

Nuclei of cranial nerves

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Cranial nerves:

❖ *they belong to the peripheral nervous system*

❖ *12 pairs:*

olfactory nerve (I)

optic nerve (II)

oculomotor nerve (III)

trochlear nerve (IV)

trigeminal nerve (V)

abducens nerve (VI)

facial nerve (VII)

vestibulocochlear (stato-acoustic) nerve (VIII)

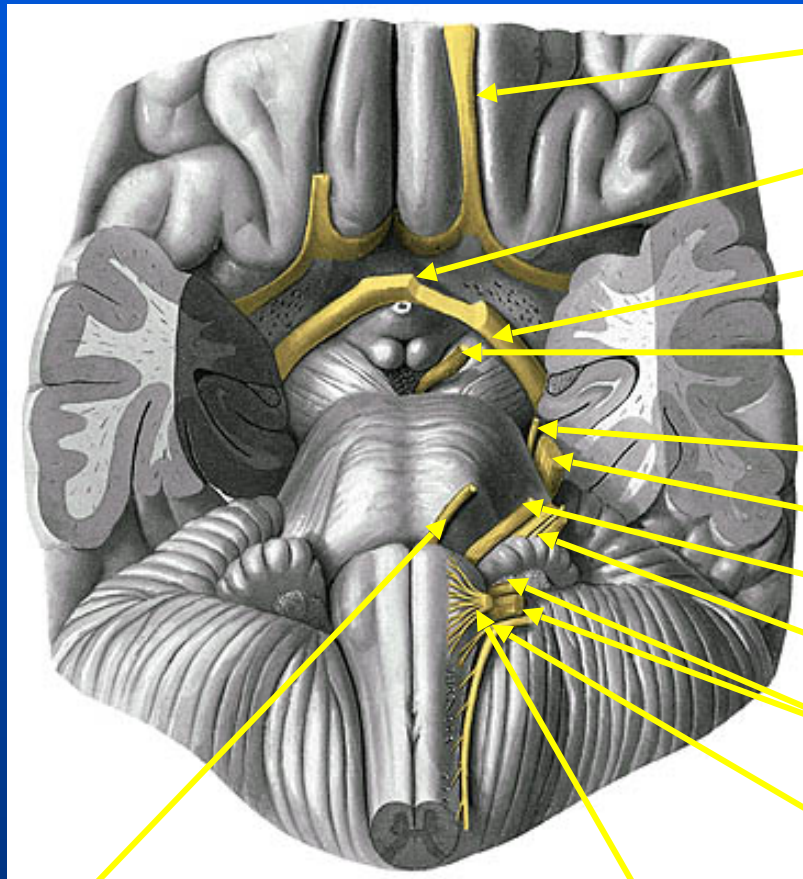
glossopharyngeal nerve (IX)

vagus nerve (X)

accessory nerve (XI)

hypoglossal nerve (XII)

Cranial nerves



Olfactory nerve (I)

Optic chiasma (II)

Optic tract (II)

Oculomotor nerve (III)

Trochlear nerve (IV)

Trigeminal nerve (V)

Facial nerve (VII)

Vestibulocochlear nerve (VIII)

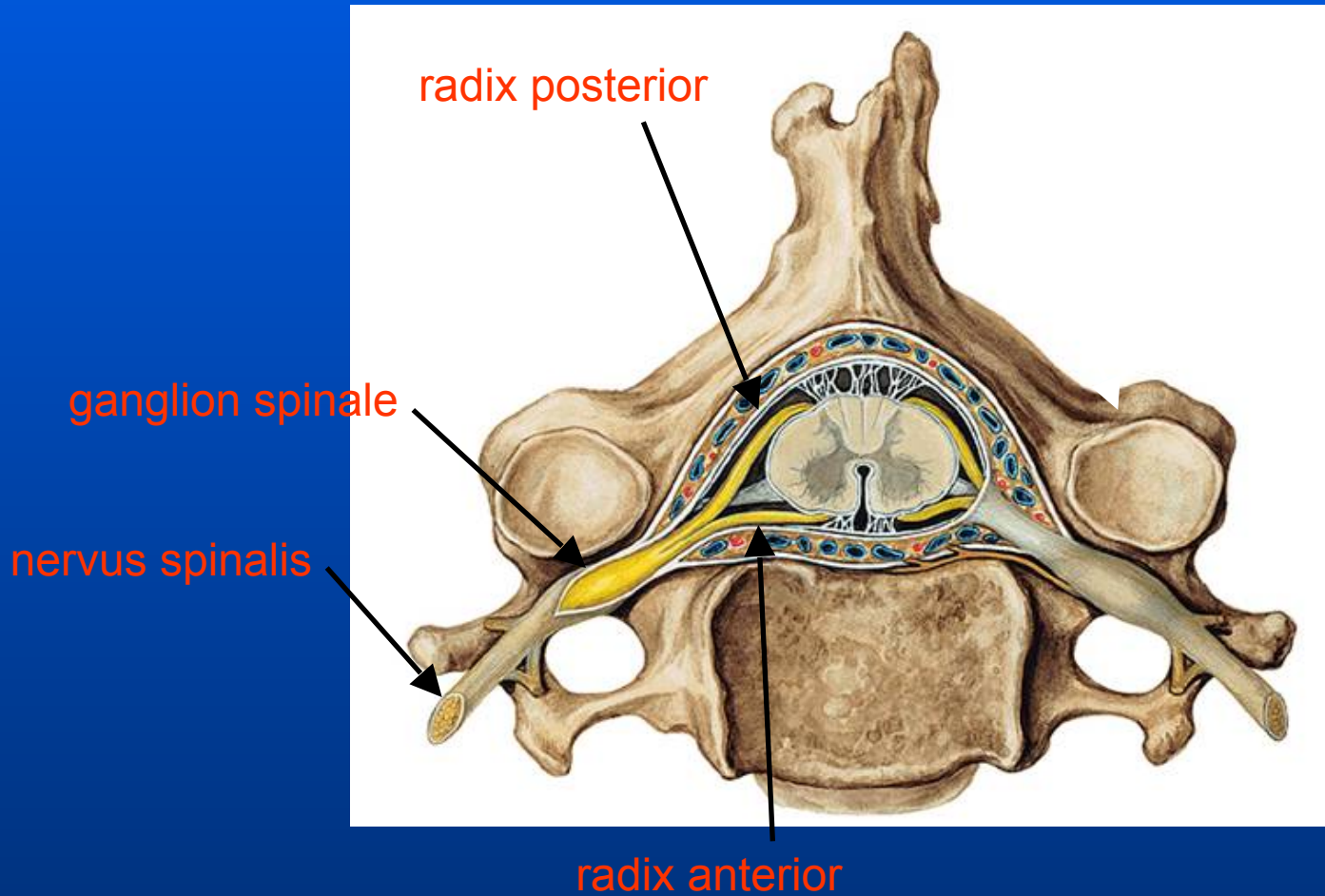
Glossopharyngeal+vagus nerves
(IX,X)

Accessory nerve (XI)

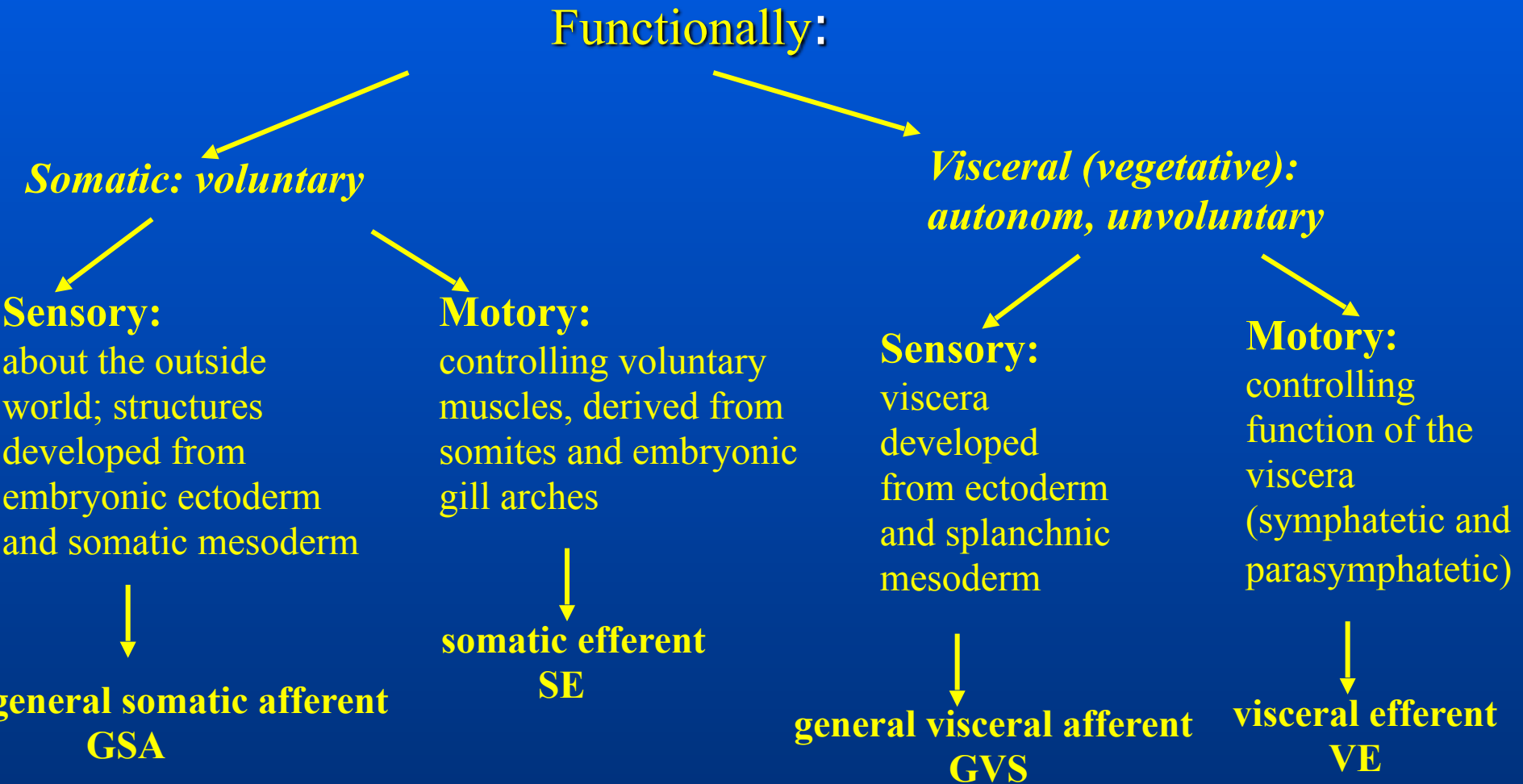
Abducens nerve (VI)

Hypoglossal nerve (XII)

Spinal nerves: mixed (sensory, motor sometimes vegetative fibers)



Cranial nerves



- Olfactory nerve (I): is developing as an early part of the primitive telencephalon
- Optic nerve (II): is developing as an outpouching from the diencephalon
- Cranial nerves III to XII:
 - ❖ originate from the brain stem
 - ❖ are embryologically homologous with spinal nerves
 - ❖ nuclei of them derived originally from cell columns homologous with the columns of the spinal cord

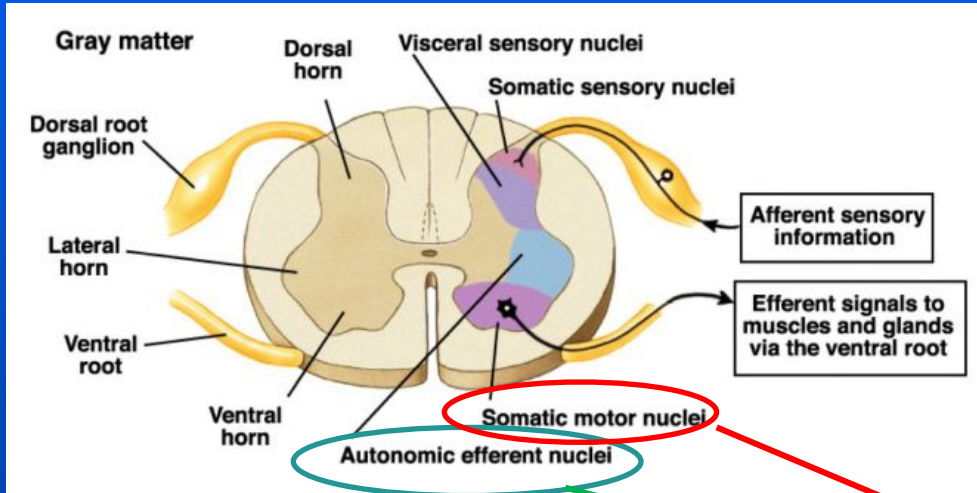
Special sensory cranial nerves

- Olfactory nerve (I)
- Optic nerve (II)
- Vestibulocochlear nerve (VIII)

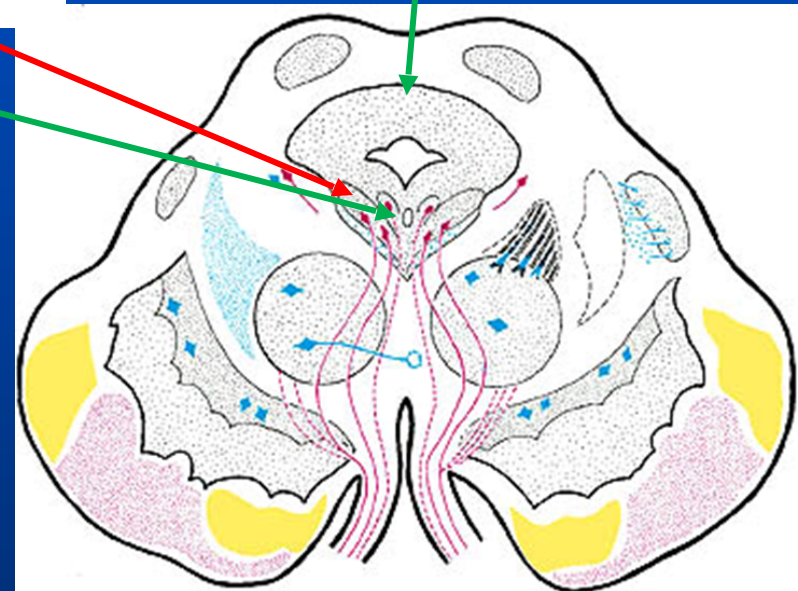
Cranial nerves

- Motor nerves:
 - IV, VI, XII – somatomotor
 - III – somatomotor, visceromotor
- Sensory:
 - VIII – special (hearing, balance)
- Mixed:
 - V, VII, IX, X - sensory, motor + vegetative (except: V)
- Special motor:
 - XI (motoros – spinal fibers)
- Not really cranial nerves:
 - I, and II – outgrowth of the central nervous system

Oculomotor nerve (III)

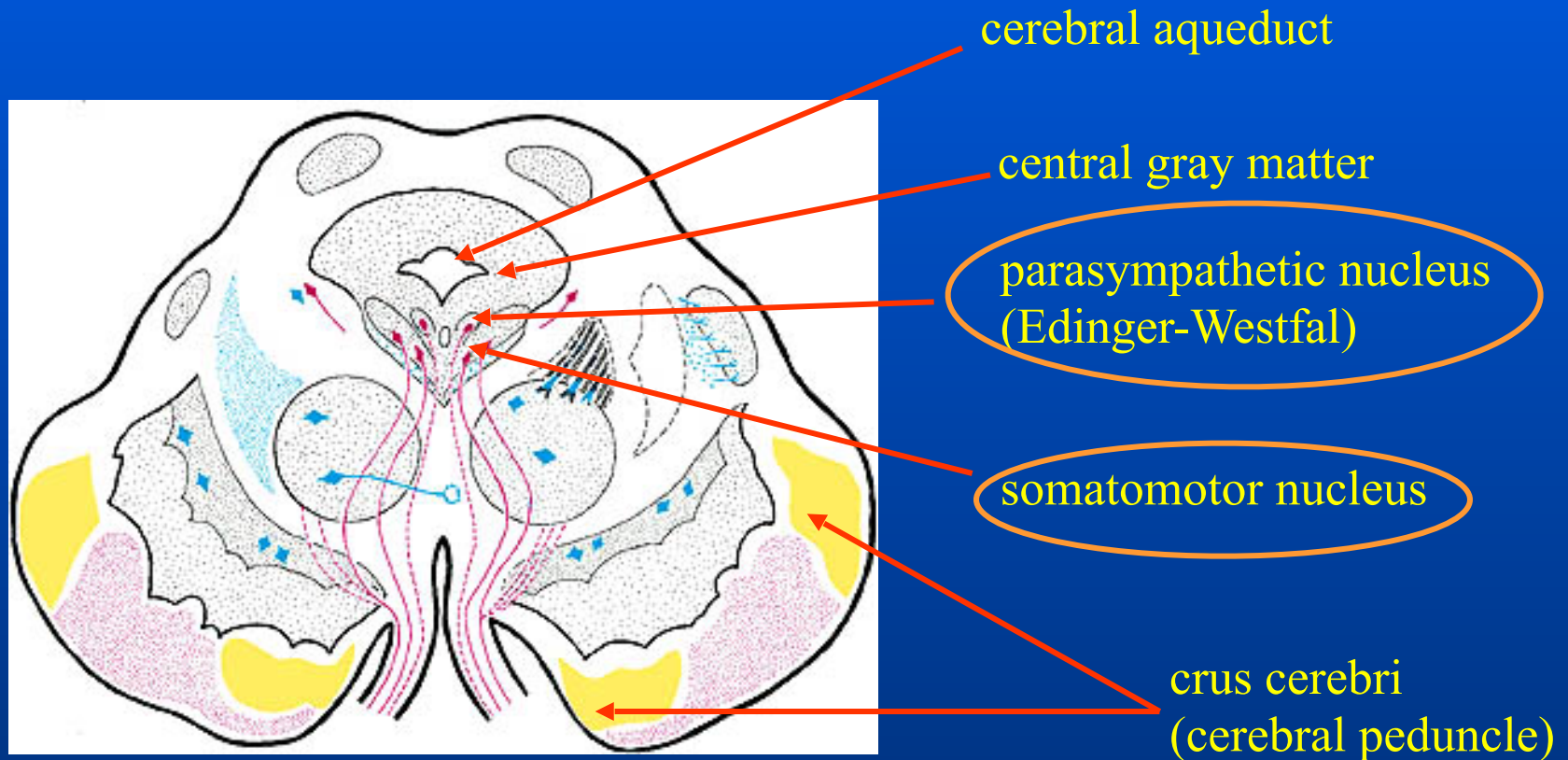


central grey matter of the midbrain



Oculomotor nerve (III)

- Somatomotory innervation of the muscles of the eye and parasympathetic motor innervation to the pupil



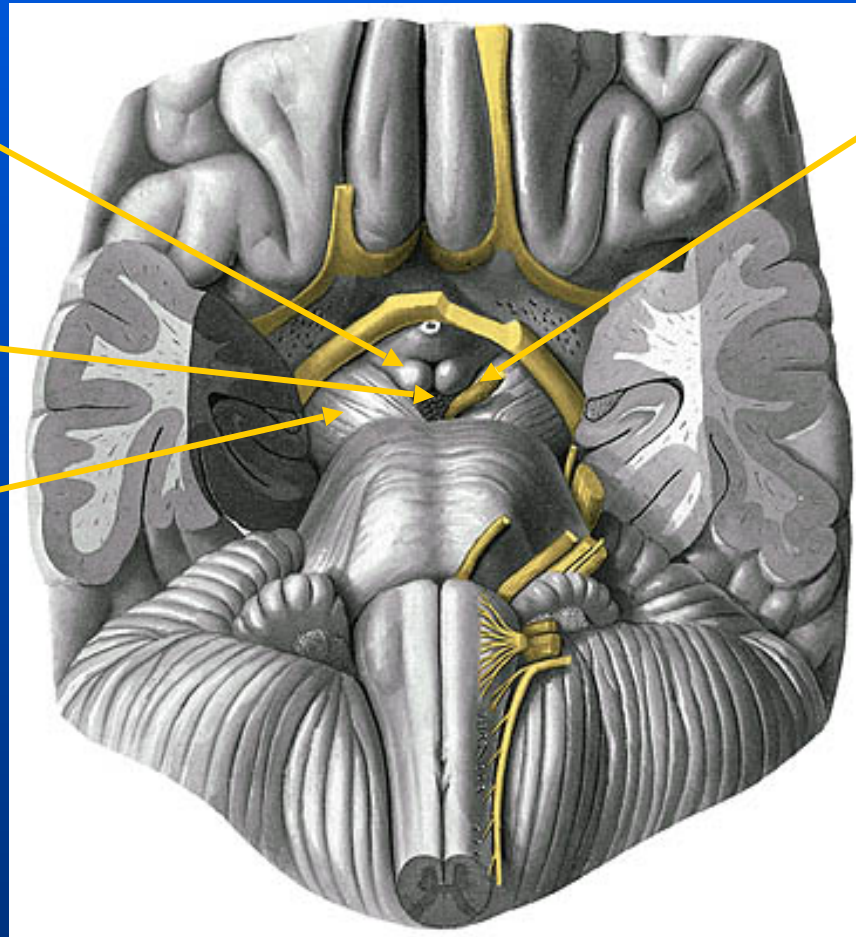
At the level of the sup. colliculi

Oculomotor nerve (III)

mamillary body

interpeduncular
fossa

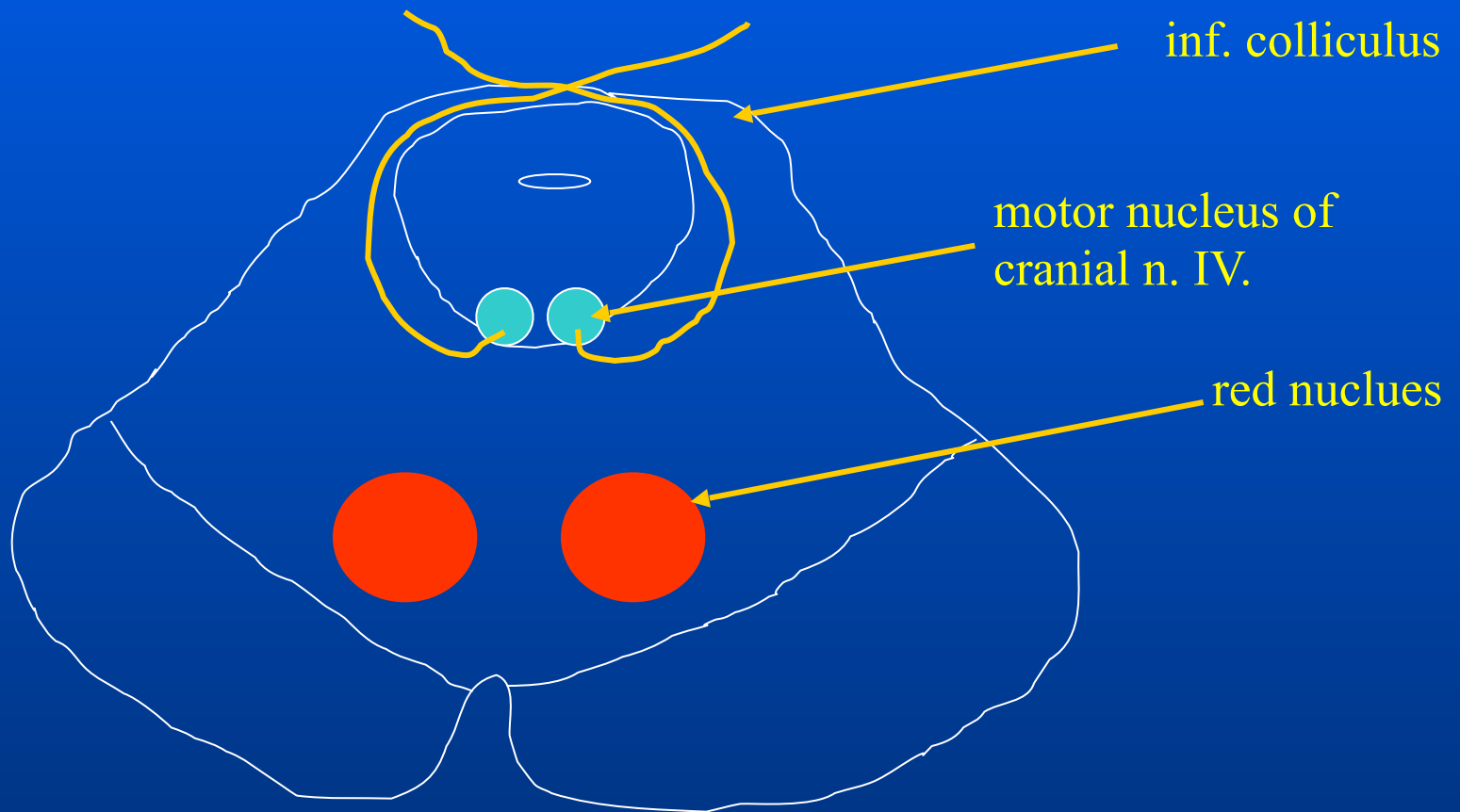
crus cerebri
(cerebral peduncle)



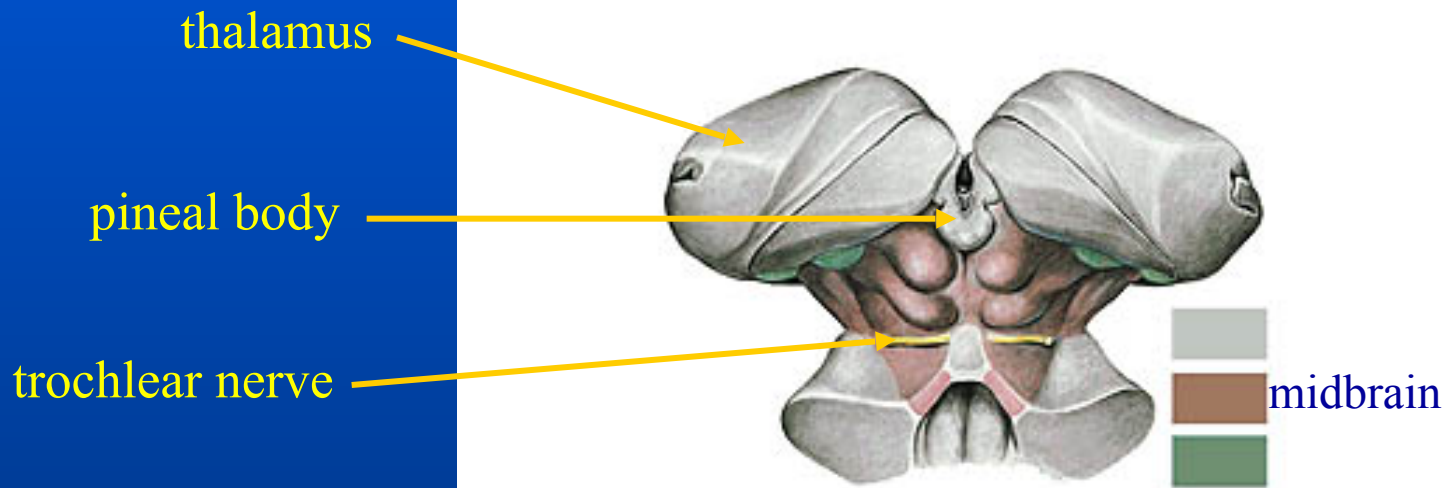
oculomotor
nerve (III)

Trochlear nerve (IV)

Somatomotory innervation of the eye muscle: sup. oblique



Trochlear nerve (IV)

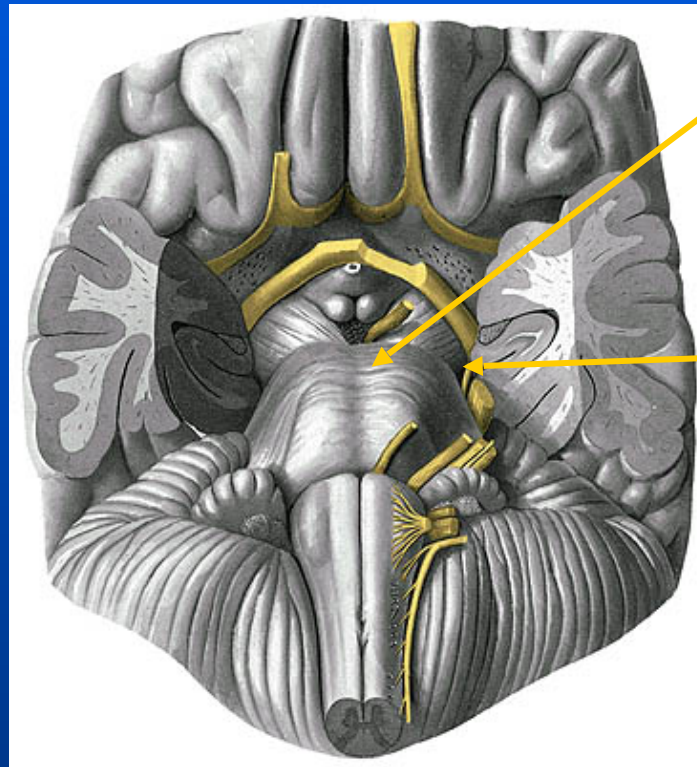


The only cranial nerve that comes out from the brain dorsally: on the 2 sides of the sup. cerebellar velum



goes back to the ventral surface in the ambiens cistern

Trochlear nerve (IV)

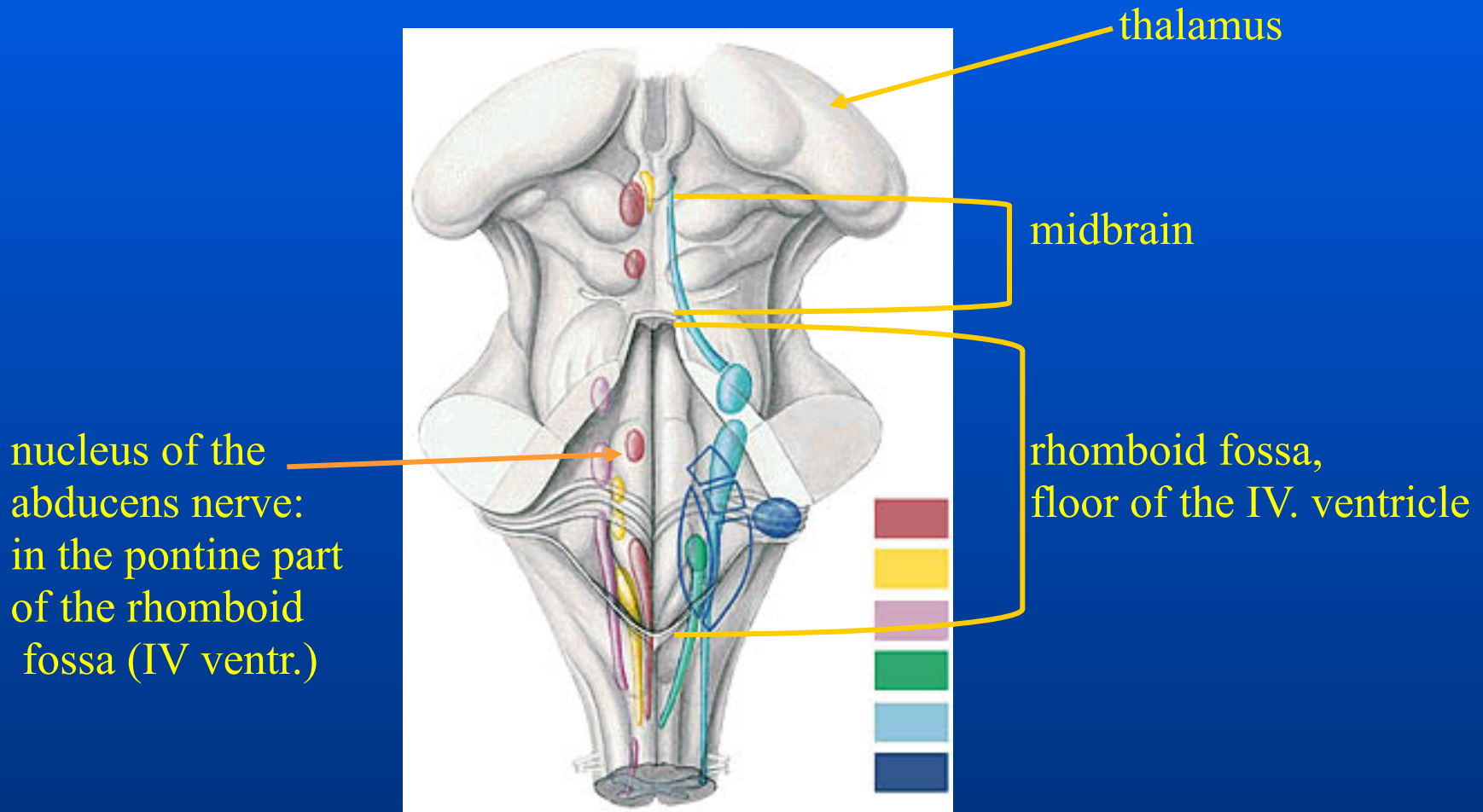


pons

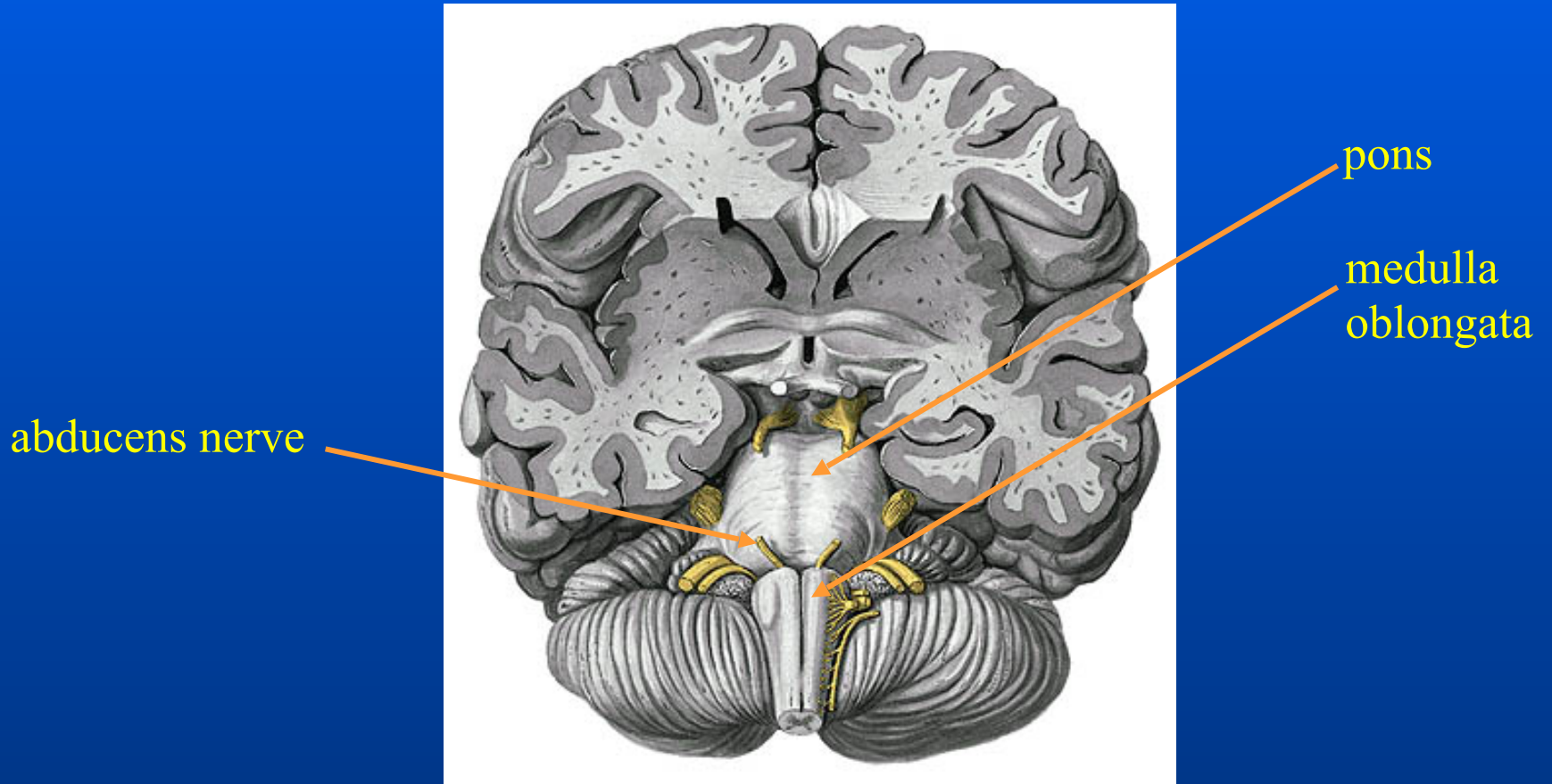
trochlear nerve

Abducens nerve (VI)

Somatomotory innervation of the muscle of the eye: rectus lateralis m.

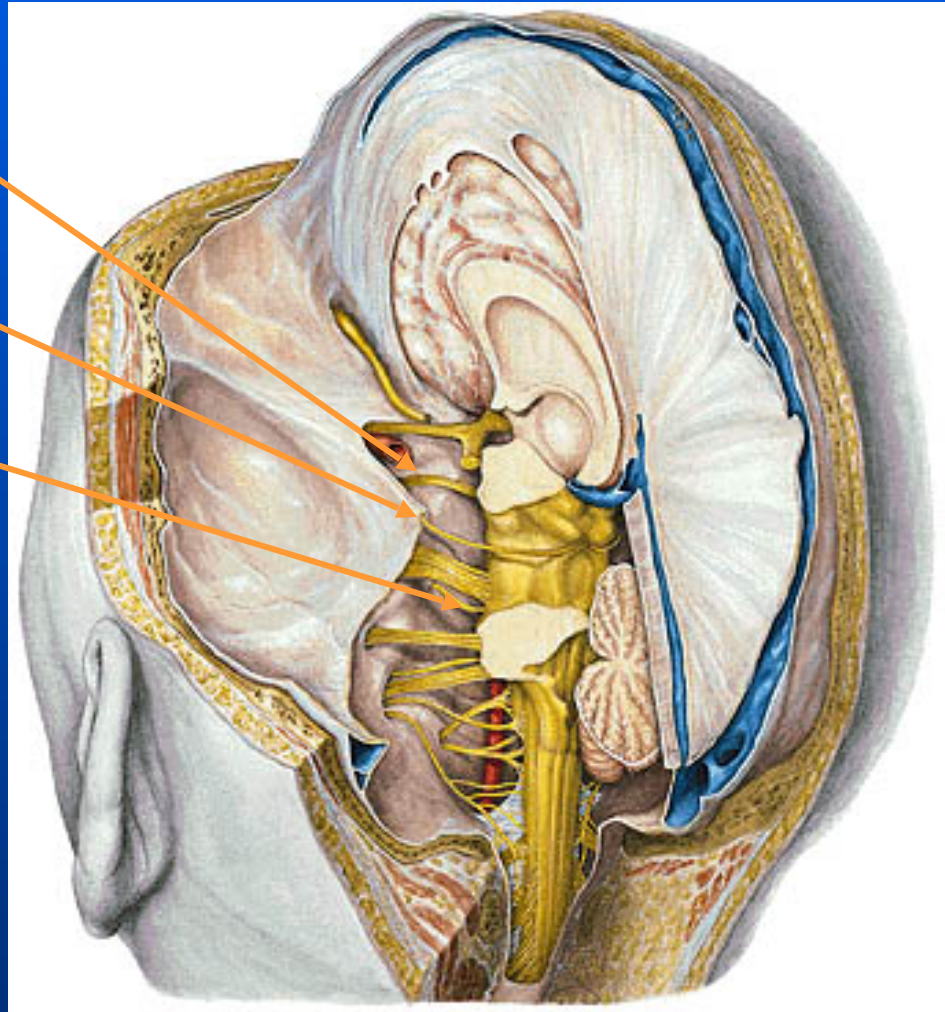


Abducens nerve (VI)

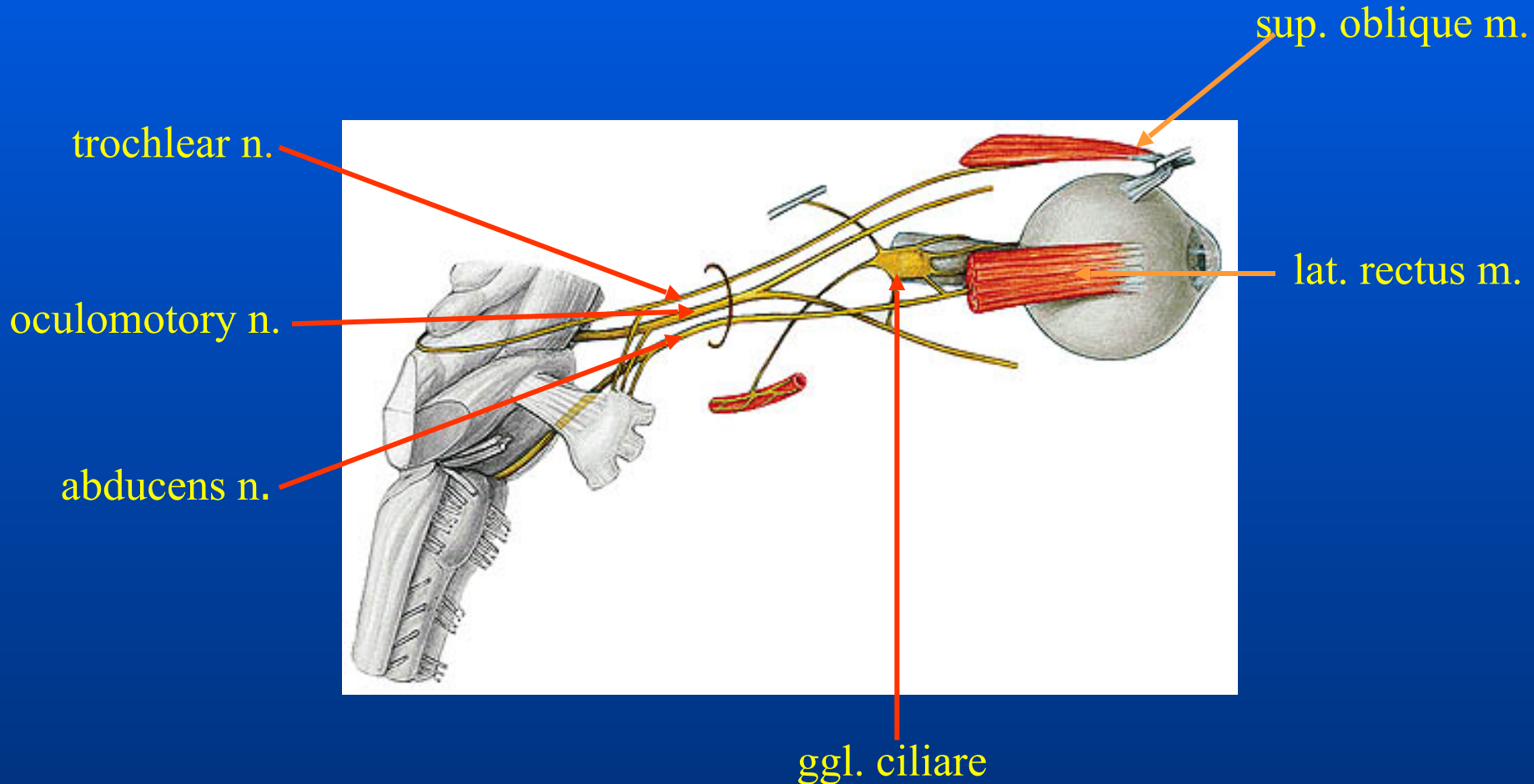


III, IV, VI cranial nerves

oculomotor n.
trochlear n.
abducens n.
↓
cavernous sinus
↓
sup. orbital fissure
↓
orbit



Cranial nerves innervating the eye's muscles: III, IV, VI

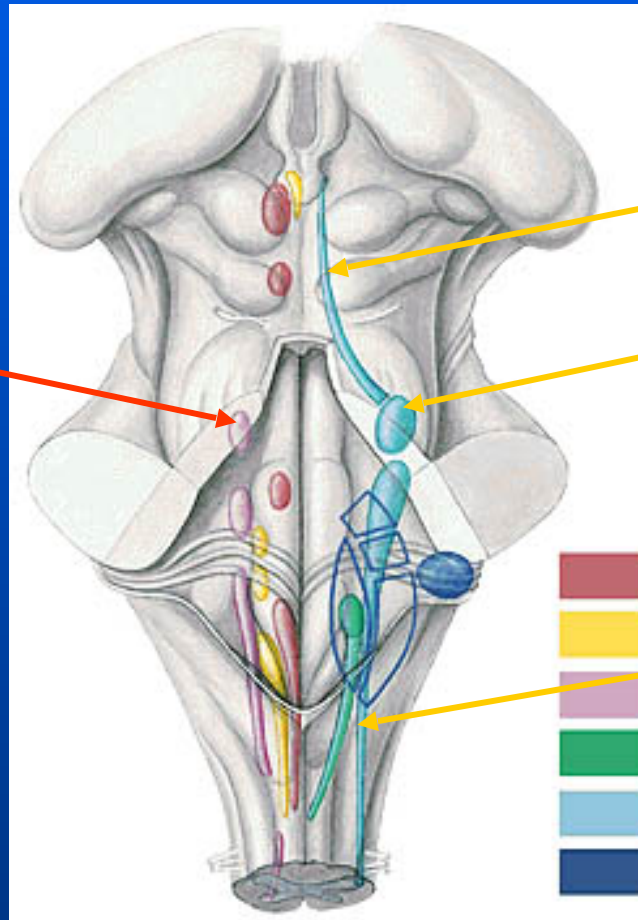


Trigeminal nerve (V)

- Mixed nerve: somatomotory and somatosensory fibers
- *Somatomotory* fibers: muscles of mastication
- *Somatosensory* fibers: entire face (from the lower margin of the mandible to the top of the scalp
the anterior wall of the auditory tube
dura mater
Mesencephalic n. of V.: is a ganglion
- Autonomic „hitchhikers”: from cranial nerves VII and IX

Trigeminal nerve (V)

Motor nucleus:
pons



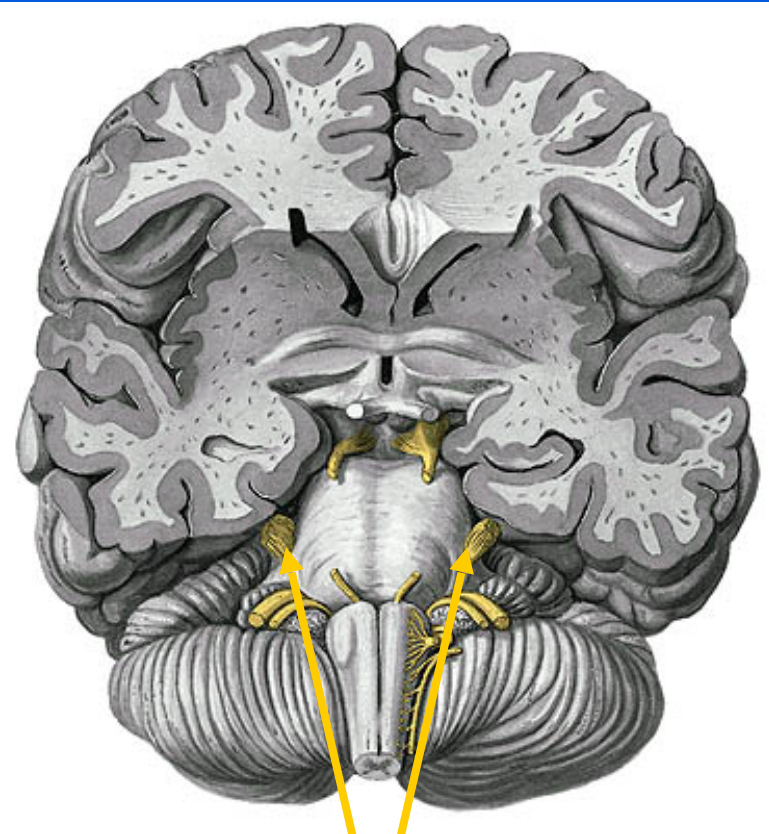
Sensory nuclei:

mesencephalic n.

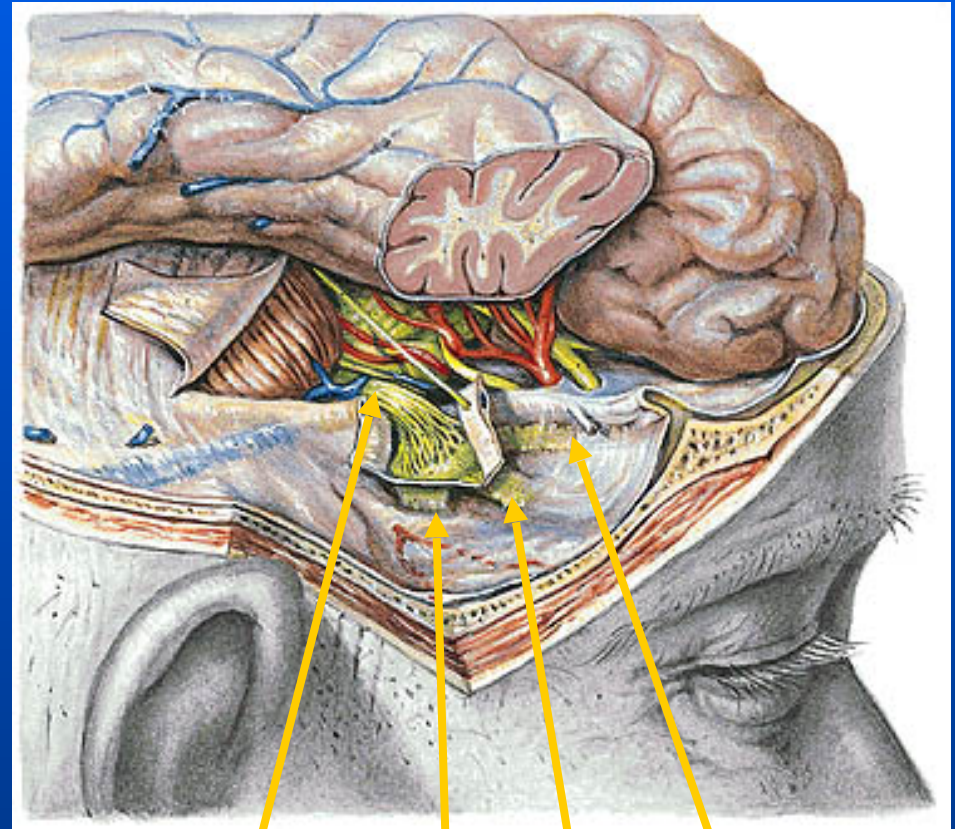
main sensory nucleus
(n. sensorius principalis)
pons

n. spinalis
(n. tractus spinalis)

Trigeminal nerve (V)



trigeminal nerves



ganglion (Gasser)
and division of
the trigeminal n.

V/3 mandibular

V/1: ophthalmic
V/2: maxillary

Trigeminal nerve (V)

- V/1: ophthalmic n.:

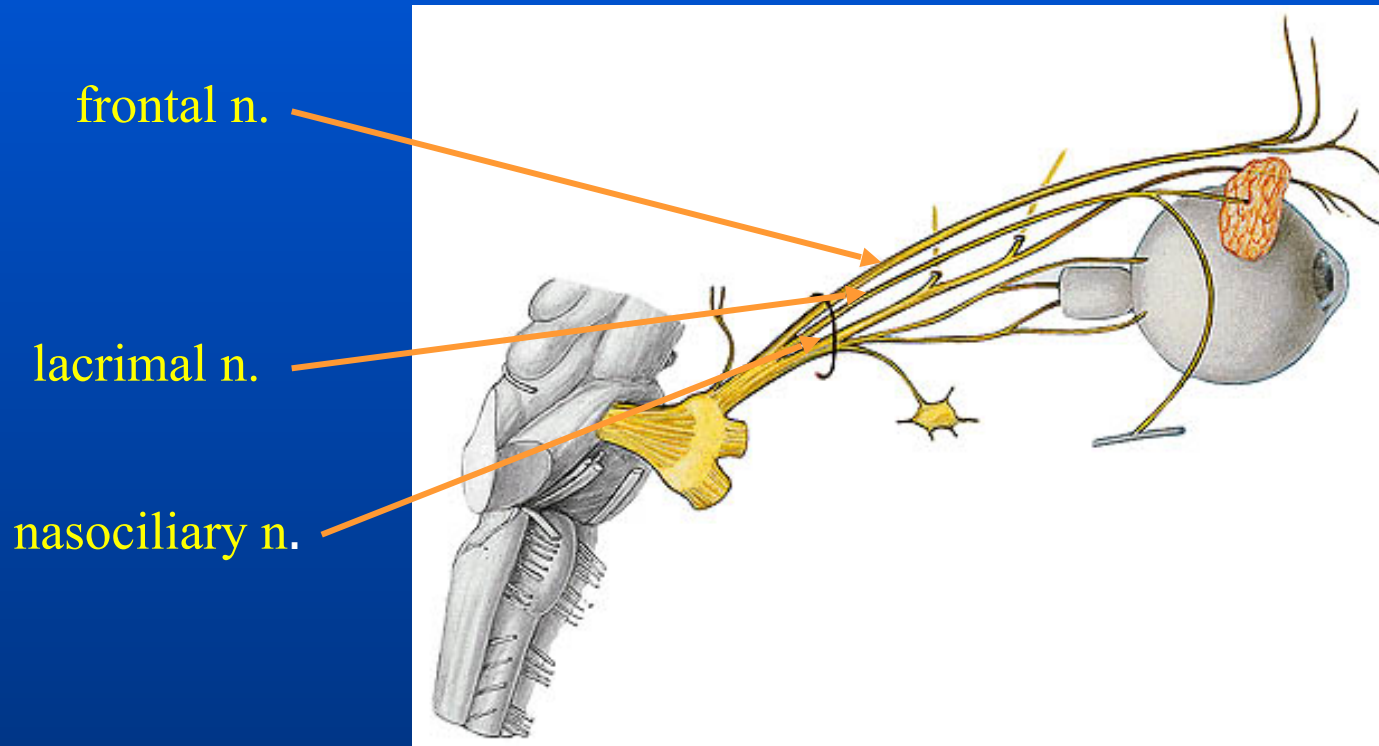
Cavernous sinus → sup. orbital fissure → orbit

Branches: frontal n: skin (sensory)

lacrimal n.: lacrimal gland (sensory fibers)+”hitchhiker” (VII)
secretomotor fibers to regulate the tear production

nasociliary n.: eye, nasal cavity, dorsal part of the nose

V/1: Ophthalmic nerve



Trigeminal nerve (V)

- V/2: maxillary:

Foramen rotundum: outcome from the bony skull

Branches: infraorbital n.: upper row of the teeth (sensory)

zygomatic n.: face along the zygomatic arch (sensory)

palatine nn.: oral cavity, palate

post. nasal rr : nasal cavity (septum, lateral wall)

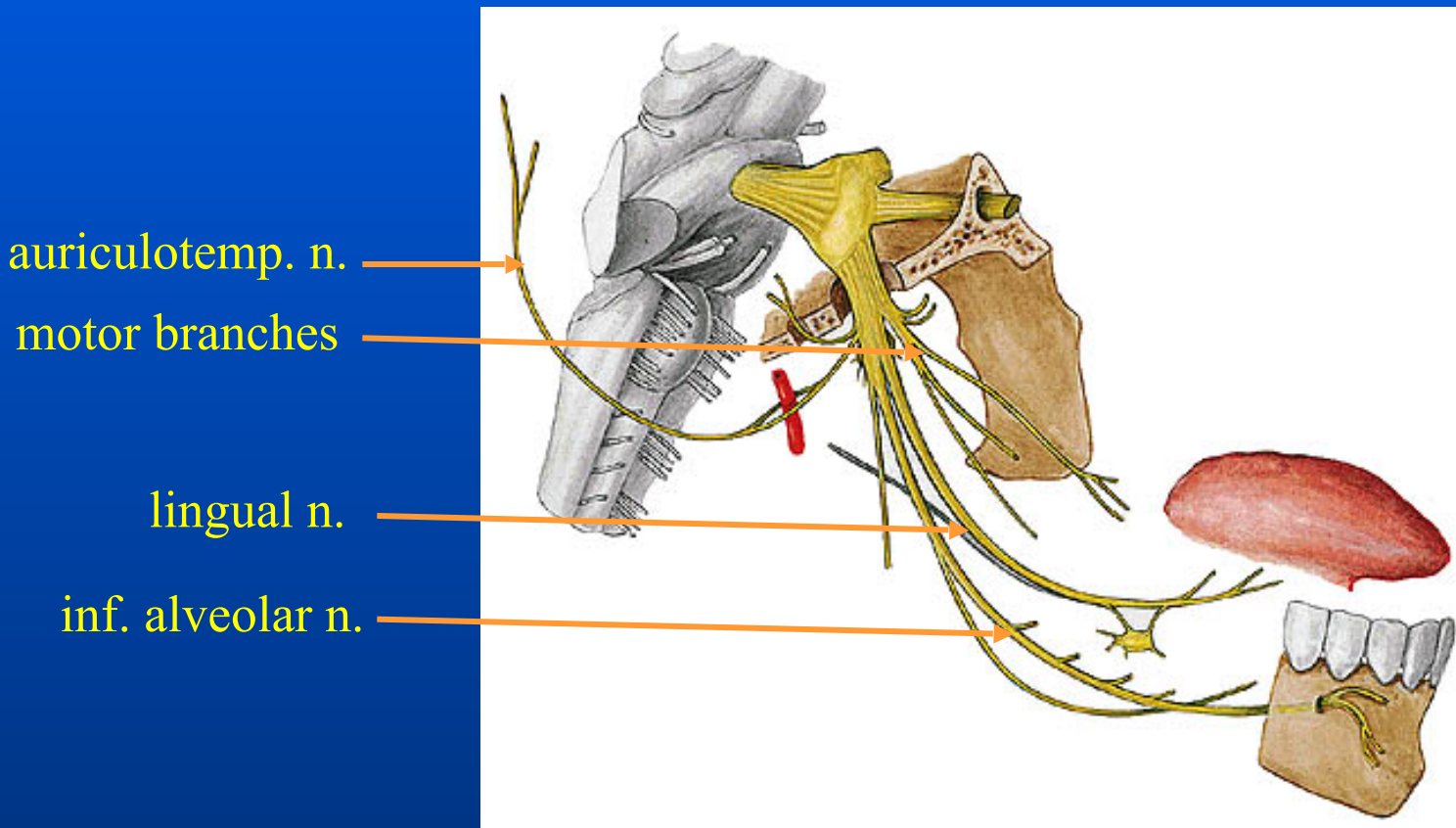
Trigeminal nerve (V)

V/3 mandibular: (carries mainly the motor fibers of the trigeminal n.)

foramen ovale → infratemporal fossa → mandibular canal →
foramen mentale

- Motor branches: to muscles of mastication
- Auriculotemporal n.: sensory innervation: temporomandibular joint
tympanic membrane (ant. part)
acoustic meatus
parotis
visceromotor innervation: parotis (fibers from CN IX)
- Inf. alveolar n.: sensory innervation: lower row of the teeth
lower lip, skin
motor innervation: mylohyoid, ant. belly of the digastricus m.
- Lingual n.: sensory innervation: general: tongue (ant. 2/3)
taste: chorda tympany (fibers from CN VII)

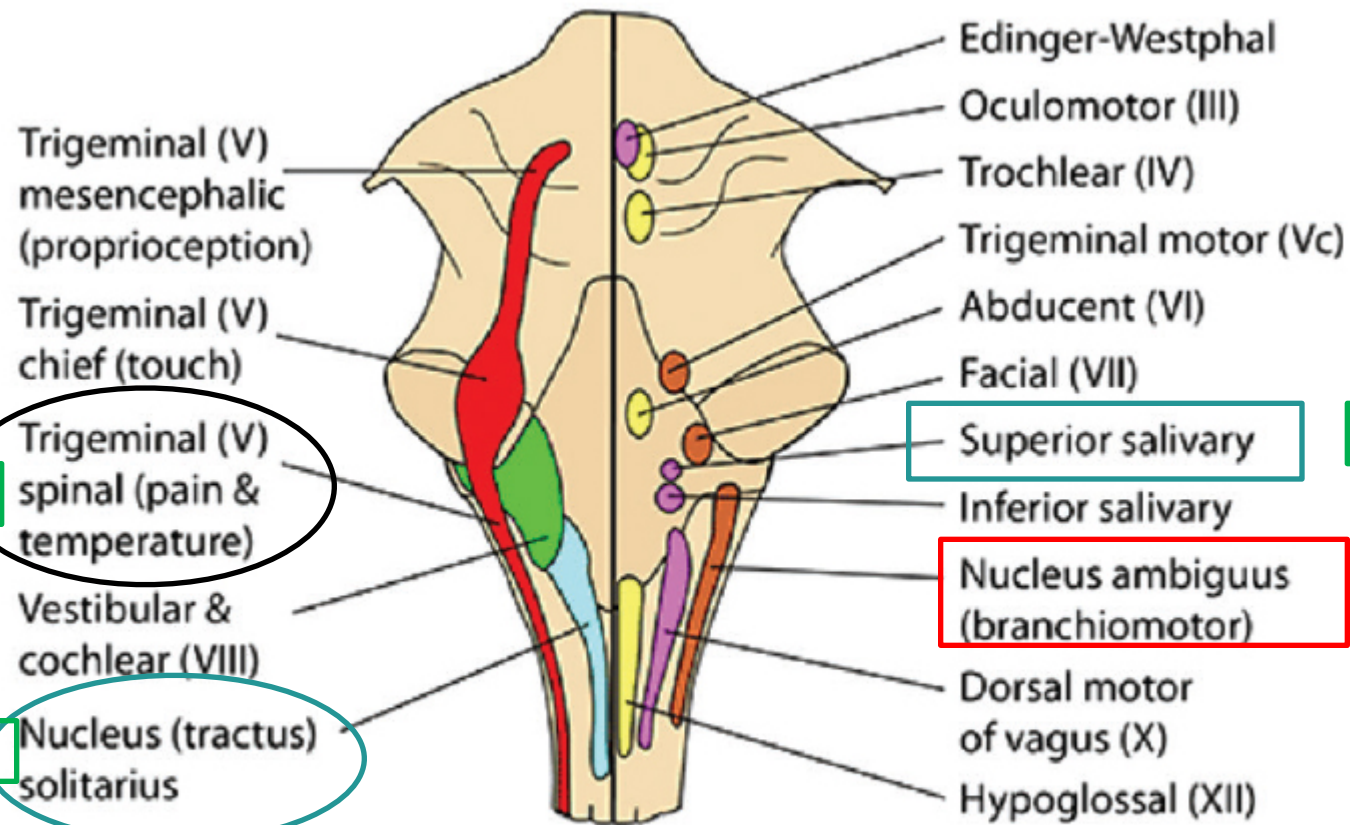
V/3 Mandibular nerve



Facial nerve (VII)

- Mixed nerve: somatomotory, viscerosensory, visceromotory fibers
- *Somatomotory*: mimetic muscles
- *Viscerosensory*: taste sensation of the anterior 2/3 of the tongue
- *Visceromotory*: lacrimal gland (V/1 „hitchhiker)
small salivary glands of the nasal cavity and soft palate
sublingual and submandibular gland

CRANIAL NERVE NUCLEI IN BRAIN STEM



Somatic	■		■	Somatic
Taste & baroreceptors	■	SENSORY	■	Parasympathetic
Hearing/balance	■		■	Branchiomotor
				MOTOR

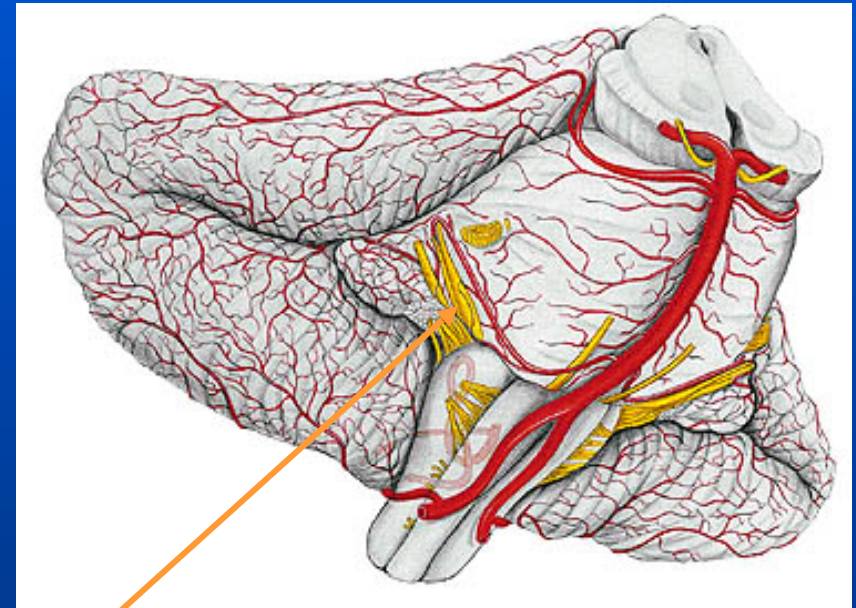
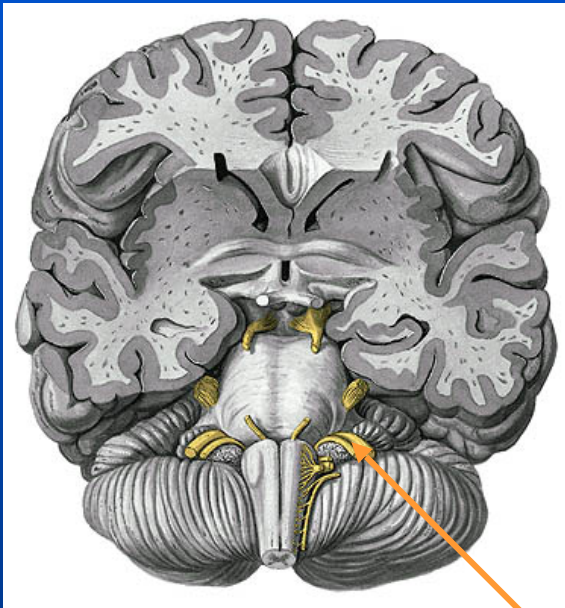
somatosensor

visceromotor

somatomotor

viscerosensor

Facial nerve (VII)



facial nerve

Facial nerve (VII)

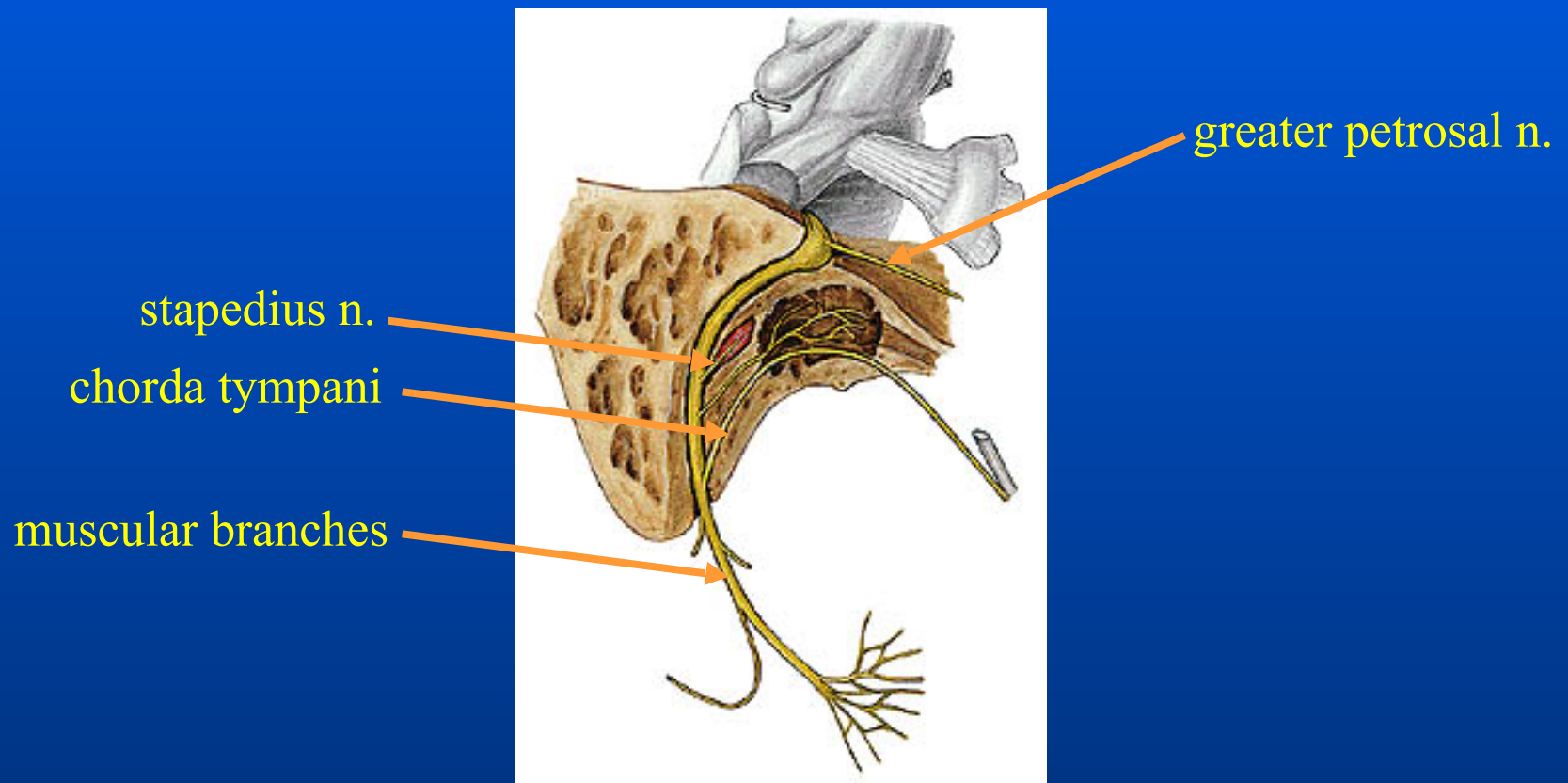
- Temporal bone (post. surface): facial canal
stylo mastoid foramen
- Branches: *greater petrosal n.*: lacrimal gland, salivary glands of the nasal cavity and soft palate (with V/1) –visceromotor

stapedius n.: motor nerve for stapedius m.

chorda tympany: taste sensory of the ant.2/3 of the tongue
(with V/3)-viscerosensor

motor branches to digasticus m. + mimetic muscles

Facial nerve (VII)



Glossopharyngeal nerve (IX)

Mixed nerve: somatosensory, somatomotory, viscerosensory and visceromotory fibers

- **Somatosensory:** general (pain) from tongue (post 1/3) pharynx
- **Somatomotory:** muscles of the pharynx
- **Viscerosensory:** taste (post. 1/3 of the tongue) swallowing reflex carotis sinus
- **Visceromotory:** parotis parasympathetic innervation (with V/3)
 - ❖ (lesser petrosal n.)

Glossopharyngeal nerve (IX)

Motor nuclei:

Sensory nuclei:

Visceromotor:
salivatory n.

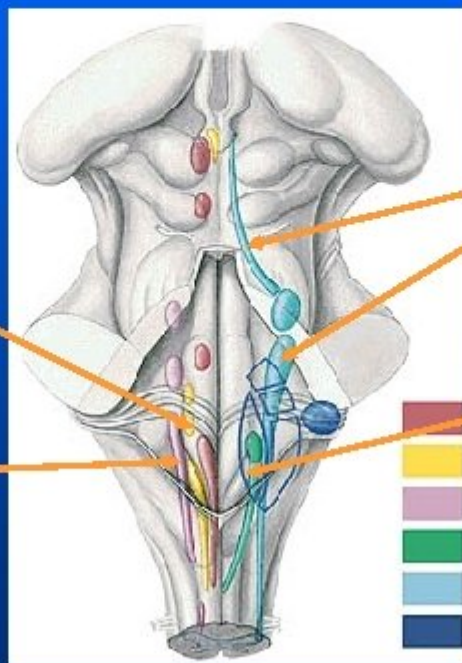
Somatomotor:
n. ambiguus

↓
medulla

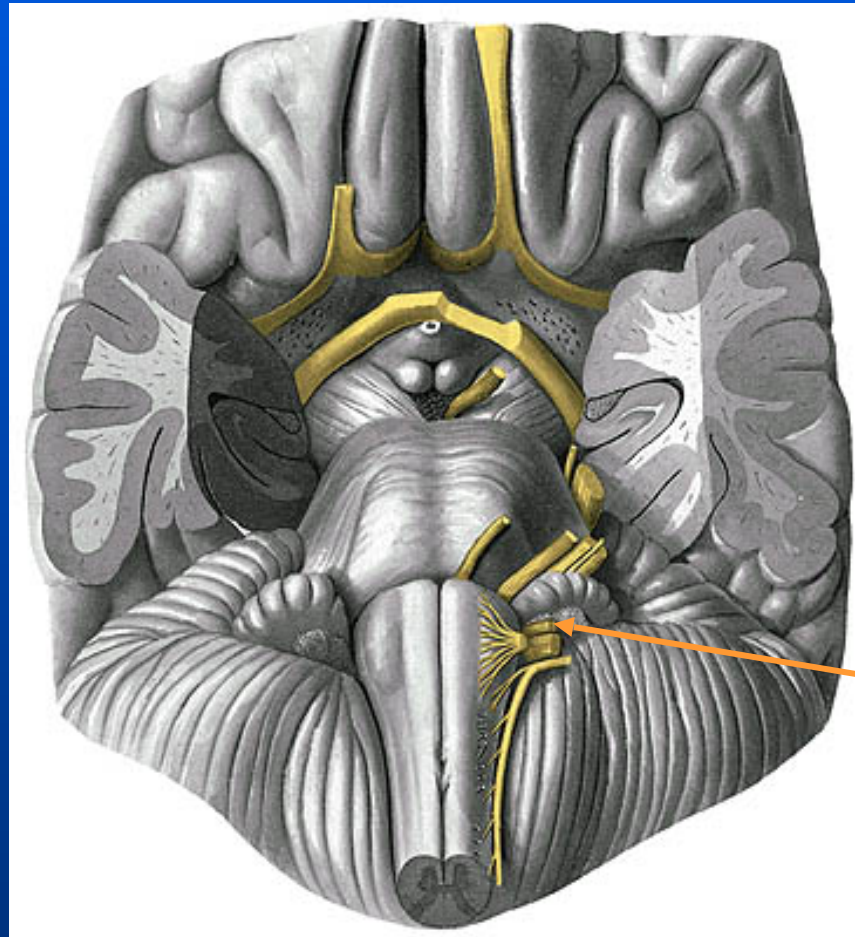
Somatosensory:
n. tractus spinalis of V

Viscerosensory:
solitary n.

↓
medulla



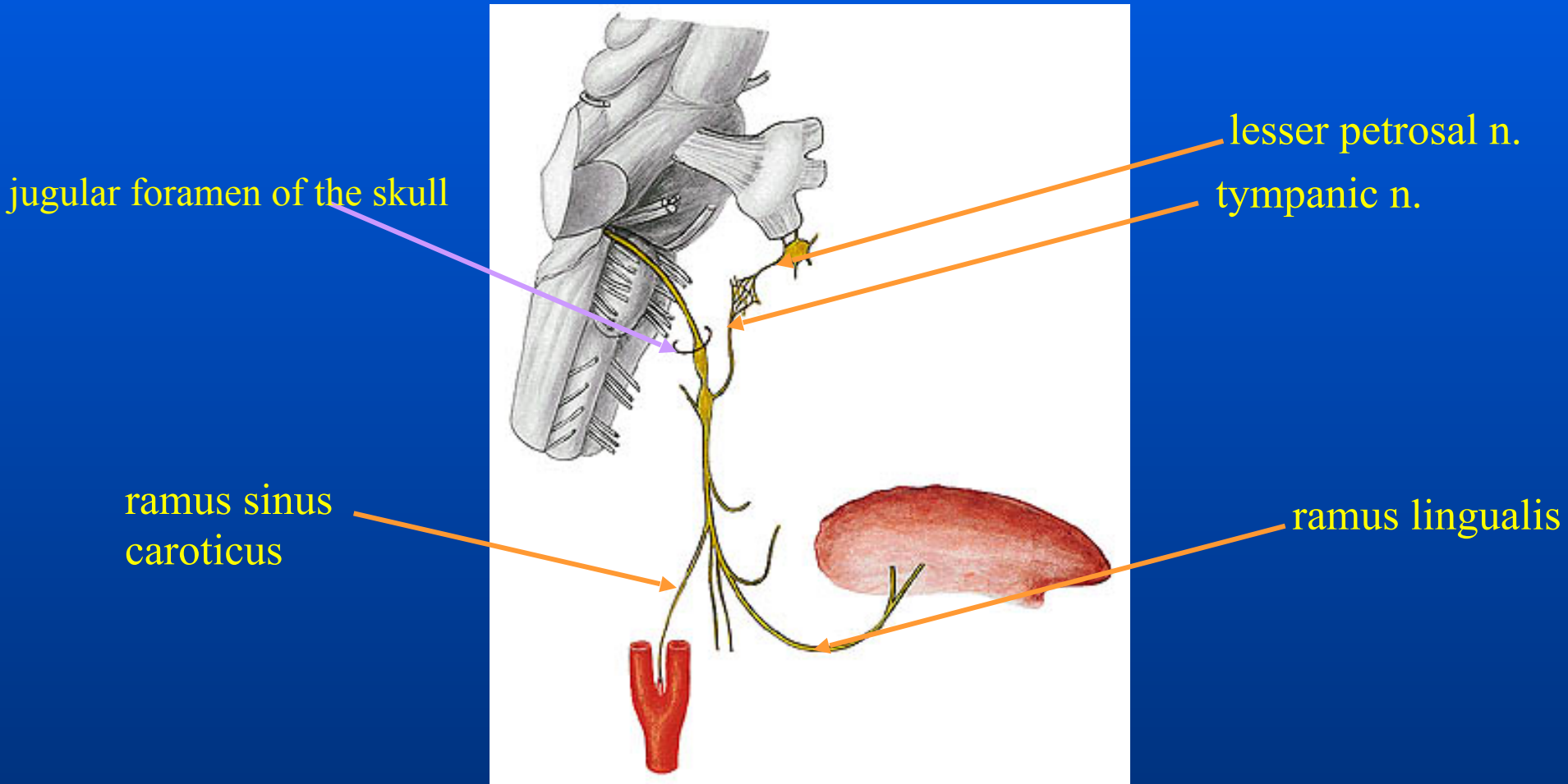
Glossopharyngeal nerve (IX)



glossopharyngeal n.

lateral parolival groove

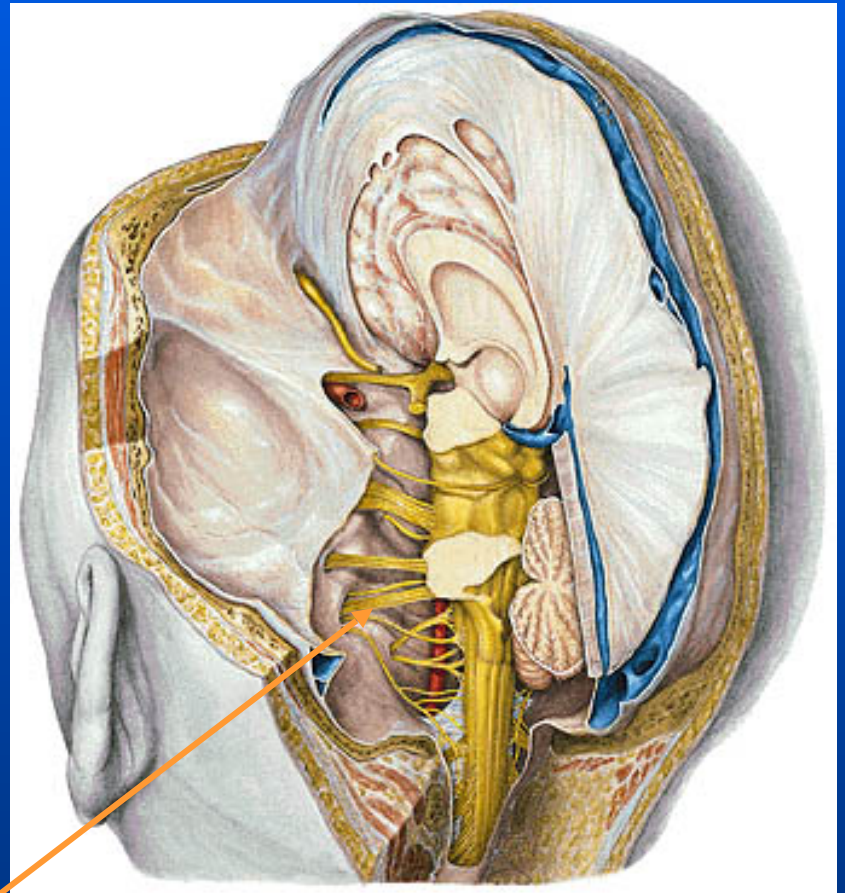
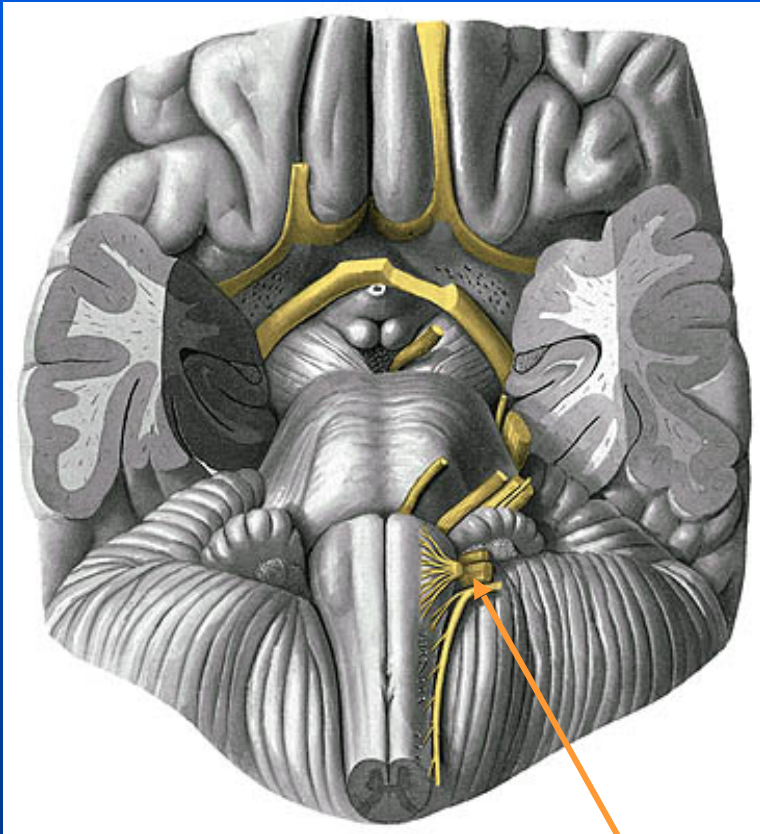
Glossopharyngeal nerve (IX)



Vagus nerve (X)

- **Mixed nerve:** somatosensory, somatomotory, viscerosensory, visceromotory fibers
- **Somatosensory:** general sensory+pain
- **Somatomotory:** striated muscles of pharynx, larynx esophagus
- **Viscerosensory:** mucosa of the larynx, pharynx trachea, esophagus pleura, pericardium, lung stomach, organs present in the upper part of the abdominal cavity
- **Visceromotory:** glands of the upper mentioned organs

Vagus nerve (X)



Vagus nerve
lateral parolivar groove

Vagus nerve (X)

- Jugular foramen → vagina carotica (neck) → chest cavity → anterior mediastinum: recurrent laryngeal nerve → post. mediastinum → esophagus → abdominal cavity

Branches: cervical: ext. acoustic meatus, pharynx, larynx

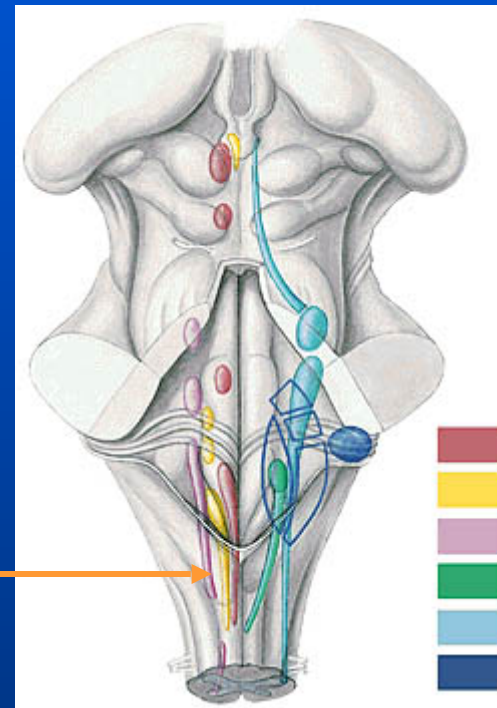
chest cavity: pericardium, pleura, trachea, bronchi, bronchioles, esophagus

abdominal cavity: stomach, liver, colon

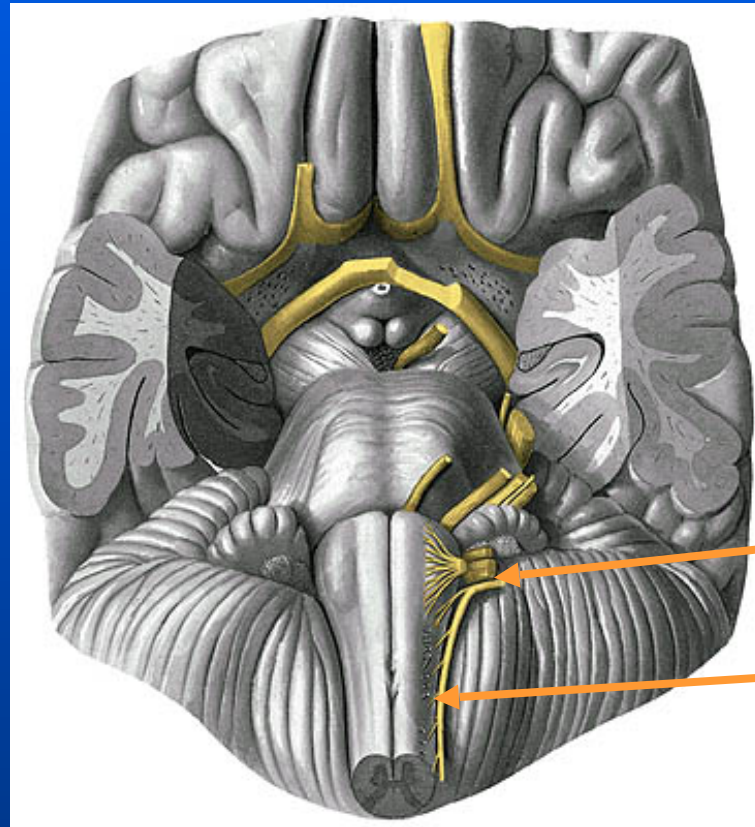
Accessory nerve (XI)

- Motor nerve: (largest part belongs to cranial nerve X), ext. branch: sternocleidomastoid + trapezius m.

N. ambiguus



Accessory nerve (XI)

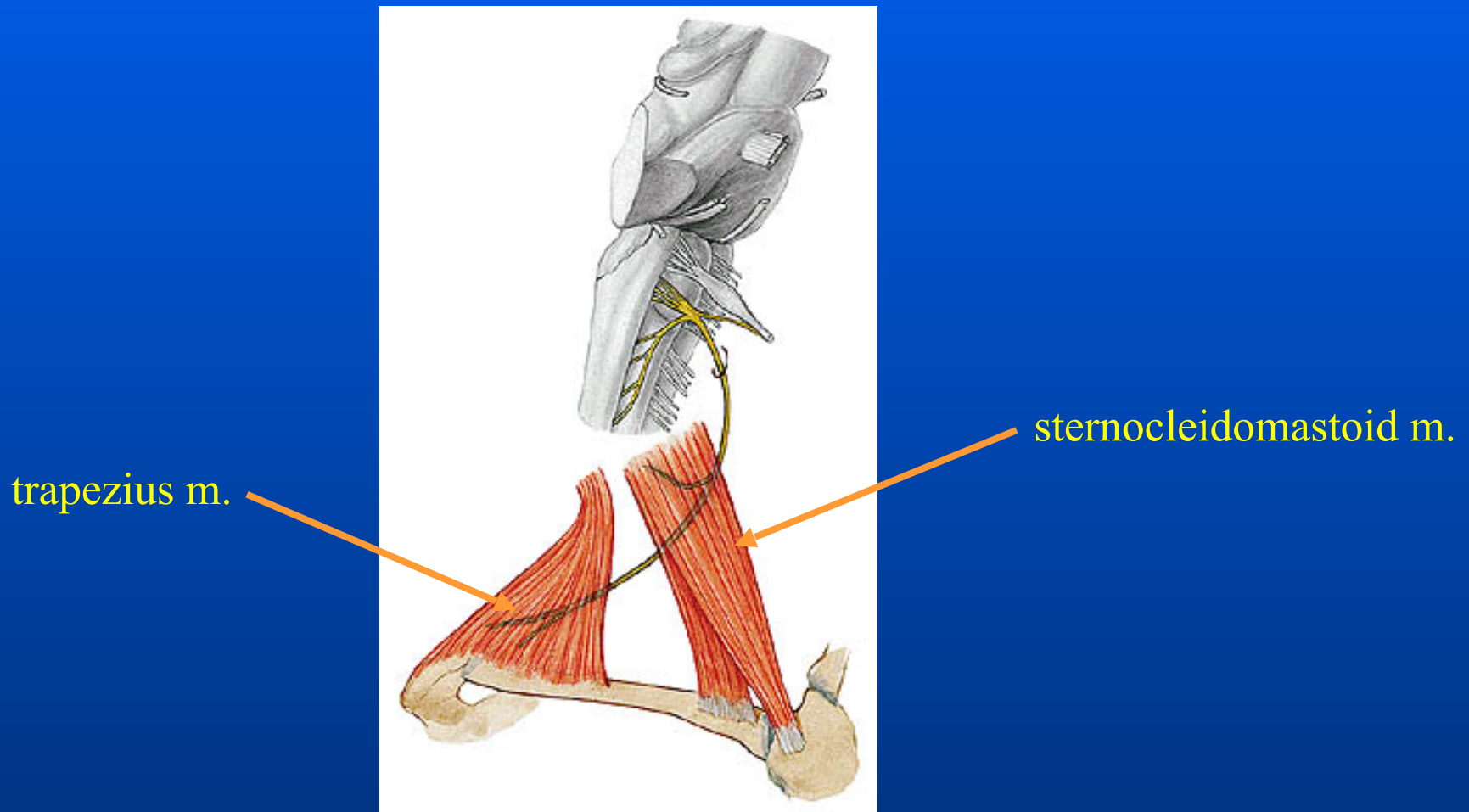


Jugular foramen

Accessory n.:
cranial root

spinal root

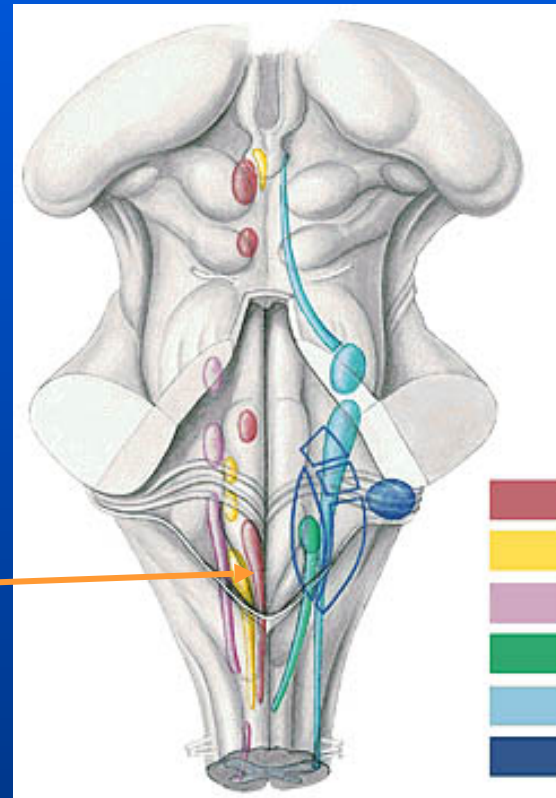
Accessory nerve (XI)



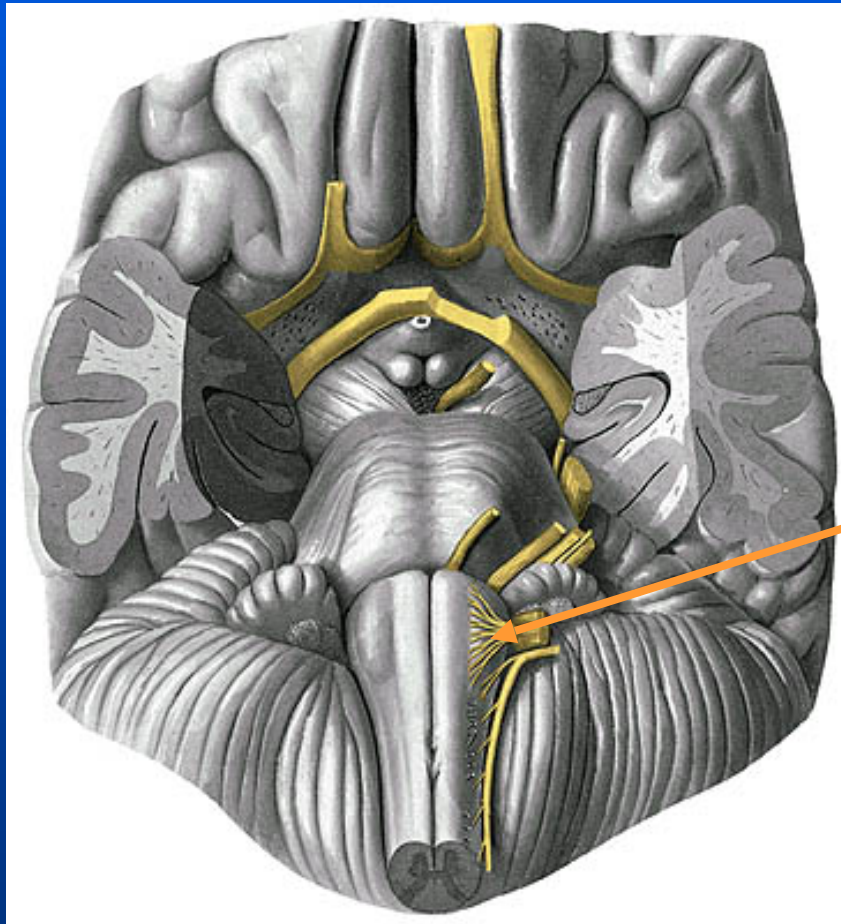
Hypoglossal nerve (XII)

- Motor nerve: muscles of the tongue, infrahyoid muscles

hypoglossal n.



Hypoglossal nerve (XII)

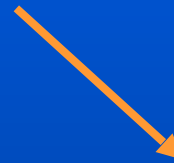


hypoglossal canal

hypoglossal nerve

Hypoglossal nerve (XII)

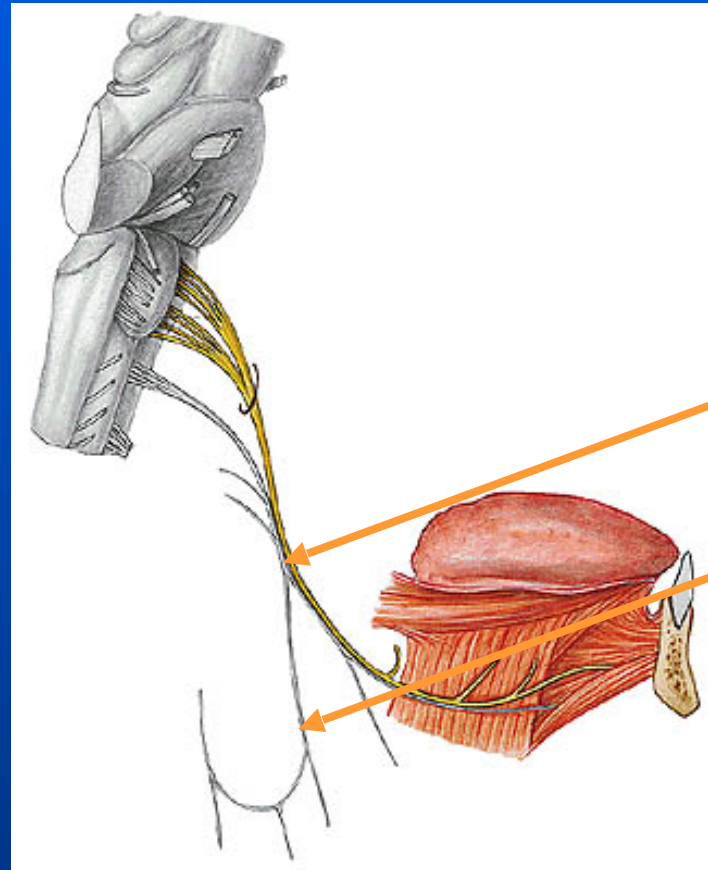
- Neck: between a. carotis comm. and int. jugular vein



- lateral groove of the tongue

ansa cervicalis

Hypoglossal nerve (XII)



hypoglossal nerve

ansa cervicalis