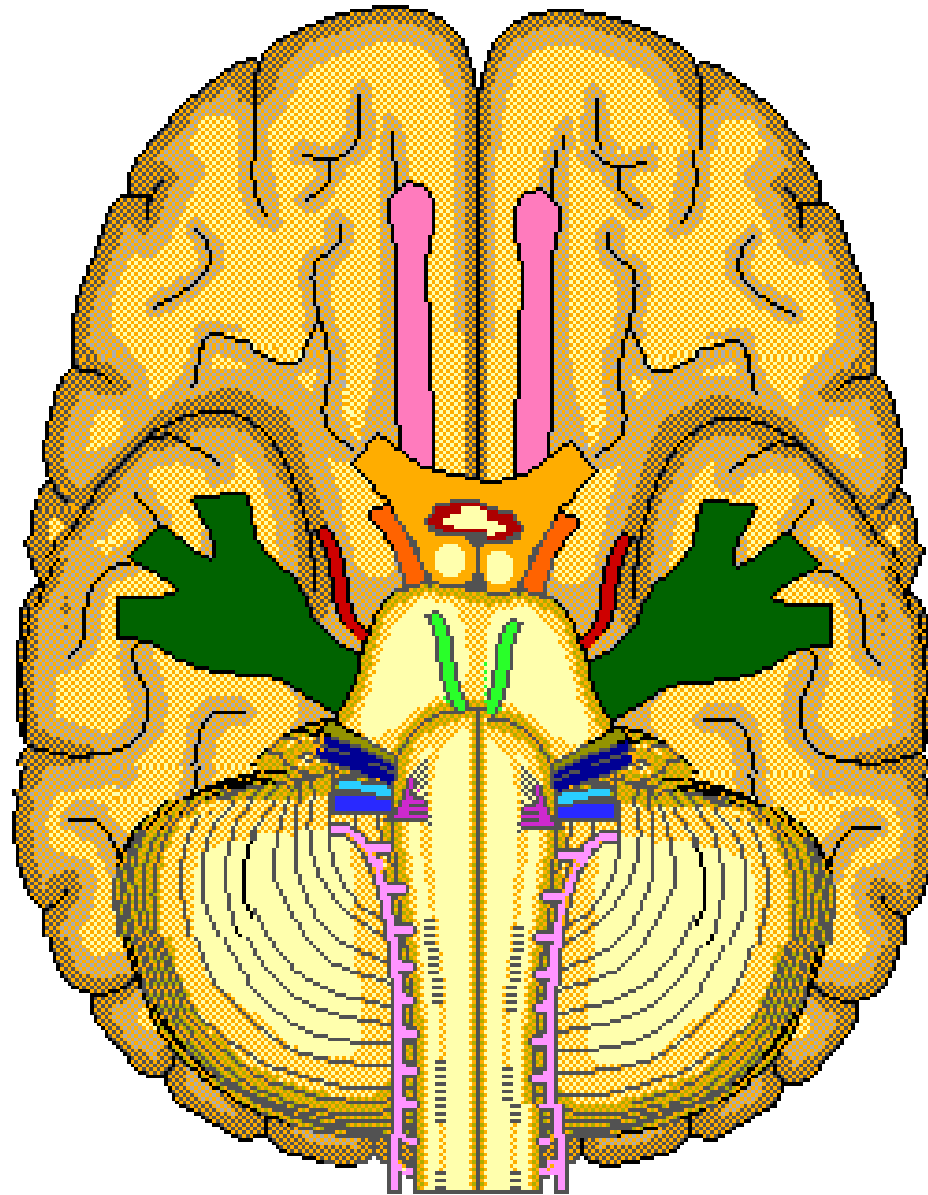
Jugular foramen
(IX, X, XI)

Hypoglossal canal
(XII)

NERVI CRANIALES

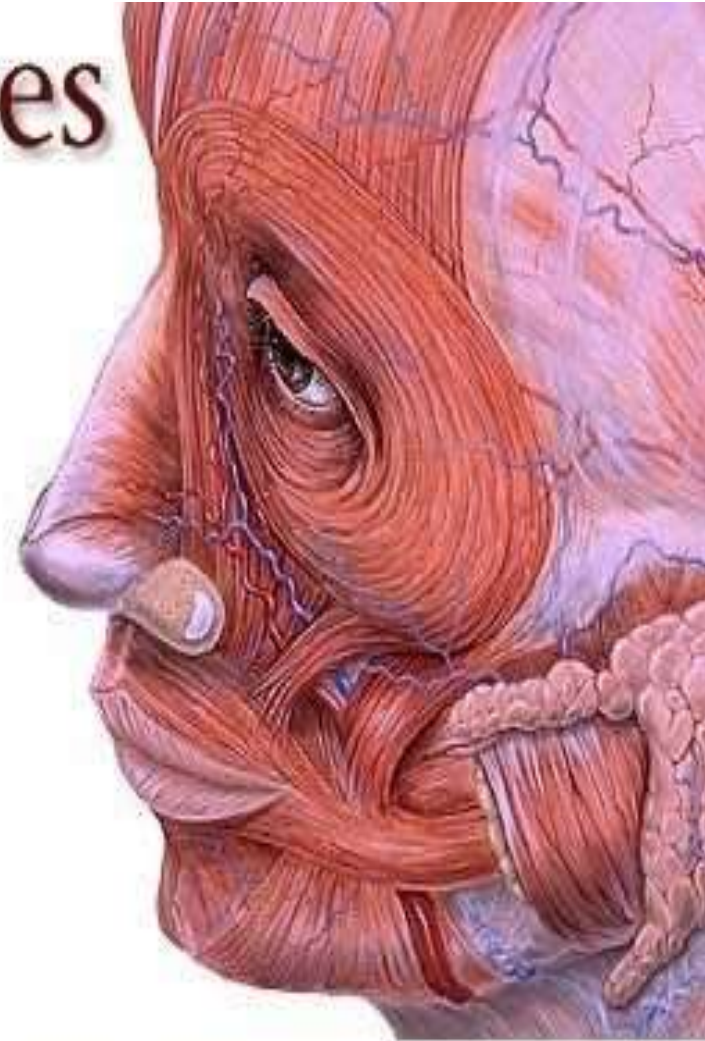


NERVI CRANIALES



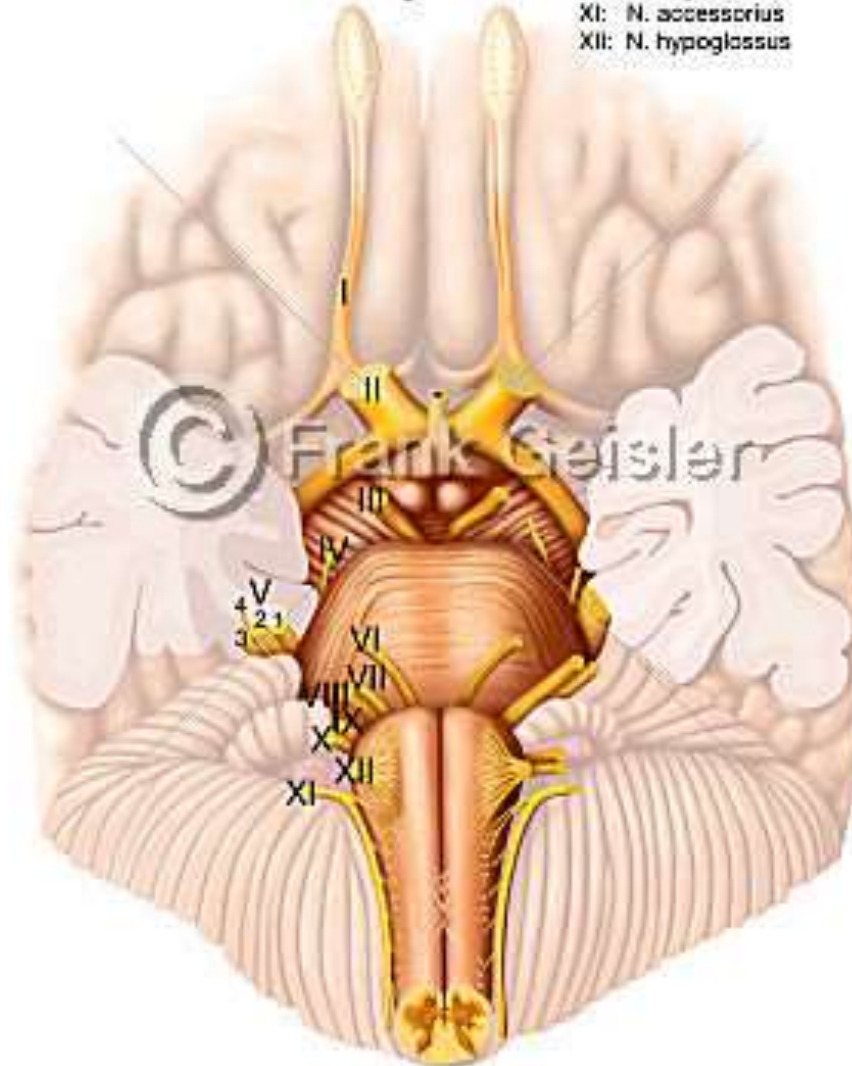
Cranial Nerves

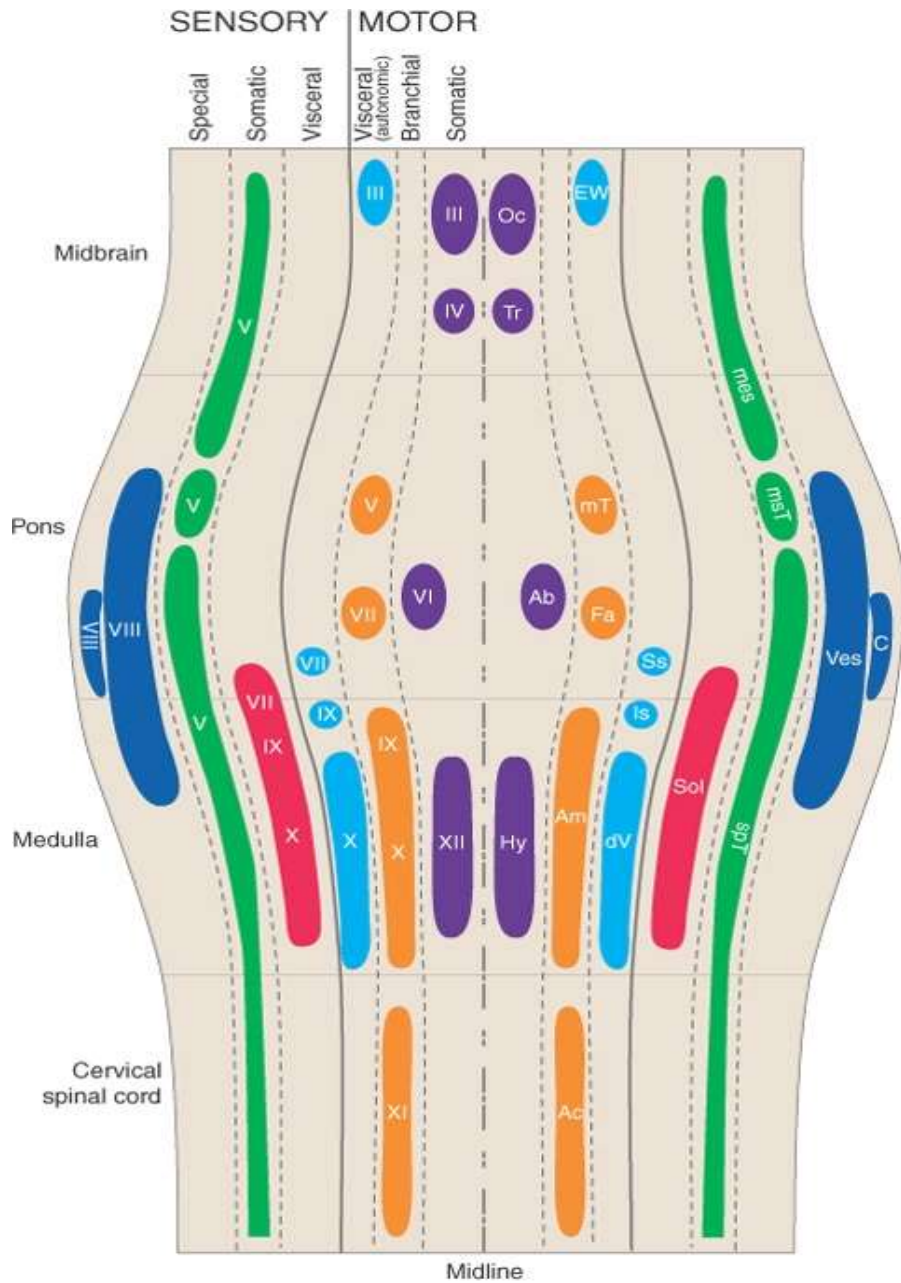
- I Olfactory
- II Optic
- III Oculomotor
- IV Trochlear
- V Trigeminal
- VI Abducens
- VII Facial
- VIII Vestibulocochlear
- IX Glossopharyngeal
- X Vagus
- XI Accessory
- XII Hypoglossal



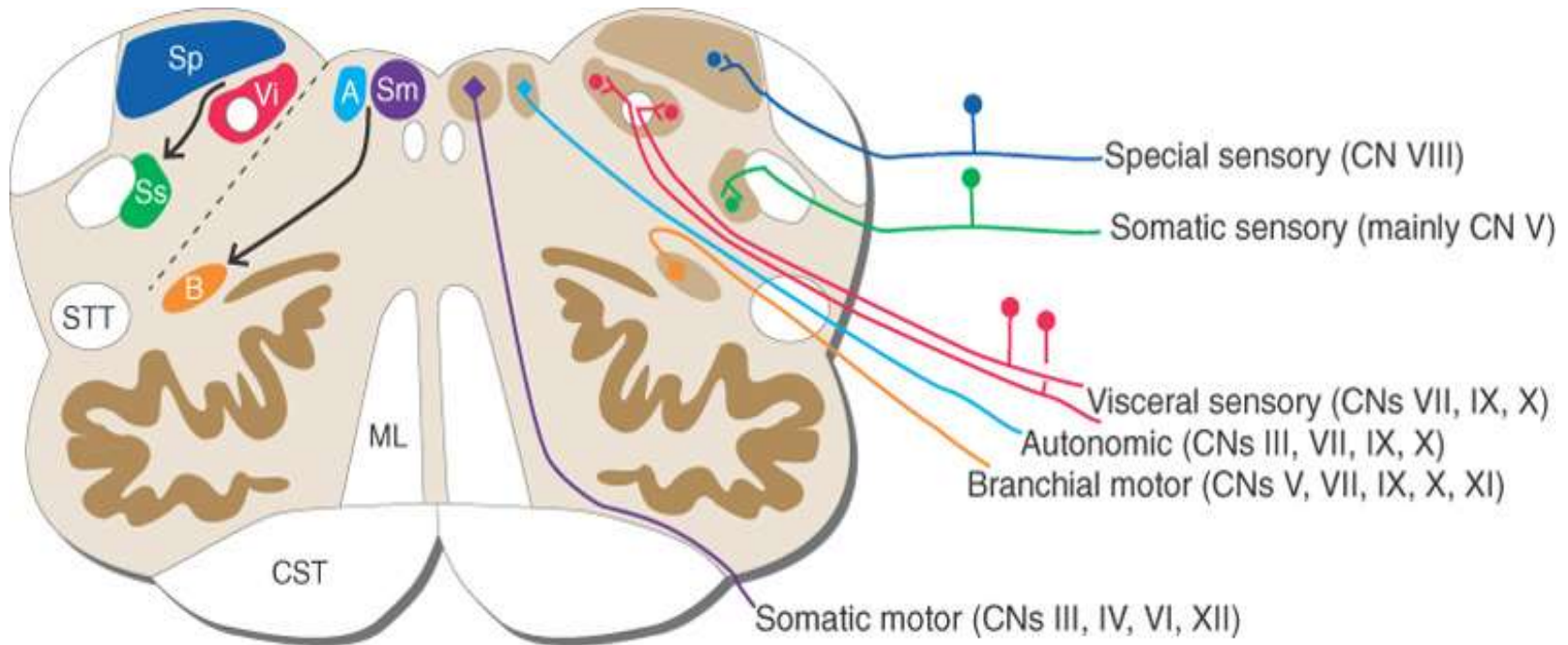
NERVI CRANIALES

- | | | |
|------------------------|-----------------------------------|------------------------------|
| I: Tractus olfactorius | V1: N. ophthalmicus | VI: N. abducens |
| II: N. opticus | V2: N. maxillaris | VII: N. facialis |
| III: N. oculomotorius | V3: N. mandibularis | VIII: N. vestibulocochlearis |
| IV: N. trochlearis | V4: Radix motoria
n. trigemini | IX: N. glossopharyngeus |
| | | X: N. vagus |
| | | XI: N. accessorius |
| | | XII: N. hypoglossus |





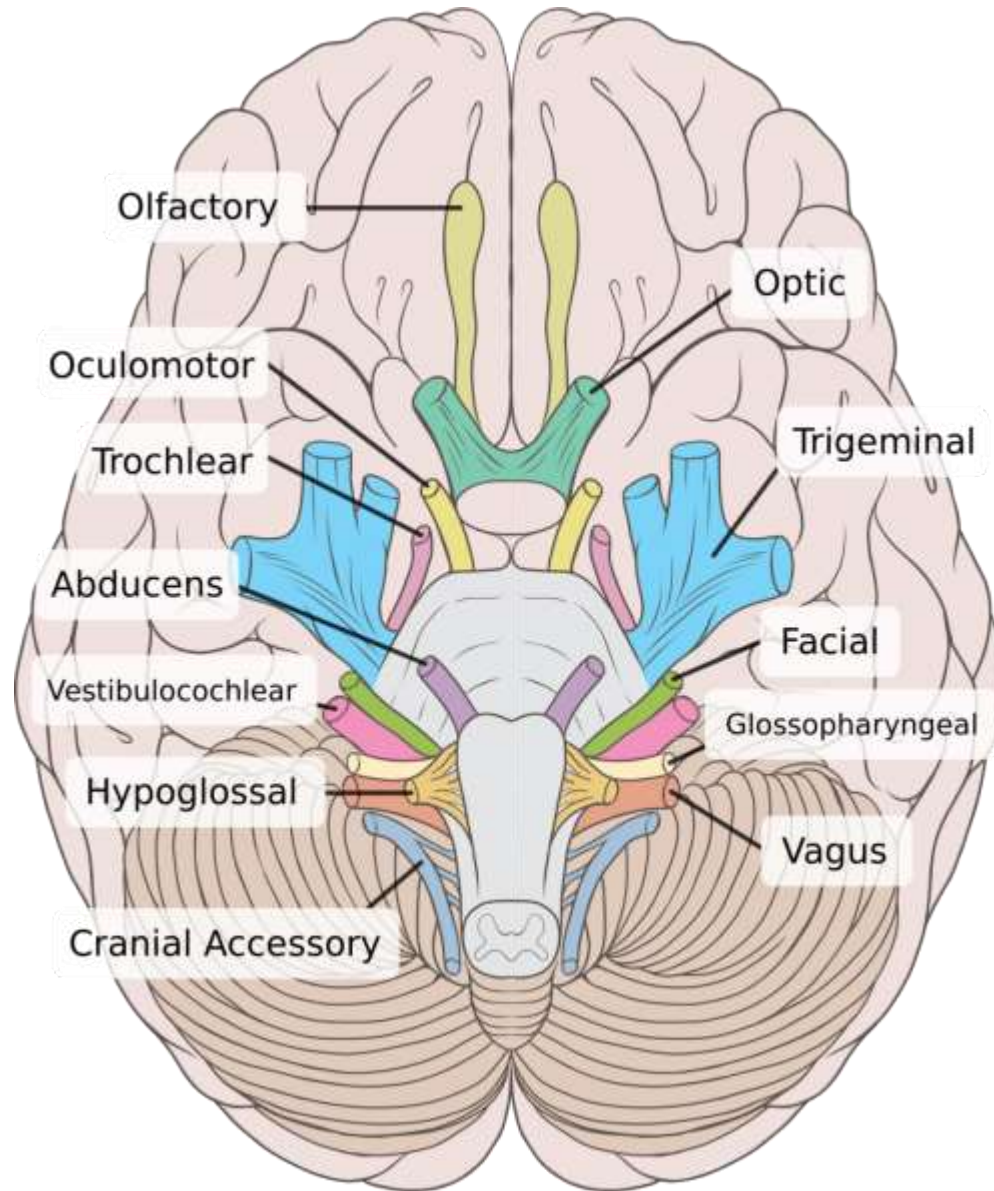
(Modified from Nieuwenhuys R et al: The human central nervous system: a synopsis and atlas, ed 3, New York, 1988, Springer-Verlag.)



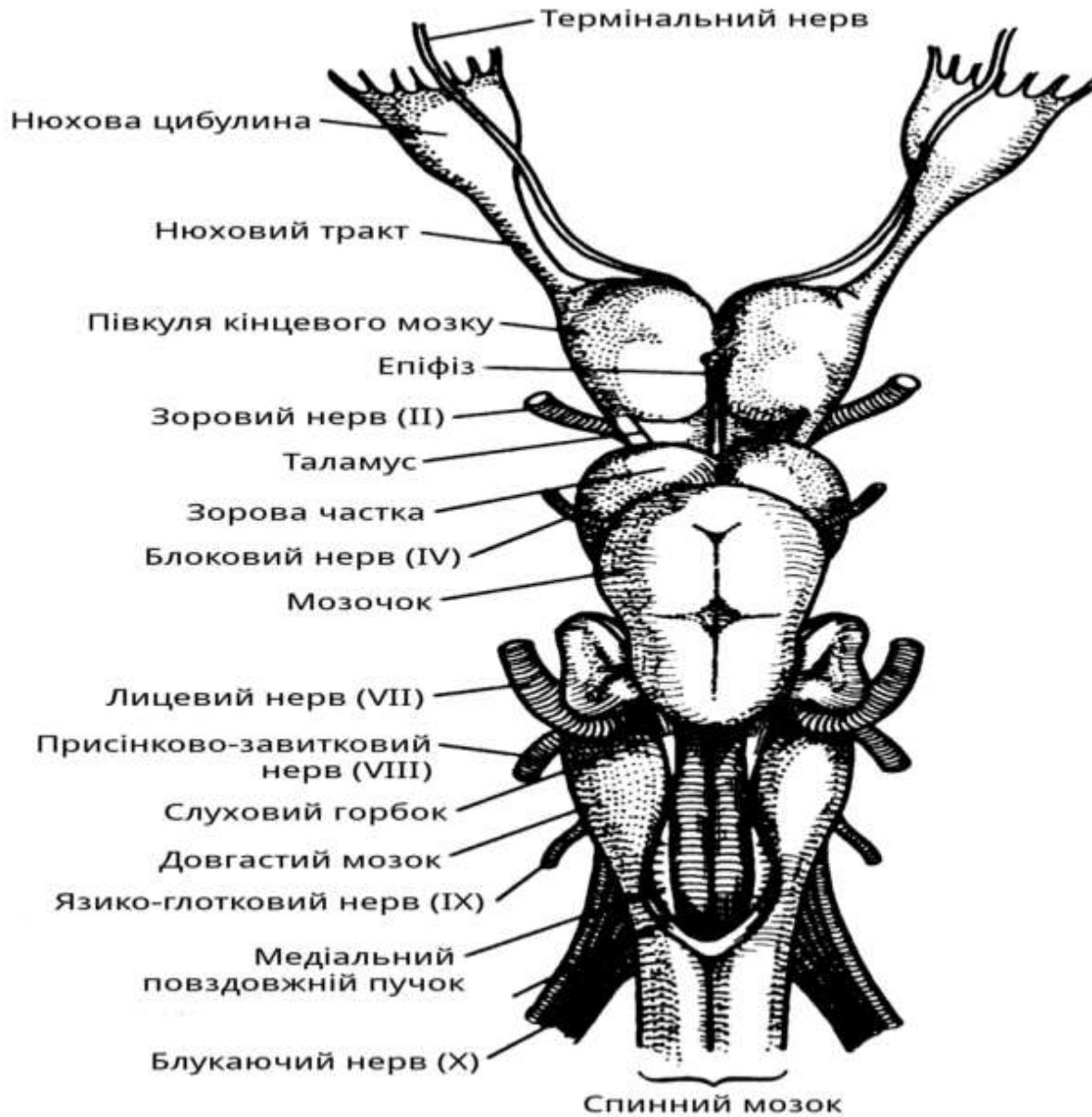
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- STT: spinothalamic tract
- CST: corticospinal tract
- ML: medial lemniscus

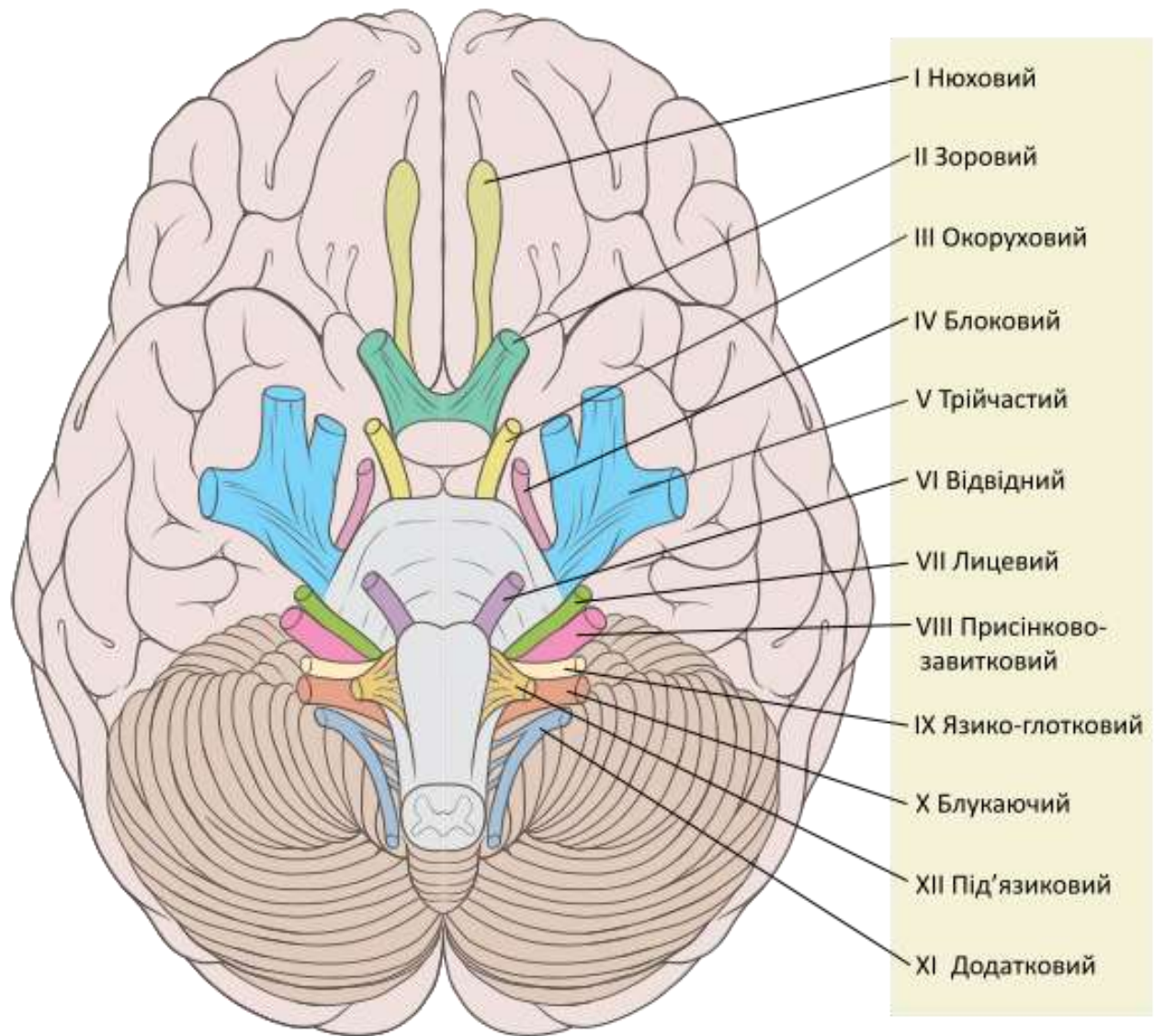
NERVI CRANIALES



NERVI CRANIALES



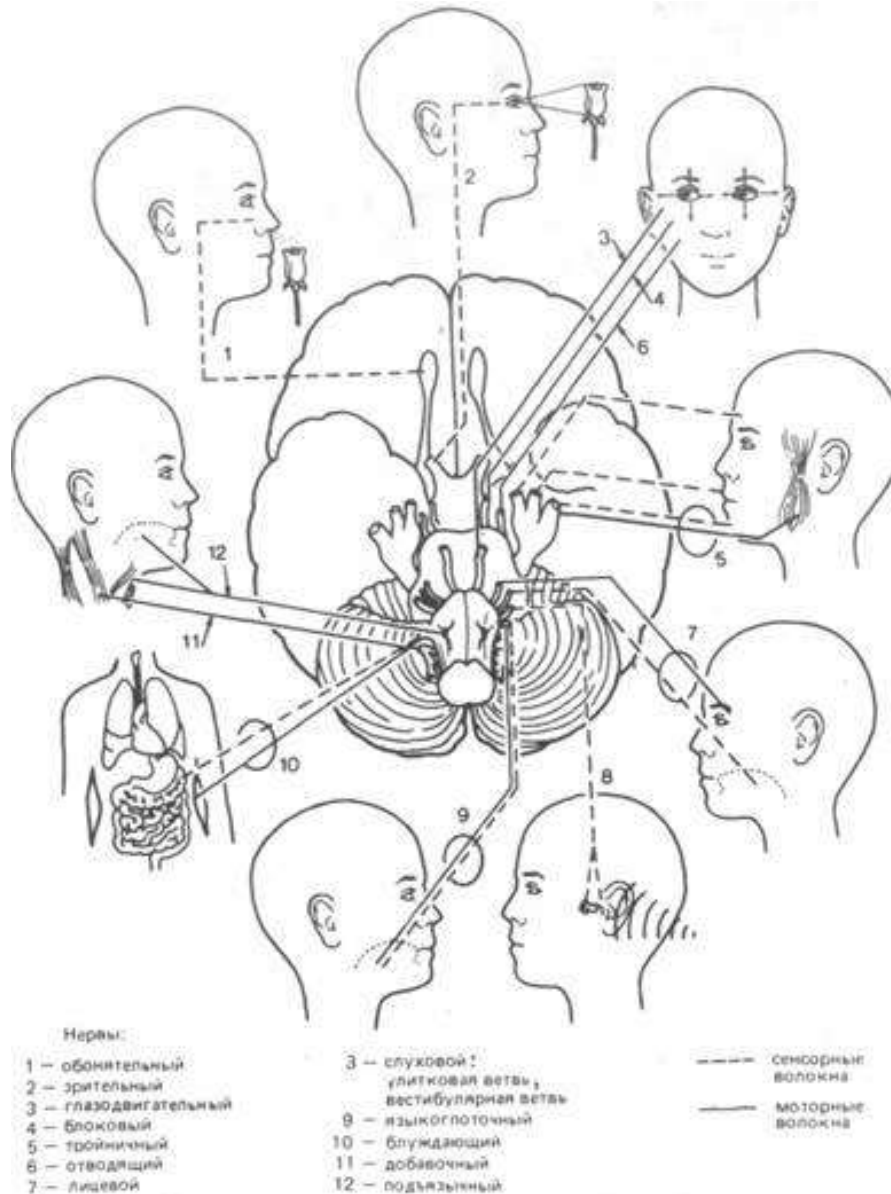
NERVI CRANIALES



NERVI CRANIALES

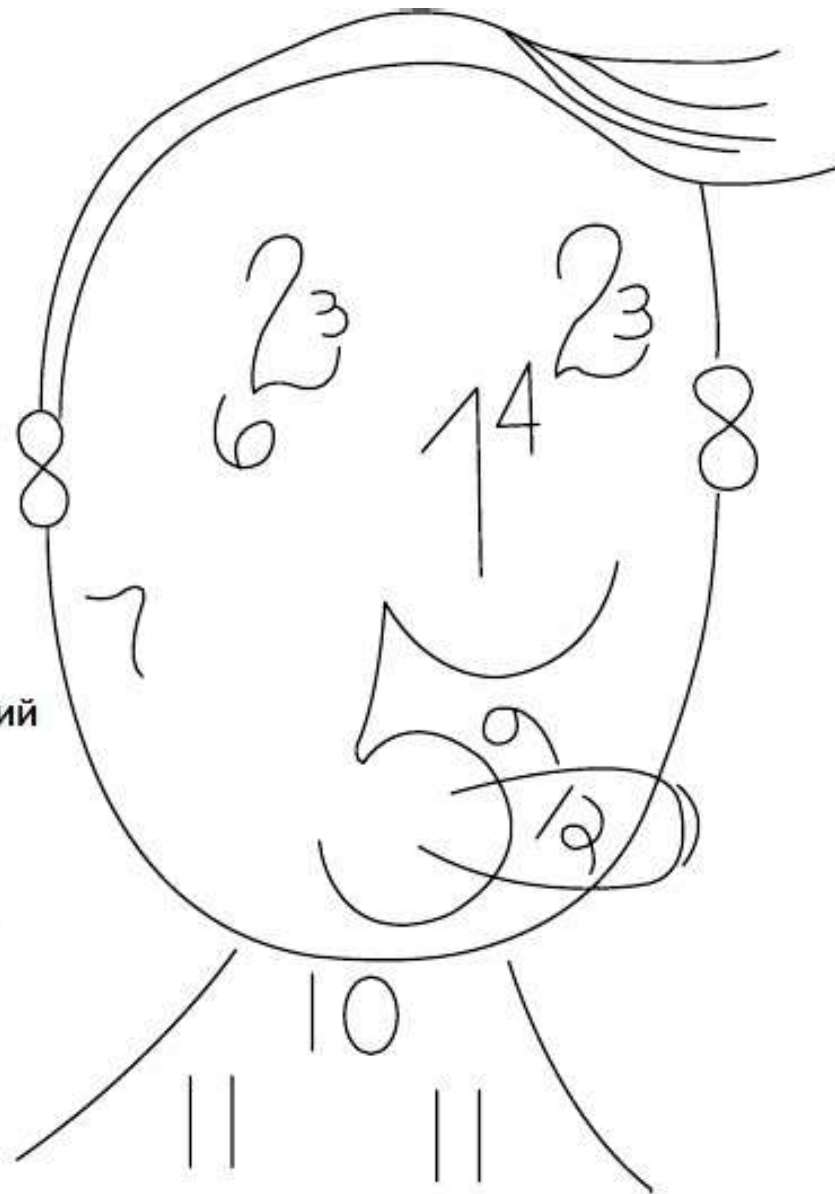


NERVI CRANIALES



NERVI CRANIALES

- I НЮХОВИЙ
- II ЗОРОВИЙ
- III ОКОРУХОВИЙ
- IV БЛОКОВИЙ
- V ТРИЧАСТИЙ
- VI ВІДВІДНИЙ
- VII ЛИЦЬОВИЙ
- VIII ПРИСІНКОВО-ЗАВИТКОВИЙ
- IX ЯЗИКОГЛОТКОВИЙ
- X БЛУКАЮЧИЙ
- XI ДОДАТКОВИЙ
- XII ПІД'ЯЗИКОВИЙ



NERVI CRANIALES



ONE MINUTE MEDICAL School.com
CRANIAL NERVES @gmail.com

*extra ocular

Memory tricks:

On old Olympus, towering
top, a Fin and German
view a hop.

Some say money matters,
but my brother says big
B [CENSORED] matter more.

- I Olfactory (S) - smell
- II Optic (S) - vision
- III Oculomotor (M) - eye muscle[†], lids
- IV Trochlear (M) - eye muscle[†]
- V Trigeminal (B) - face sensation, chewing
- VI Abducens (M) - eye muscle[†]
- VII Facial (B) - facial expression, taste
- VIII Acoustic (S) - hearing, balance, gravity
- IX Glossopharyngeal (B) - taste, muscles @ tongue/base
- X Vagus (B) - swallow, speak, *parasympathetic*
- XI Accessory (M) - shrugging, head motion
- XII Hypoglossal (M) - tongue muscle, swallowing, speech

Cerebrum

MIDBRAIN

PONS

Medulla



NERVI CRANIALES

1. Olfactory - Smell Function

2. Optic - Vision

3. Oculomotor

4. Trochlear

6. Abducens → Eye Movement

5. Trigeminal - Light touch of face

- Mastication

Facial { Motor

- Raise Eyebrows
- Frown
- Tightly close eyes
- Show all teeth
- Smile
- Puff cheeks

Sense

Taste

Motor

8. Vestibulo-Cochlear - Hearing (balance too)

9. + 10. Gag Response (Don't test this)
Glossopharyngeal Palatal Articulation "KA"
VAGUS (Babys!) Guttural Articulation "GO"

11. Spinal-Accessory - Shrug and head turns

12. Hypoglossal - Swallow

Fupil constriction!

1) forehead, cheek, chin

2) Masseter, Temporalis

Taste

KA

GO

Mike Scott DPT.com

Always Evolve

CRANIAL NERVES

O-Lympic (Olfactory)

O-Pium (Optic)

O-Ccupies (Oculomotor)

T-ROubled (Trochlear)

T-RIathletes (Trigeminal)

A-fter (Abducens)

F-inishing (Facial)

V-Egas (Vestibulocochlear)

G-ambling (Glossopharyngeal)

V-Acations (Vagus)

S-till (Spinal Accessory)

H-igh (Hypoglossal)

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NERVI CRANIALES








CRANIAL NERVES		
<p>1</p>  <p>God gave us one nose (olfactory)</p>	<p>2</p>  <p>God gave us 2 eyes to see with (optic)</p>	<p>3,4,6</p>  <p>Makes my eyes do tricks! (oculomotor, trochlear, abducens)</p>
<p>5</p> <p>TRI</p> <p>Rhymes with Tri (for Trigeminal)</p>	<p>7</p>  <p>Can fit nicely across your face to help you remember the Facial Cranial nerves</p>	<p>8</p>  <p>Fits nicely into your ear to assist you to remember the acoustic</p>
<p>9, 10</p>  <p>check gag reflex Is under my chin. (glossopharyngeal, vagus)</p>	<p>11</p>  <p>Put a 1 on each shoulder and then shrug them, The 1's should not fall off (spinal accessory)</p>	<p>12</p>  <p>For tongue movement (hypoglossal)</p> <p><small>©2008 CAN Publishing, Inc.</small></p>

The Cranial Nerves



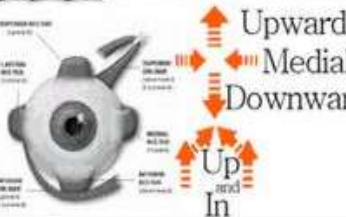







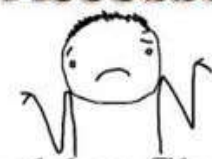

Nerve Number and Name	Composition	Some Functions
I Olfactory	Sensory only	Olfaction (smell)
II Optic	Sensory only	Vision
III Oculomotor	Motor and sensory	Serves muscles of the eye
IV Trochlear	Motor and sensory	Serves the superior oblique eye muscle
V Trigeminal	Motor and sensory	Sensory from face and mouth; motor to muscles of mastication (chewing)
VI Abducens	Motor and sensory	Serves the lateral rectus eye muscle
VII Facial	Motor and sensory	Serves the muscles of facial expression, lacrimal glands, and salivary glands
VIII Vestibulocochlear	Sensory only	Equilibrium and hearing
IX Glossopharyngeal	Motor and sensory	Serves the pharynx (throat) for swallowing, posterior third of tongue, parotid salivary gland
X Vagus	Motor and sensory	Sensations from visceral (internal) organs, and parasympathetic motor regulation of visceral organs
XI Accessory	Motor and sensory	Serves muscles that move head, neck, and shoulders
XII Hypoglossal	Motor and sensory	Serves muscles of the tongue

Nerve	Classification	Major functions	Assessment
I Olfactory 	Sensory	Smell	Have patient identify a familiar scent with eyes closed (usually deferred).
II Optic 	Sensory	Vision (acuity and field of vision); pupil reactivity to light and accommodation (afferent impulse)	Have patient read from a card or newspaper, one eye at a time. Test visual fields by having patient cover one eye, focus on your nose, and identify the number of fingers you're holding up in each of four visual quadrants.
III Oculomotor 	Motor	Eyelid elevation; most EOMs; pupil size and reactivity (efferent impulse)	Check pupillary responses by shining a bright light on one pupil; both pupils should constrict. Do the same for other eye. To check accommodation, move your finger toward the patient's nose; the pupils should constrict and converge. Check EOMs by having patient look up, down, laterally, and diagonally.
IV Trochlear 	Motor	EOM (turns eye downward and laterally)	Have patient look down and in.
V Trigeminal 	Both	Chewing; facial and mouth sensation; corneal reflex (sensory)	Ask patient to hold the mouth open while you try to close it and to move the jaw laterally against your hand. With patient's eyes closed, touch her face with cotton and have her identify the area touched. In comatose patients, brush the cornea with a wisp of cotton; the patient should blink.

NERVI CRANIALES

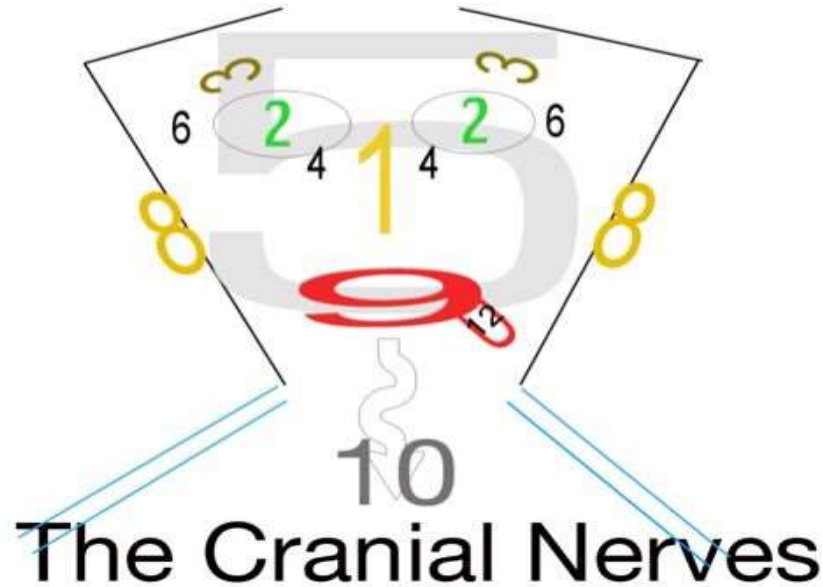
VI Abducens 	Motor	EOM (turns eye laterally)	Have patient move the eyes from side to side.
VII Facial 	Both	Facial expression; taste; corneal reflex (motor); eyelid and lip closure	Ask patient to smile, raise eyebrows, and keep eyes and lips closed while you try to open them. Have patient identify salt or sugar placed on the tongue (usually deferred).
VIII Acoustic/ Vestibulocochlear 	Sensory	Hearing; equilibrium	To test hearing, use tuning fork or rub your fingers, place a ticking watch, or whisper near each ear. Equilibrium testing is usually deferred.
IX Glossopharyngeal 	Both	Gagging and swallowing (sensory); taste	Touch back of throat with sterile tongue depressor or cotton-tipped applicator. Have patient swallow.
X Vagus 	Both	Gagging and swallowing (motor); speech (phonation)	Assess gag and swallowing with CN IX. Assess vocal quality.
XI Spinal accessory 	Motor	Shoulder movement; head rotation	Have patient shrug shoulders and turn head from side to side (not routinely tested).
XII Hypoglossal 	Motor	Tongue movement; speech (articulation)	Have patient stick out tongue and move it internally from cheek to cheek. Assess articulation.

NERVI CRANIALES

<p>I Olfactory</p> <p>Smell</p> 	<p>II Optic</p> <p>Vision</p> 	<p>III Oculomotor</p>  <p>Upward Medial Downward Up and In</p>
<p>IV Trochlear</p> <p>Down and In</p> 	<p>V Trigeminal</p> <p>Touch Forehead and Cheek Clench Teeth</p> 	<p>VI Abducens</p> <p>Look Side to Side</p> 
<p>VII Facial</p> <p>Taste for the Anterior 2/3 of Tongue</p> <p>Smile</p> 	<p>VIII Acoustic</p> <p>Hearing Equilibrium</p> 	<p>Glossopharyngeal IX</p> <p>Posterior 1/3 of the Tongue</p> <p>Speech</p> 
<p>X Vagus</p> <p>Defecation</p> <p>Slowed Heart Rate</p> 	<p>XI Spinal Accessory</p> <p>Shoulder Shrug</p> 	<p>XII Hypoglossal</p> <p>Tongue Movement</p> 

NERVI CRANIALES

- | | | |
|---------------|---------------|----------------------|
| 1. Olfactory | 5. Trigeminal | 9. Glossopharyngeal |
| 2. Optic | 6. Abducens | 10. Vagus |
| 3. Oculomotor | 7. Facial | 11. Spinal Accessory |
| 4. Trochlear | 8. Acoustic | 12. Hypoglossal |



1. Sniff test
2. Visual acuity
3. 6 cardinal gazes, pupillary constriction, opening & closing of the eyes.
4. 6 cardinal gazes, downward & inward movement of the eyes
5. Facial sensation-maxillary, mandibular **Masseter** strength & **temporalis** muscle strength
6. 6 cardinal gazes, lateral movement of the eyes
7. puffing out cheeks, smile and frown
8. whisper test, weber, rhine and **Rhomberg**
9. gag reflex, swallow
10. coughing, gag **reflex** (motor)
11. shrugging-Trapezius **side to side movement- Sternocleidomastoid**
12. tongue movement and strength, "light, tight, dynamite"

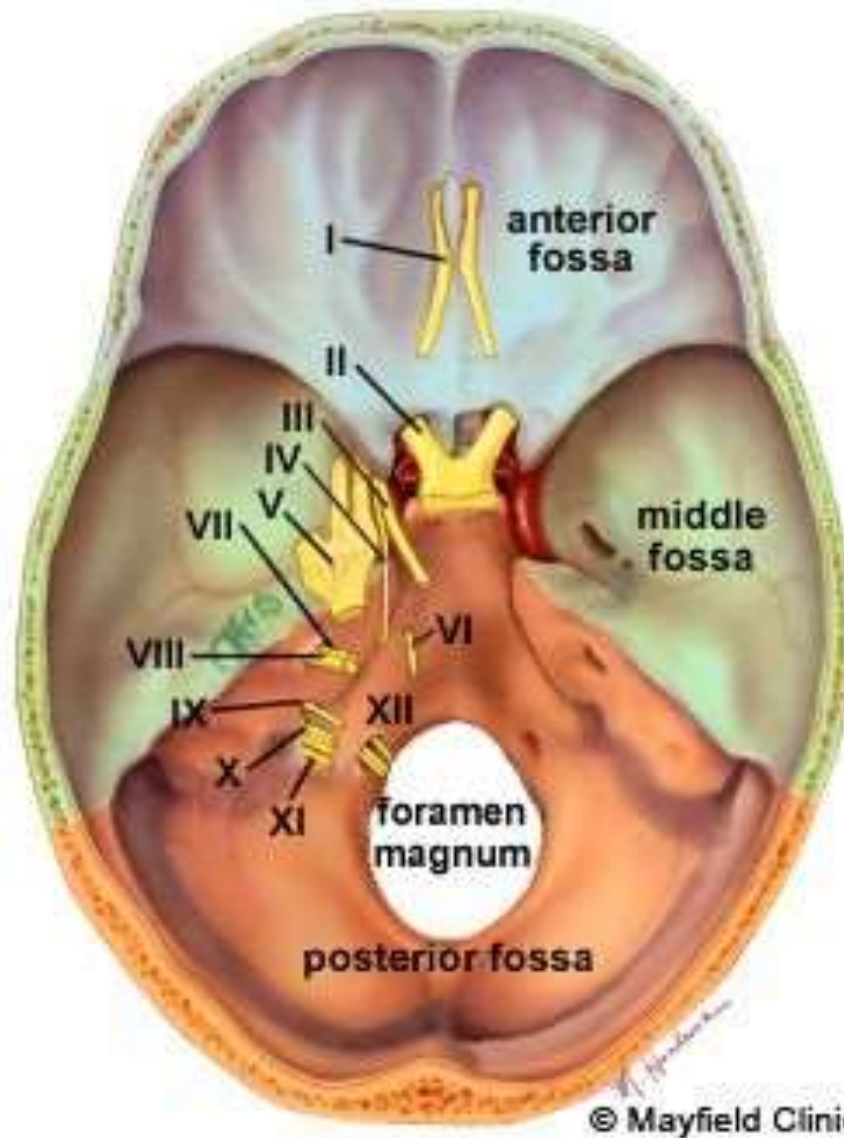
CRANIAL NERVES

- 1. OLFACTORY
- 2. OPTIC
- 3. OCULOMOTOR
- 4. TROCHLEAR
- 5. TRIGEMINAL
- 6. ABDUCENS

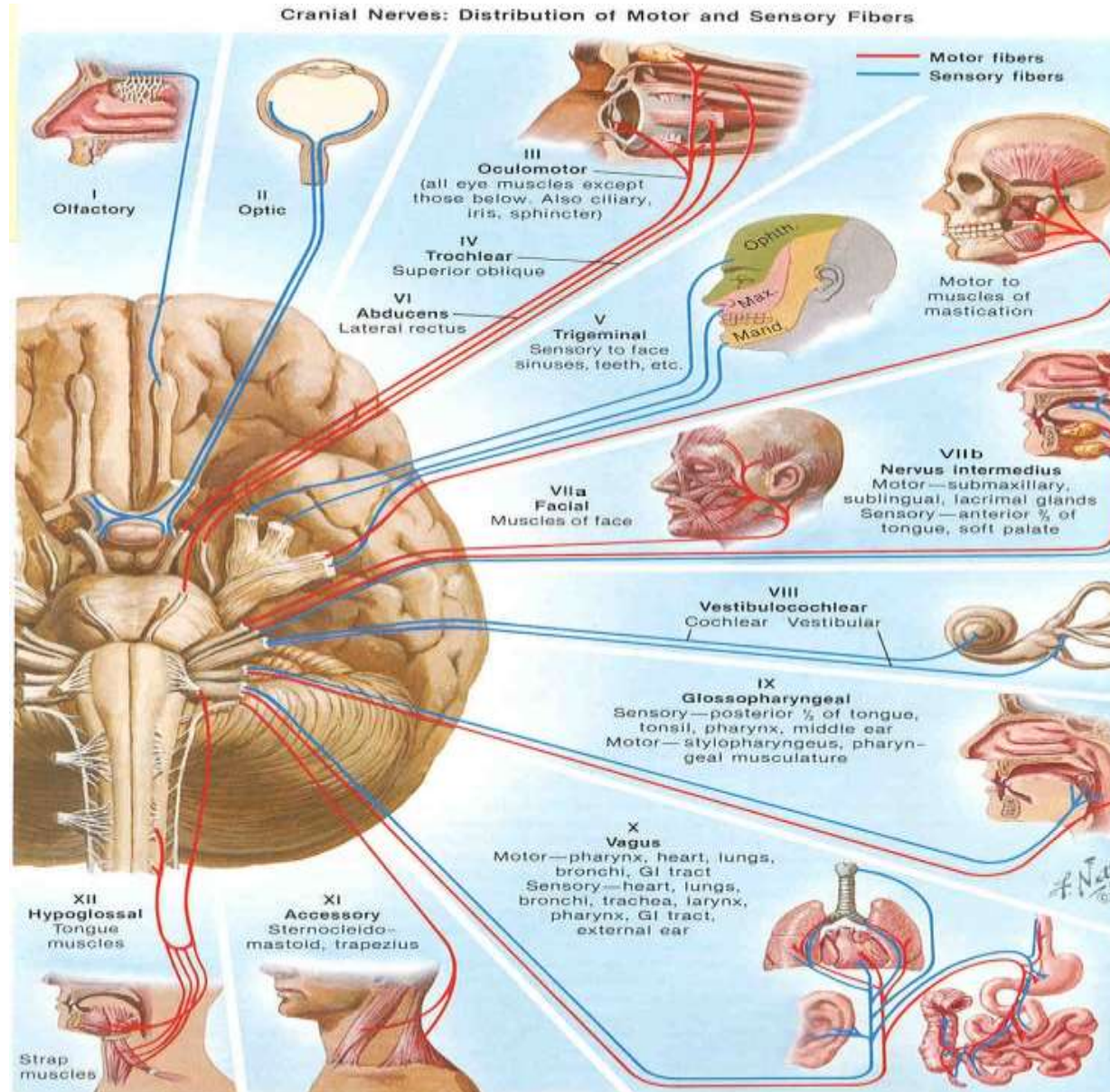


- 7. FACIAL
- 8. ACOUSTIC
- 9. GLOSSOPHARYNGEAL
- 10. VAGUS
- 11. ACCESSORY
- 12. HYPOGLOSSAL

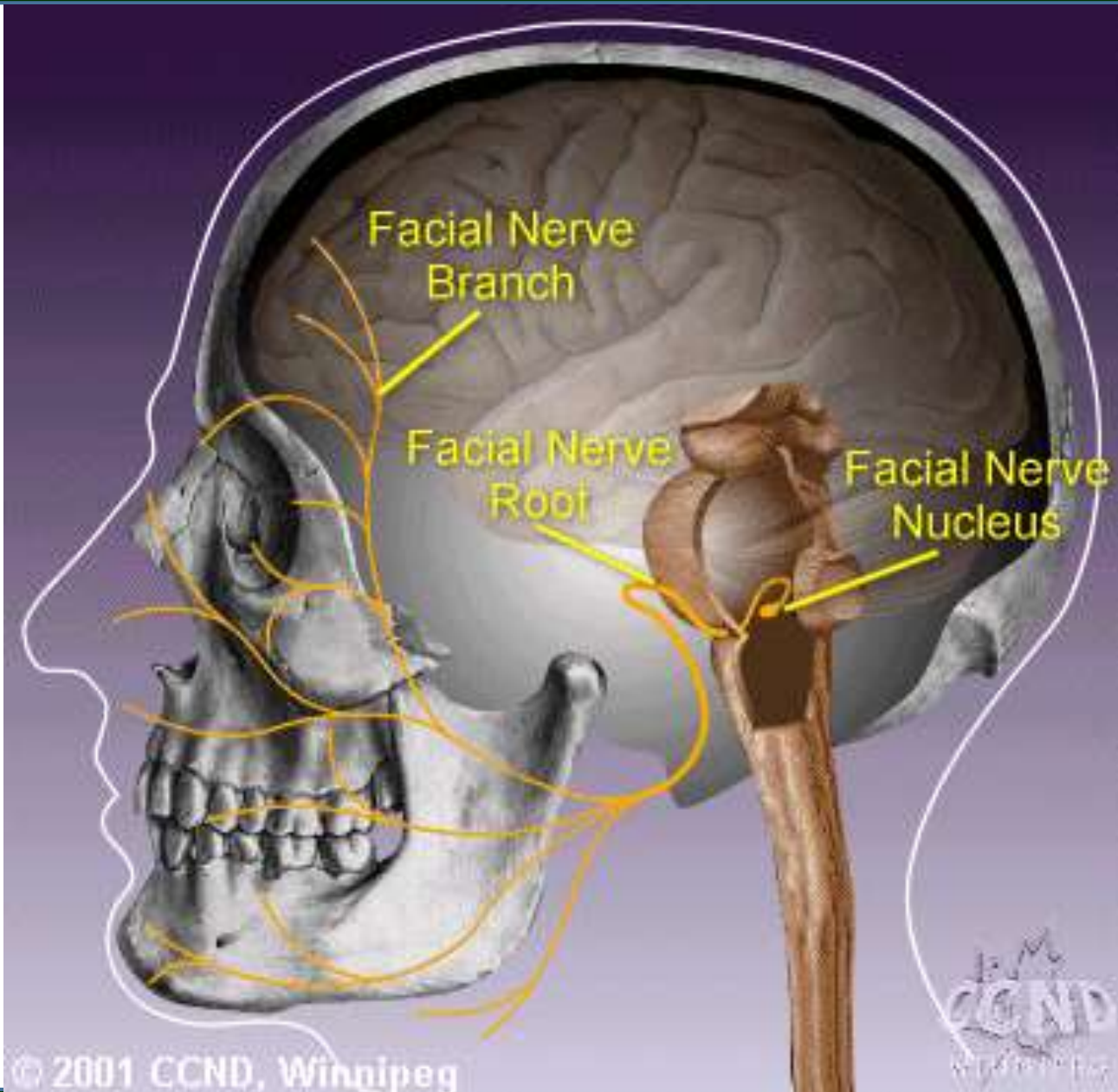
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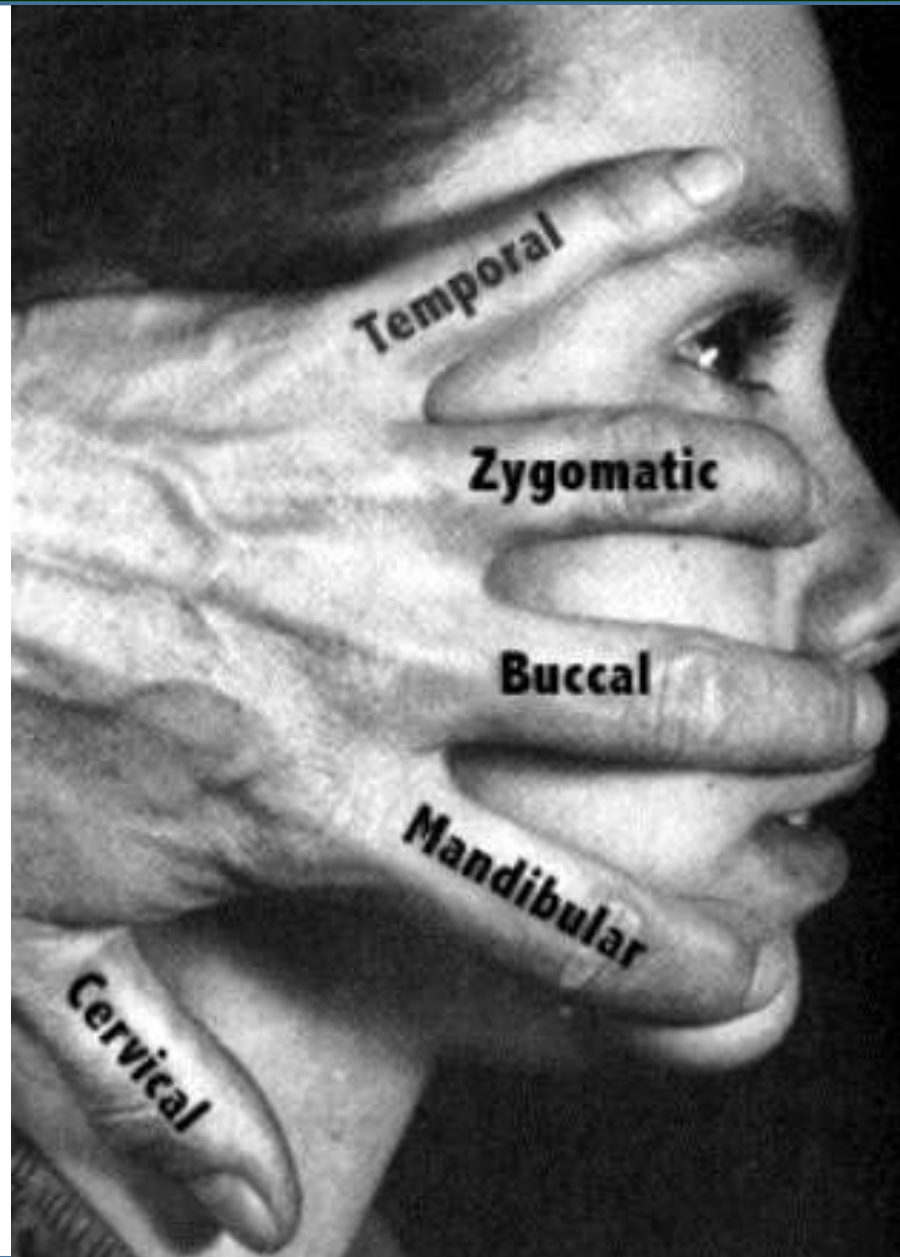
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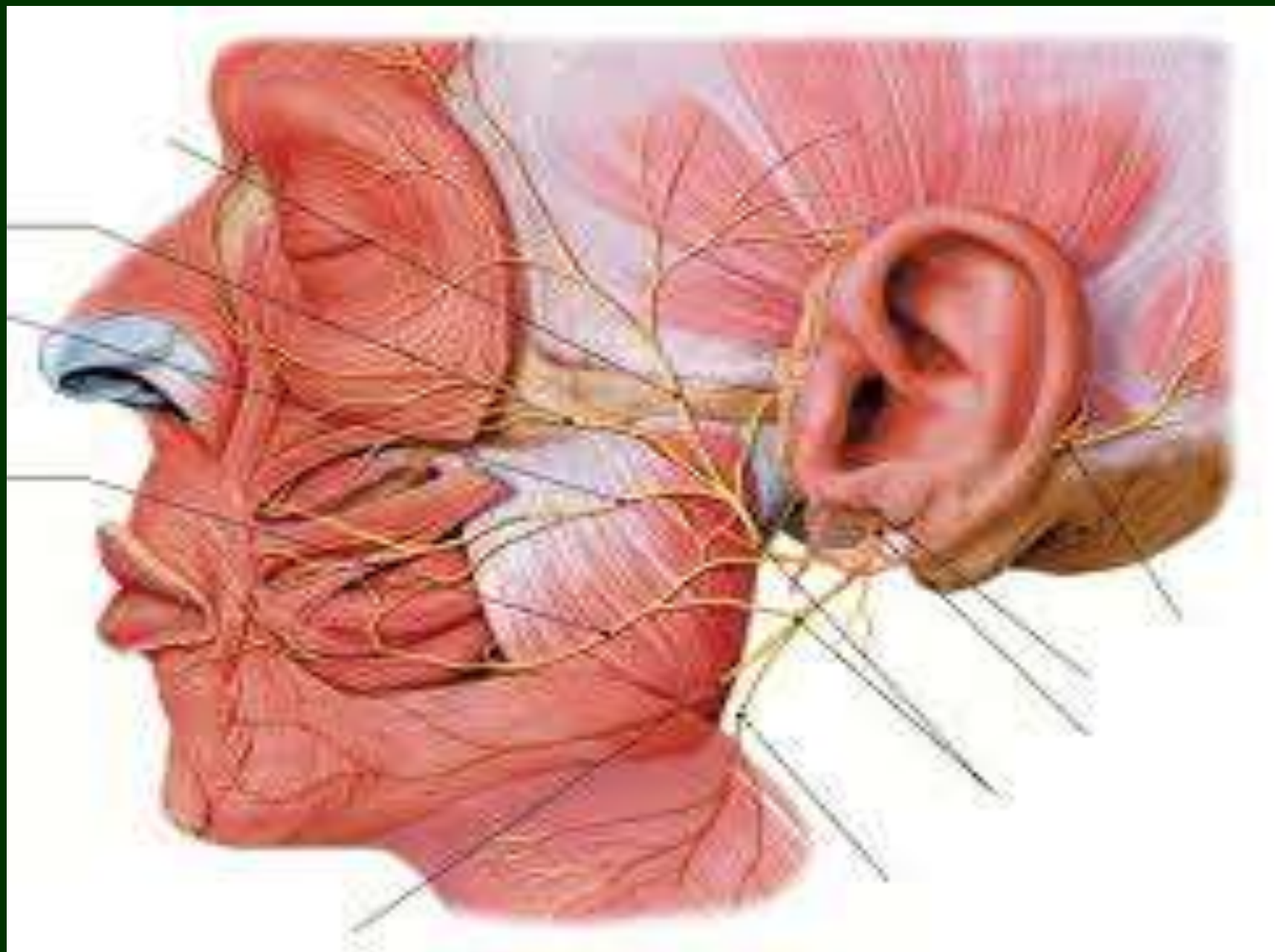


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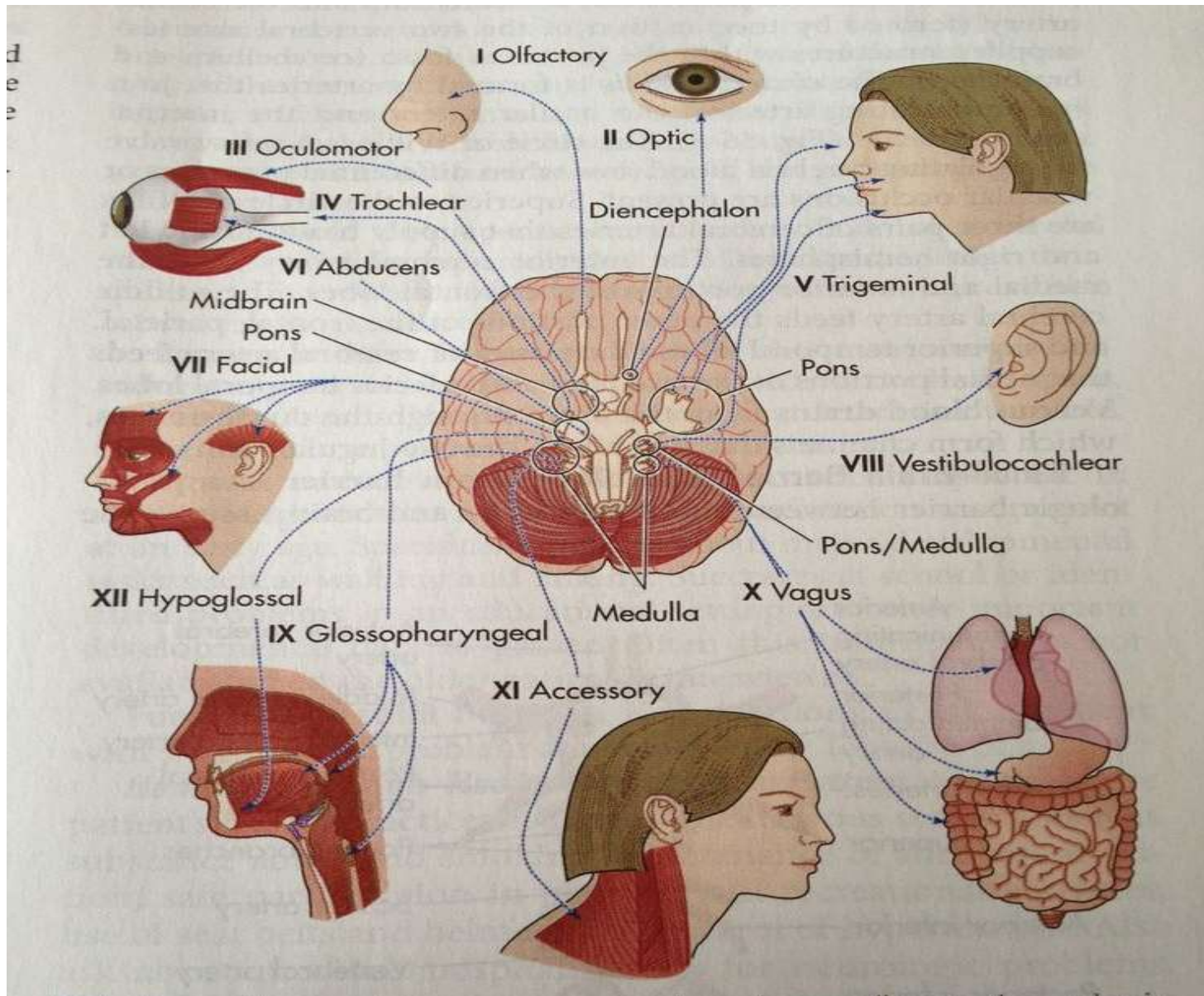


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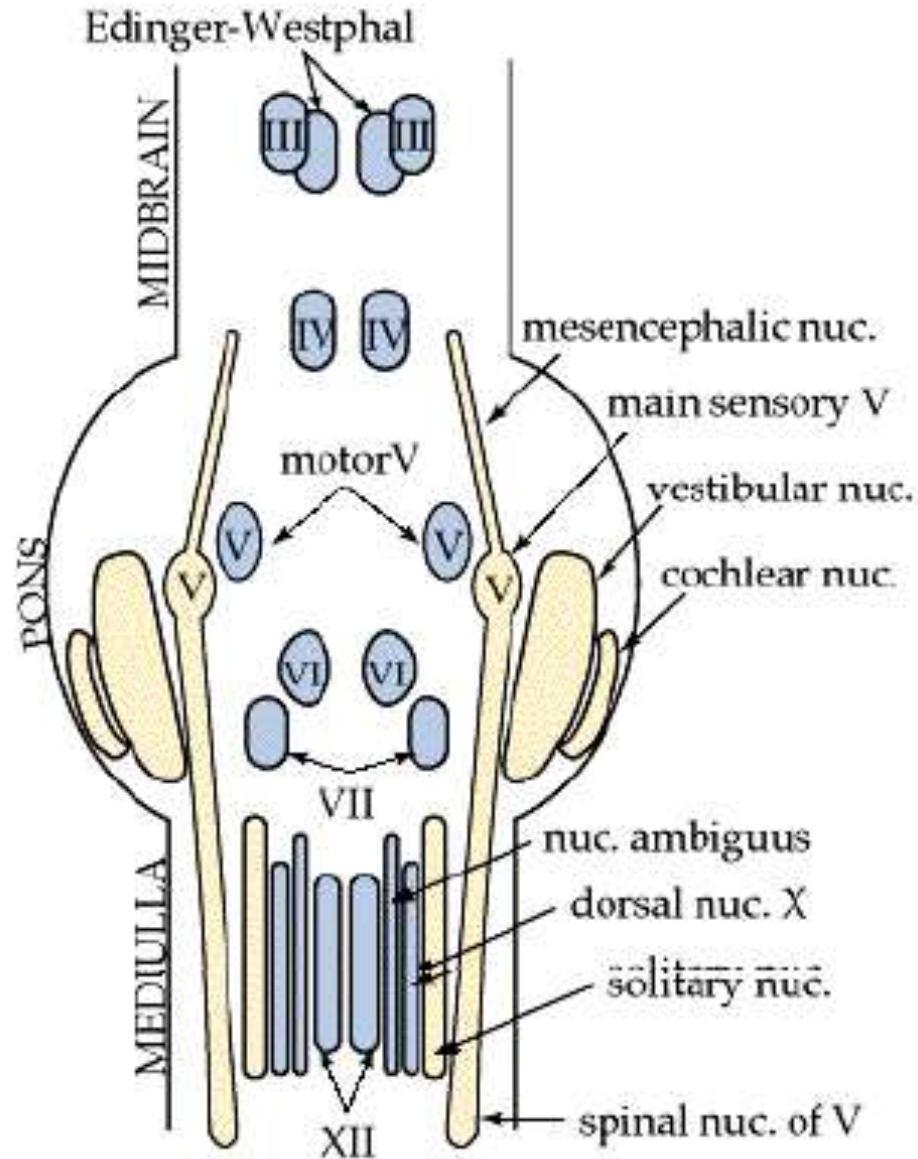




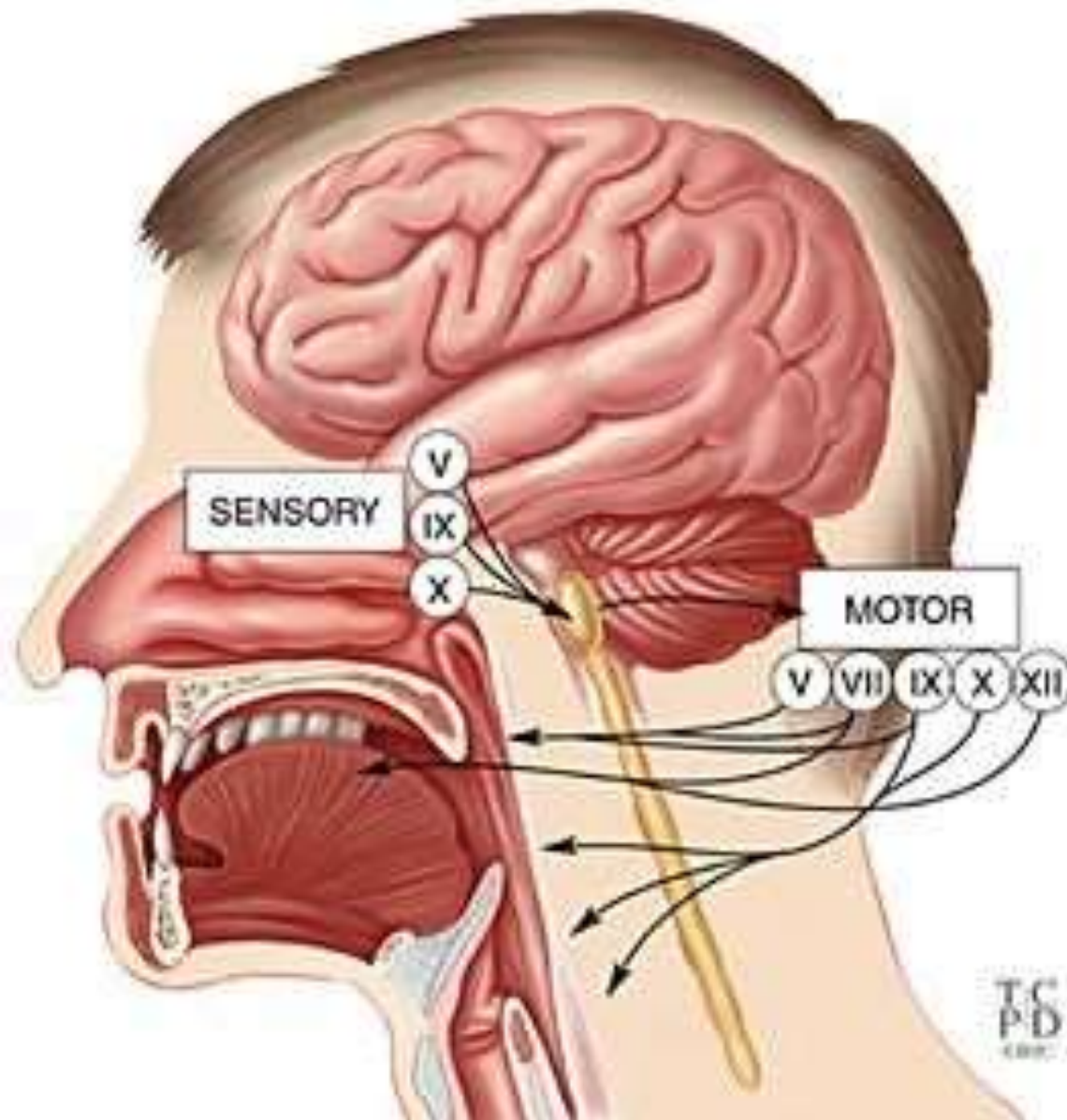
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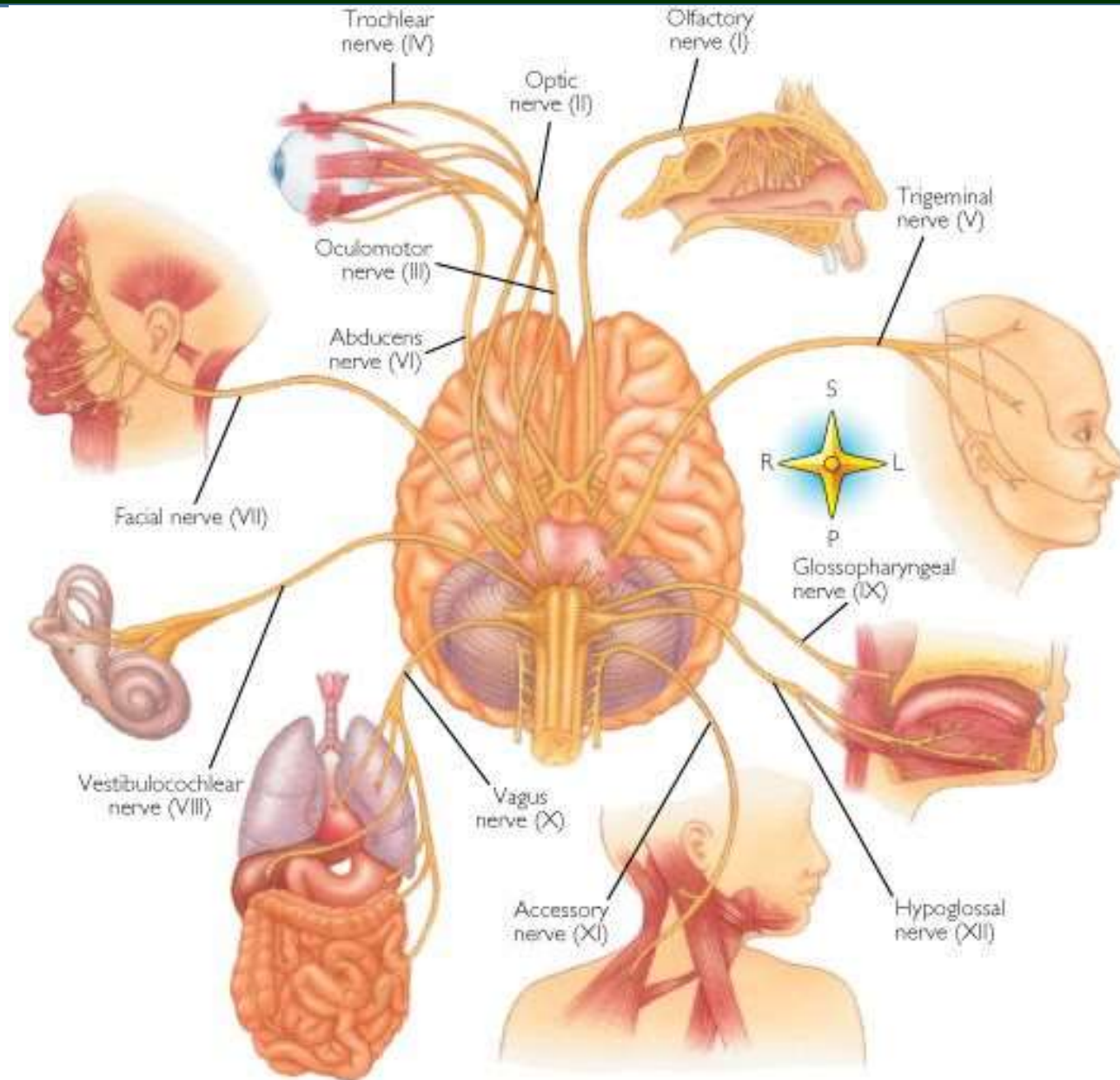
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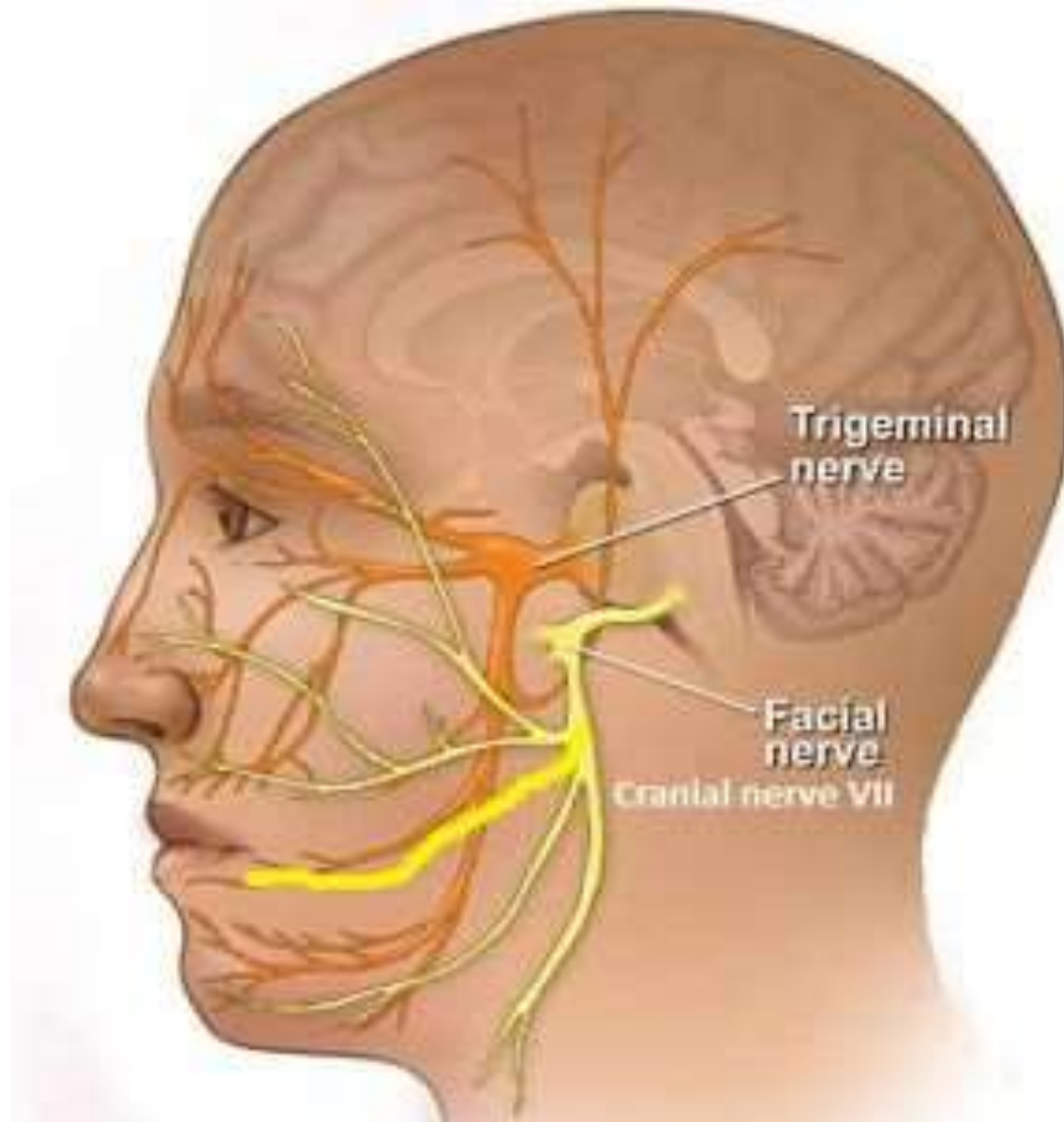
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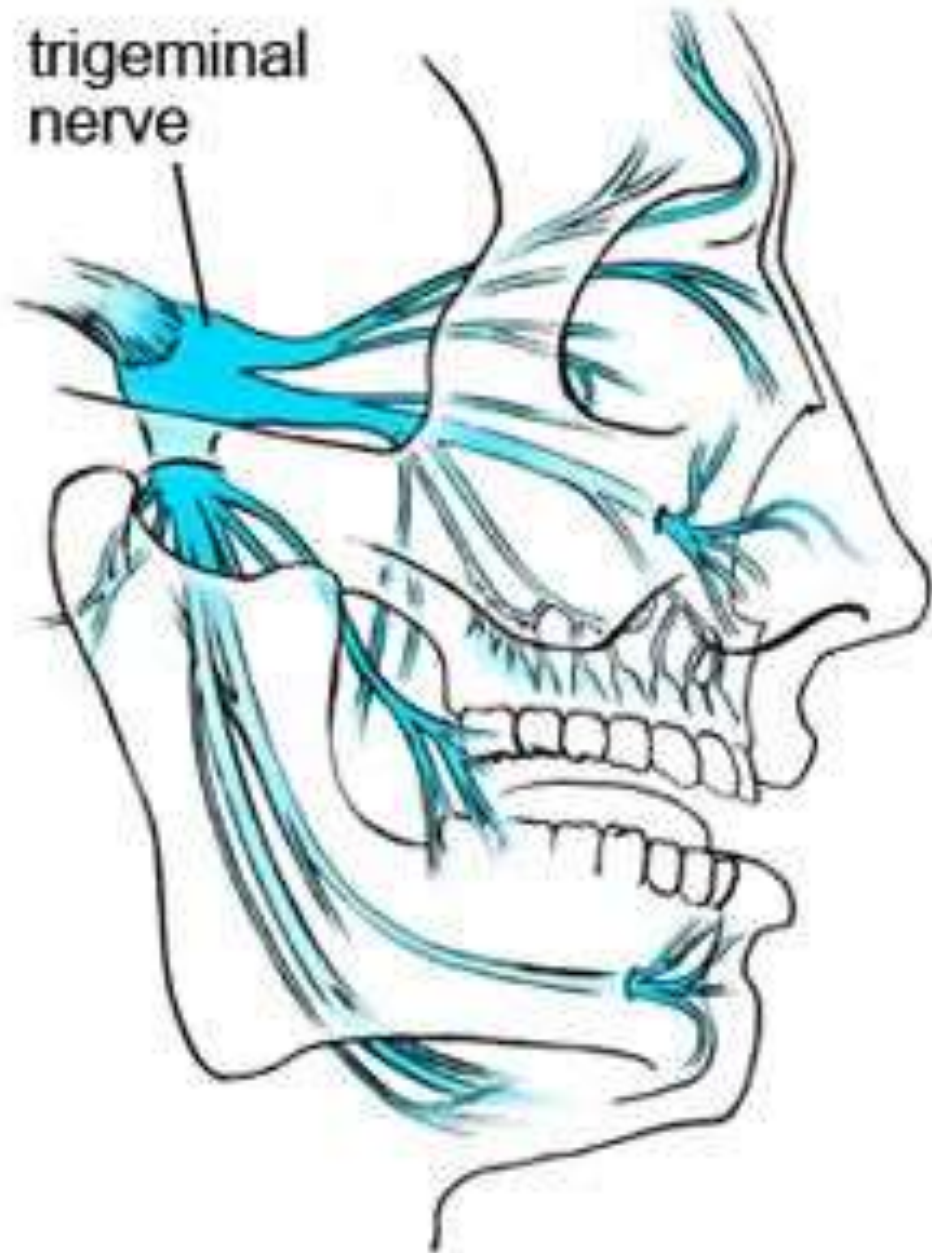
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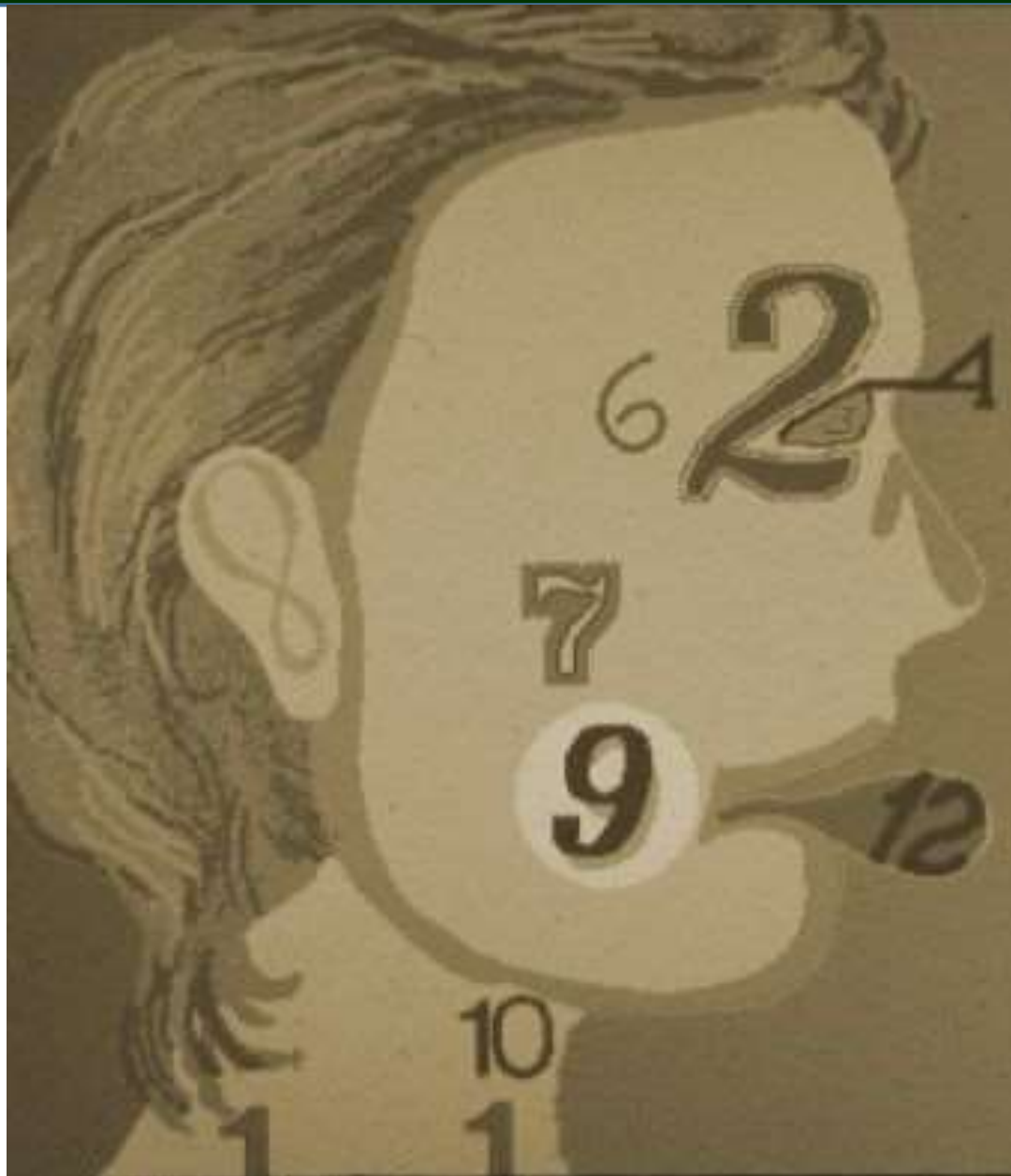
NERVI CRANIALES



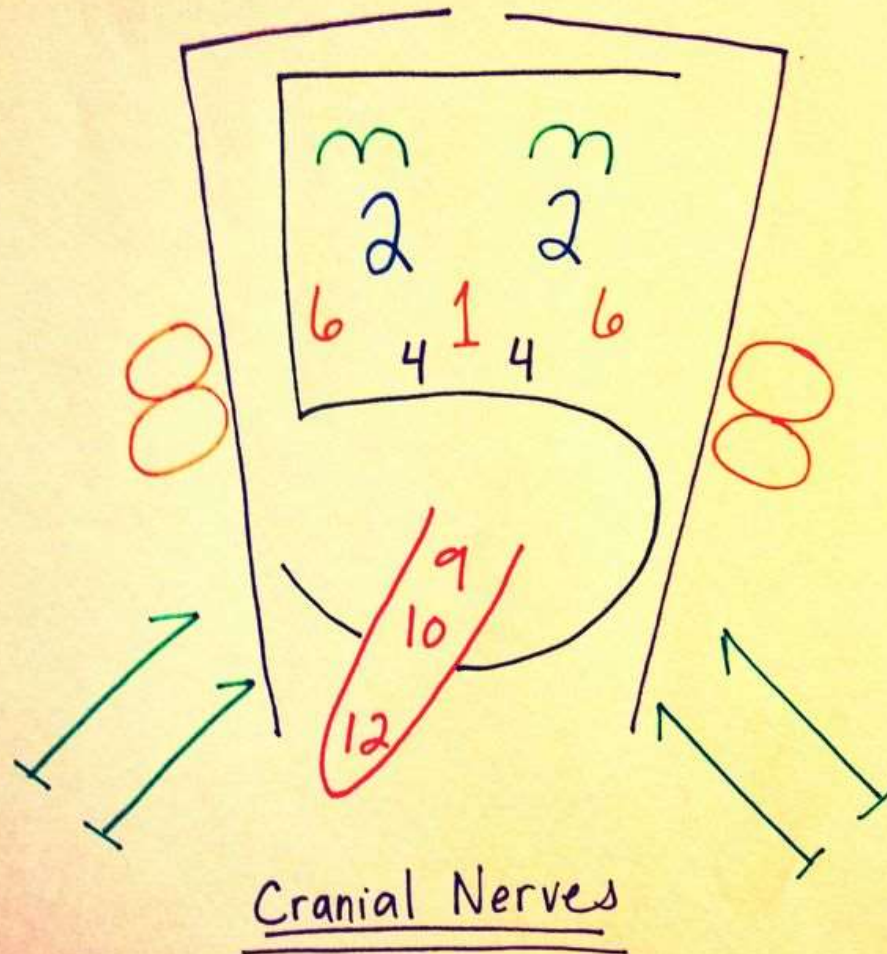
trigeminal
nerve



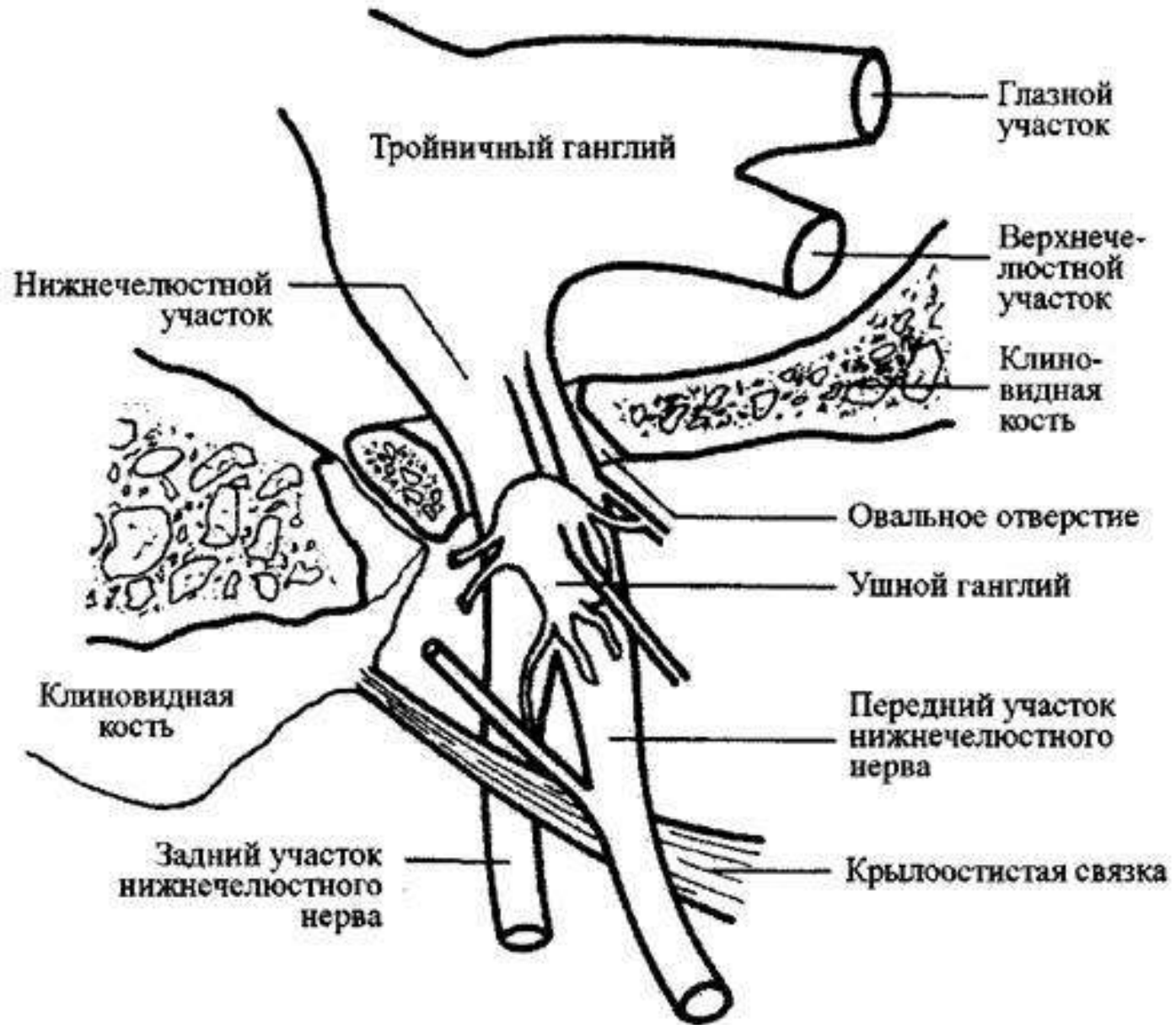
NERVI CRANIALES





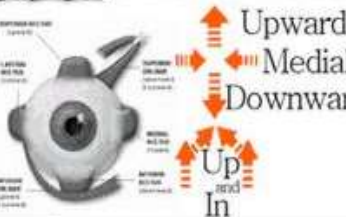







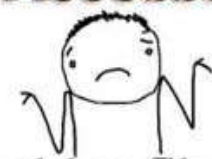

NERVI CRANIALES



NERVI CRANIALES



NERVI CRANIALES

<p>I Olfactory</p> <p>Smell</p> 	<p>II Optic</p> <p>Vision</p> 	<p>III Oculomotor</p>  <p>Upward Medial Downward Up and In</p>
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<p>VII Facial</p> <p>Taste for the Anterior 2/3 of Tongue</p> <p>Smile</p> 	<p>VIII Acoustic</p> <p>Hearing Equilibrium</p> 	<p>Glossopharyngeal IX</p> <p>Posterior 1/3 of the Tongue</p> <p>Speech</p> 
<p>X Vagus</p> <p>Defecation</p> <p>Slowed Heart Rate</p> 	<p>XI Spinal Accessory</p> <p>Shoulder Shrug</p> 	<p>XII Hypoglossal</p> <p>Tongue Movement</p> 

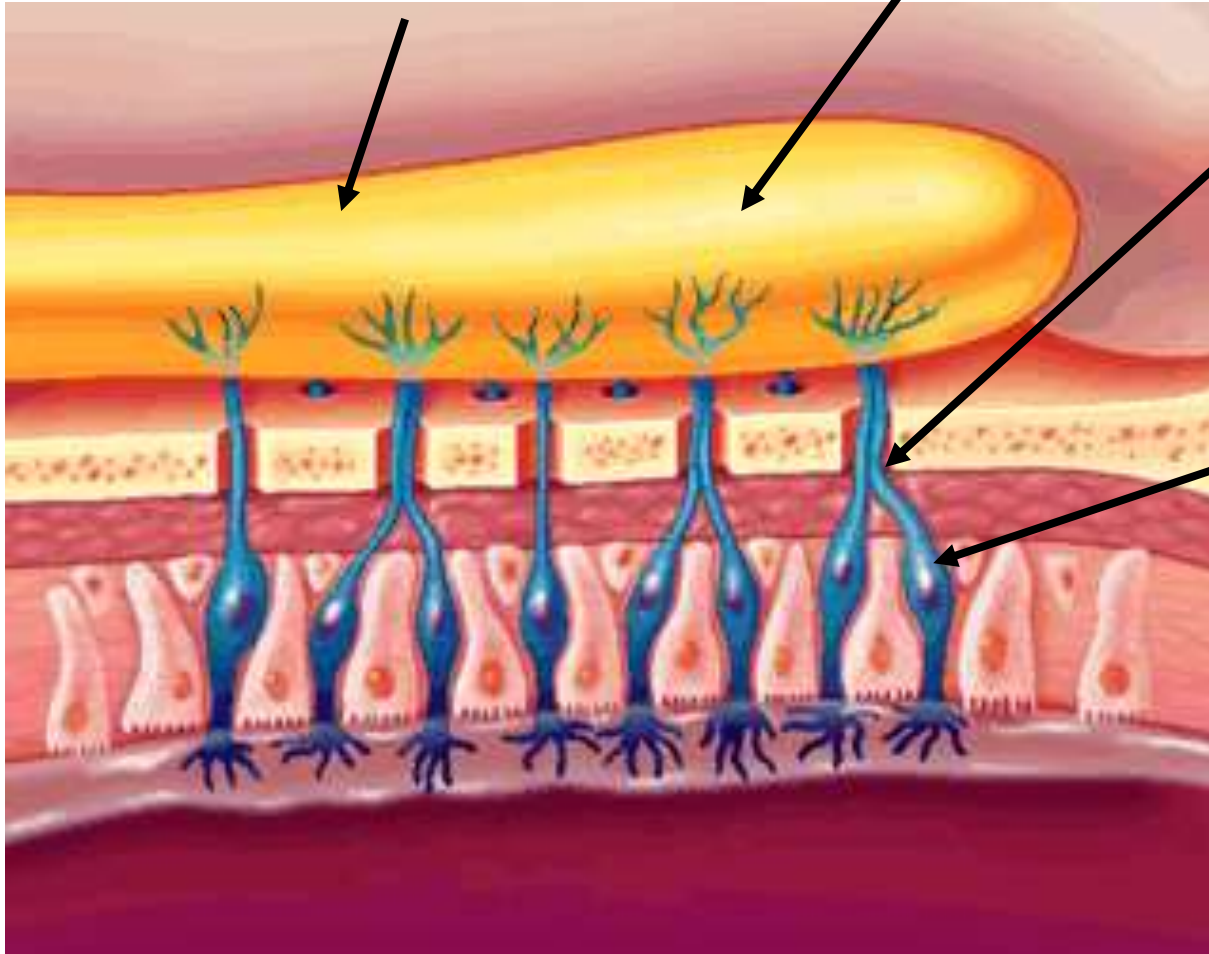
Olfactory Nerves I

Olfactory tract

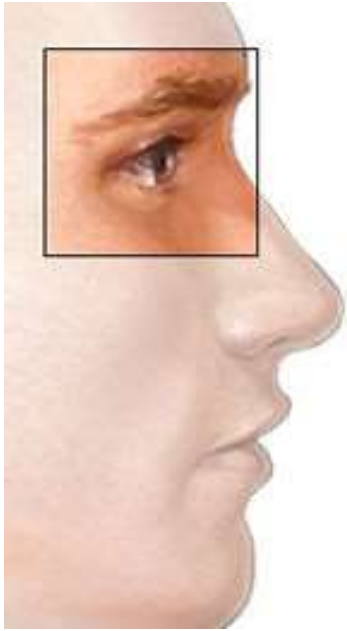
Olfactory bulb

Filaments of olfactory nerve

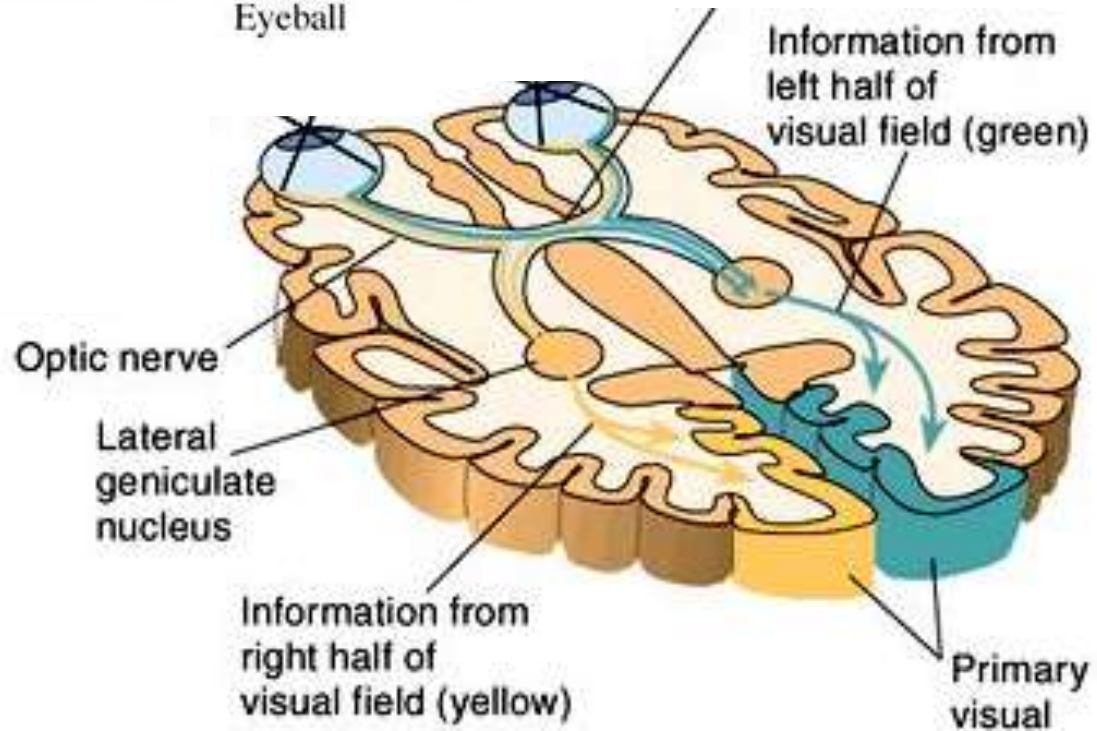
Olfactory receptor cell



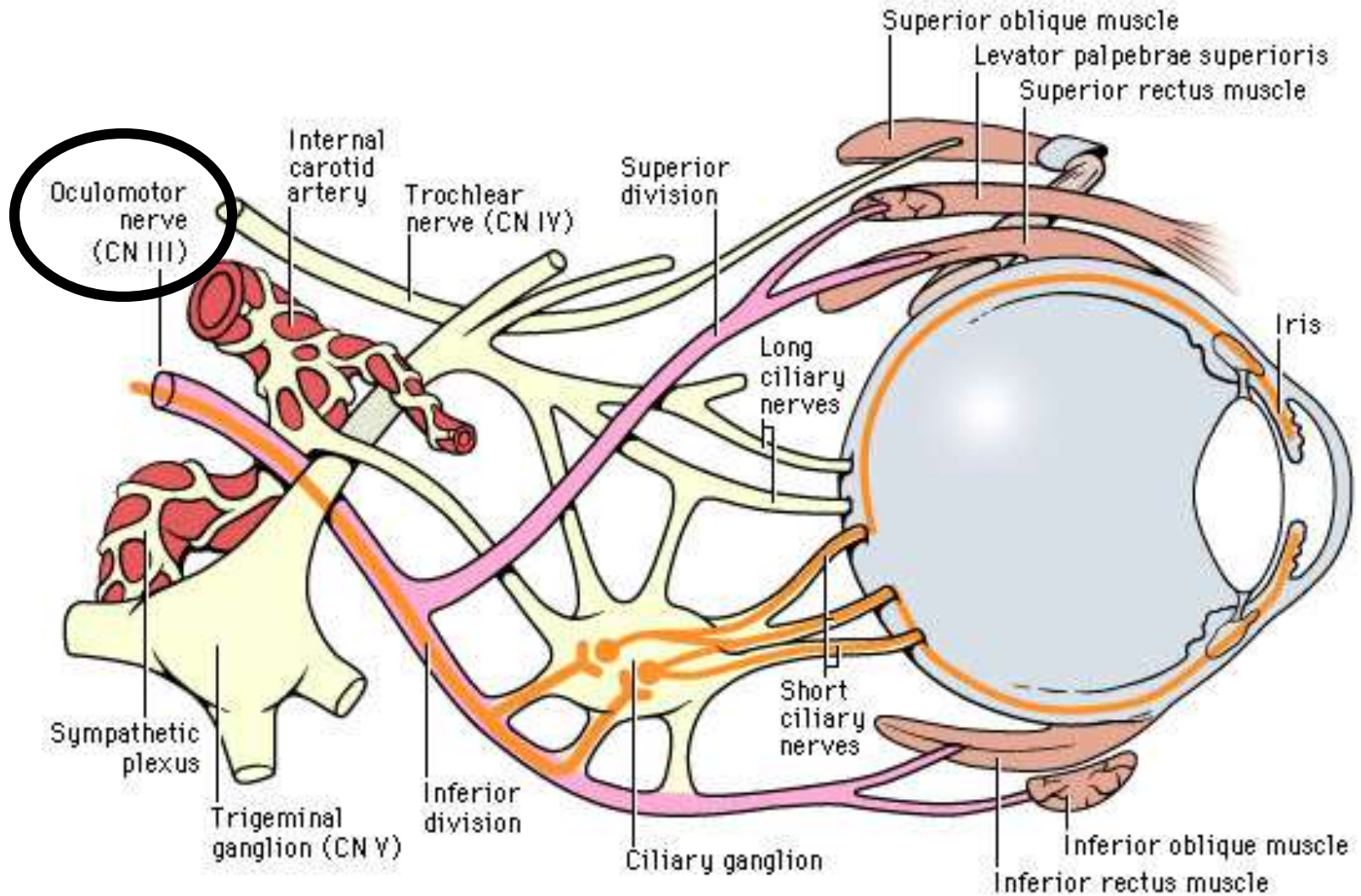
Optic Nerves II



Eyeball



Oculomotor Nerves III



Trochlear Nerves IV

Superior oblique muscle

Superior rectus muscle

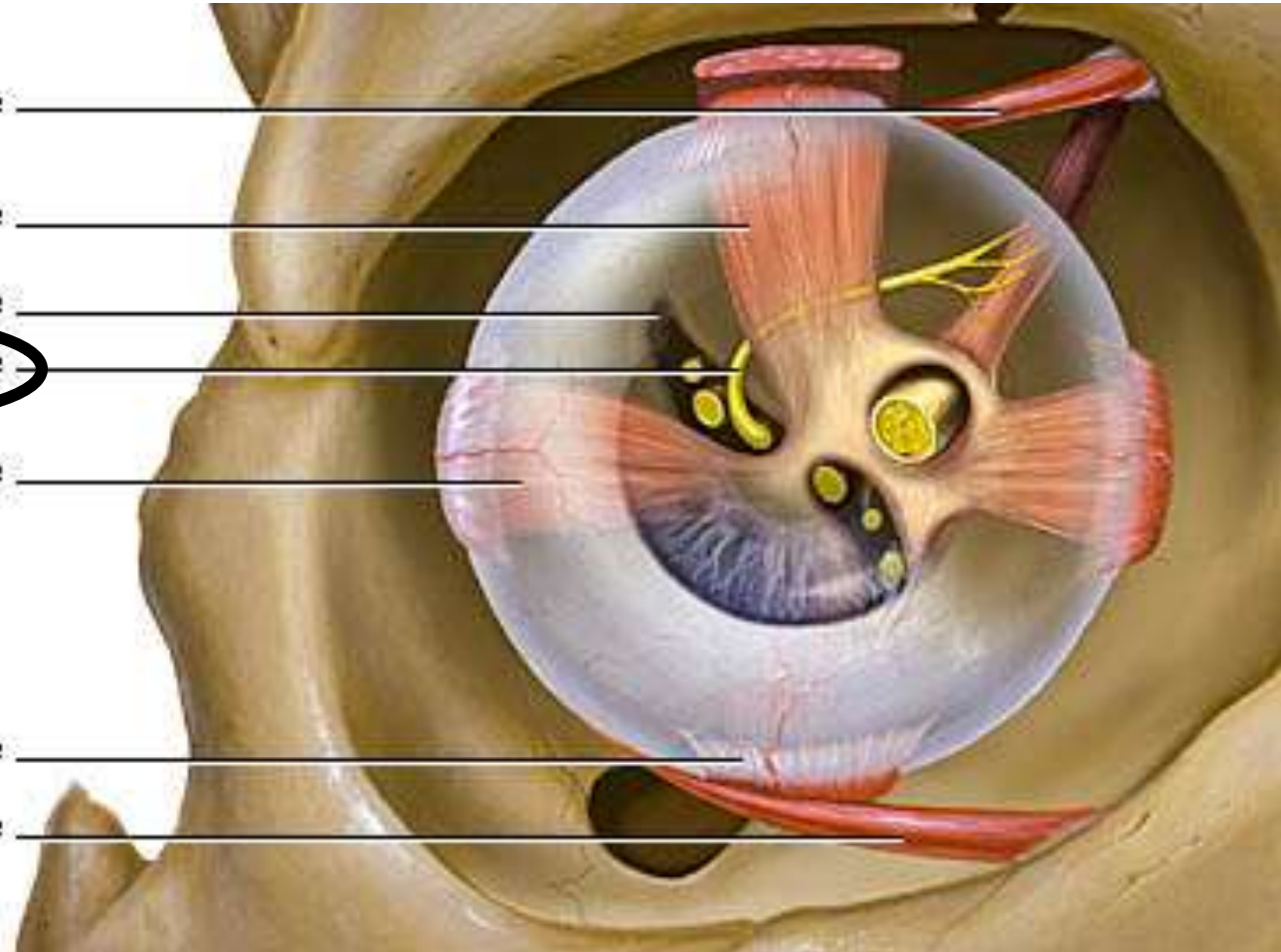
Superior orbital fissure

Trochlear nerve

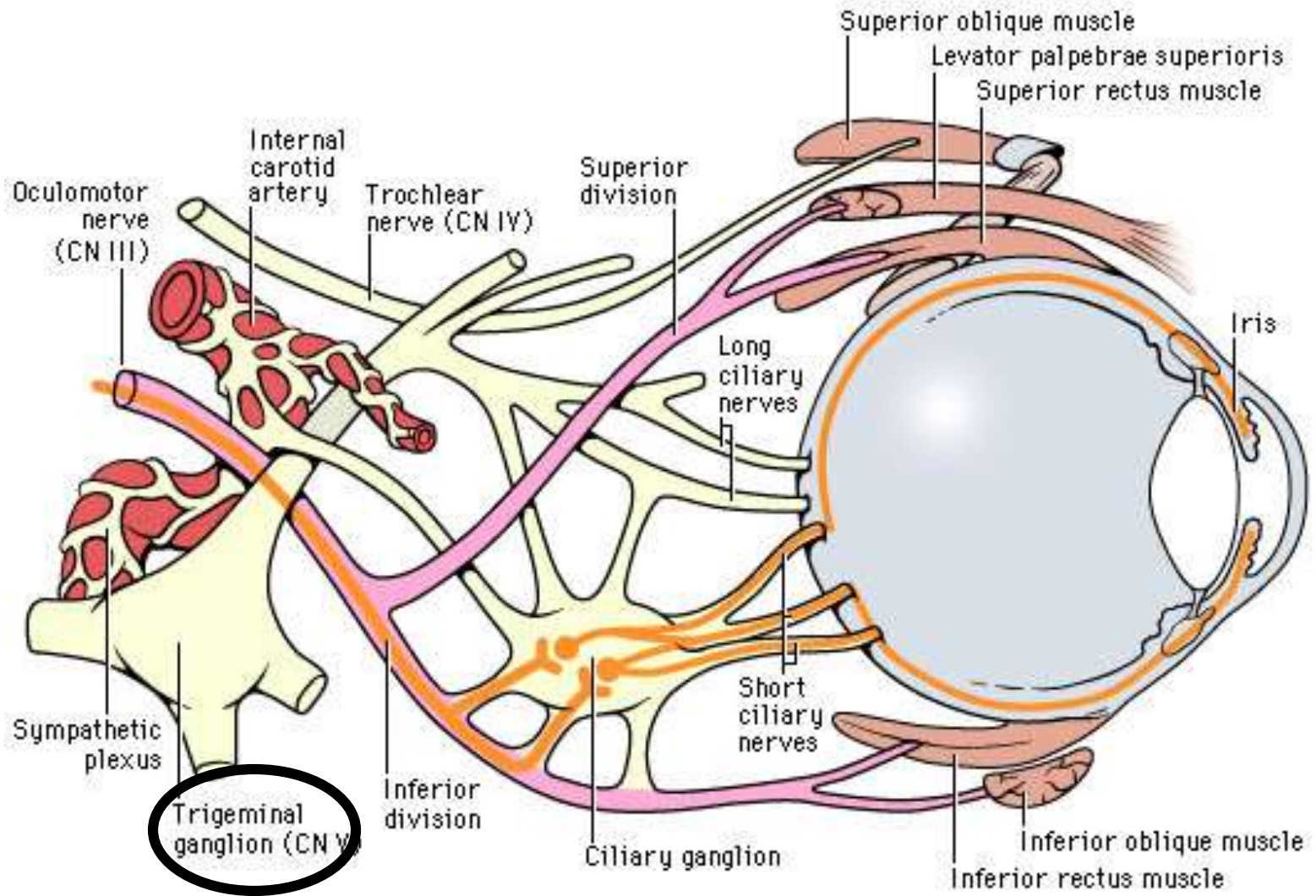
Lateral rectus muscle

Inferior rectus muscle

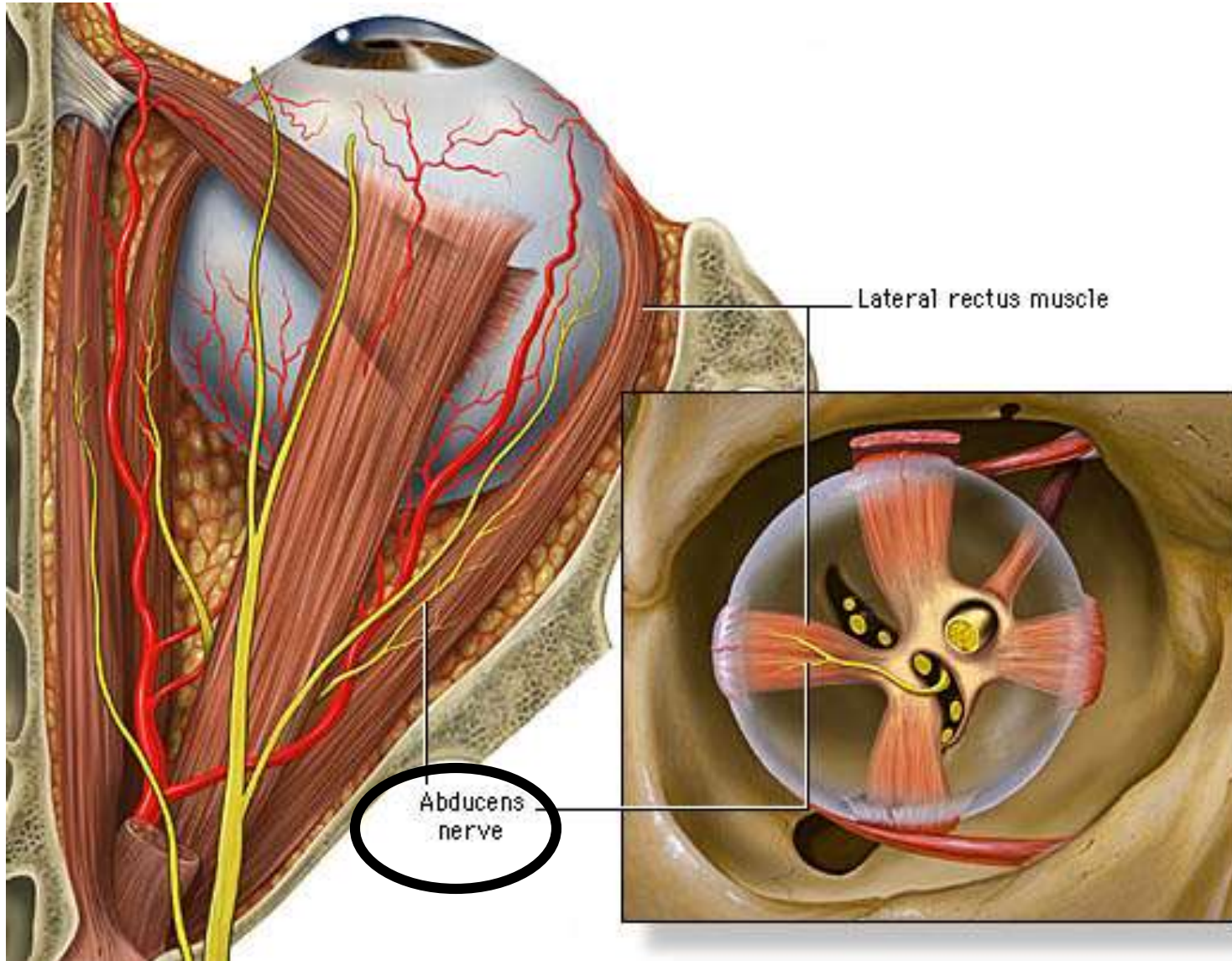
Inferior oblique muscle



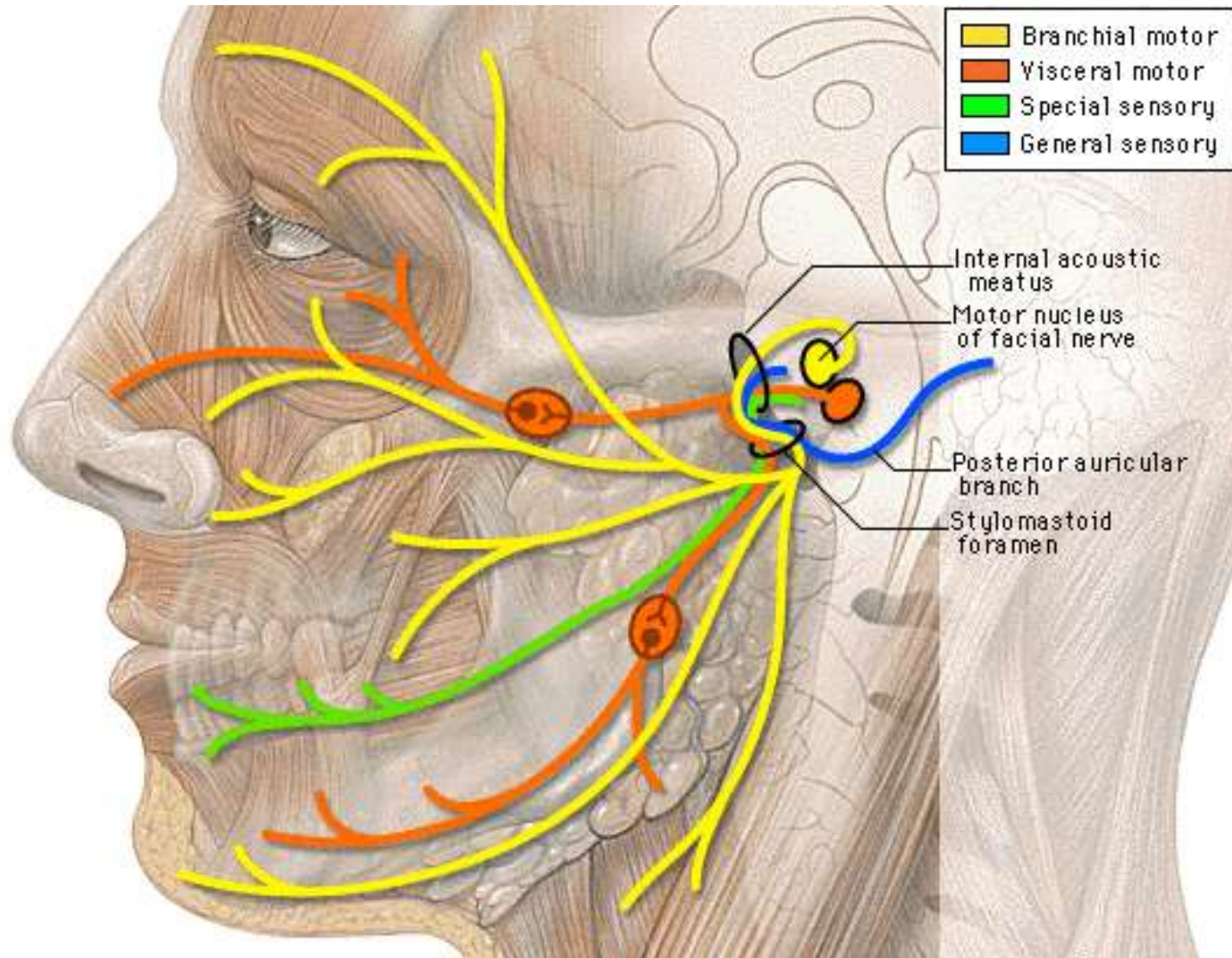
Trigeminal Nerves V



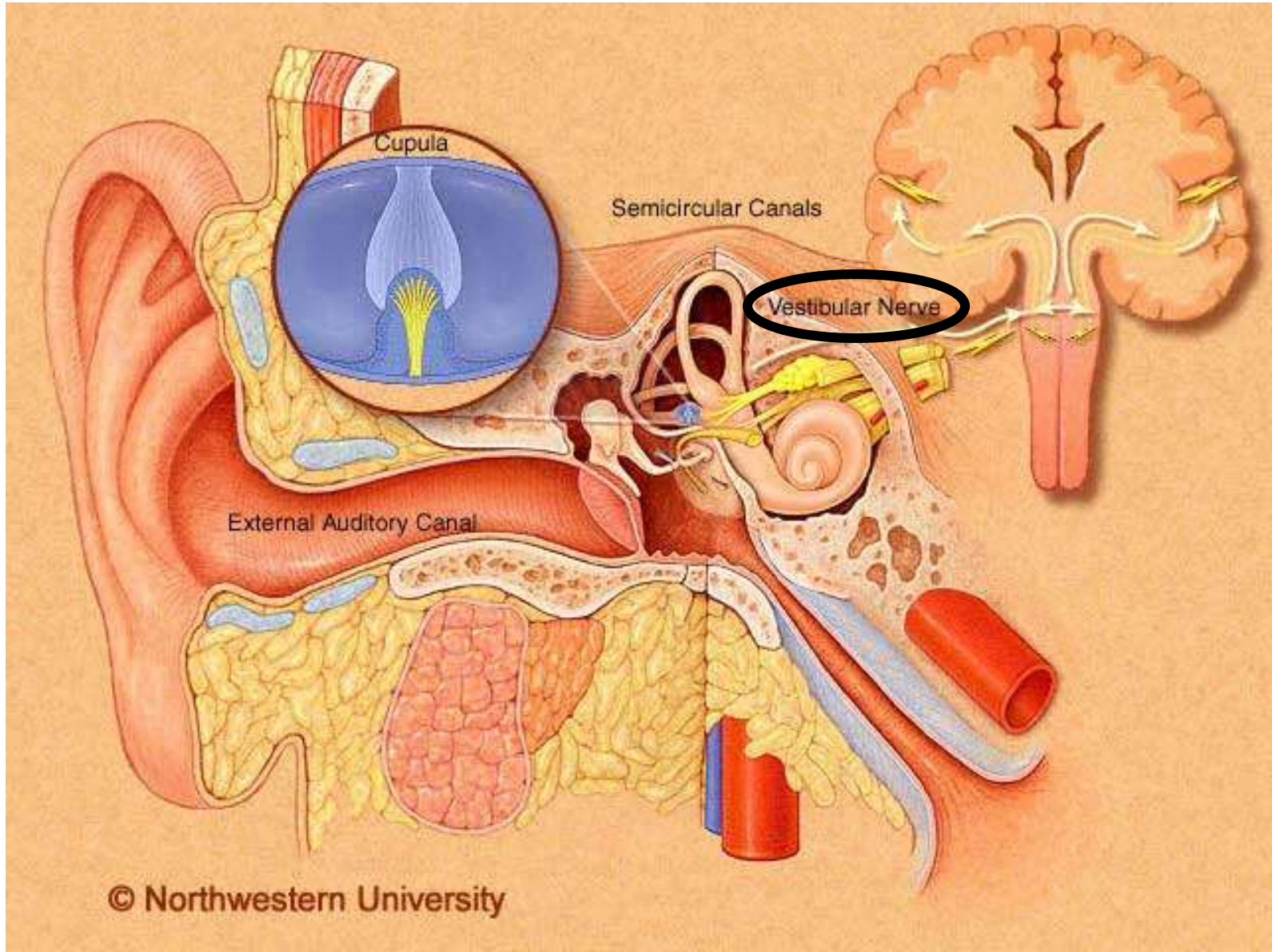
Abducens Nerves VI



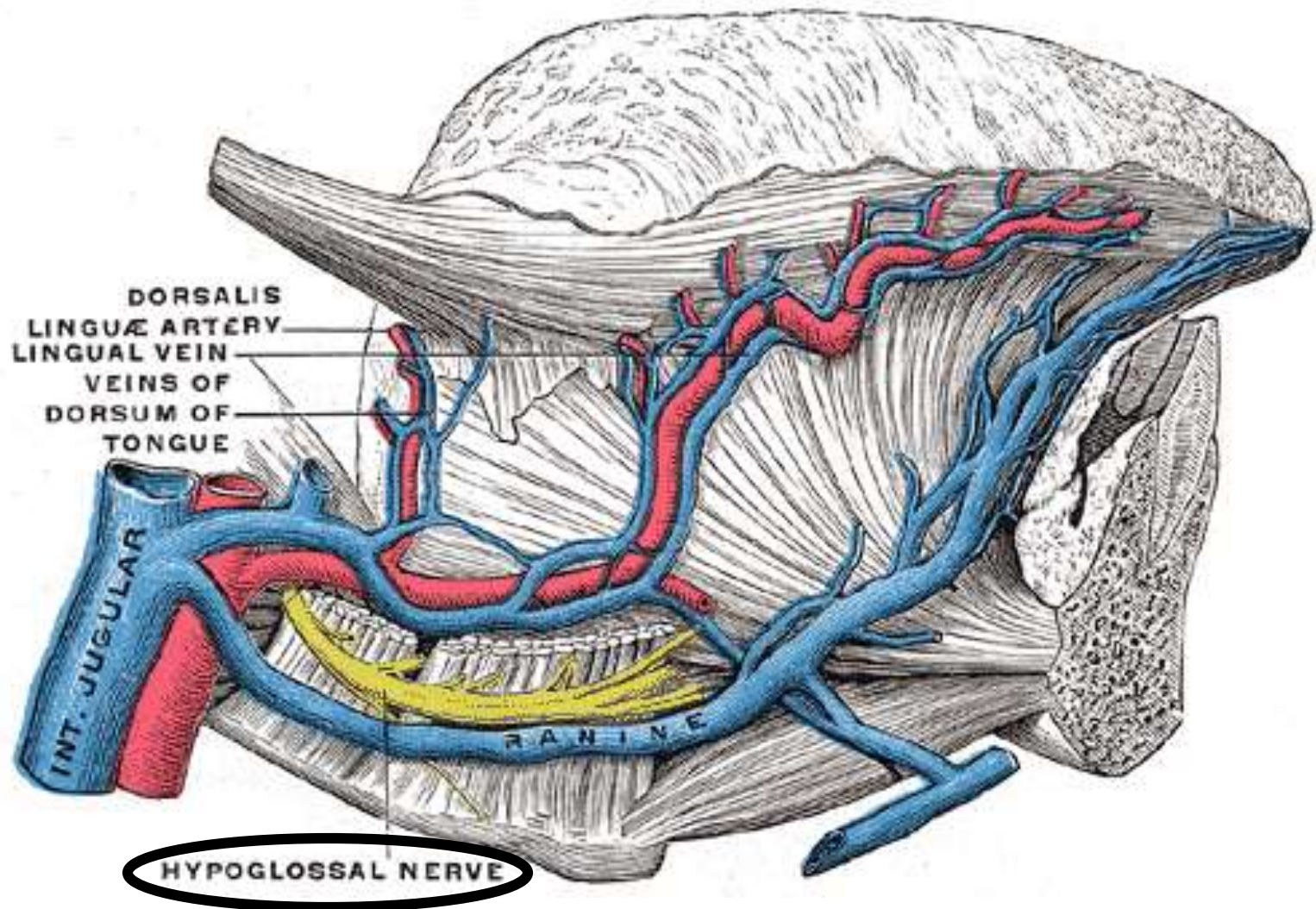
Facial Nerves VII



Vestibulochoclear Nerves VIII

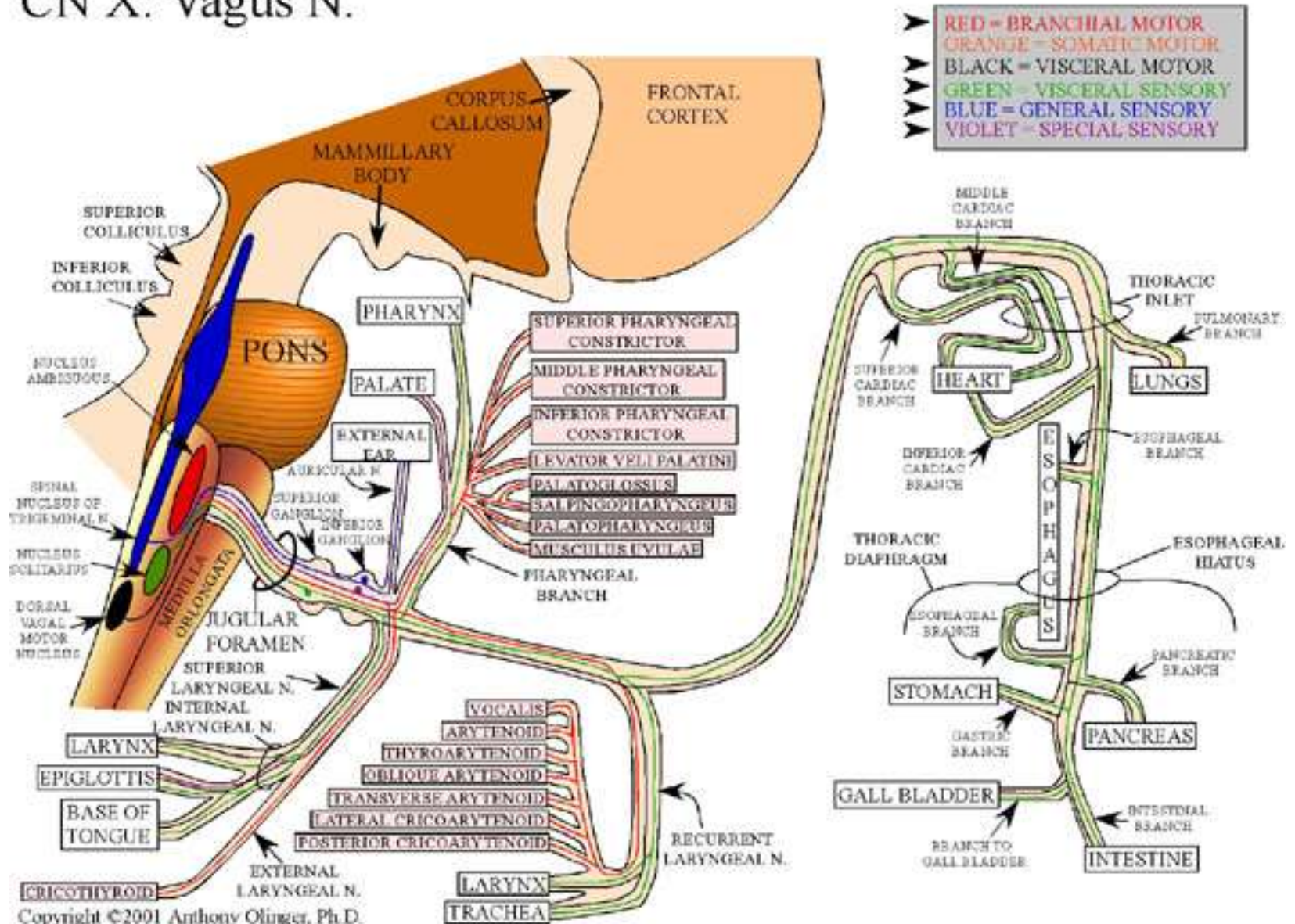


Glosopharyngeal Nerves IX

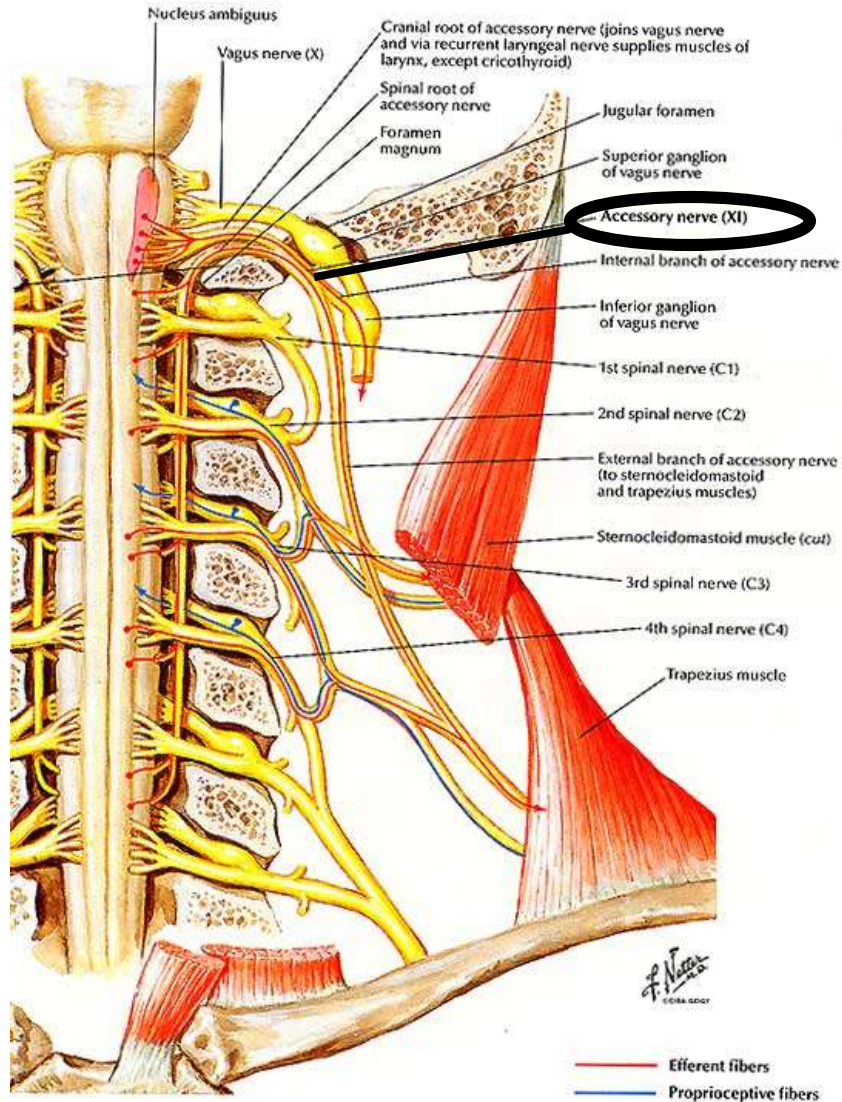


Vagus Nerves X

CN X: Vagus N.

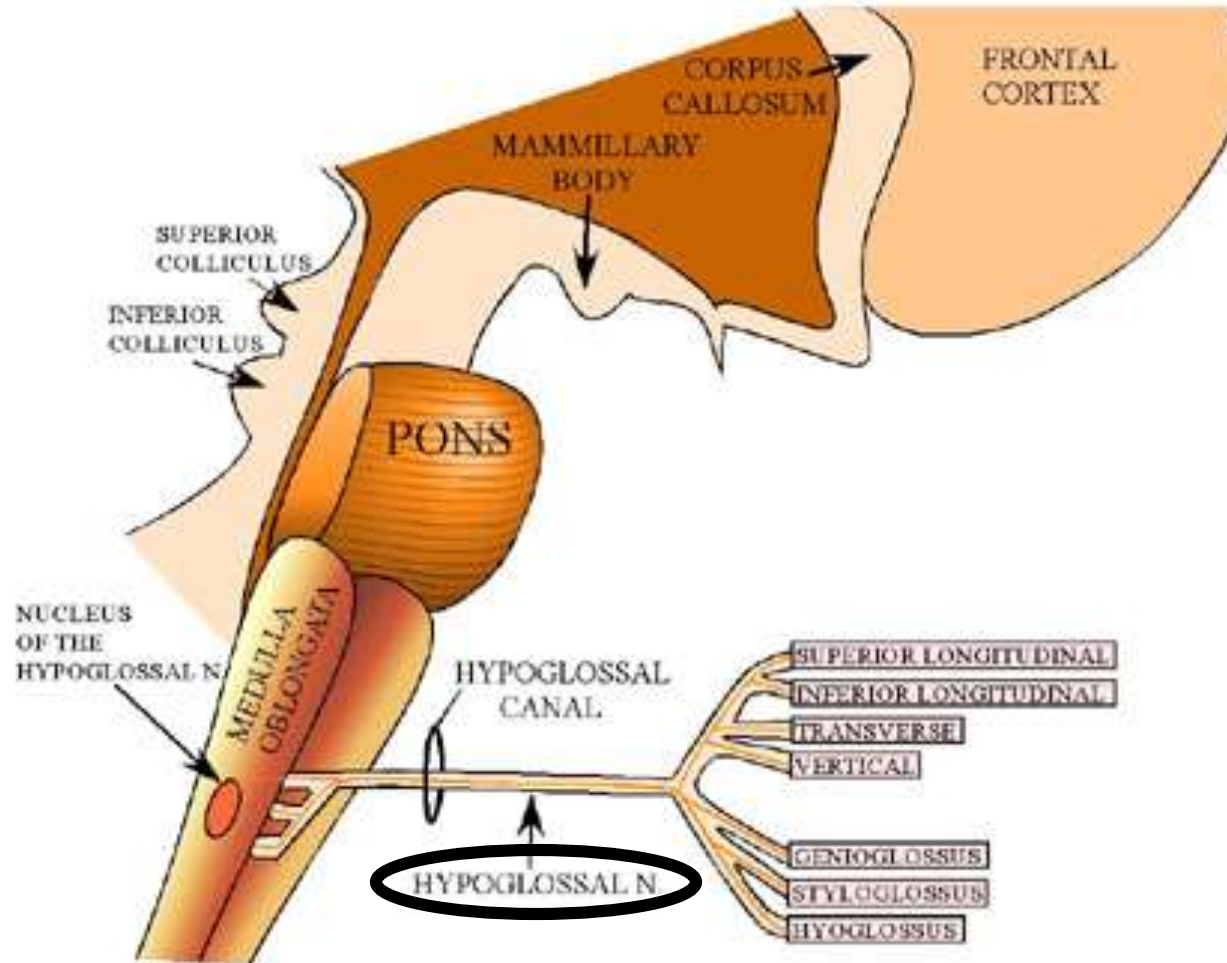


Accessory Nerves XI



Hypoglossal Nerves XII

CN XII: Hypoglossal N.



RED = BRANCHIAL MOTOR
ORANGE = SOMATIC MOTOR
BLACK = VISCERAL MOTOR
GREEN = VISCERAL SENSORY
BLUE = GENERAL SENSORY
VIOLET = SPECIAL SENSORY

Traumatic Brain Injuries

- Concussion
- Contusion
- Subdural or subarachnoid hemorrhage
- Contrecoup injury

Cerebrovascular Accidents (CVAs)

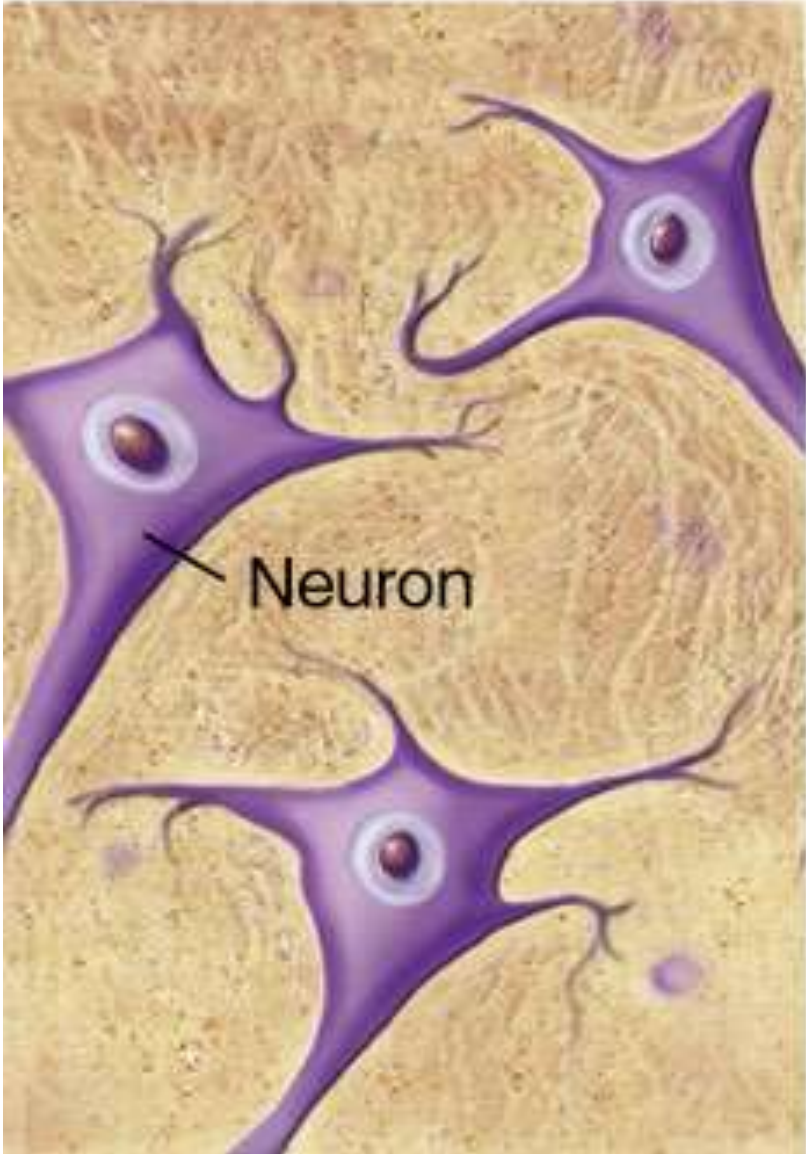
- Ischemia
- Thrombus
- Embolism
- Arteriosclerosis
- Stroke



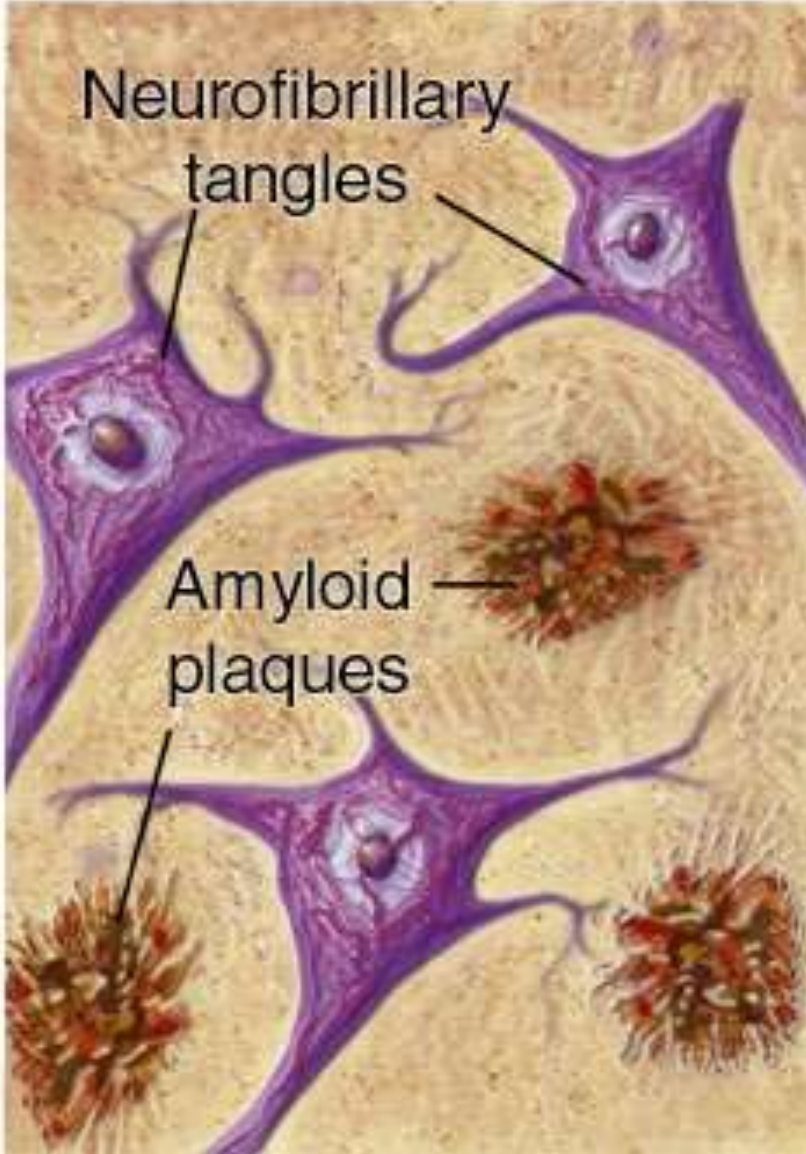
Degenerative brain diseases

- Alzheimer's
- Down's
- Parkinson's
- Huntington's Chorea
- MS
- Epilepsy
- Schizophrenia

Normal

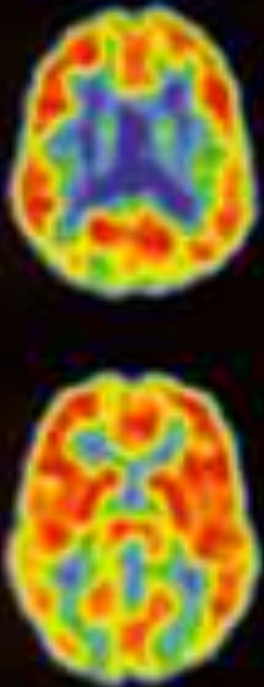


Alzheimer's

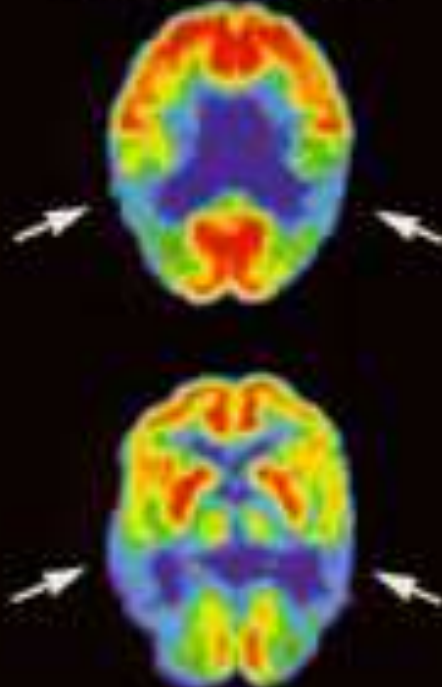


PET Scans

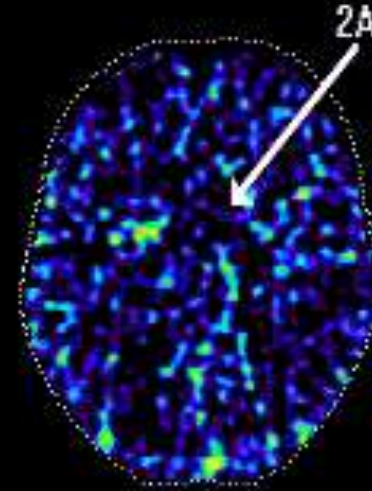
NORMAL



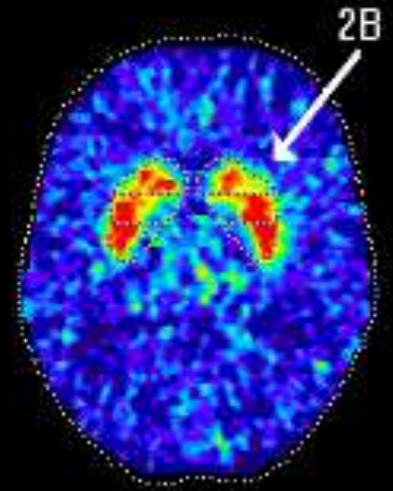
ALZHEIMER'S



PARKINSON'S DISEASE



NORMAL CONTROL



F-Dopa deficiency