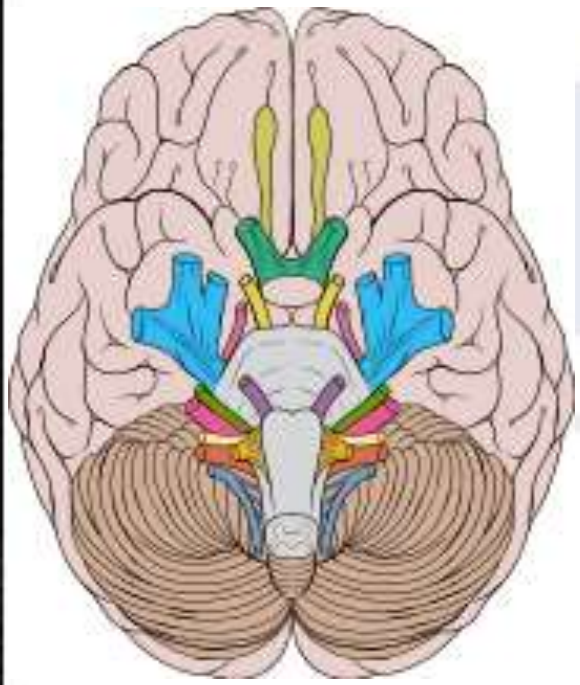
Cranial Nerves

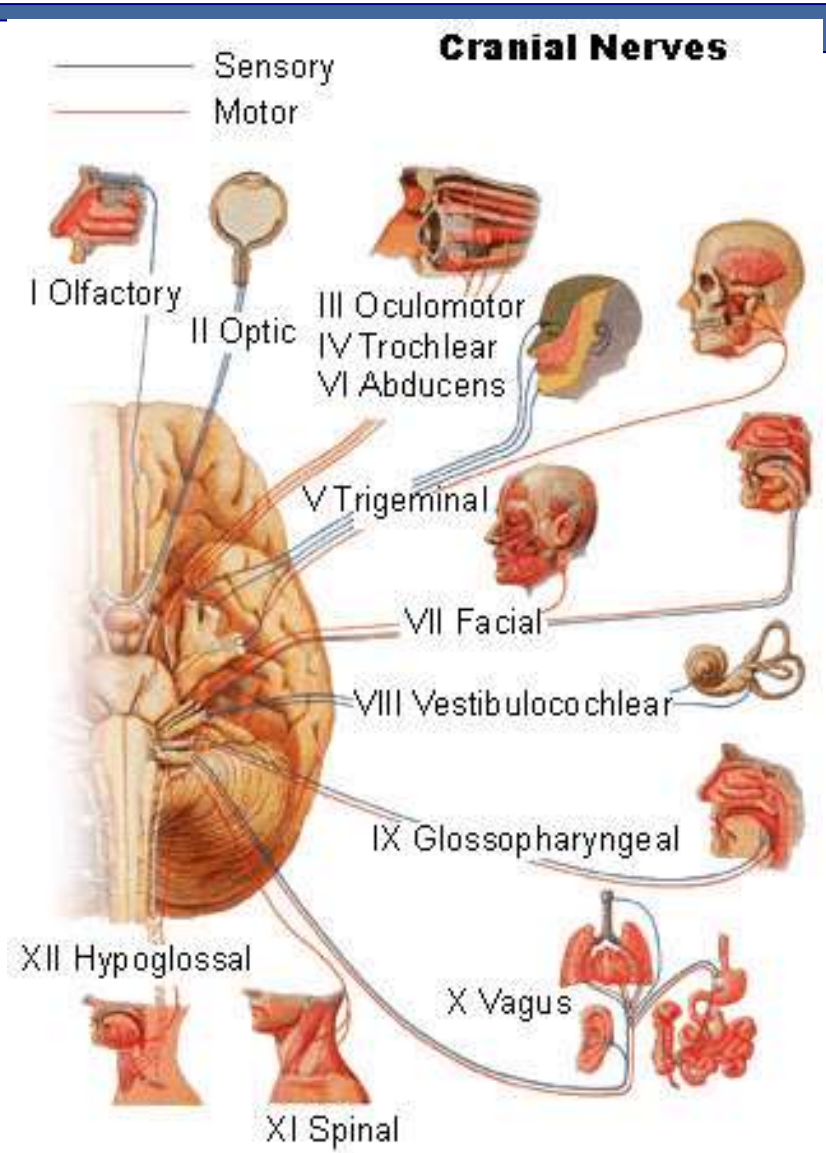


1. Cranial nerves - overview:
   - ✓ origin and peripheral distribution
   - ✓ functional components and modality
   - ✓ innervation zones

I. Olfactory nerves, *nn. olfactorii*
II. Optic nerve, *n. opticus*
III. Oculomotor nerve, *n. oculomotorius*
IV. Trochlear nerve, *n. trochlearis*
V. Trigeminal nerve, *n. trigeminus*
VI. Abducent nerve, *n. abducens*
VII. Facial nerve, *n. facialis*
VIII. Vestibulocochlear nerve, *n. vestibulocochlearis*
IX. Glossopharyngeal nerve, *n. glossopharyngeus*
X. Vagus nerve, *n. vagus*
XI. Accessory nerve, *n. accessorius*
XII. Hypoglossal nerve, *n. hypoglossus*

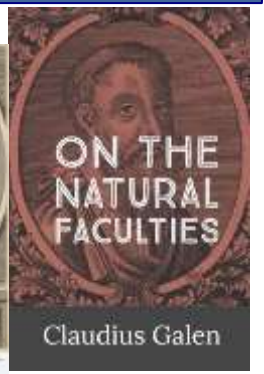
Cranial nerves

0. N. terminalis
I. N. olfactorius
II. N. opticus
III. N. oculomotorius
IV. N. trochlearis
V. N. trigeminus
VI. N. abducens
VII. N. facialis
VIII. N. vestibulocochlearis
IX. N. glossopharyngeus
X. N. vagus
XI. N. accessorius
XII. N. hypoglossus



Cranial nerves

- Claudius Galenus (Galen of Pergamon) – 2nd. century identified seven cranial nerves, a description still valid for at least 1200 years until the Italian Renaissance
- Thomas Willis in *Cerebri anatome* (1664) introduced a classification that included nine cranial nerves
- Samuel Thomas Sömmerring in his Doctoral Dissertation (1778) formulated the current classification composed of 12 cranial pairs that has been accepted up to the present



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Overview of the History of the Cranial Nerves: From Galen to the 21st Century

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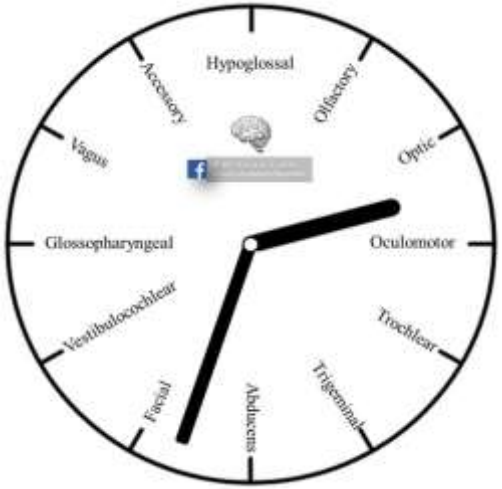
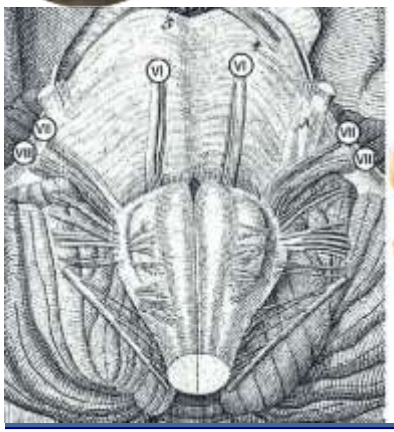
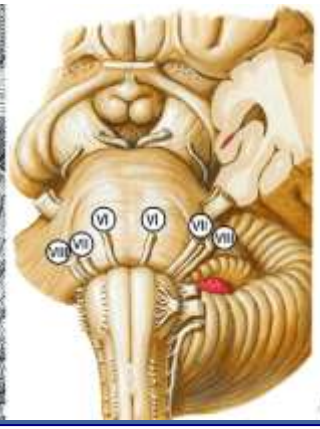






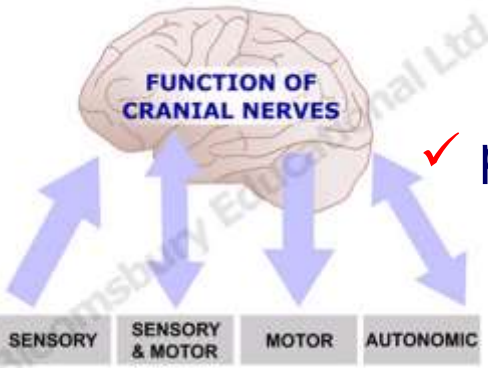
Cranial nerves

Cranial nerves

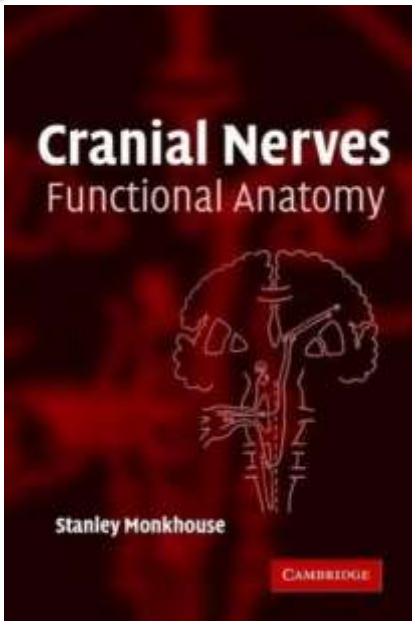
Numbered for convenience…

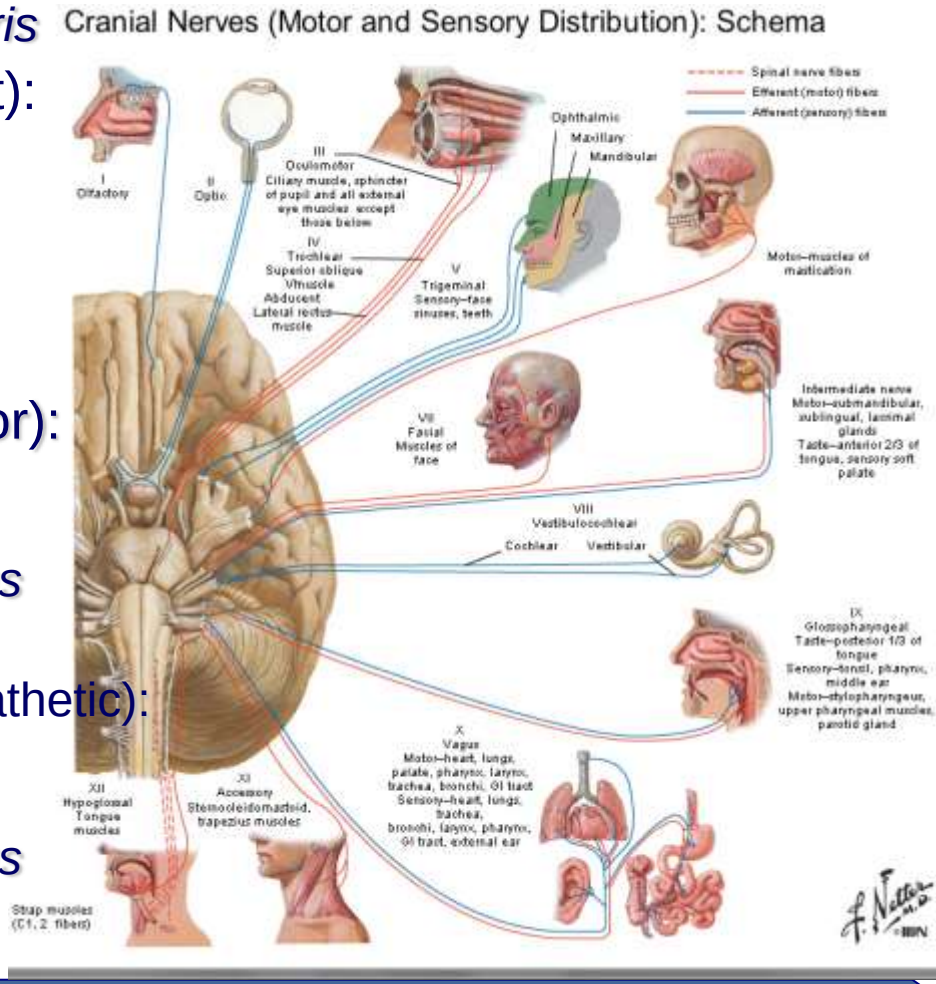
…and named for what they do (mostly)

Functional classification



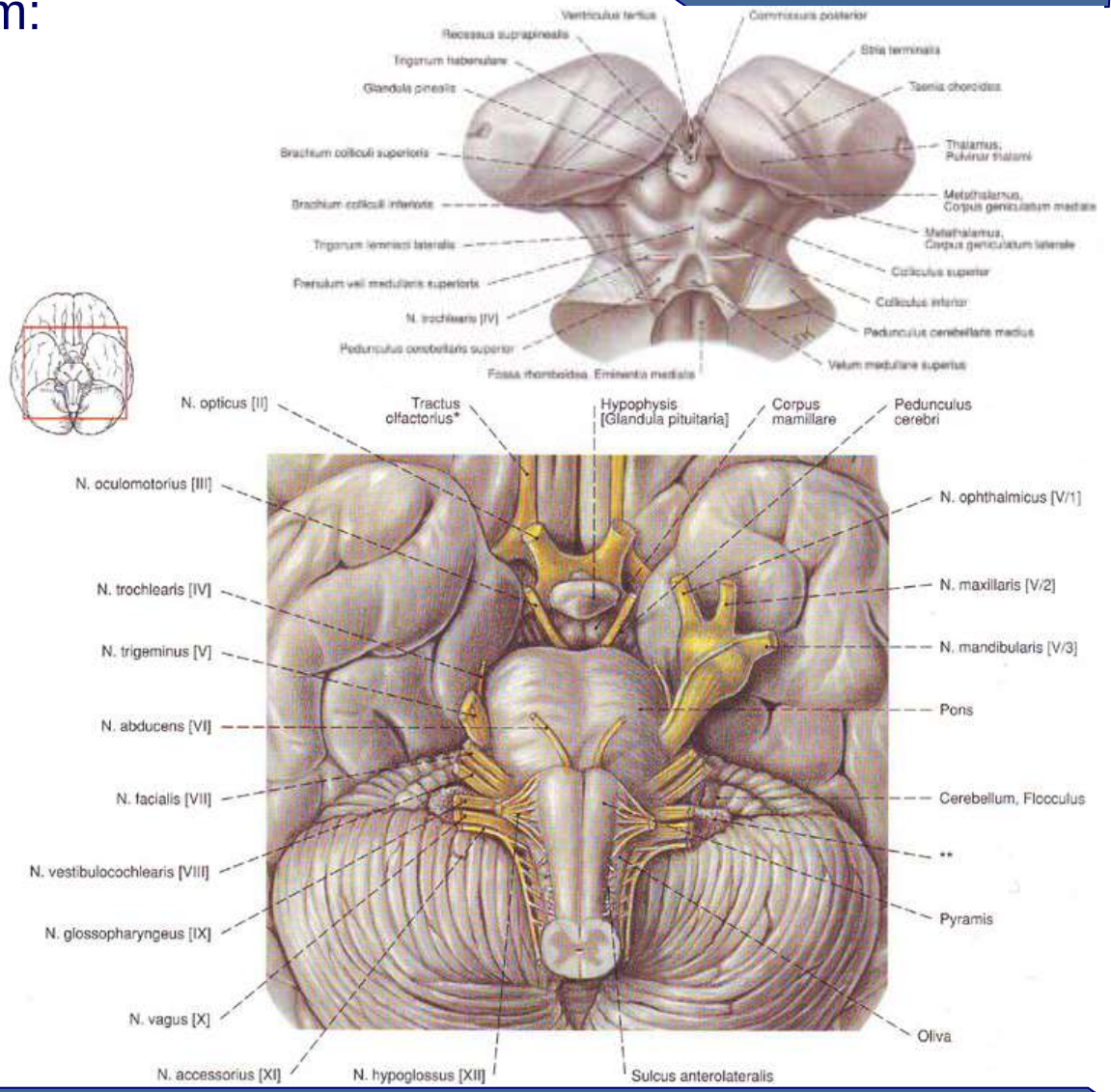
- ✓ purely sensory (afferent):
  - ➢ *n. olfactorius*
  - ➢ *n. opticus*
  - ➢ *n. vestibulocochlearis*
- ✓ purely motor (efferent):
  - ➢ *n. oculomotorius*
  - ➢ *n. trochlearis*
  - ➢ *n. abducens*
  - ➢ *n. accessorius*
  - ➢ *n. hypoglossus*
- ✓ mixed (sensory&motor):
  - ➢ *n. trigeminus*
  - ➢ *n. facialis*
  - ➢ *n. glossopharyngeus*
  - ➢ *n. vagus*
- ✓ autonomic (parasympathetic):
  - ➢ *n. oculomotorius*
  - ➢ *n. facialis*
  - ➢ *n. glossopharyngeus*
  - ➢ *n. vagus*





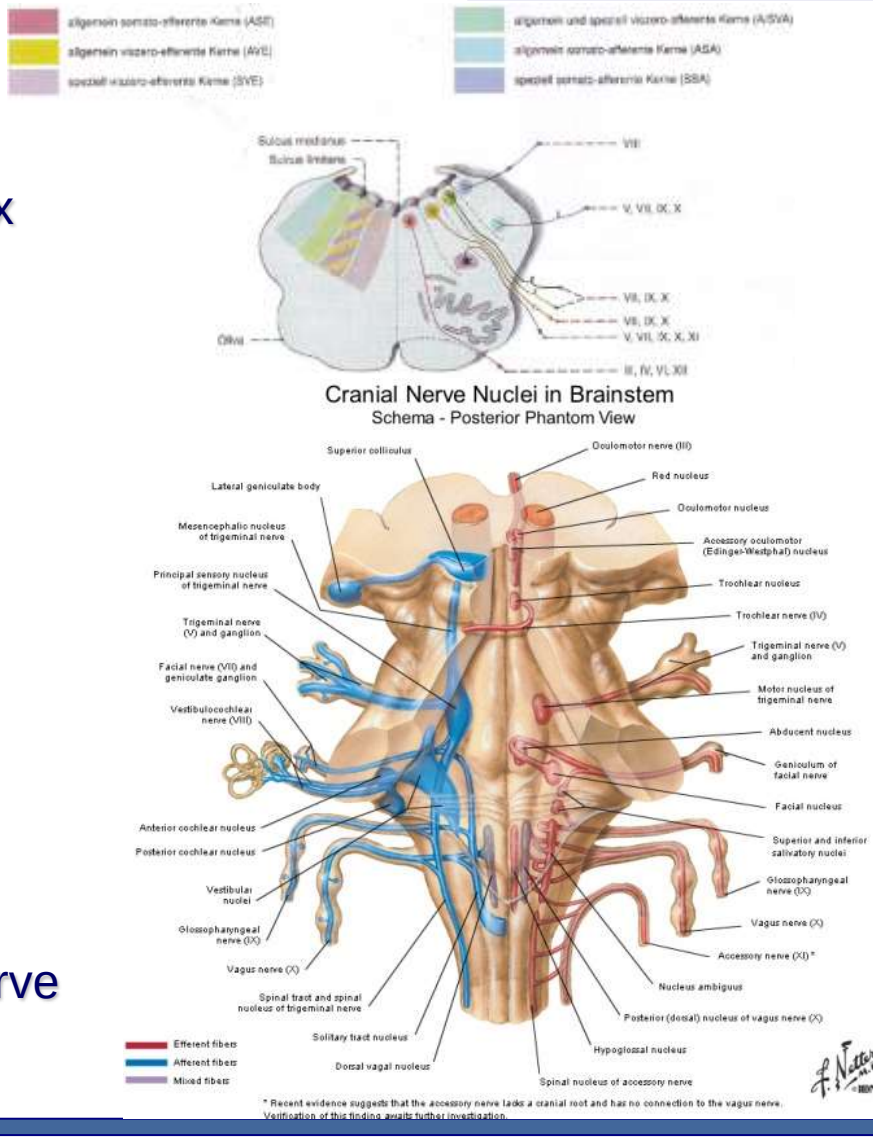
Anatomic relationships

- Location within the brainstem:
  - ✓ ventrally:
    - ➢ *n. olfactorius*
    - ➢ *n. opticus*
    - ➢ *n. oculomotorius*
    - ➢ *n. abducens*
    - ➢ *n. hypoglossus*
  - ✓ laterally:
    - ➢ *n. trigeminus*
    - ➢ *n. facialis*
    - ➢ *n. vestibulocochlearis*
    - ➢ *n. glossopharyngeus*
    - ➢ *n. vagus*
    - ➢ *n. accessorius*
  - ✓ dorsally:
    - ➢ *n. trochlearis*

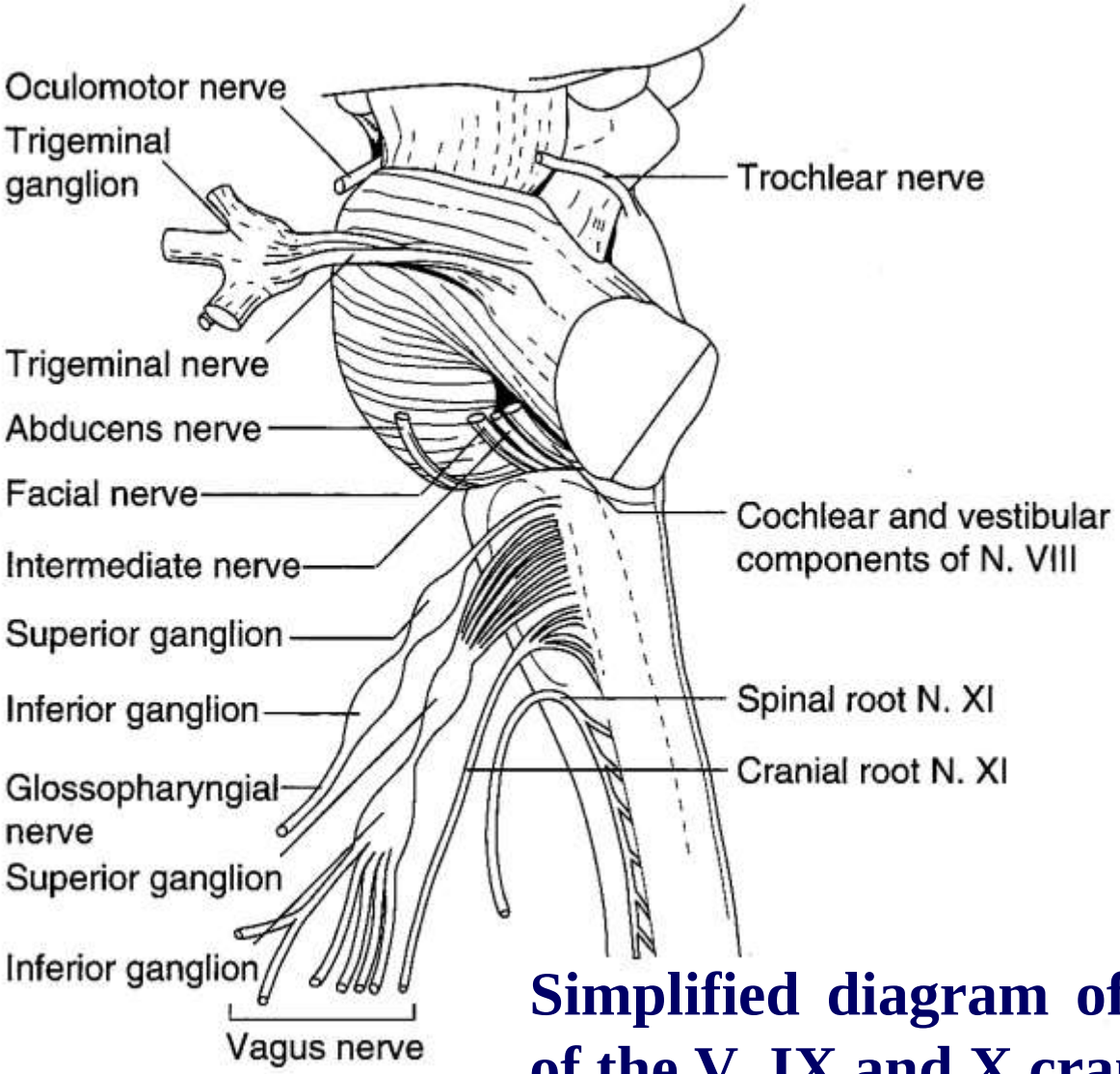


Distribution of cranial nerve nuclei

- Location within the brainstem:
  - ✓ sensory column – dorsolaterally in the brainstem tegmentum:
    - ➢ trigeminal sensory nuclear complex
    - ➢ solitary tract nucleus
    - ➢ cochlear nuclei
    - ➢ vestibular nuclei
  - ✓ motor column – paramedian plan:
    - ➢ oculomotor nerve nuclei
    - ➢ trochlear nerve nucleus
    - ➢ abducent nucleus
    - ➢ facial nucleus
    - ➢ nucleus ambiguus
    - ➢ hypoglossal nucleus
  - ✓ autonomic nuclei – medially:
    - ➢ autonomic nuclei of oculomotor nerve
    - ➢ dorsal nucleus of vagus



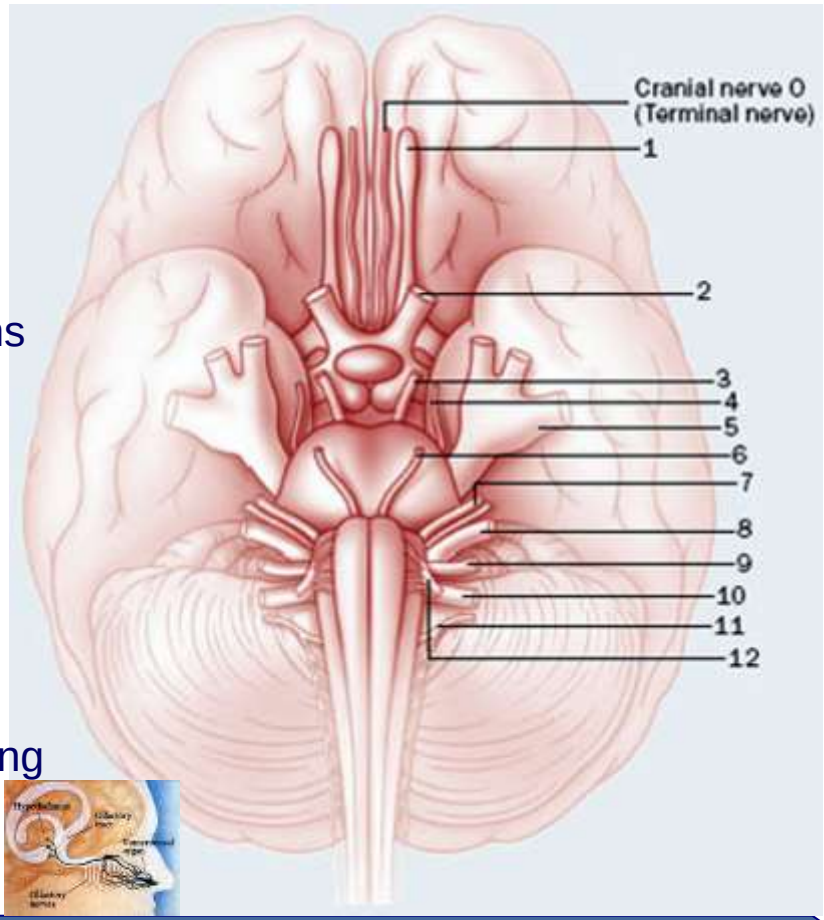
Cranial ganglia



Simplified diagram of the sensory ganglia of the V, IX and X cranial nerves

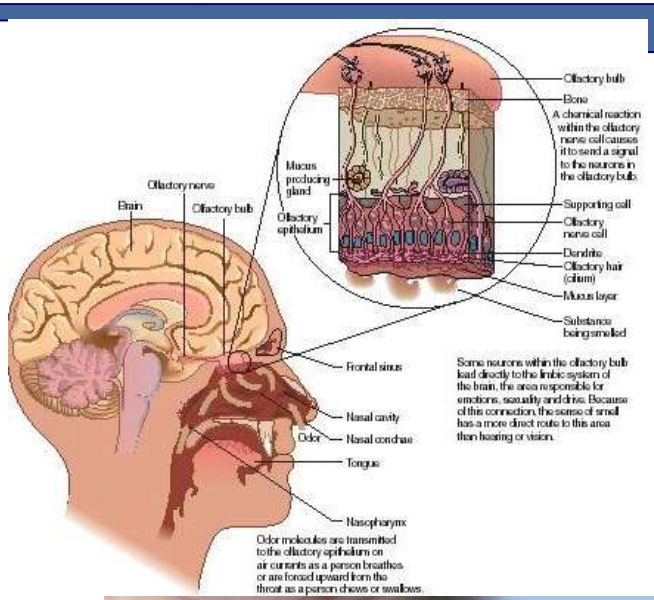
Terminal nerve, *n. terminalis*

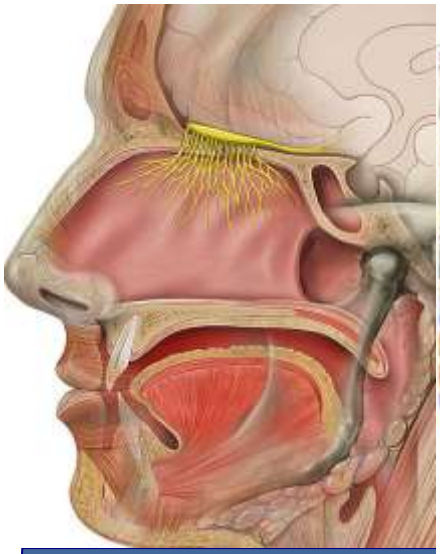
- the neglected cranial nerve: cranial nerve zero – C0
- first description – *Gustav Fritsch* (1878) in the brains of sharks
  "überzähliger Nerv" = supernumerary nerve
- terminal nerve – *Locy* (1905) – closely connected with the *lamina terminalis*
  - ✓ accessory olfactory nerve
- first description in humans – 1913
  - ✓ very distinct in human fetuses and infants
  - ✓ rudimentary (vestigial) in adult human brains
- non-myelinated axons
  - ✓ arise from autonomic as well as sensory neurons
  - ✓ pass through the cribriform plate
    medial to those of the olfactory nerve fila
  - ✓ peripherally end in the nasal mucosa
  - ✓ centrally end in:
    - ➢ lateral and medial septal nuclei
    - ➢ preoptic area and rostral perforate substance
- functions – uncertain:
  - ✓ related to the sensing of pheromones transmitting sexual signals from the vomeronasal organ
  - ✓ play a role in reproductive (sexual) behavior

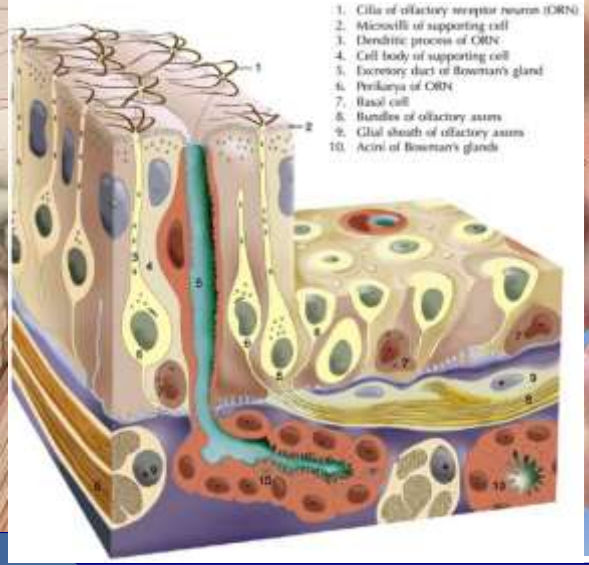


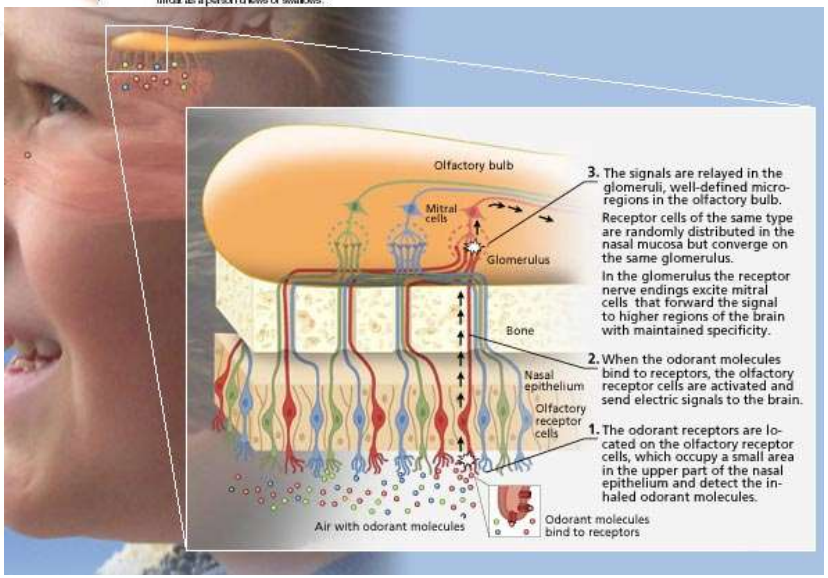
Olfactory nerves, *nn. olfactorii*

- specific sense of smell (olfaction)
- the shortest cranial nerve – cribriform plate *(lamina cribrosa)*
- 18-20 bundles, *fila olfactoria* – non-myelinated axons
  - ✓ olfactory receptor neurons – 40 millions in olfactory epithelium
- Ist neuron of the olfactory pathway



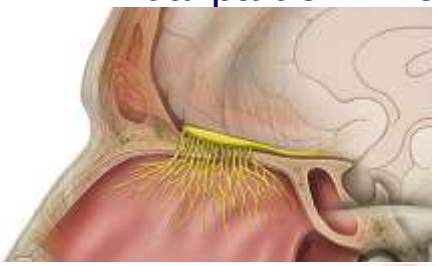


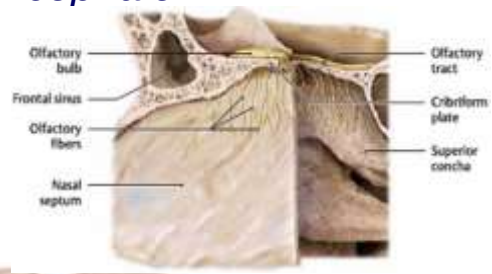




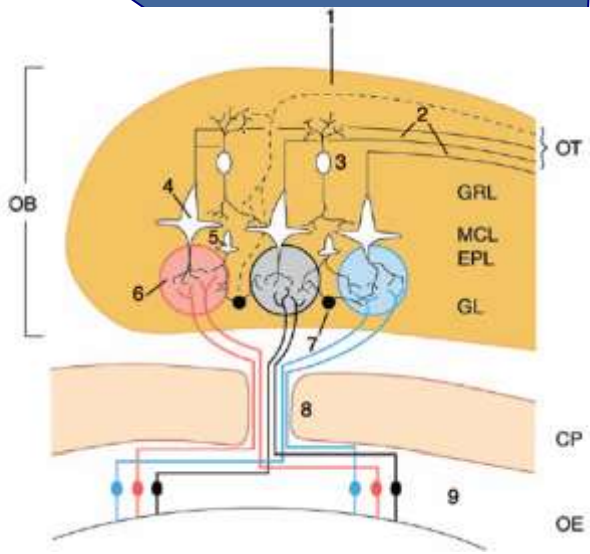
Olfactory bulb, *bulbus olfactorius*

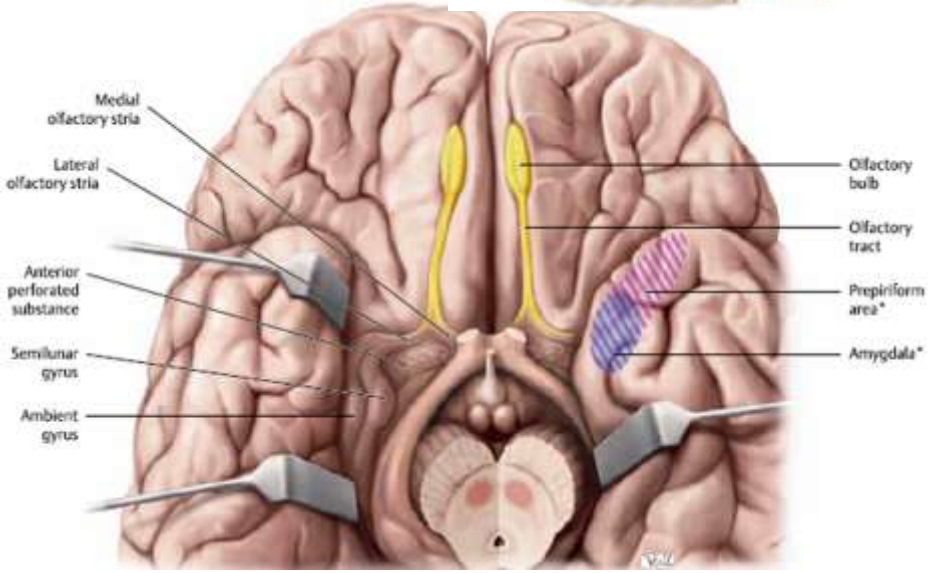
- olfactory bulb – synaptic glomeruli
  - ✓ nucleus of termination of cranial nerve I
  - ✓ mitral, granule and periglomerular cells
  - ✓ initial part of *rhinencephalon*

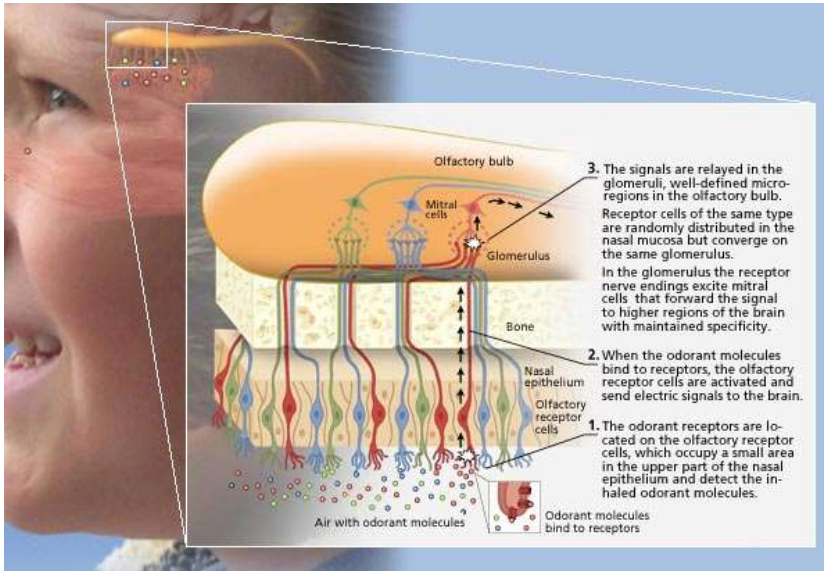




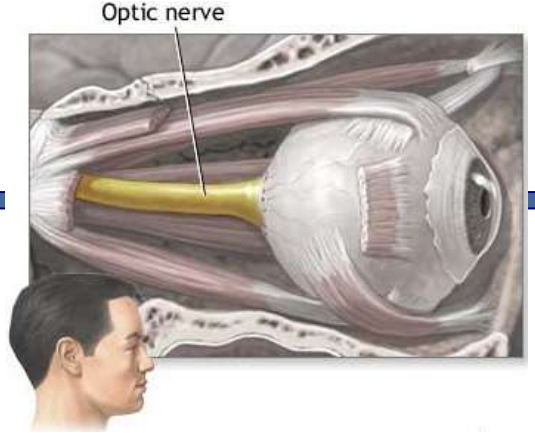
1. Centrifugal (efferent) fibers
2. Centripetal axons of mitral and tufted (M/T) cells
3. Granule cell
4. Mitral cell
5. Tufted cell
6. Glomerulus
7. Periglomerular cell
8. Cribriform plate
9. Olfactory receptor neurons



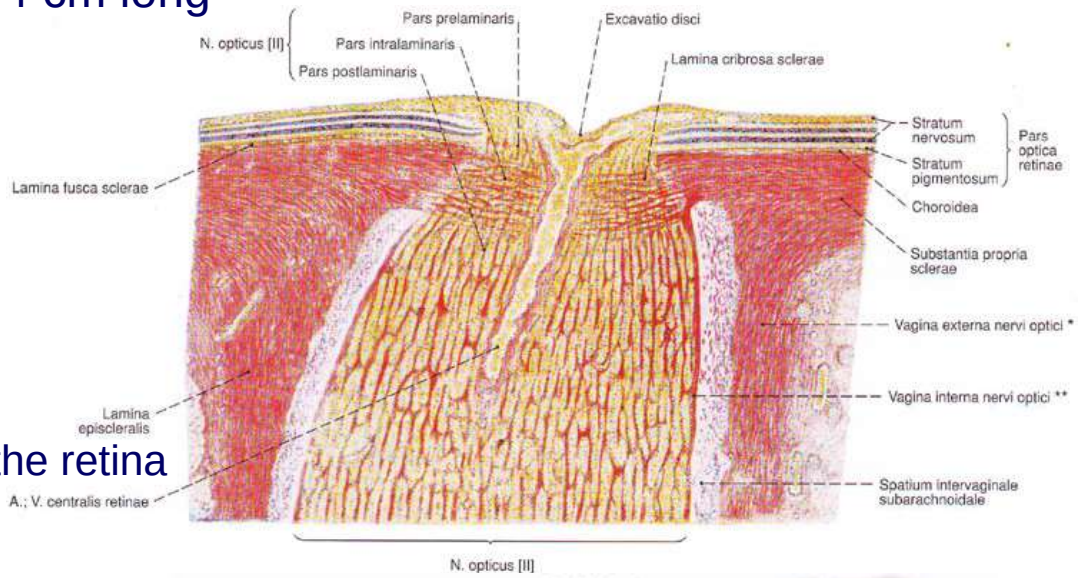




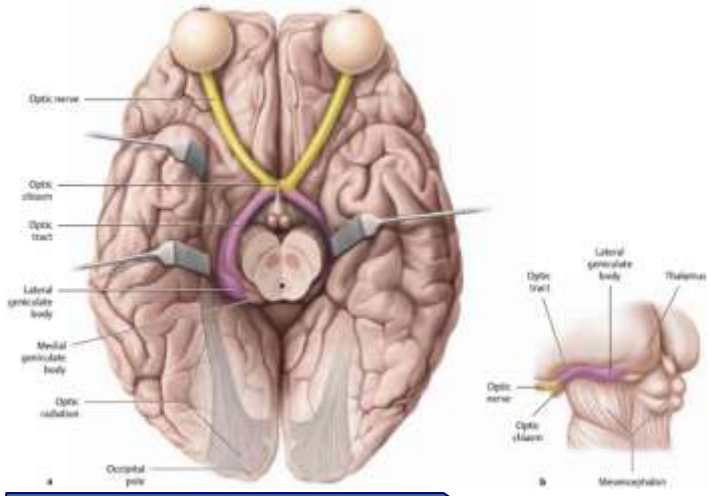
Optic nerve, *n. opticus*

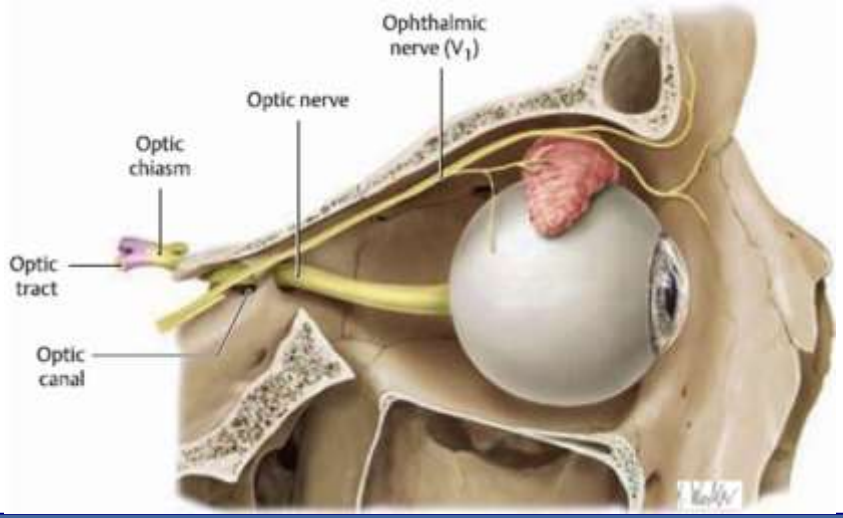


~ 4 cm long



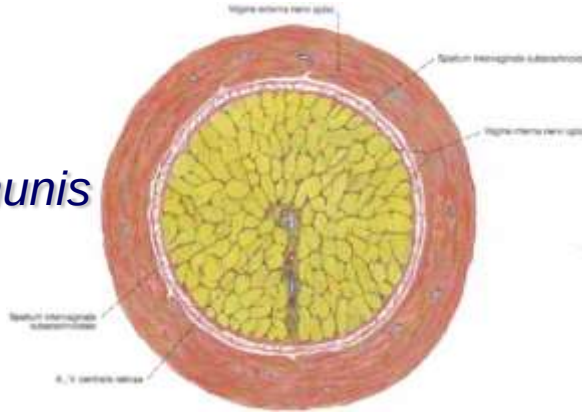
- specific sense of sight (vision)
  - ✓ intraorbital part – 25 mm long
  - ✓ canal part ~ 5 mm long
  - ✓ intracranial part ~ 10 mm long
- 1 million axons of ganglion cells in the retina
- III[rd] neuron of the visual pathway

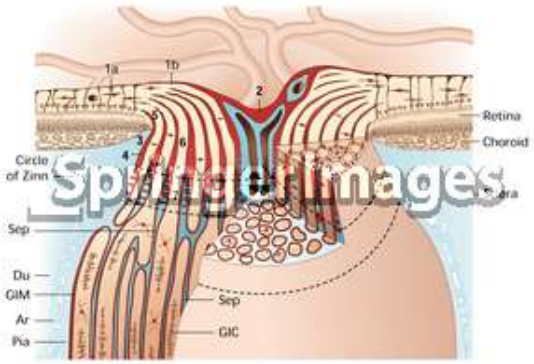


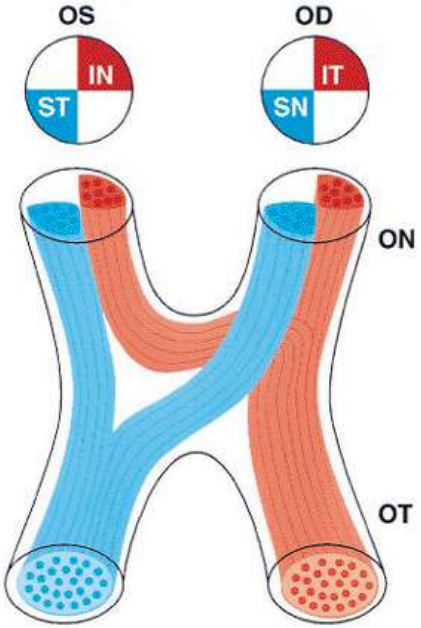


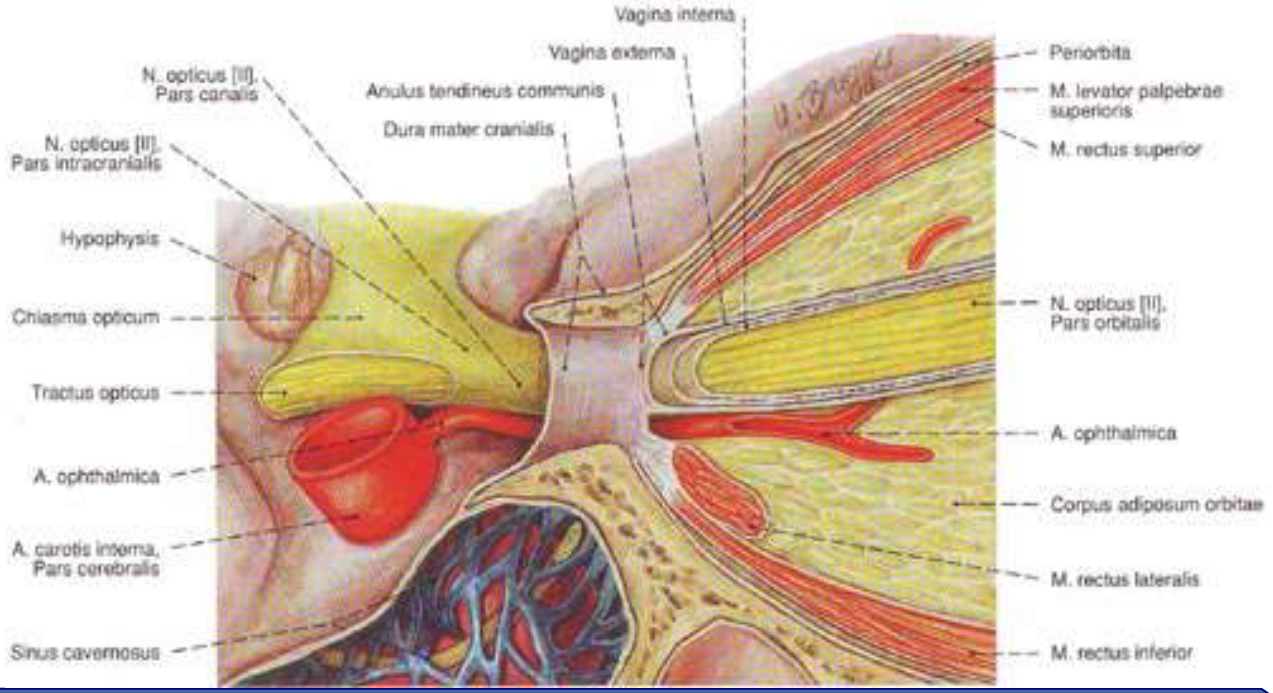
Optic nerve, *n. opticus*

- optic disc (optic nerve head)
- *a. et v. centralis retinae*
- optic canal
- through *anulus tendineus communis* (circle of Zinn)
- optic chiasm ⇨ optic tract:
  - ✓ partial (~ 53%) decussation of the (medial) fibers



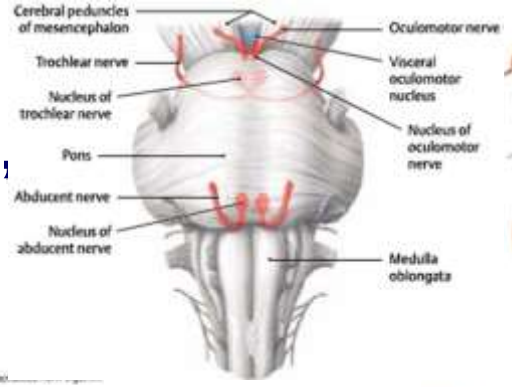


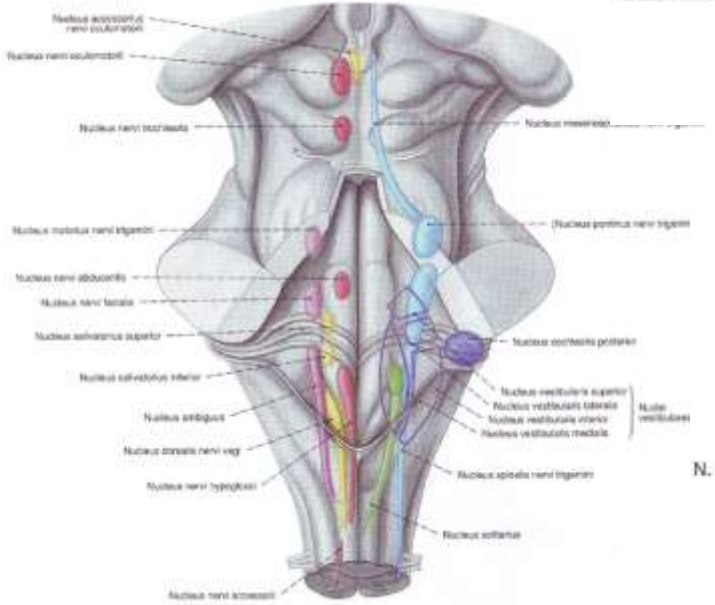


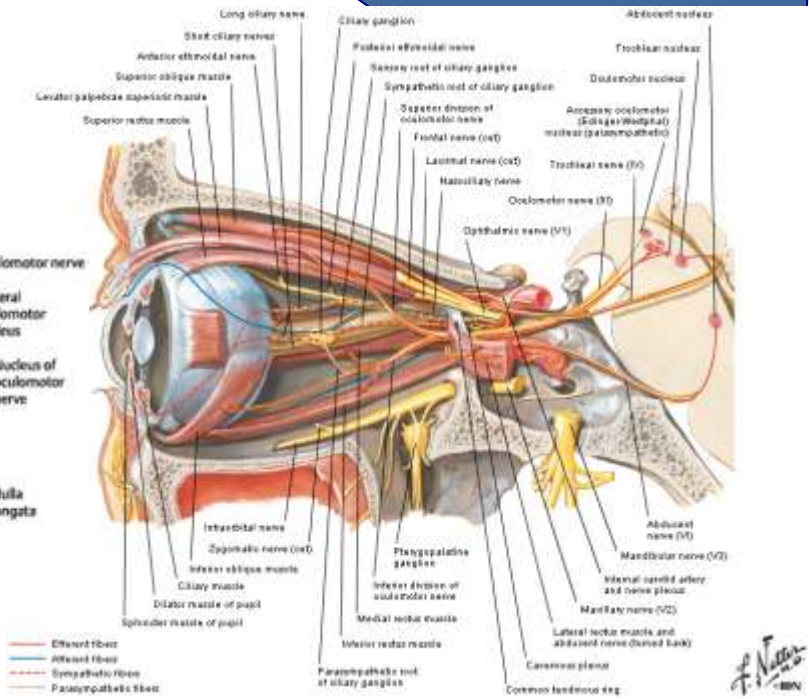


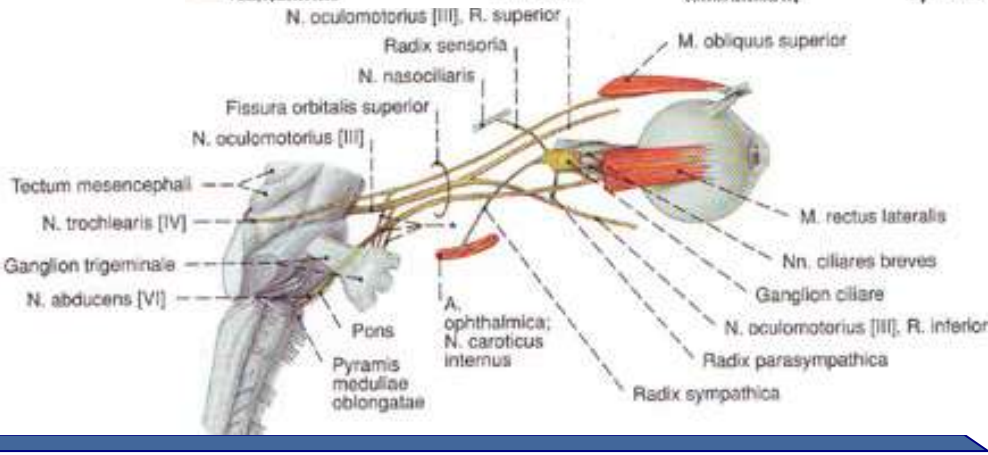
Optomotor group

- ✓ oculomotor nerve, *n. oculomotorius*
- ✓ trochlear nerve, *n. trochlearis*
- ✓ abducent nerve, *n. abducens*



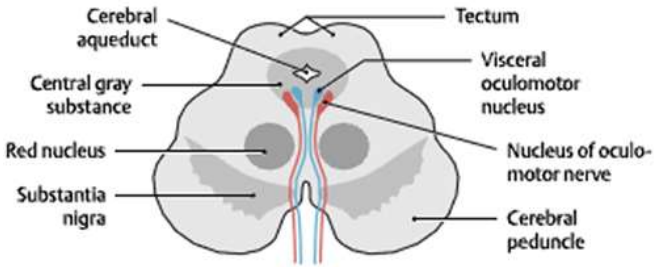


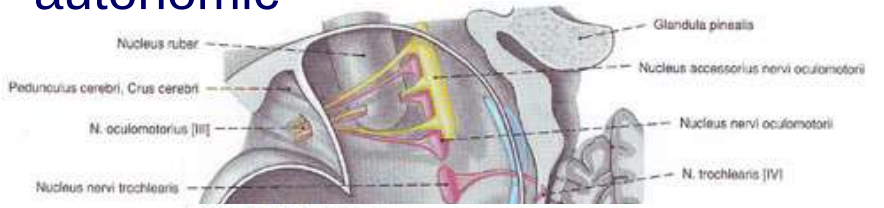


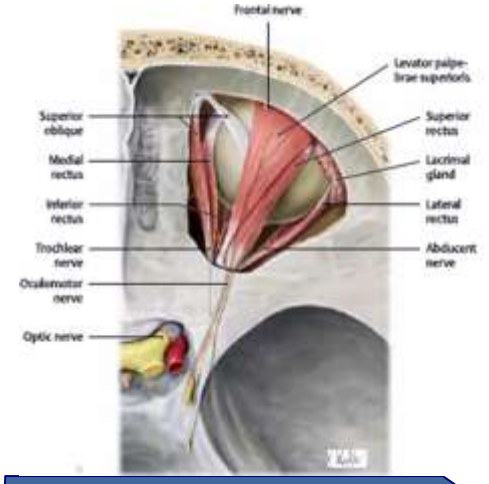


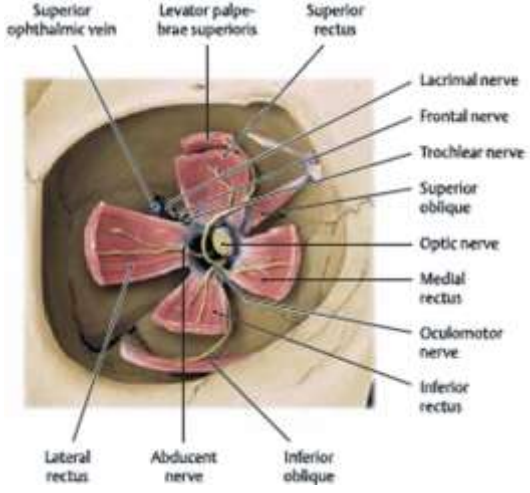
Oculomotor nerve, *n. oculomotorius*

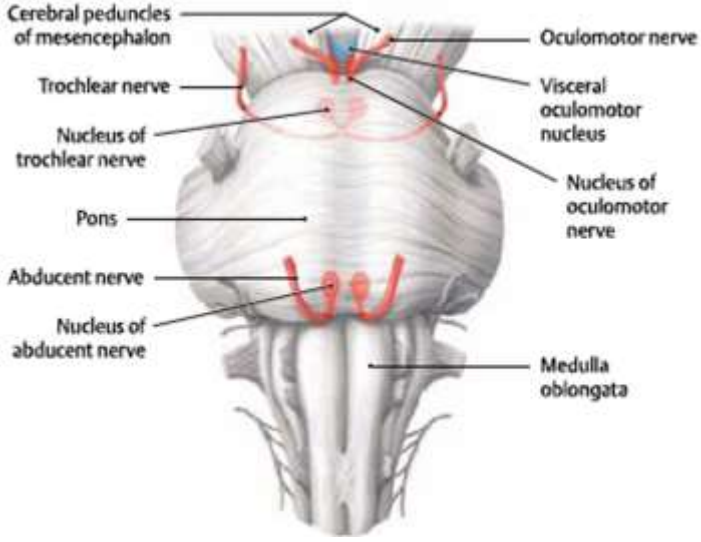
- III[rd] cranial nerve – somatomotor and parasympathetic
- nuclei at the level of superior colliculus:
  - ✓ *nucleus nervi oculomotorii* – motor
  - ✓ *nucleus oculomotorius accessorius (of Edinger-Westphal)* – autonomic
- *sulcus medialis cruris cerebri*
- *fissura orbitalis superior*
- *anulus tendineus communis*







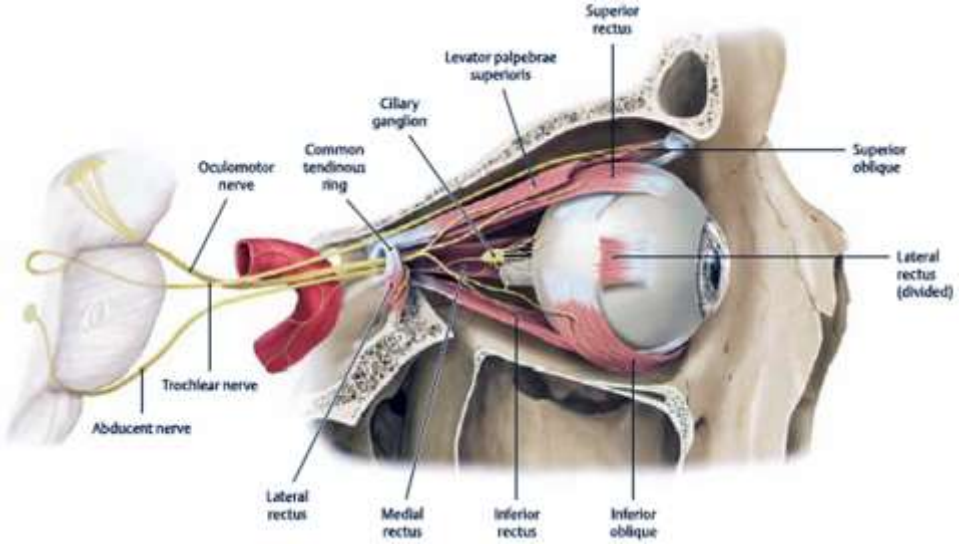


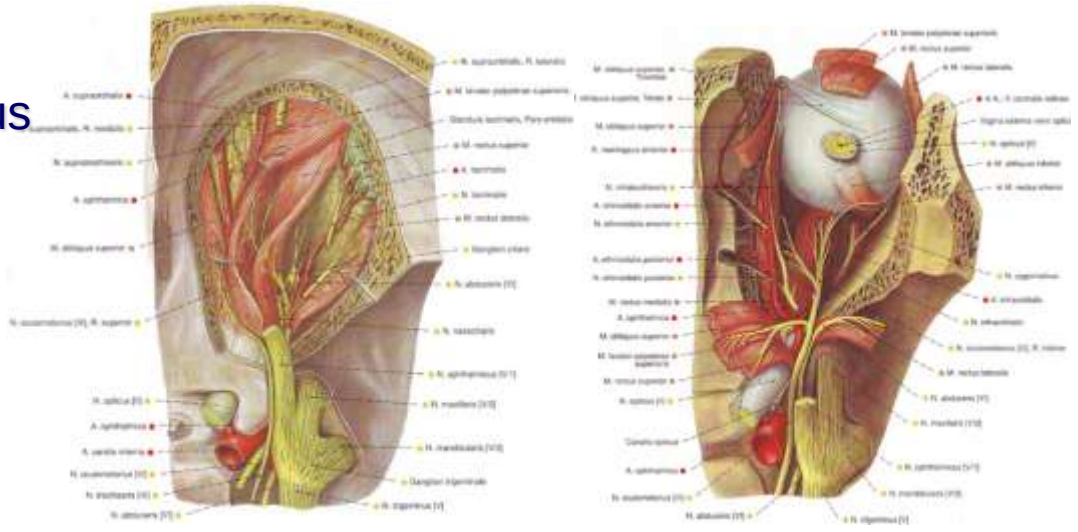


Oculomotor nerve, *n. oculomotorius*

- *ramus superior:*
  - ✓ *m. rectus superior*
  - ✓ *m. levator palpebrae superioris*
- *ramus inferior* – motor fibers:
  - ✓ *mm. rectus inferior et medialis*
  - ✓ *m. obliquus inferior*
- *radix oculomotoria parasympathica (ramus ad ganglion ciliare)* – autonomic fibers from *ramus inferior*
- *ganglion ciliare – nn.ciliares breves*
  - ✓ *m. ciliaris*
  - ✓ *m. sphincter pupillae*

  in injury ⇨ divergent strabismus

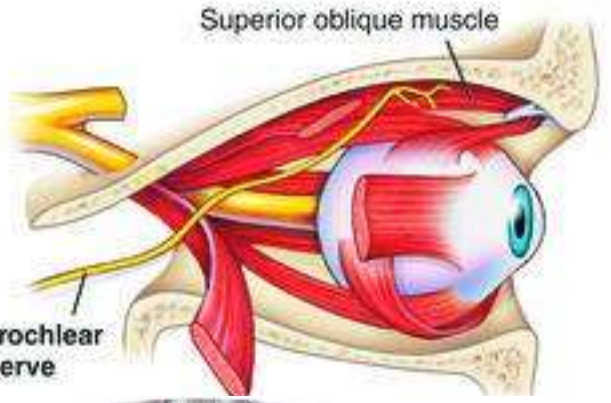


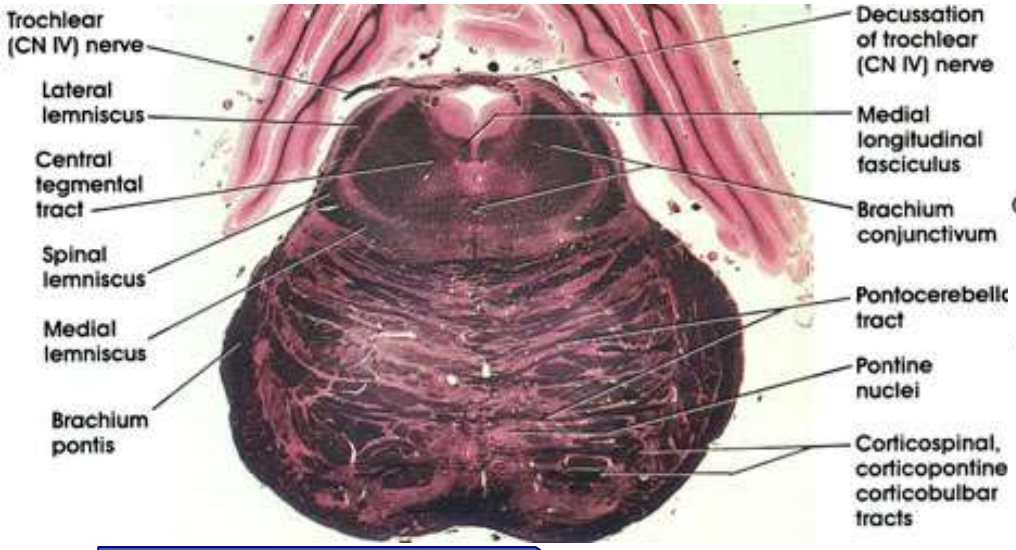


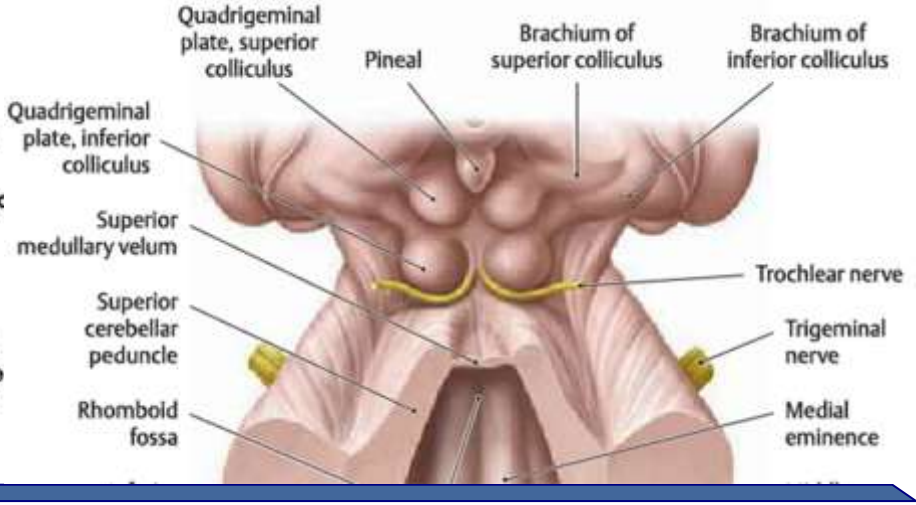
NB: Modern Latin, from Greek strabismos; squint-eyed

Trochlear nerve, *n. trochlearis*

- IVth cranial nerve – motor (optomotor) nerve
- nucleus – upper part of the inferior colliculus:
  - ✓ *nucleus nervi troclearis*
- dorsal emergence – below the inferior colliculus
- trochlear decussation

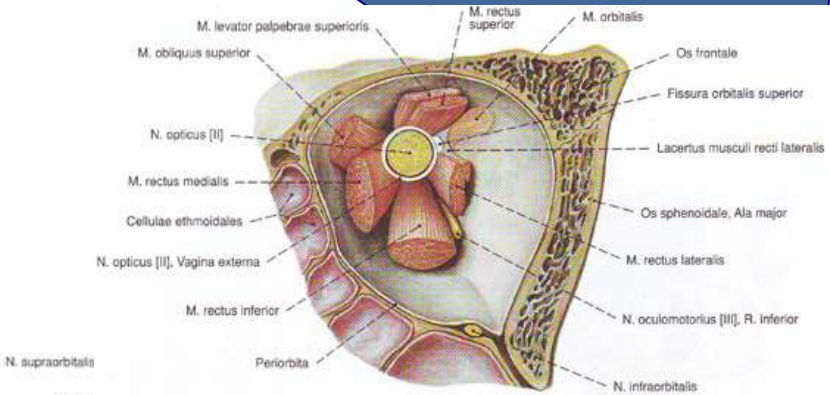


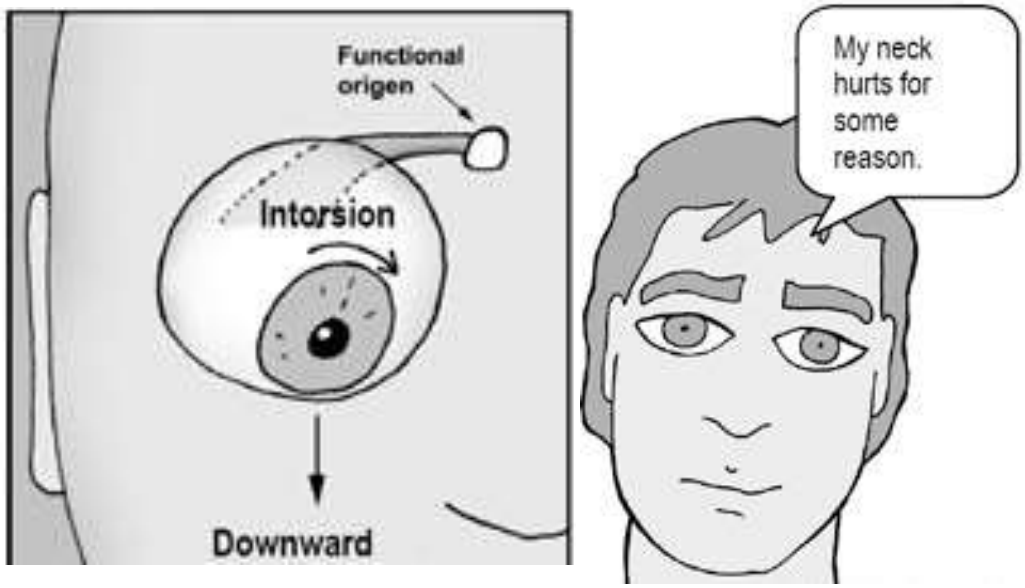


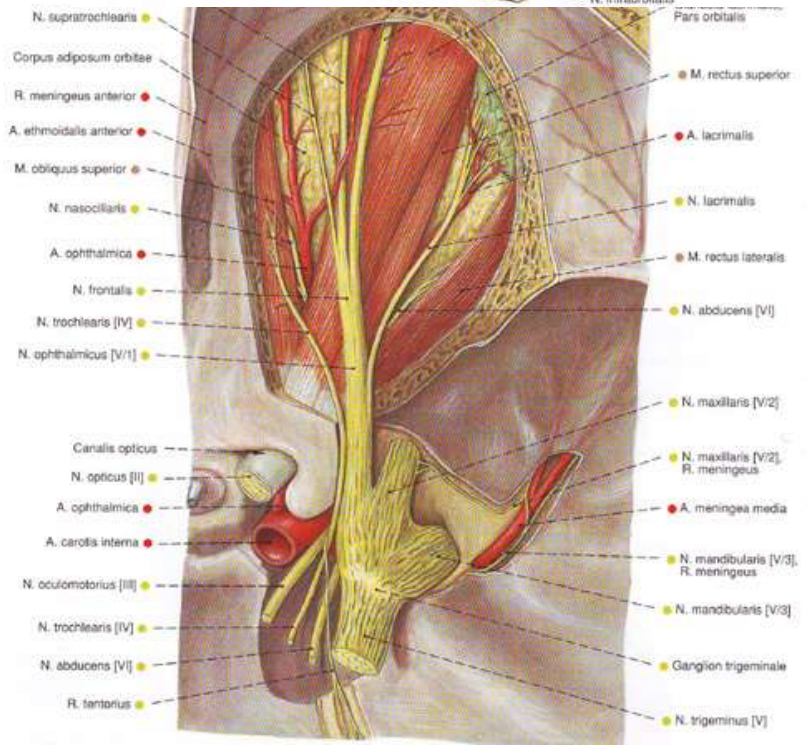


Trochlear nerve, *n. trochlearis*

- *fissura orbitalis superior*
- above *anulus tendineus communis (Zinn)*
- innervation:
  - ✓ *m. obliquus superior*
- in injury ⇨ torsional diplopia

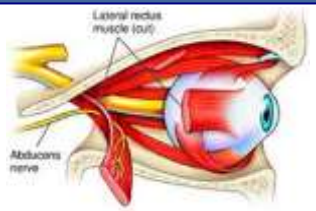


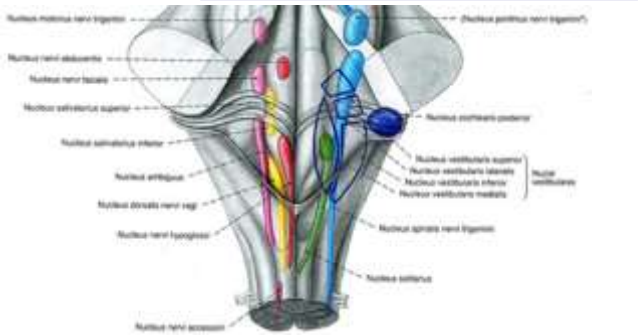


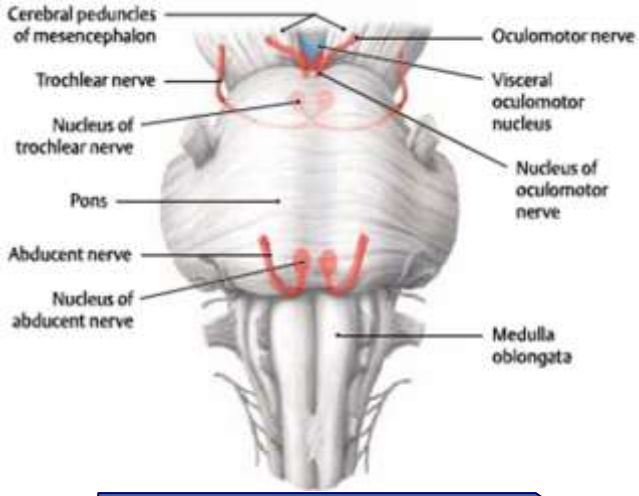


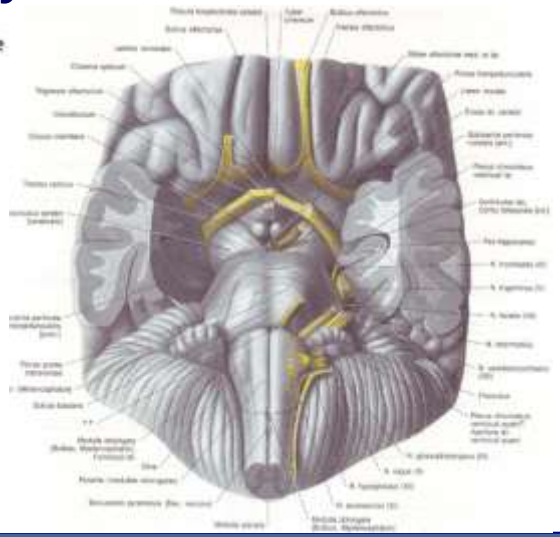
Abducent nerve, *n. abducens*

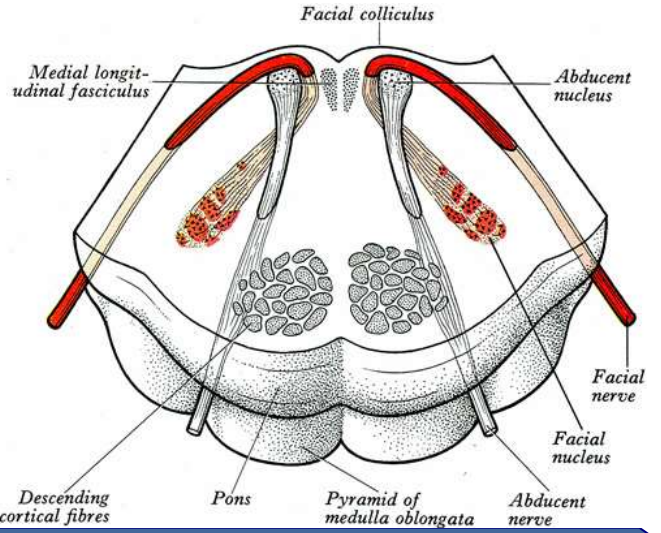
- VIth cranial nerve – motor (optomotor) nerve
- nucleus – in pons *(fossa rhomboidea)* beneath the *colliculus facialis:*
  - ✓ *nucleus nervi abducentis*
- emergence between the pons and the medullar pyramid





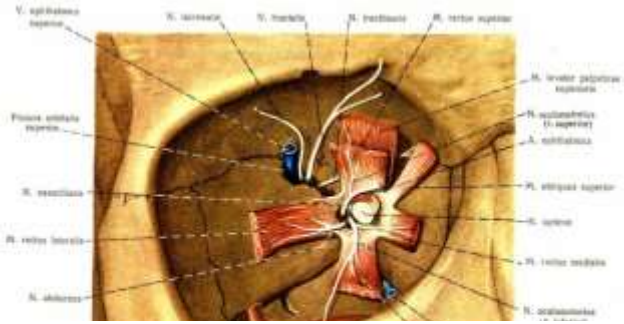


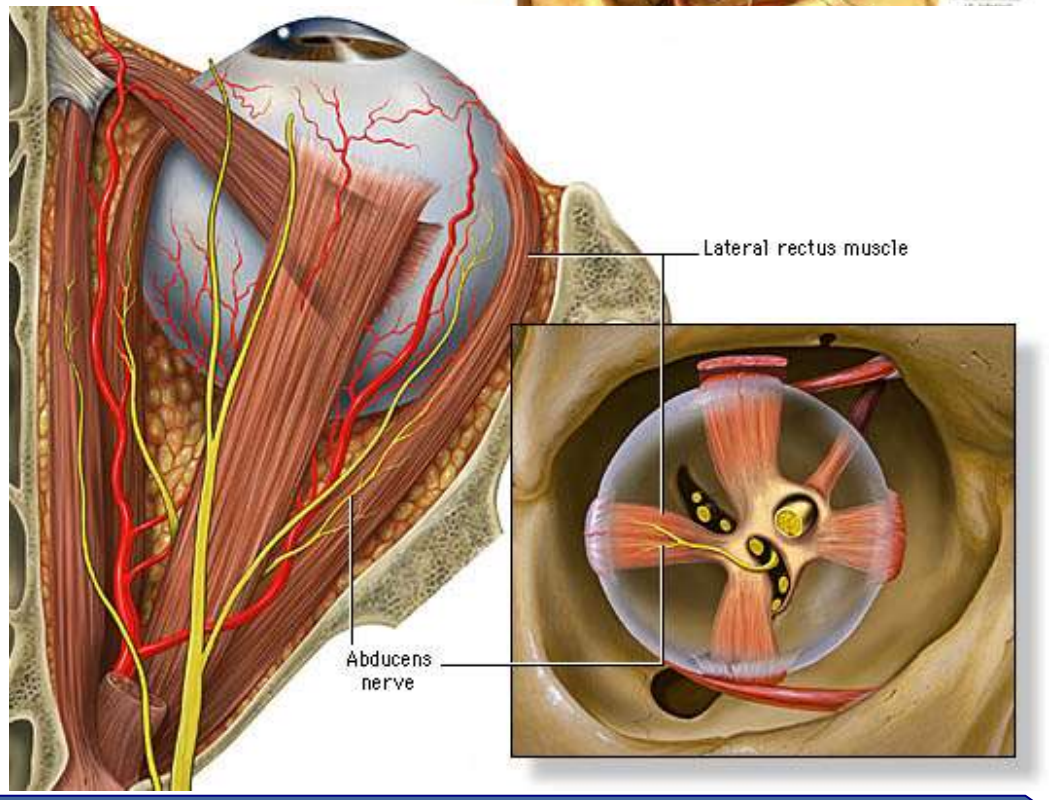




Abducent nerve, *n. abducens*

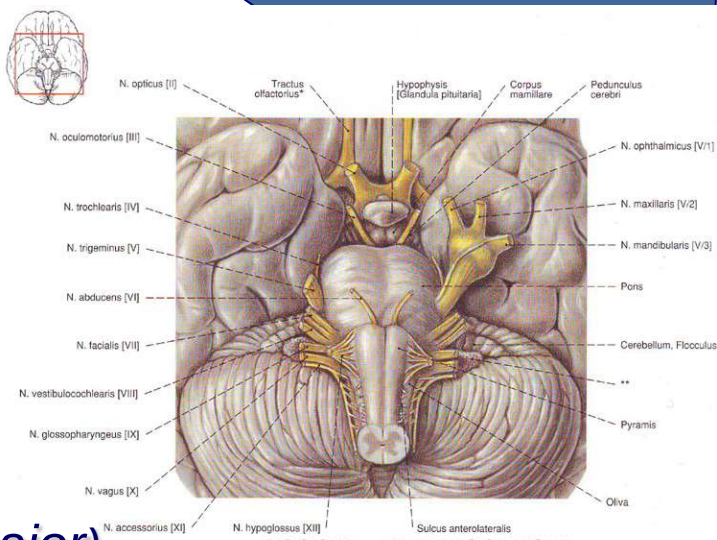
- through *anulus tendineus communis*
- innervation:
  - ✓ *m. rectus lateralis*
- in injury ⇨ convergent strabismus

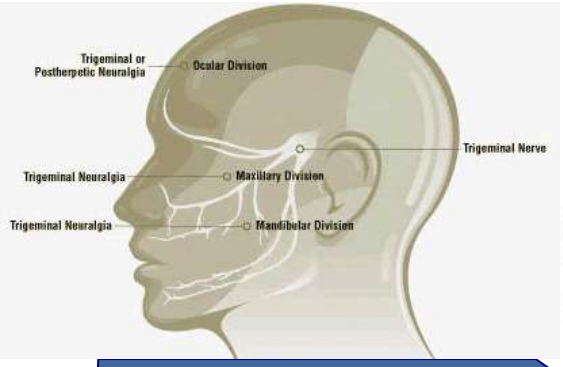


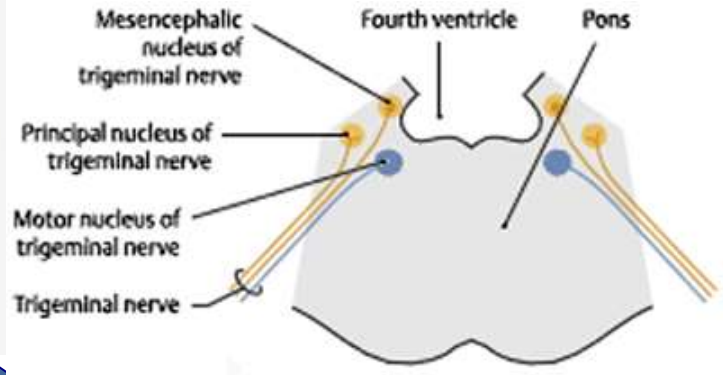


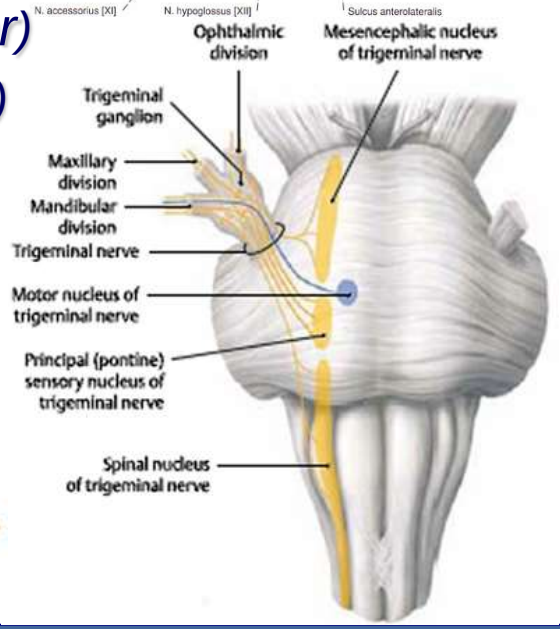
Trigeminal nerve, *n. trigeminus*

- Vth cranial nerve – the largest cranial nerve
- Mixed nerve:
  - ✓ sensory – sensory innervation of orofacial region
  - ✓ motor *(n. mandibularis)* – supply of masticatory muscles
- Formation:
  - ✓ larger sensory root, *radix sensoria (portio major)*
  - ✓ smaller motor root, *radix motoria (portio minor)*
- Emergence – at the level of the pons



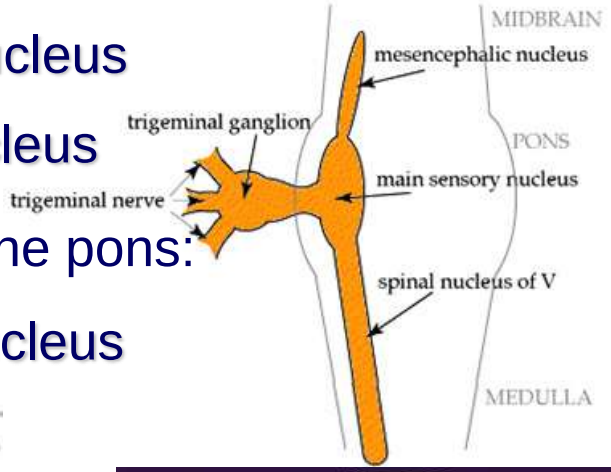


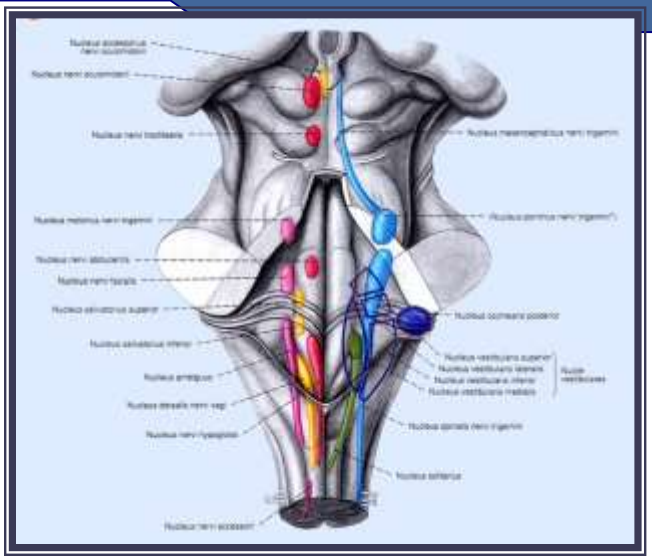


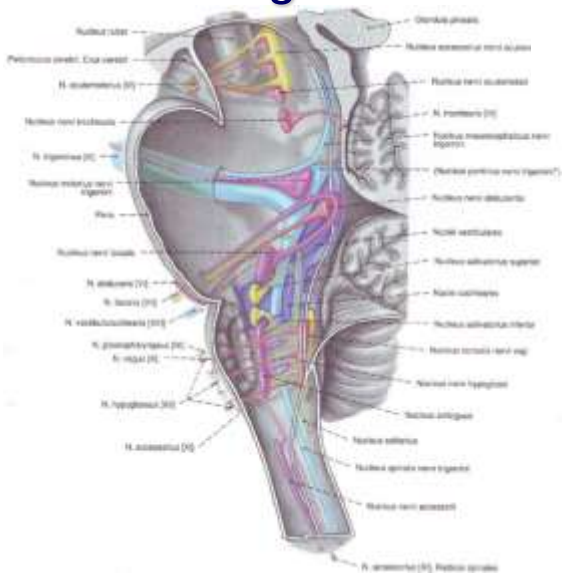


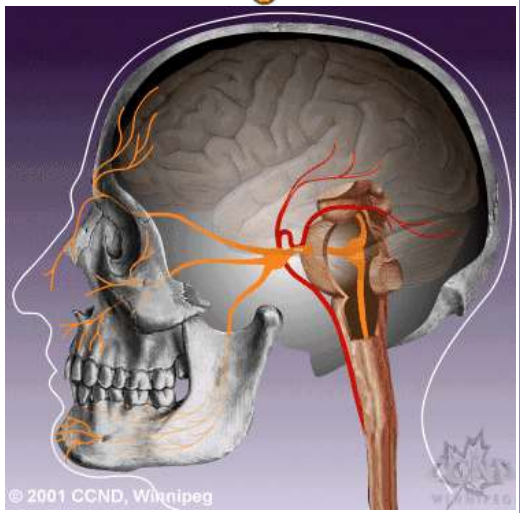
Trigeminal nuclear complex

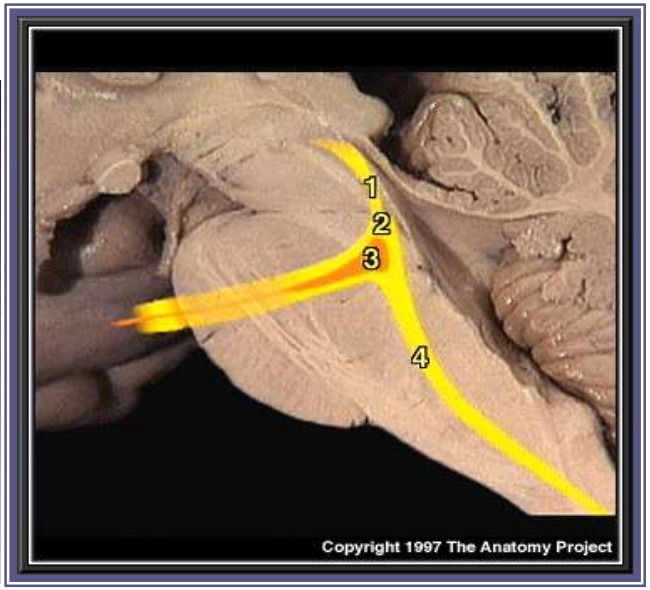
- Three sensory nuclei – in the brainstem:
  - ✓ main (principal) sensory nucleus – pontine
  - ✓ spinal trigeminal nucleus
  - ✓ mesencephalic nucleus
- Motor nucleus – in the pons:
  - ✓ motor trigeminal nucleus







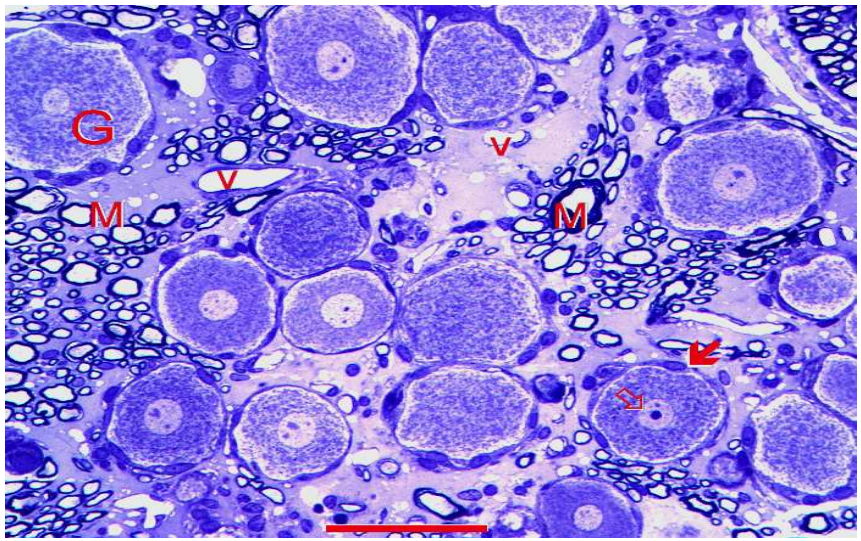


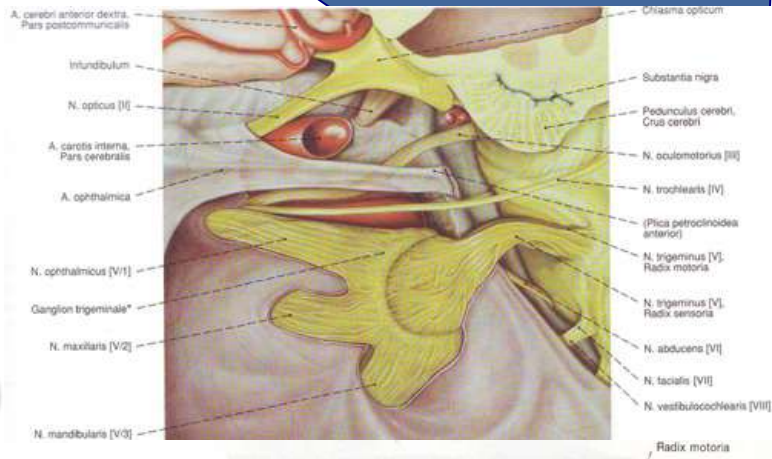


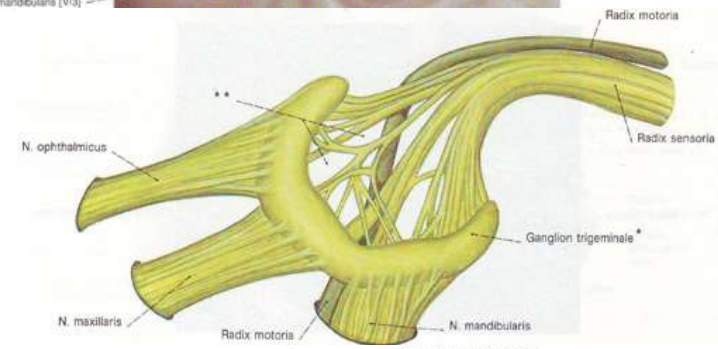
Trigeminal ganglion, *ganglion trigeminale*

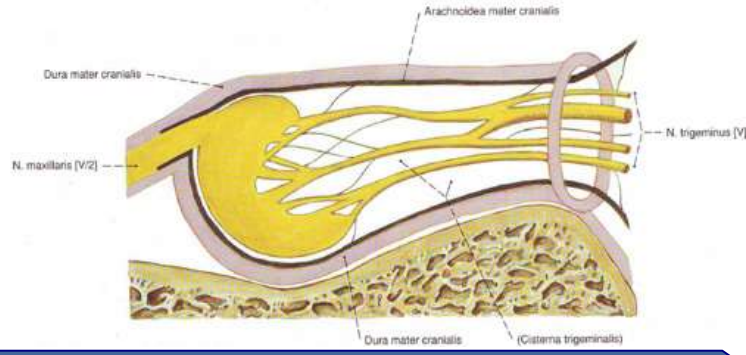
Johann Lorentz Gasser
1723-1765

- ✓ *ganglion trigeminale, (semilunare, Gasseri)*
- ✓ *impressio trigeminalis*
- ✓ *cavum trigeminale (Meckeli)*
- ✓ pseudounipolar neurons



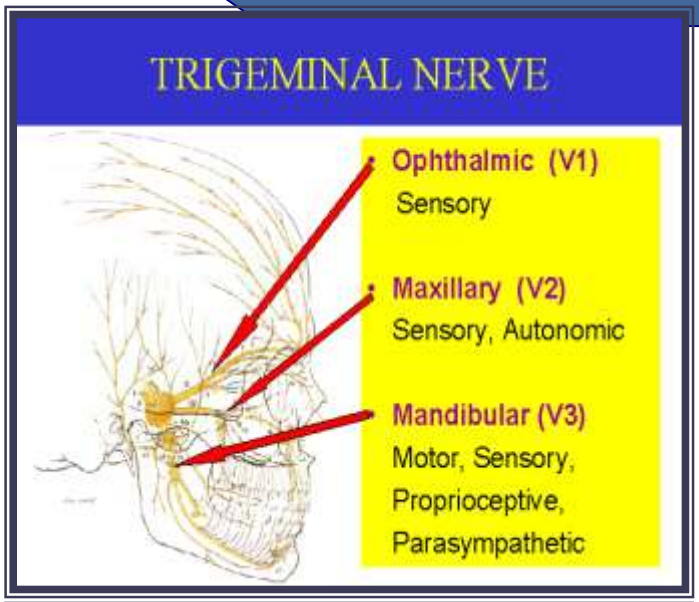


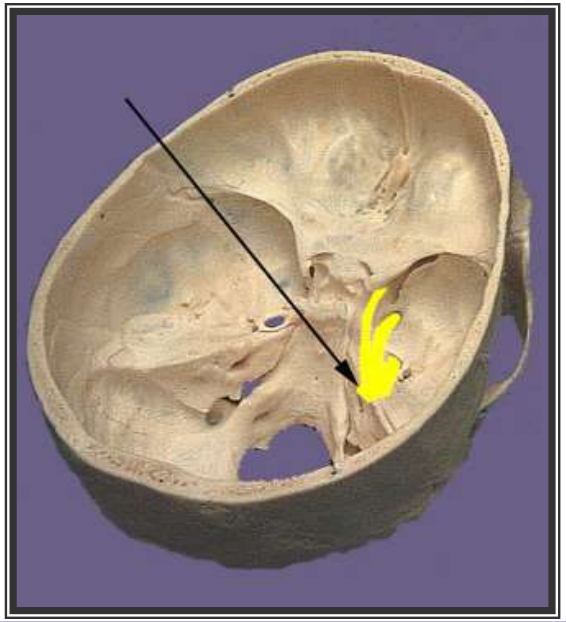


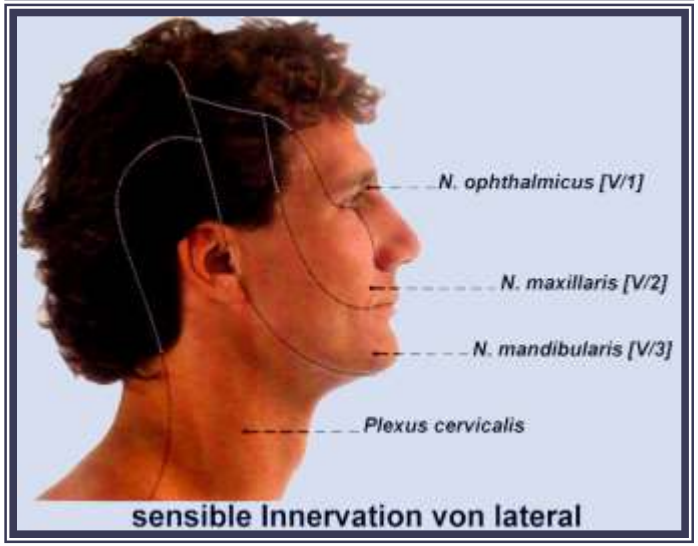


Trigeminal nerve, *n. trigeminus*

- Major branches:
  - ✓ ophthalmic nerve – pure sensory
    n. ophthalmicus
  - ✓ maxillary nerve – pure sensory
    n. maxillaris
  - ✓ mandibular nerve – mixed, motor&sensory
    n. mandibularis

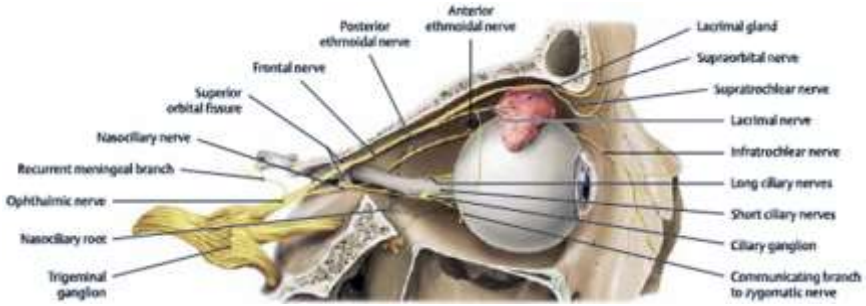


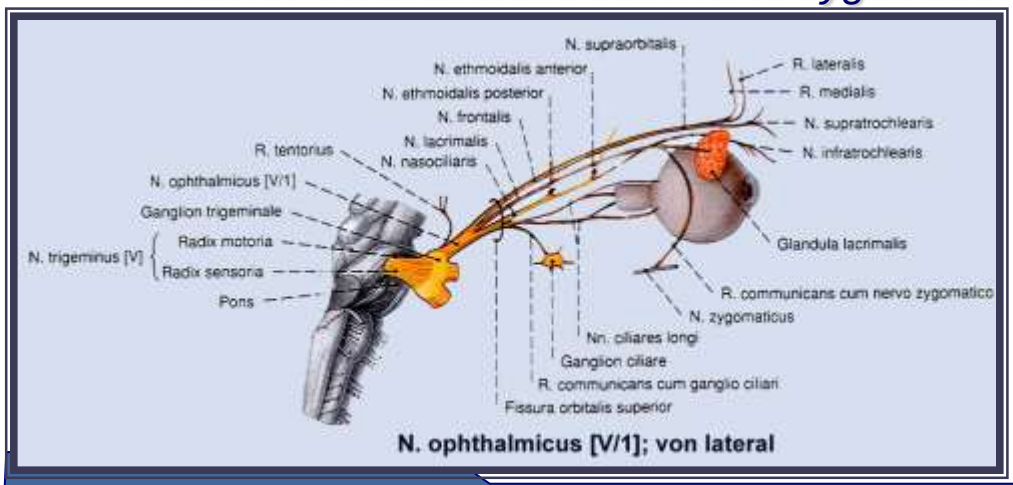


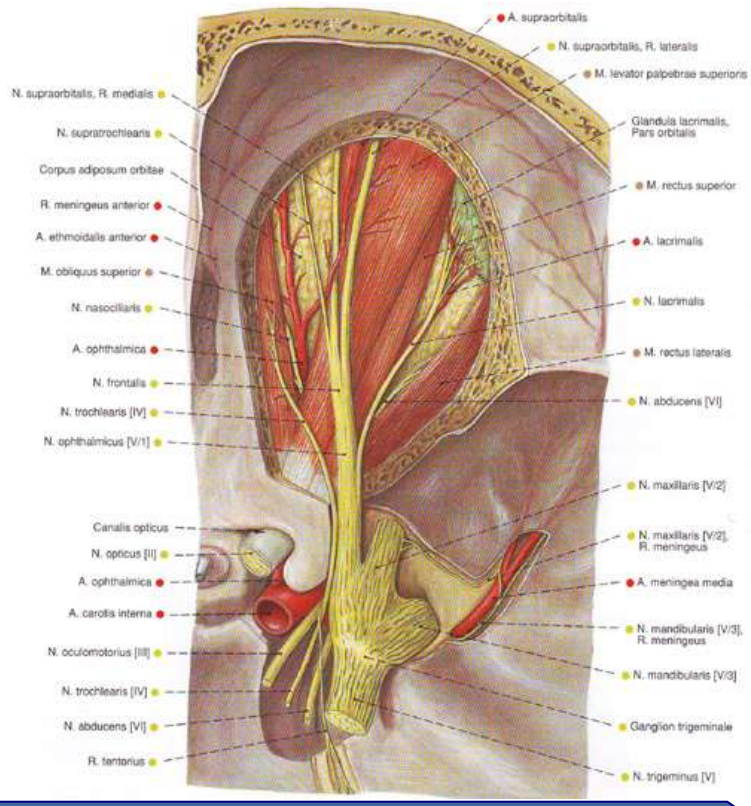


Ophthalmic nerve, *n. ophthalmicus*

- Branches:
  - ✓ *n. frontalis:*
    - ➢ *n. supraorbitalis – rr. medialis et lateralis*
    - ➢ *n. supratrochlearis*
  - ✓ *n. nasociliaris:*
    - ➢ *ramus communicans cum ganglio ciliari*
    - ➢ *n. ethmoidalis anterior et posterior*
    - ➢ *n. infratrochlearis*
  - ✓ *n. lacrimalis* ⇨ *gl. lacrimalis*, upper eyelid and conjunctiva
    - ➢ *ramus communicans cum nervo zygomatico*

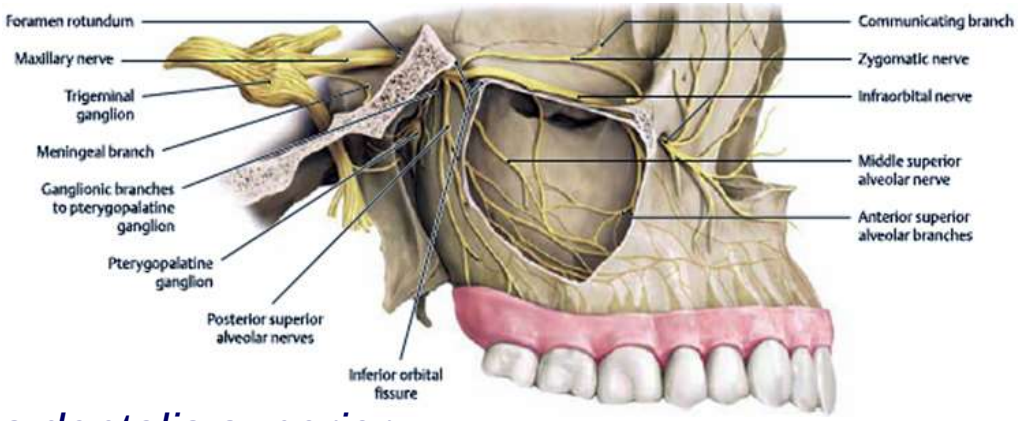


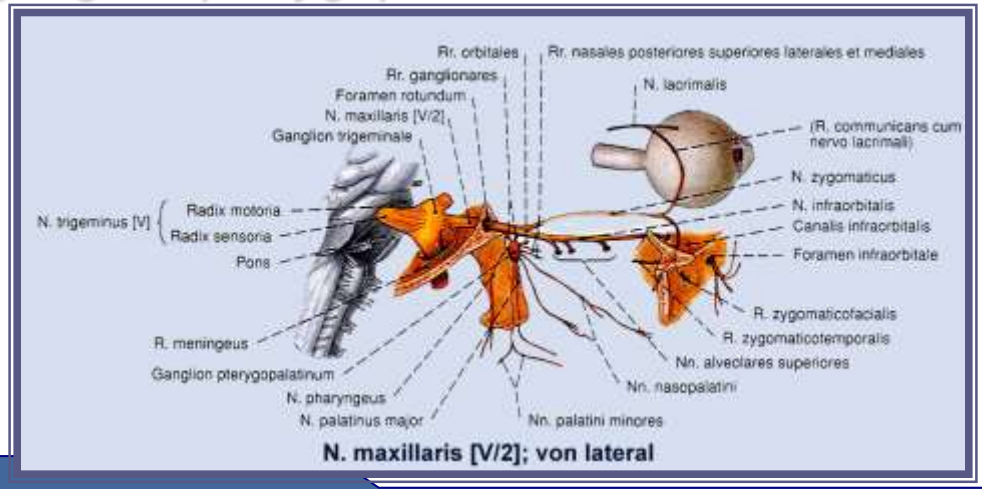


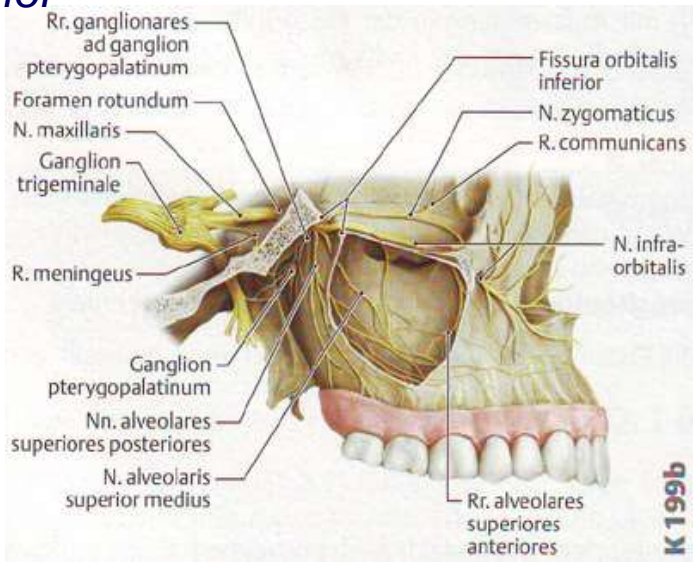


Maxillary nerve, *n. maxillaris*

- Branches:
  - ✓ *n. zygomaticus* – in *fossa pterygopalatina:*
    - ➢ *ramus zygomaticofacialis*
    - ➢ *ramus zygomaticotemporalis*
  - ✓ *n. infraorbitalis:*
    - ➢ *rr. palpebrales inferiores*
    - ➢ *rr. nasales externi et interni*
    - ➢ *rr. labiales superiores*
    - ➢ *nn. alveolares superiores, postt., medius et inff.* ⇨ *plexus dentalis superior*
  - *ganglion pterygopalatinum*

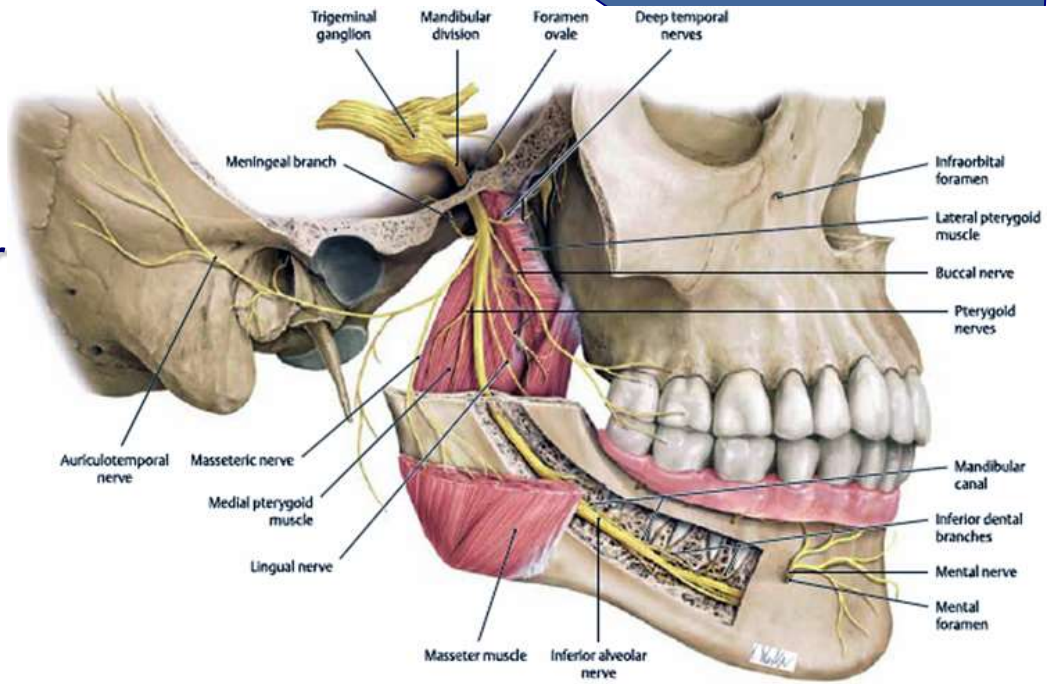


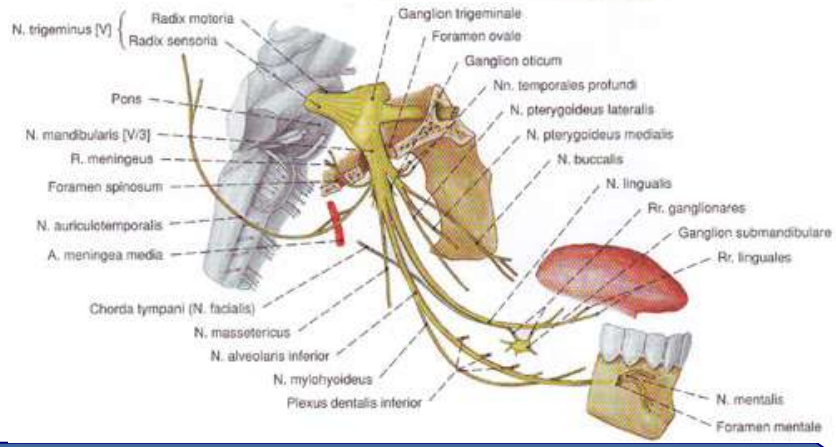




Mandibular nerve, *n. mandibularis*

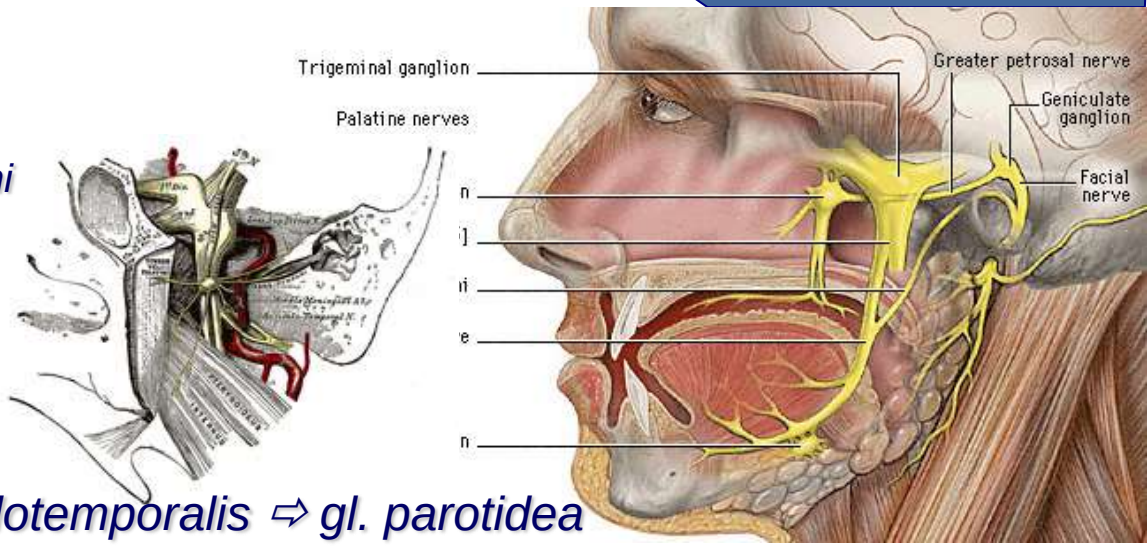
- *foramen ovale*
- *fossa infratemporalis*
- *pars anterior et posterior*
- Motor branches – muscles of mastication:
  - ✓ *nn. temporales profundi*
  - ✓ *n. massetericus*
  - ✓ *n. pterygoideus lateralis*
  - ✓ *n. pterygoideus medialis:*
    - ➢ *n. musculi tensoris veli palatini*
    - ➢ *n. musculi tensoris tympani*

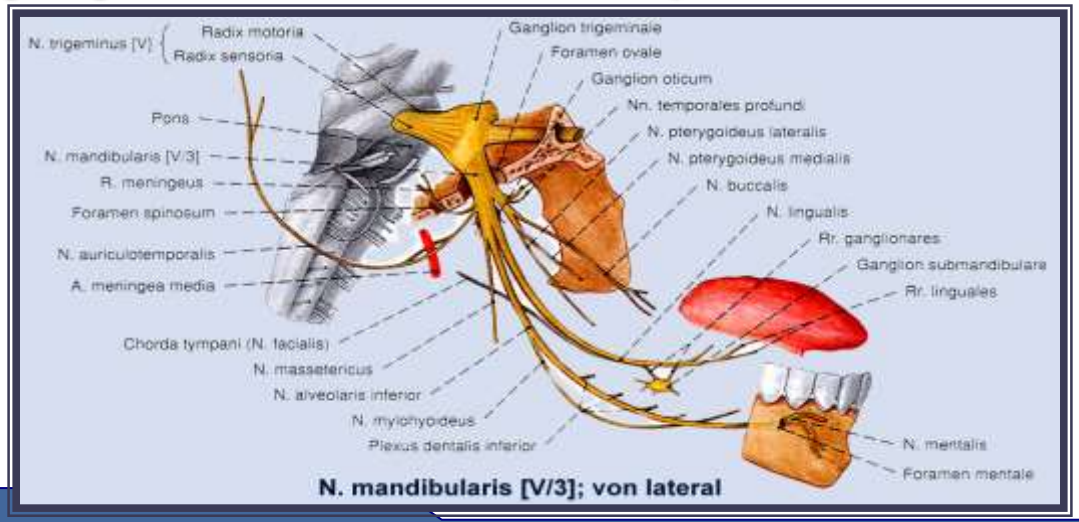


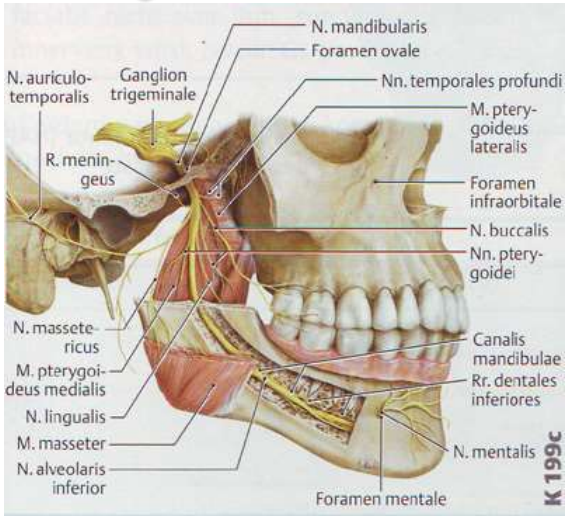


Mandibular nerve, *n. mandibularis*

- Sensory branches:
  - ✓ *n. buccalis*
  - ✓ *n. auriculotemporalis*
  - ✓ *n. lingualis* ⇦ *chorda tympani*
- Mixed branch:
  - ✓ *n. alveolaris inferior*
    - ➢ *n. mylohyoideus*
    - ➢ *plexus dentalis inferior*
    - ➢ *n. mentalis*
- *ganglion oticum* ⇨ *n. auriculotemporalis* ⇨ *gl. parotidea*
- *ganglion submandibulare* ⇨ *gl. submandibularis et gl. sublingualis*

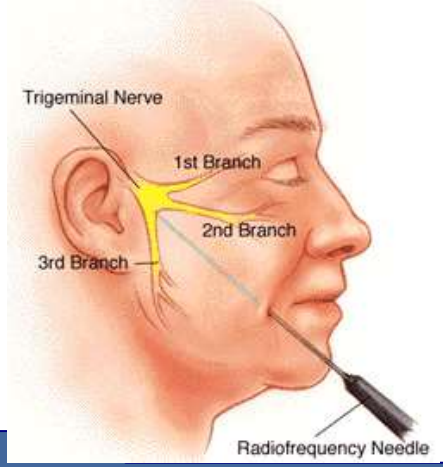


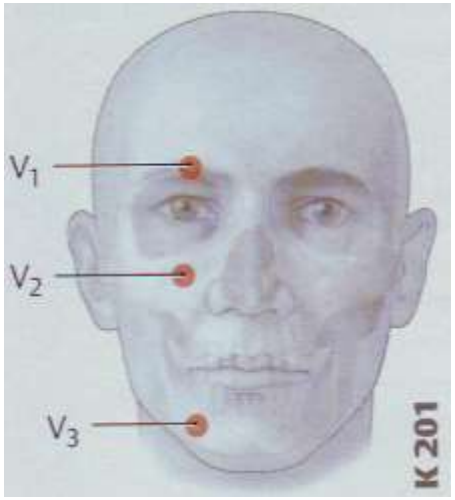


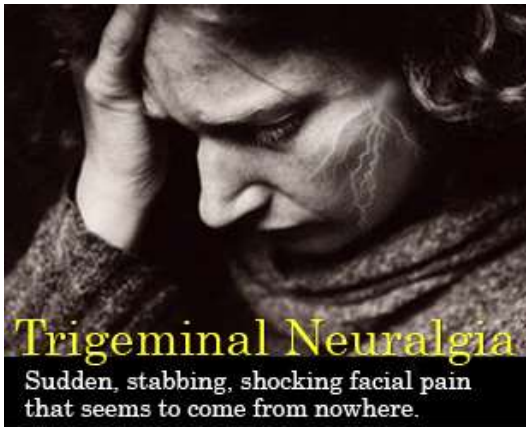


Trigeminal neuralgia

- "The Suicide Disease“ or *tic douloureux* (also known as prosopalgia)
  - ✓ key trigger points
  - ✓ trigeminal nerve block

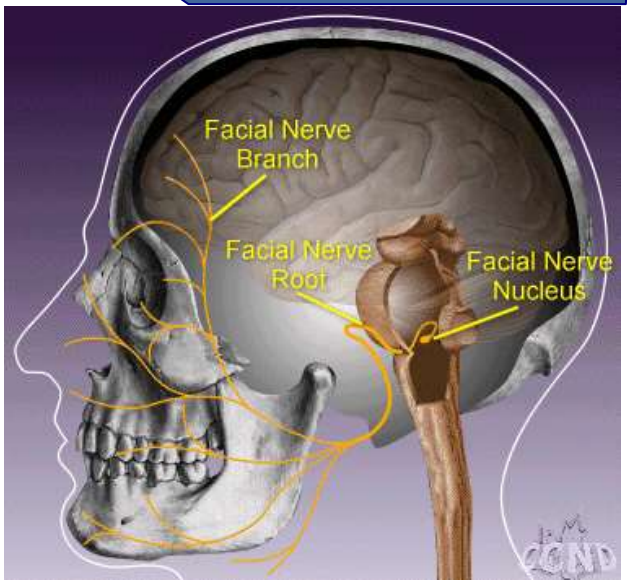


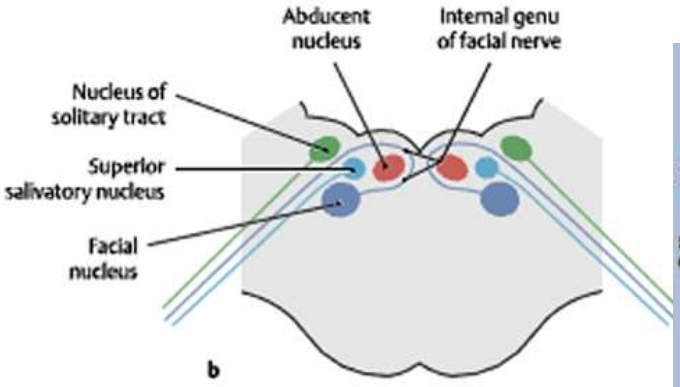


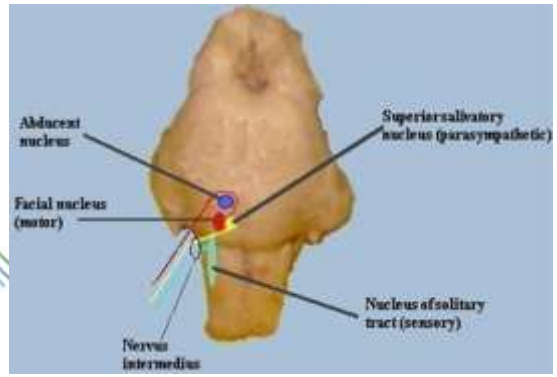


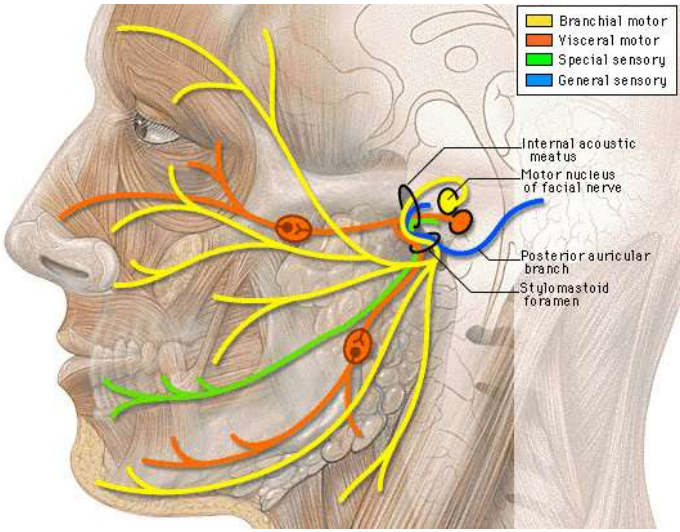
Facial nerve, *n. facialis*

- mixed nerve: motor root ⇨ facial (mimic) muscles, sensory and parasympathetic root ⇨ glands (*intermediate nerve)* ⇨ tongue and soft palate
- motor nucleus – in pons at the level of facial colliculus:
  - ✓ *facial nucleus*
- parasympathetic nucleus:
  - ✓ *superior salivatory nucleus,* incl. *lacrimal nucleus*
- sensory nucleus – common nucleus with nn. IX and X:
  - ✓ *solitary tract nucleus*



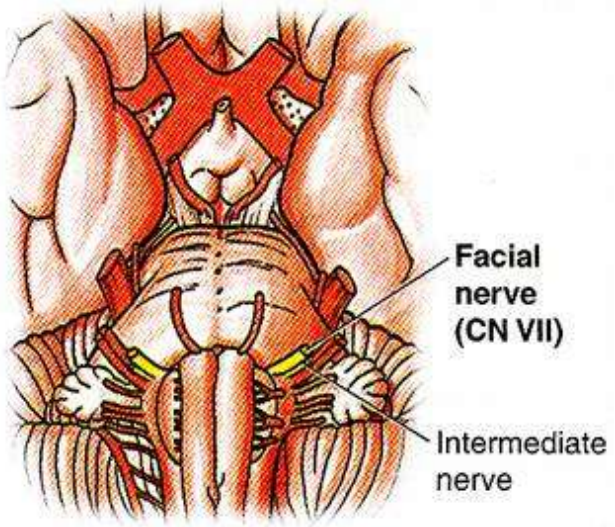


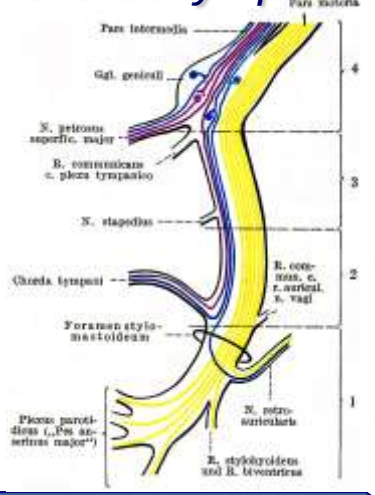


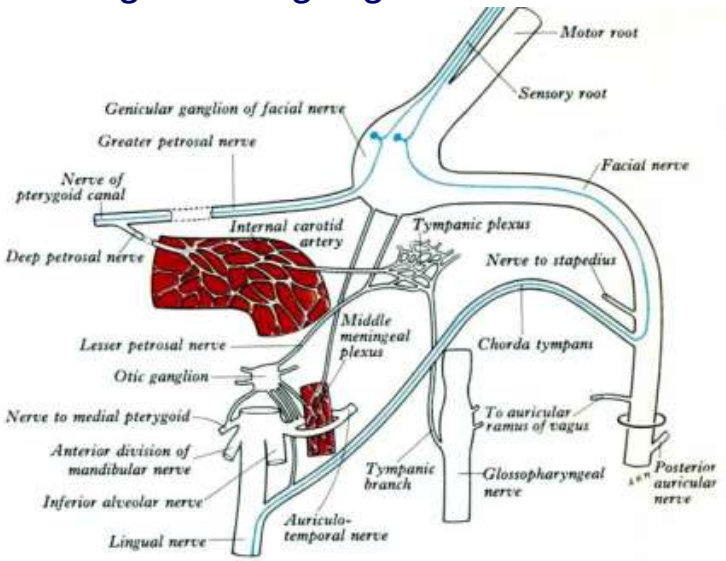


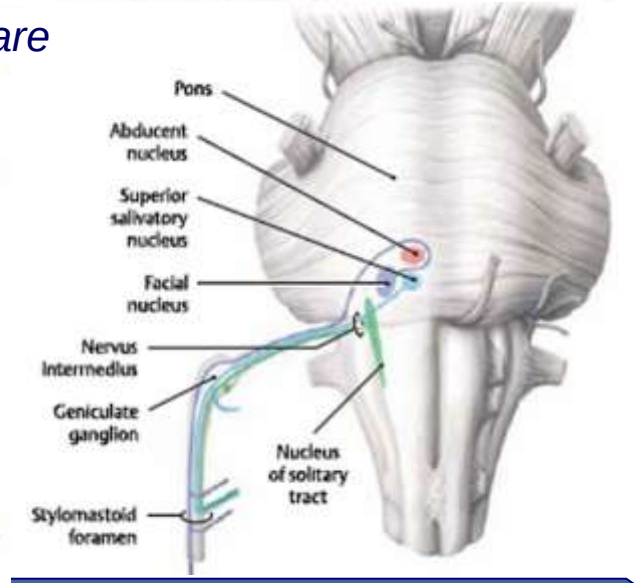
Facial nerve, *n. facialis*

- emergence – between the olive and inferior cerebellar peduncle
- course into *meatus acusticus internus* ⇨ join the intermediate nerve (somatosensory)
- genicular ganglion *(ganglion geniculatum)*
- branches inside the internal acoustic meatus
- in the facial canal:
  - ✓ *n. petrosus major* ⇨ *ganglion pterygopalatinum*
  - ✓ *n. stapedius* ⇨ *m. stapedius*
  - ✓ *chorda tympani* ⇨ *n. lingualis* ⇨ *ganglion submandibulare*



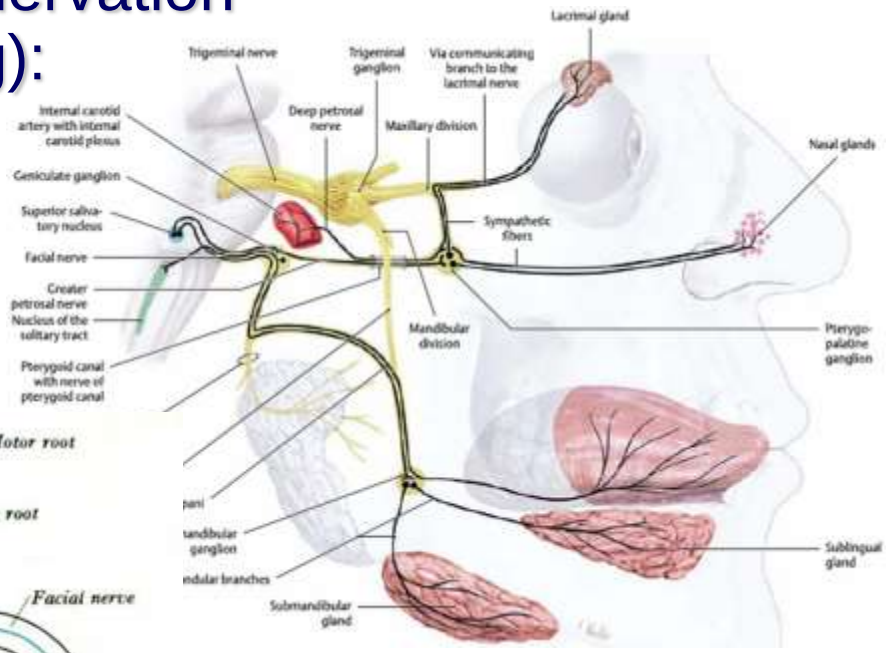


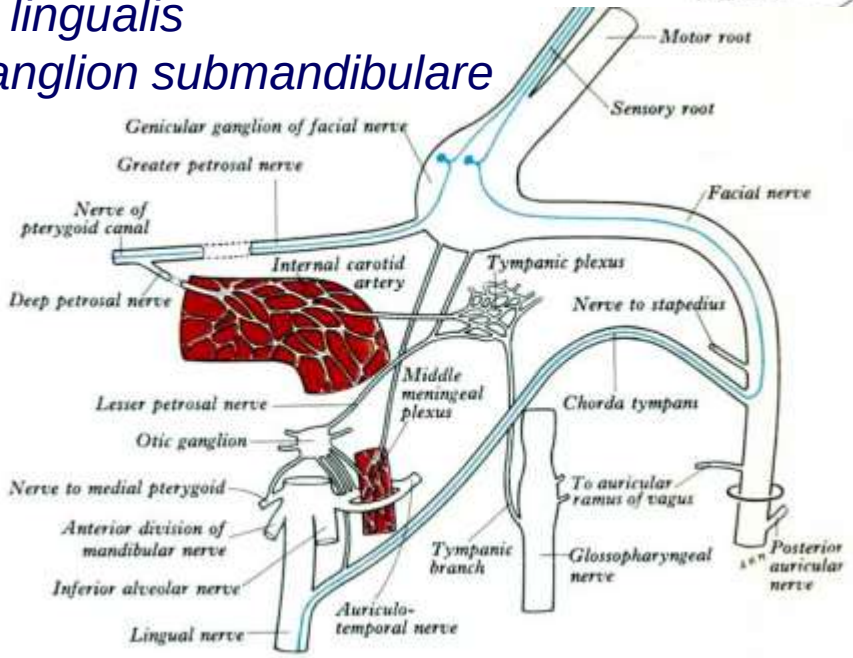




Facial nerve, *n. facialis*

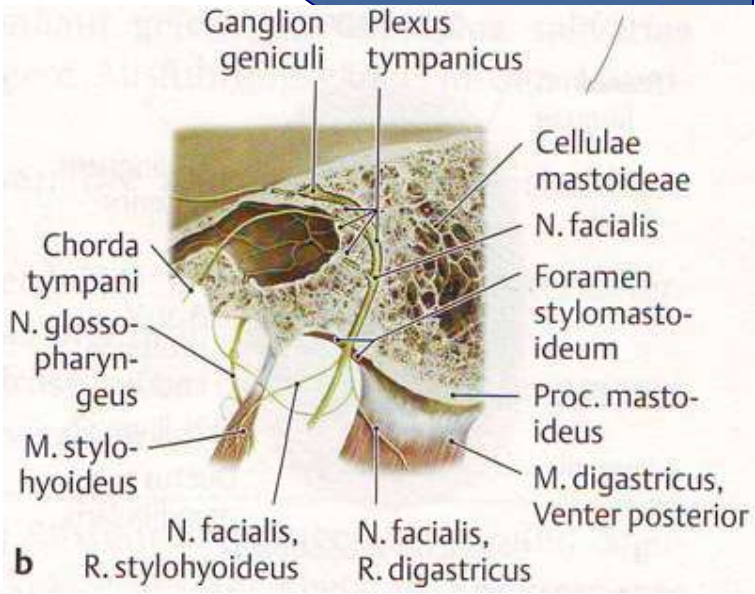
- Sensory and parasympathetic innervation – intermediate nerve (of Wrisberg):
  - ✓ visceral efferents
    - ➢ *n. petrosus major*
      - ⇨ *ganglion pterygopalatinum*
    - ➢ *chorda tympani*
      - ⇨ *n. lingualis*
      - ⇨ *ganglion submandibulare*

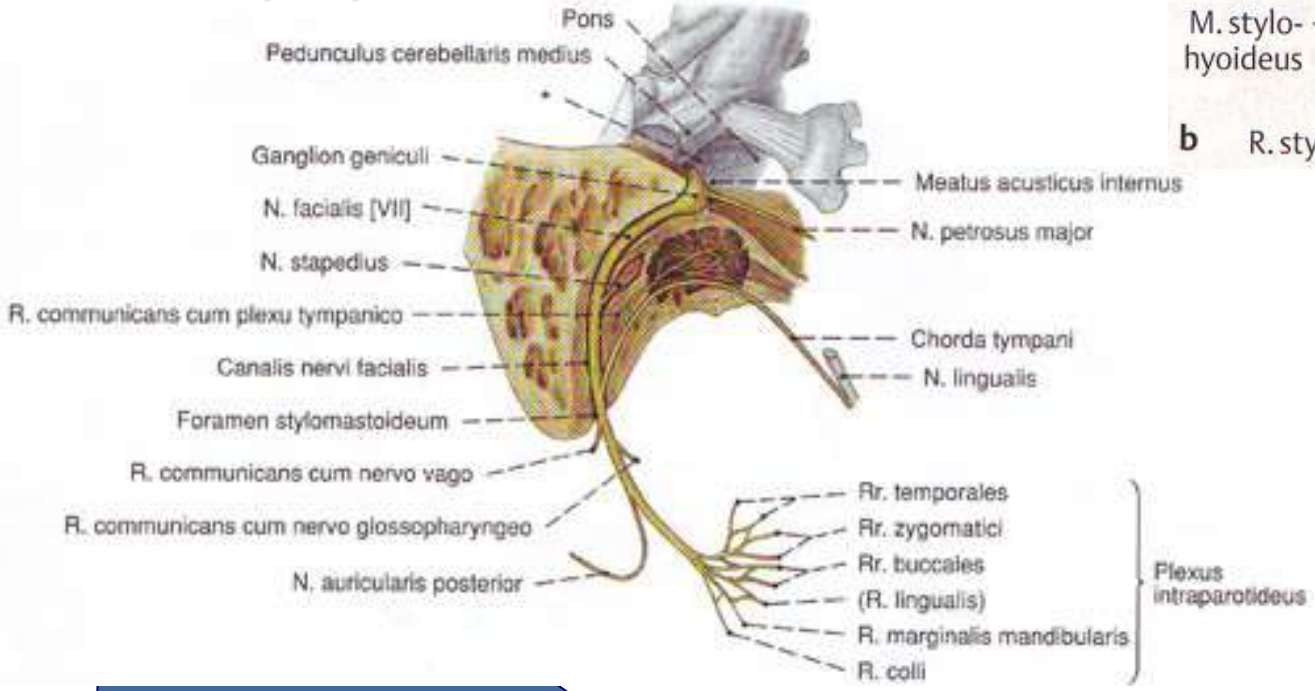




Nerve branches outside skull

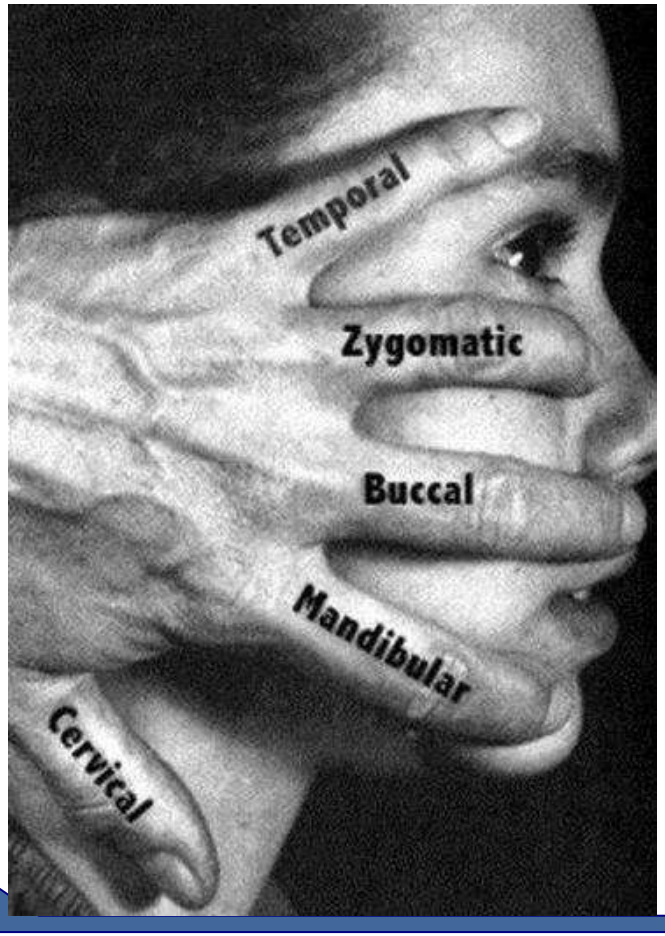
- at exit of stylomastoid foramen:
  - ✓ *n. auricularis posterior*
  - ✓ *r. digastricus* ⇨ *r. communicans cum nervo glossopharyngeo*
  - ✓ *r. stylohyoideus*

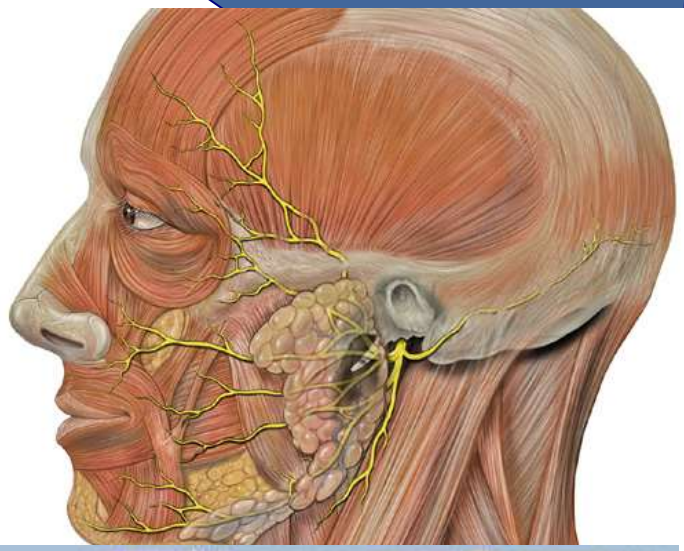


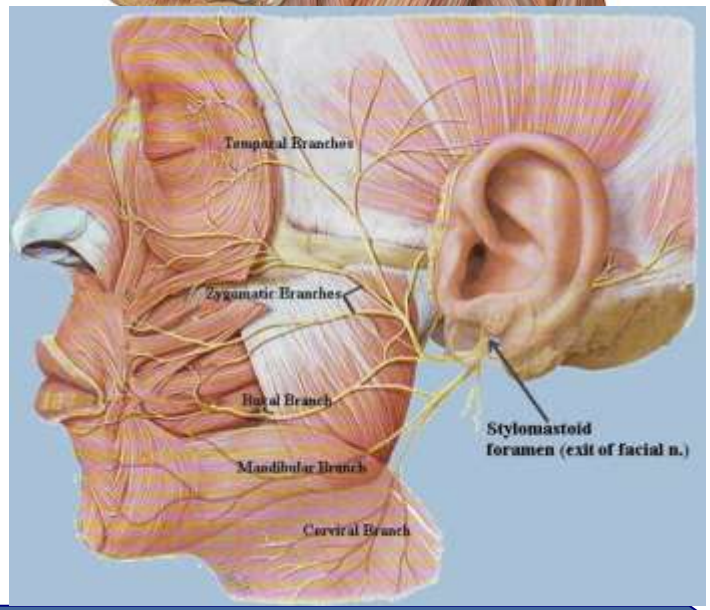


Nerve branches outside skull

- on the face – *plexus intraparotideus:*
  - ✓ temporal branches, *rr. temporales*
  - ✓ zygomatic branches, *rr. zygomatici*
  - ✓ buccal branches, *rr. buccales*
  - ✓ marginal mandibular, *r. marginalis mandibulae*
  - ✓ cervical, *r. colli*

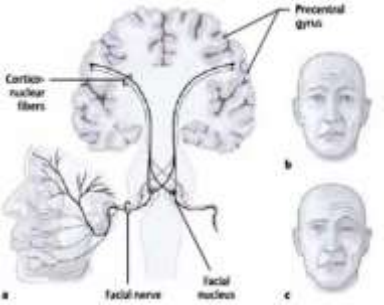


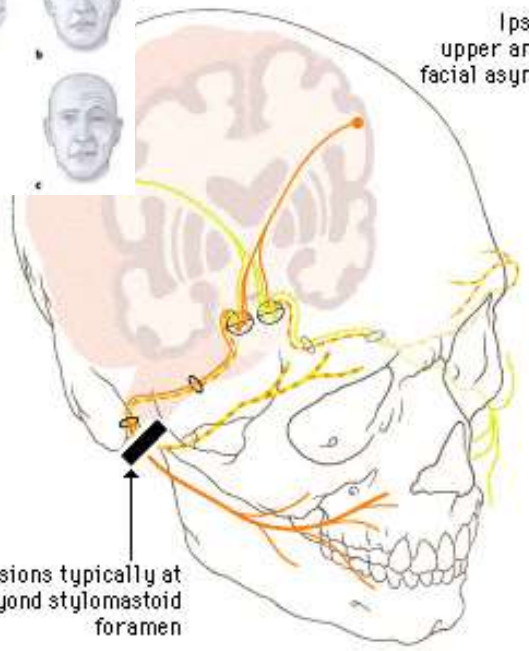


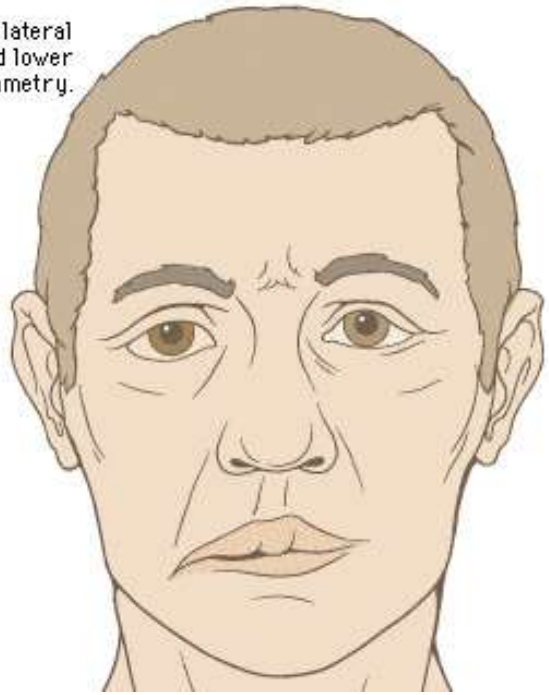


Facial (Bell's) palsy

- ✓ motor innervation of the face
- ✓ sensory innervation of the anterior ⅔ of the tongue
- ✓ paralysis of cranial nerve VII resulting in inability to control facial muscles on the affected side

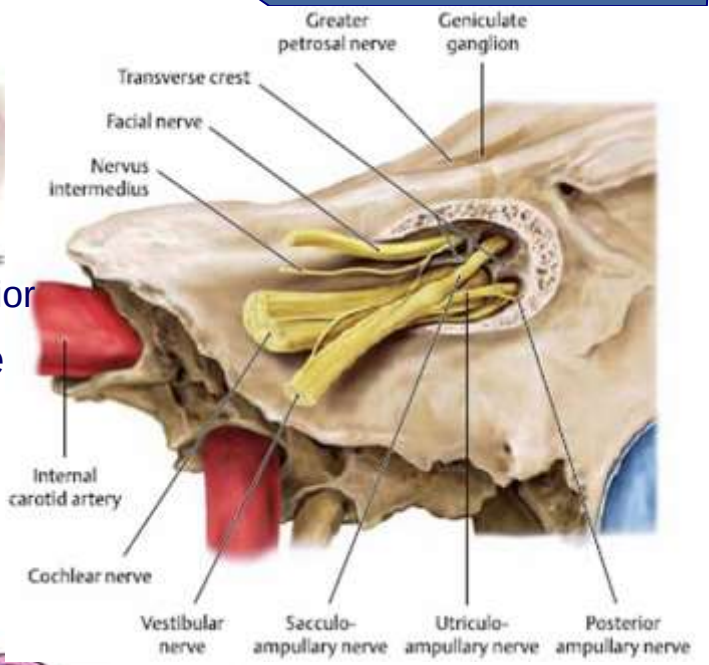


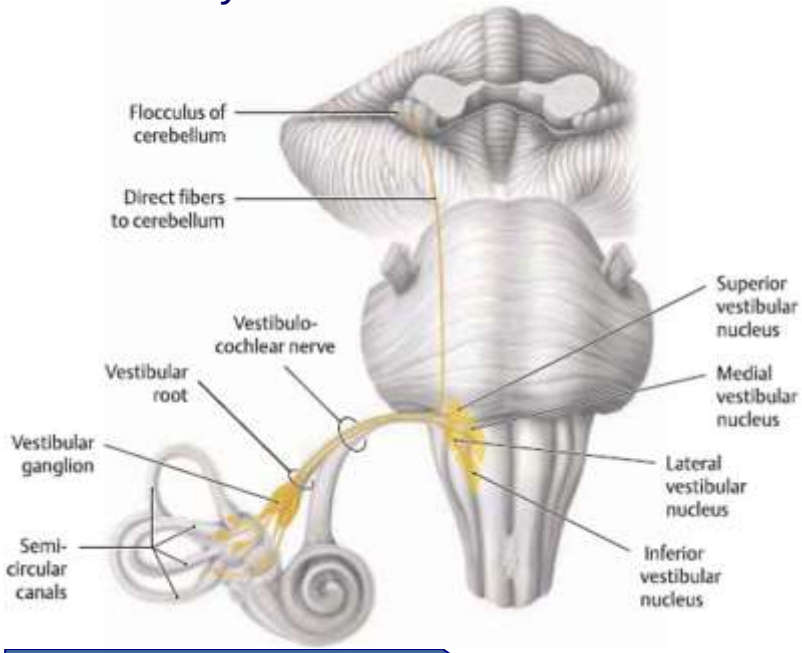


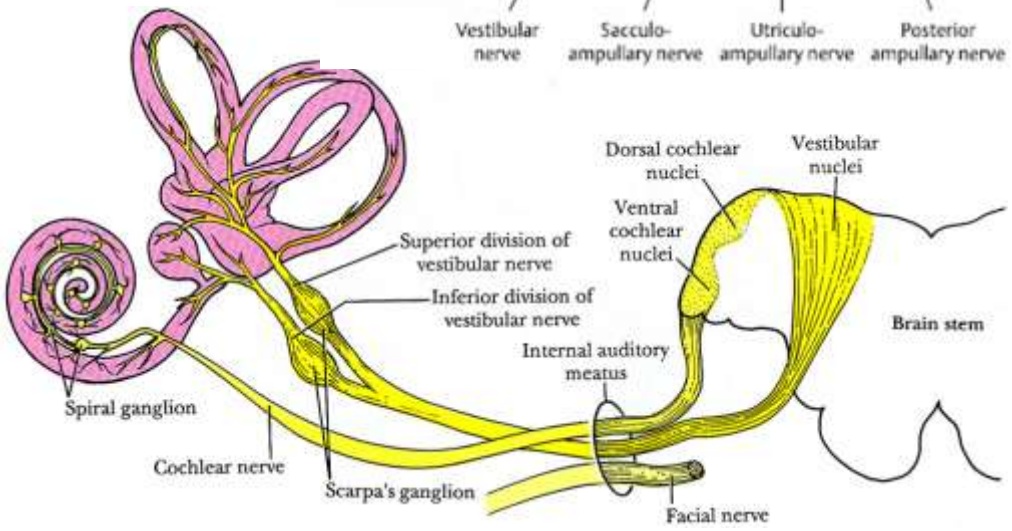


Vestibulocochlear nerve

- specific sense of sound and equilibrium (balance):
  - ✓ vestibular nerve (upper root)
  - ✓ cochlear nerve (lower root)
- vestibular nerve (root):
  - ✓ Scarpa's ganglion *(ganglion vestibulare)* – superior&inferior
  - ✓ peripherally ⇨ receptor cells of the maculae and cristae
  - ✓ centrally ⇨ vestibular nuclei in the brainstem

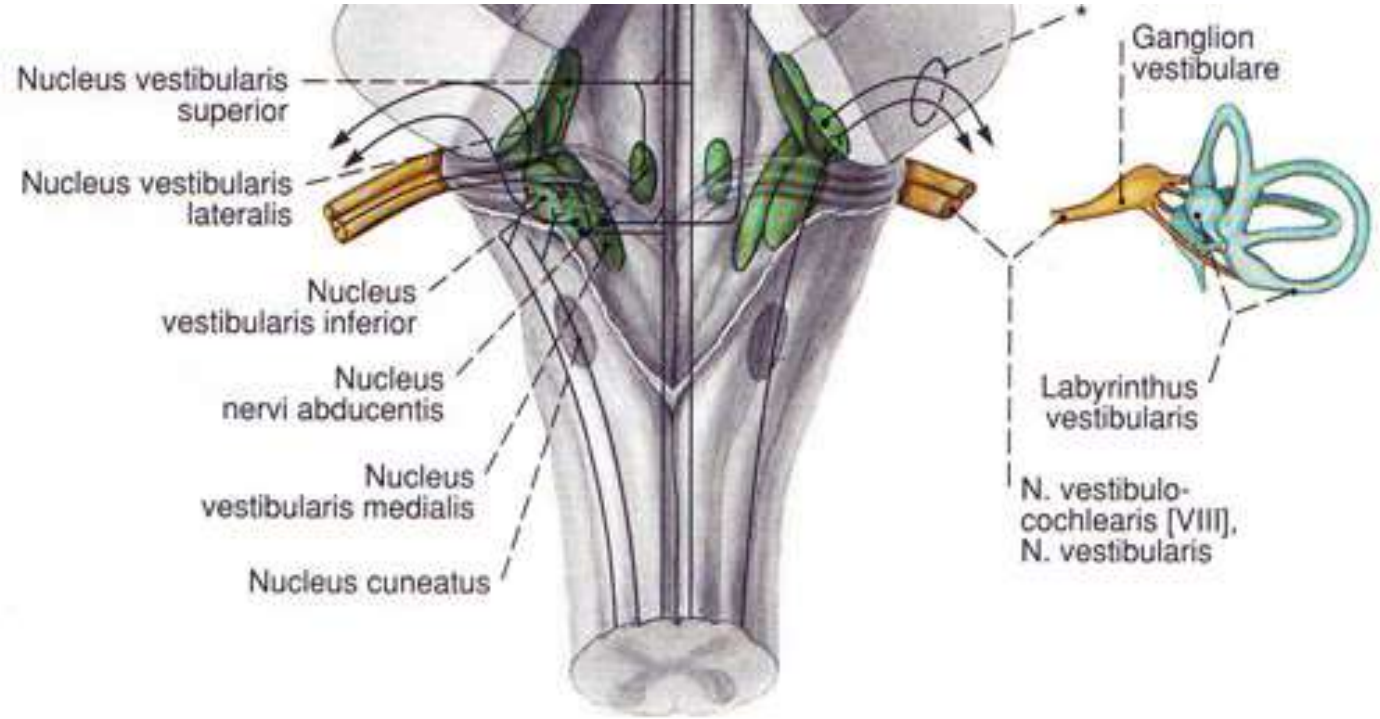


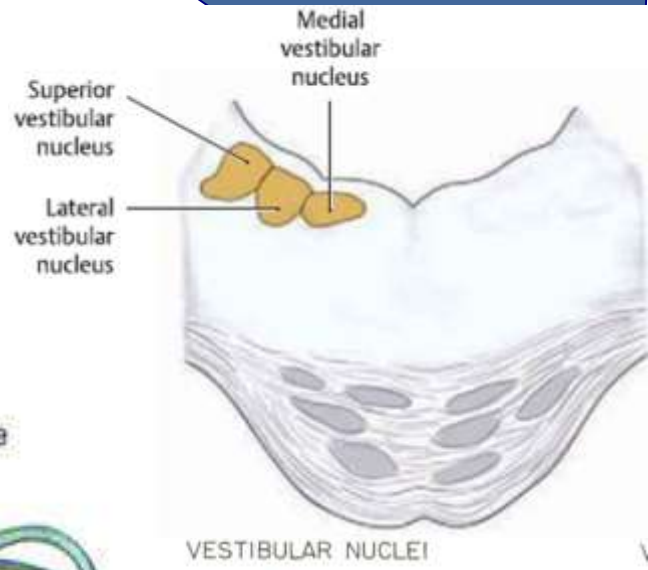


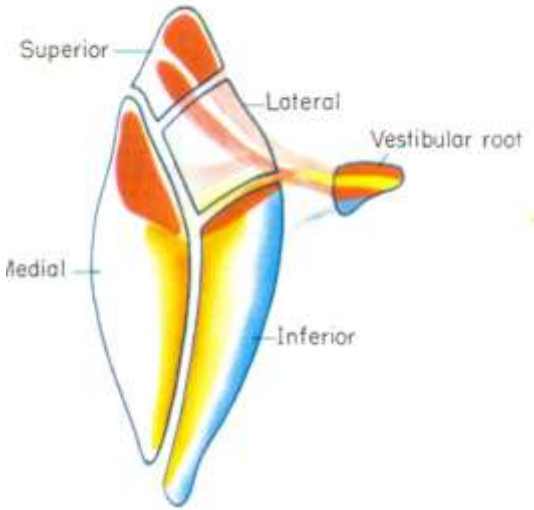


Vestibular nuclei

- Vestibular nuclear complex:
  - ✓ superior vestibular nucleus (Bechterew)
  - ✓ inferior vestibular nucleus (Roller)
  - ✓ medial vestibular nucleus (Schwalbe)
  - ✓ lateral vestibular nucleus (Deiters)

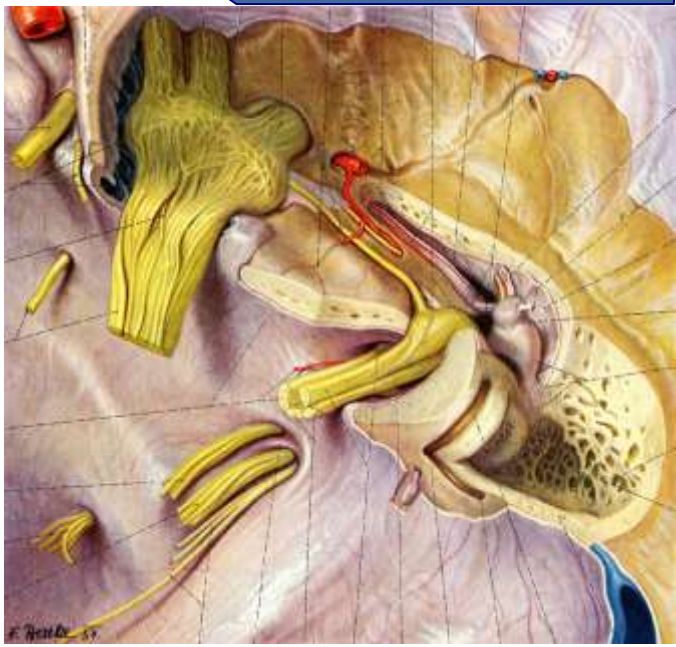


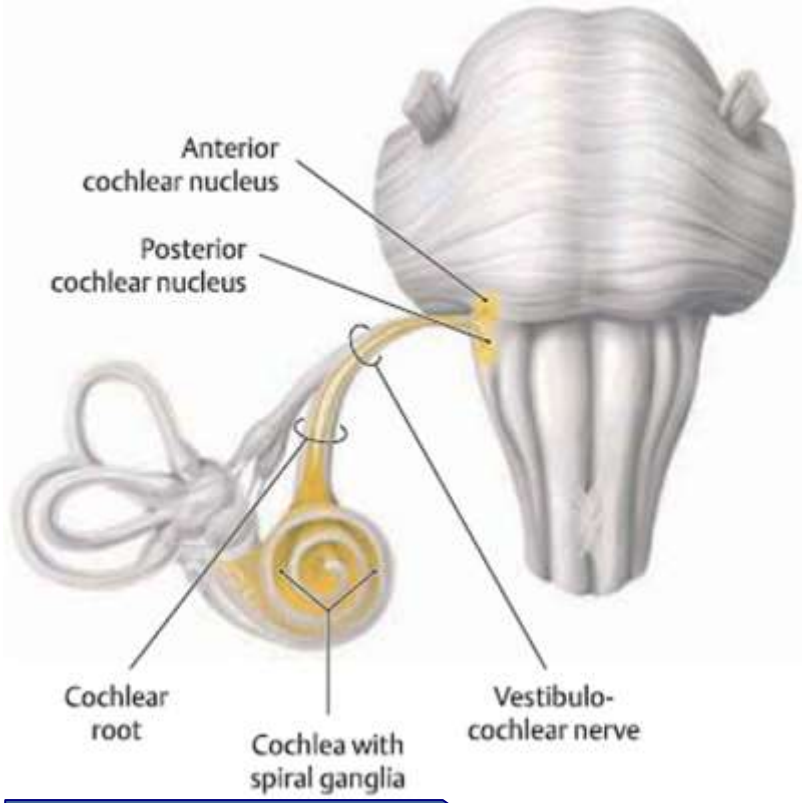


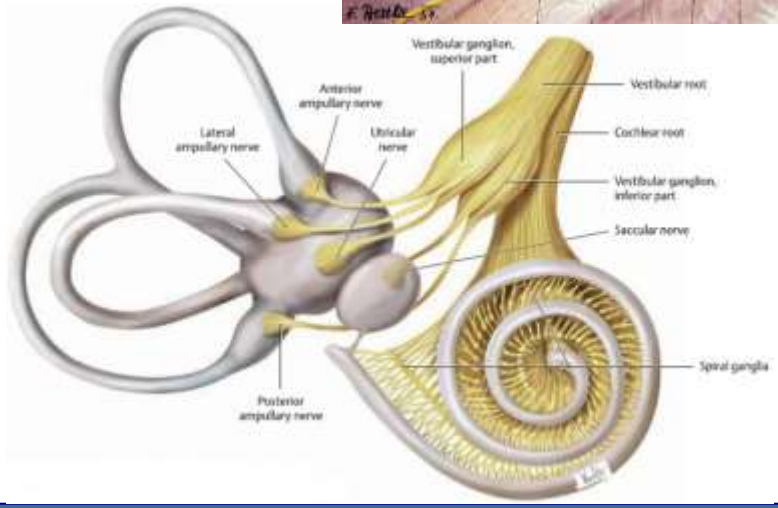


Vestibulocochlear nerve

- cochlear nerve (root):
  - ✓ spiral ganglion *(ganglion cochleare)* – bipolar and pseudounipolar neurons
  - ✓ peripherally ⇨ hair cells of the organ of Corti
  - ✓ centrally ⇨ cochlear nuclei in the brainstem

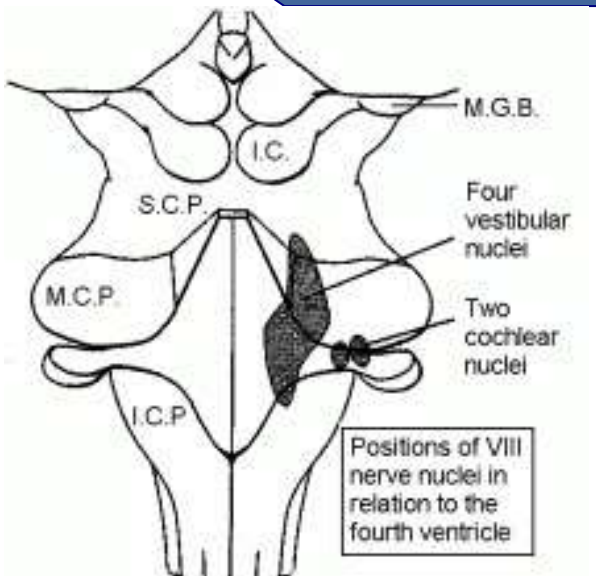


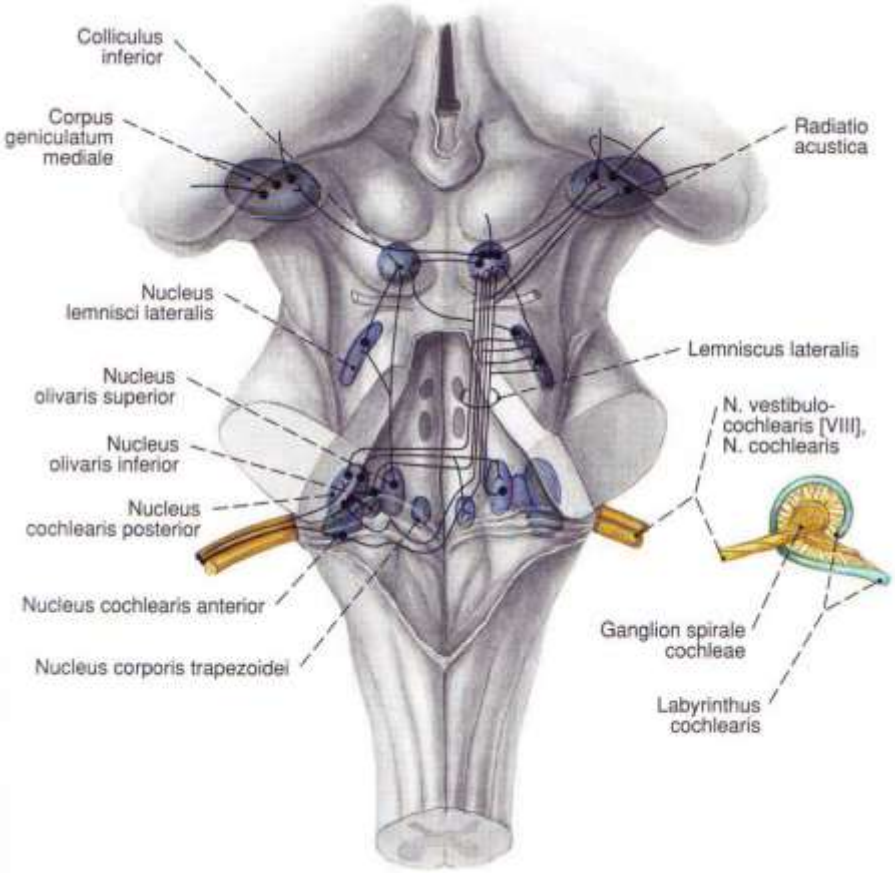


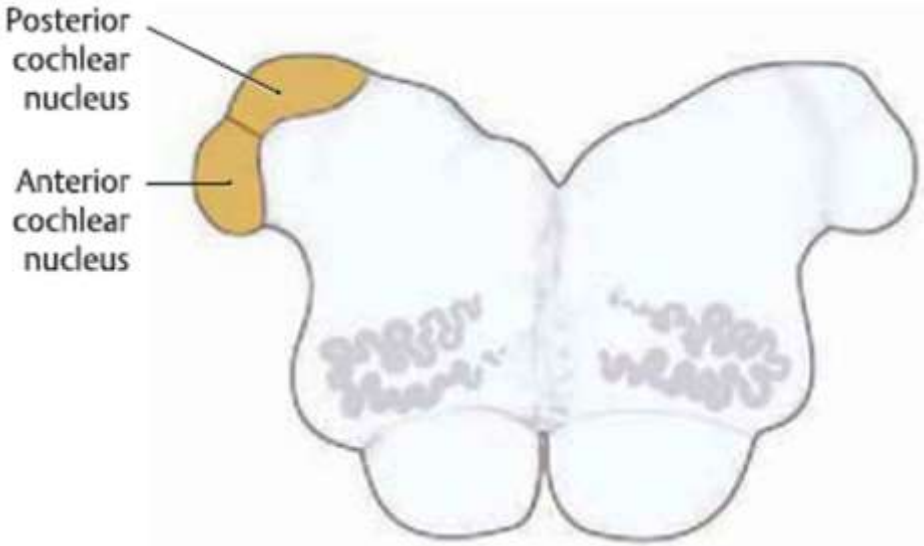


Cochlear nuclei

- Cochlear nuclei:
  - ✓ ventral cochlear nucleus
  - ✓ dorsal cochlear nucleus

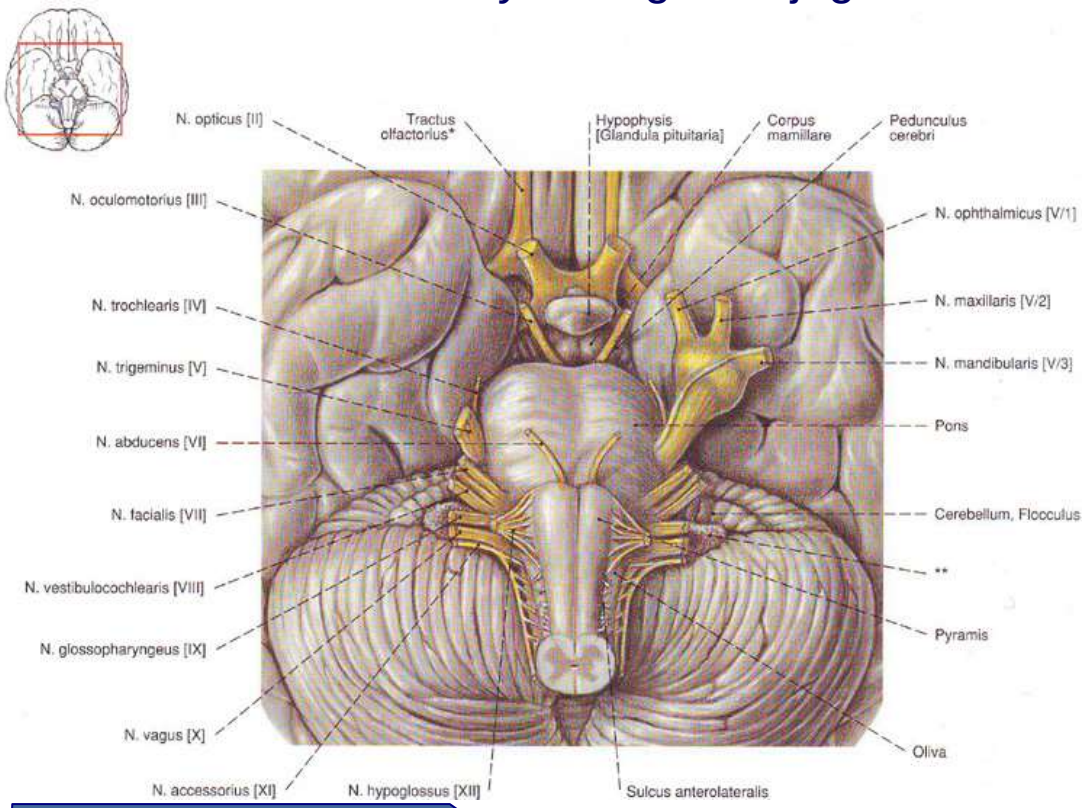


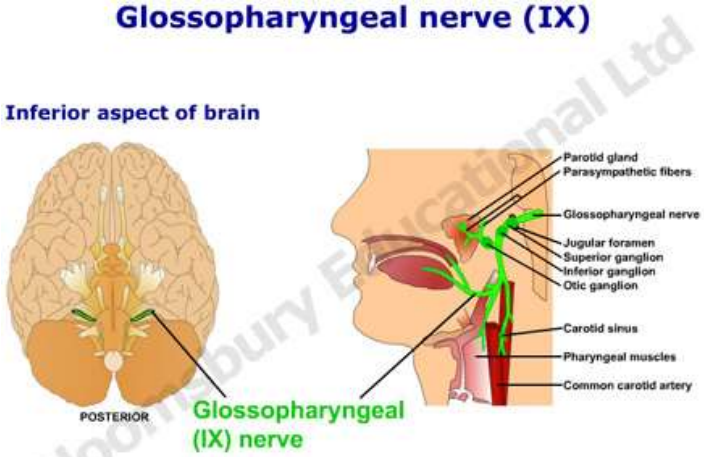




Glossopharyngeal nerve

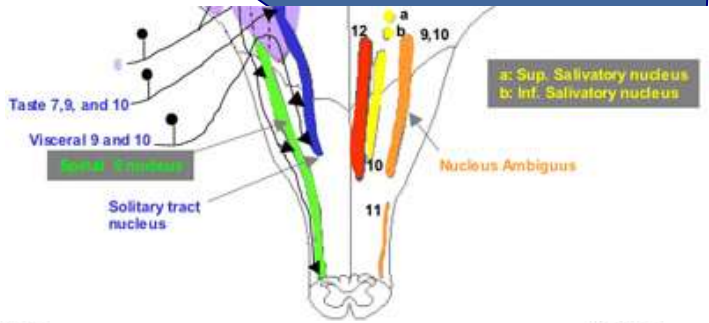
- mixed branchiomeric nerve – motor, somatosensory, special visceral afferent and parasympathetic fibers
- site of emergence – 3-4 rootlets in the groove between the olive and inferior cerebellar peduncle
- leaves the cranial cavity through the jugular foramen

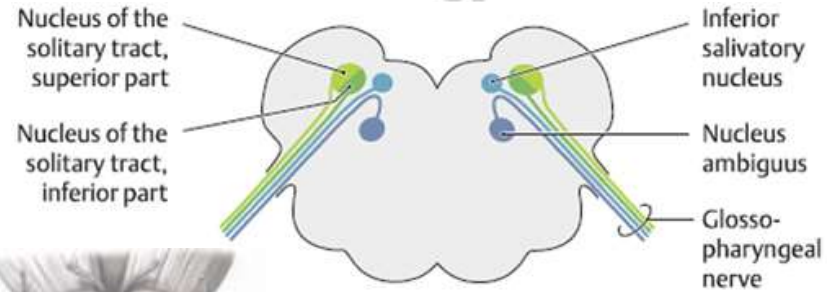


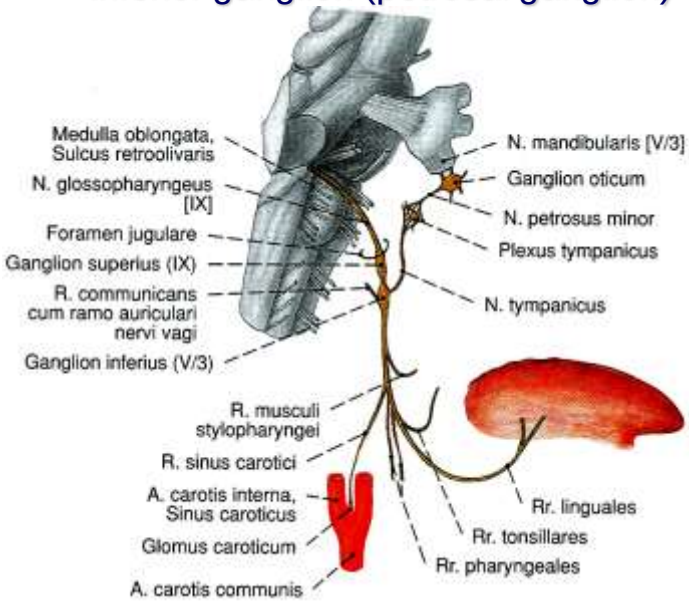


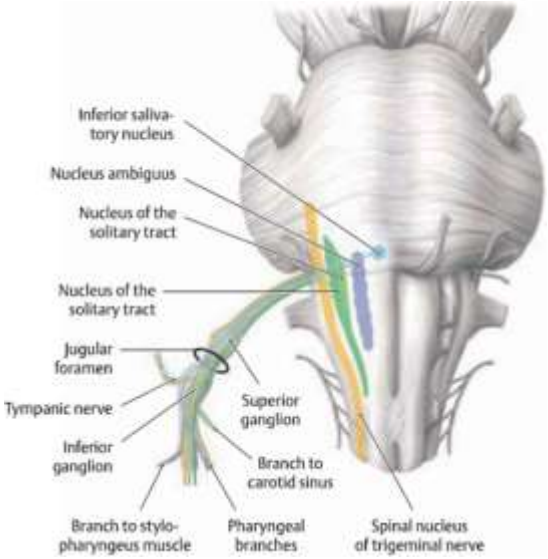
Glossopharyngeal nerve nuclei

- nuclei – in the medulla oblongata:
  - ✓ motor – nucleus ambiguus (common with nn. X and XI)
  - ✓ parasympathetic – inferior salivatory nucleus
  - ✓ sensory:
    - ➢ solitary tract nucleus (common with nn. VII and X)
    - ➢ spinal trigeminal nucleus? – common sensation
- in *foramen jugulare:*
  - ✓ superior ganglion (jugular ganglion)
  - ✓ inferior ganglion (petrosal ganglion)



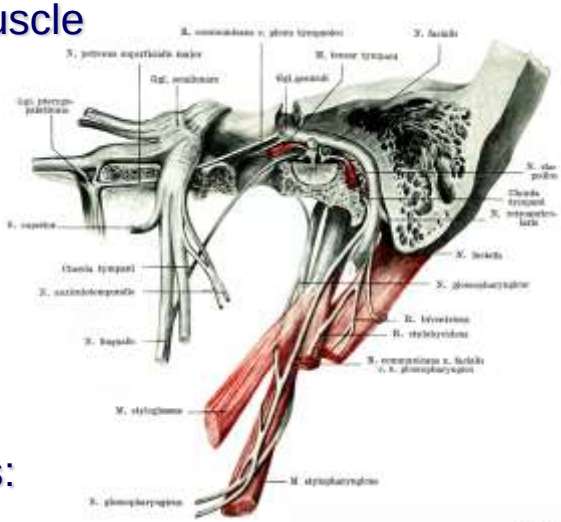


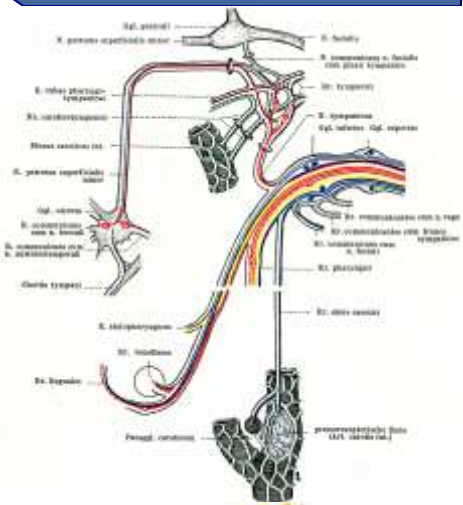


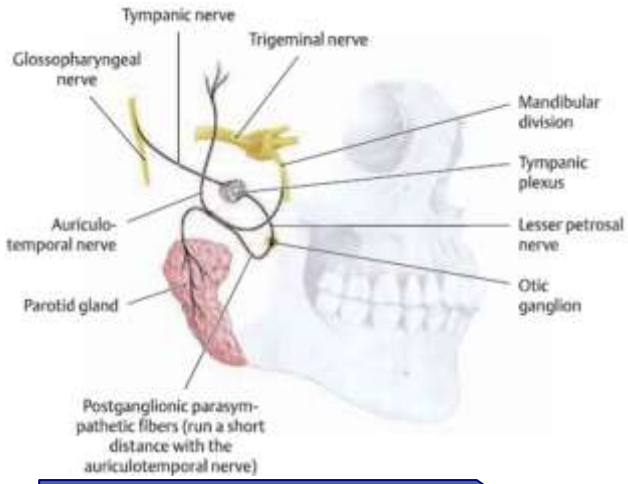


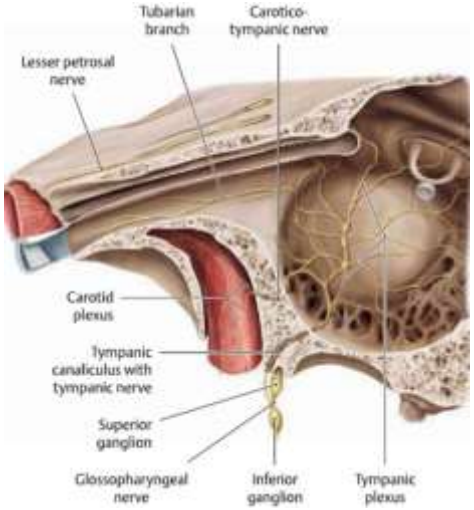
Glossopharyngeal nerve branches

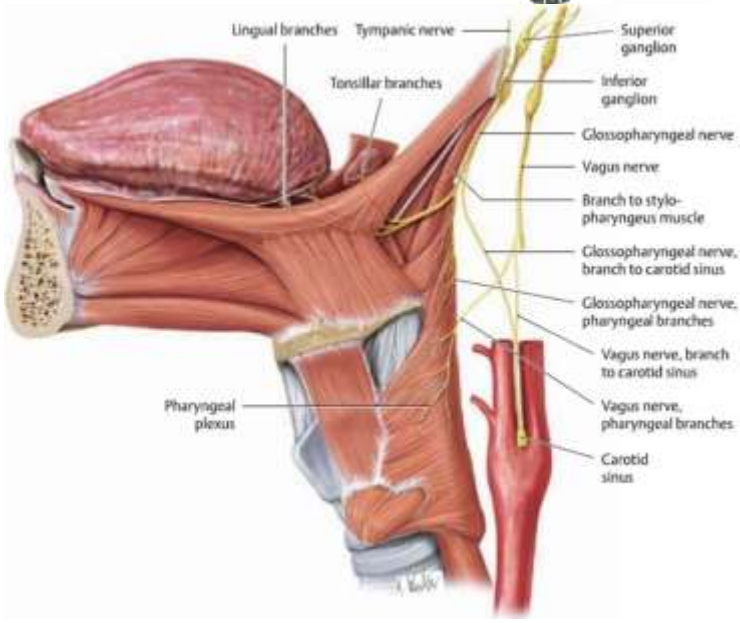
- muscular branches⇨ stylopharyngeal muscle
- sensory branches:
  - ✓ tympanic nerve ⇨ tympanic plexus
  - ✓ carotid sinus nerve
  - ✓ pharyngeal branches
  - ✓ tonsillar branches
  - ✓ lingual branches – posterior ⅓ (postsulcal) part of tongue
- parasympathetic (secretomotor) branches:
  - ✓ lesser petrosal nerve ⇨ otic ganglion ⇨ auriculotemporal nerve ⇨ parotid gland





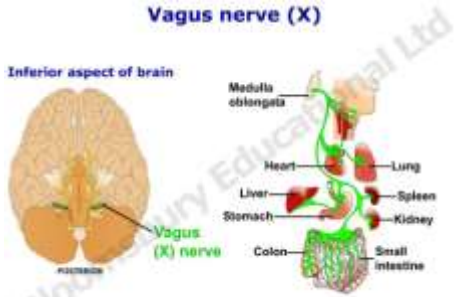


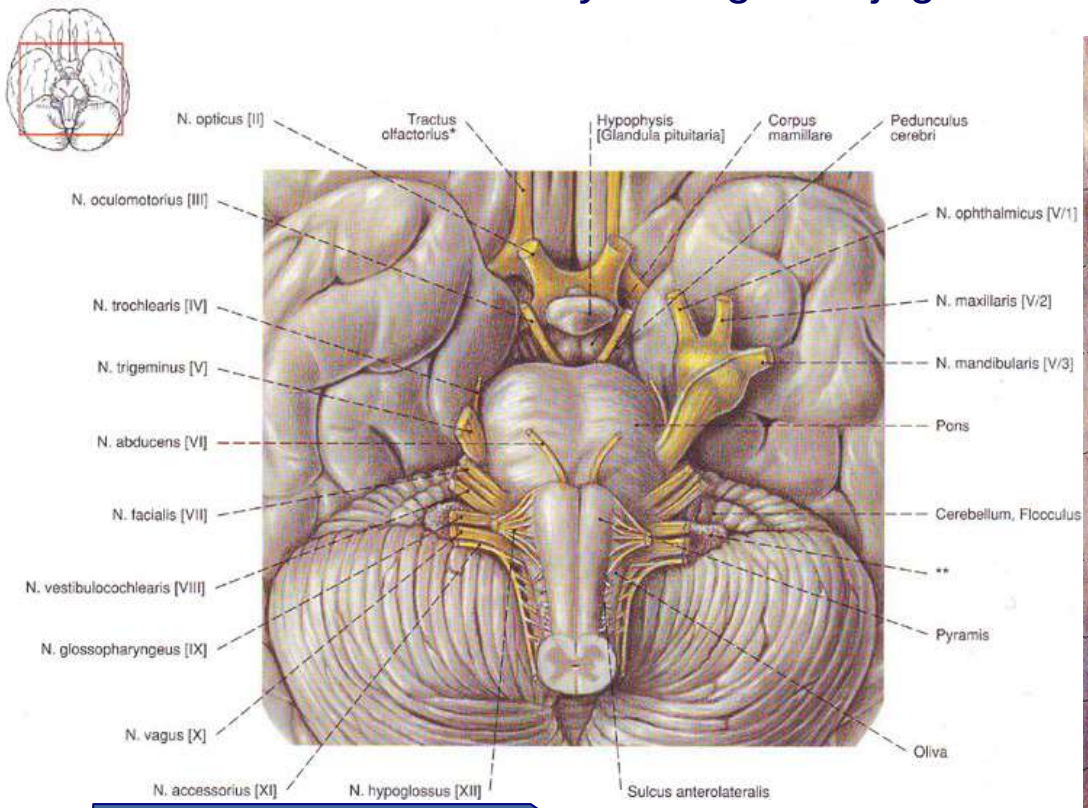


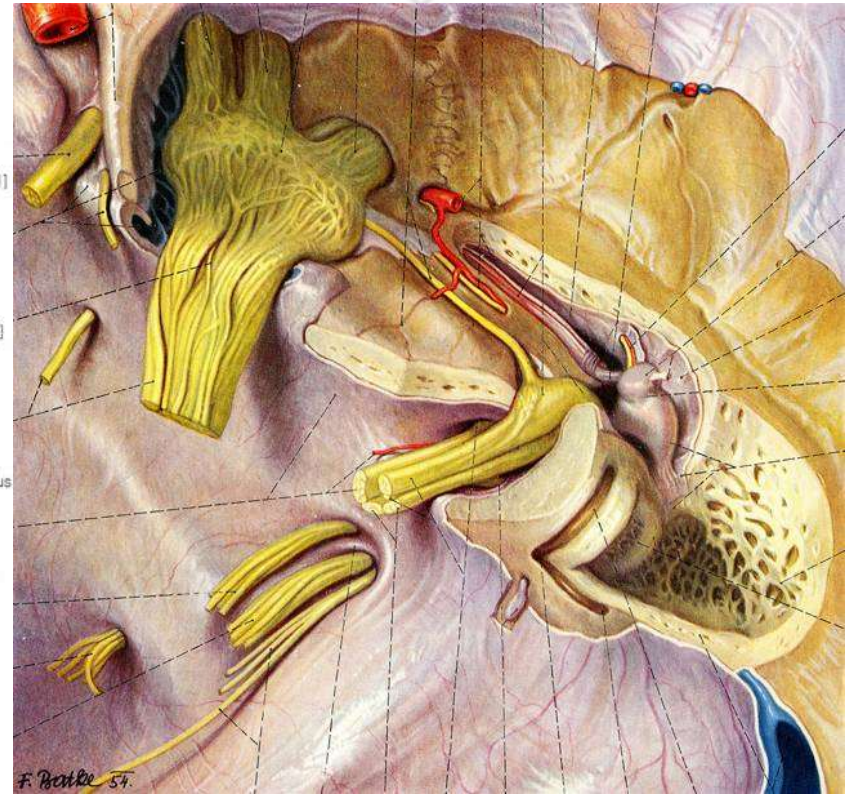


Vagus nerve, *n. vagus*

- mixed (pneumogastric) nerve – motor, somatosensory, special visceral afferent and parasympathetic fibers
- emergence – below the n. IX; with 8-10 rootlets in posterolateral sulcus between the olive and inferior cerebellar peduncle
- leaves the cranial cavity through the jugular foramen



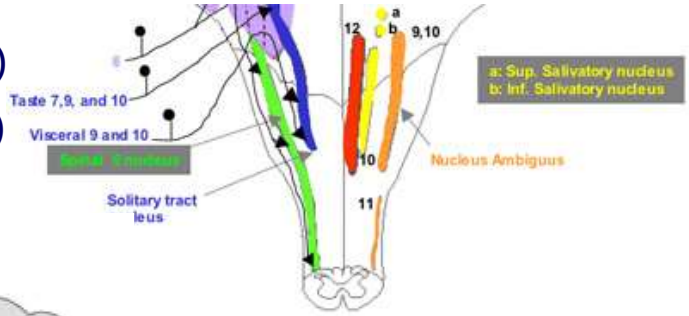


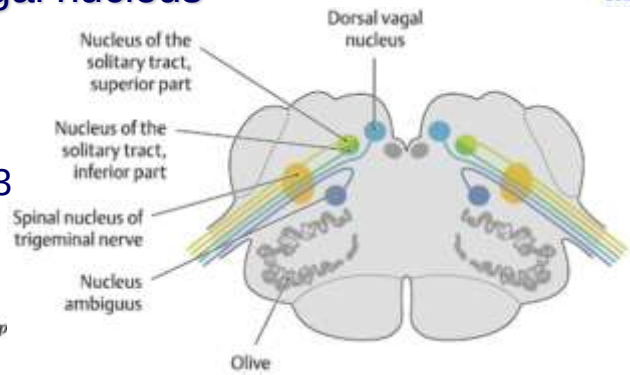


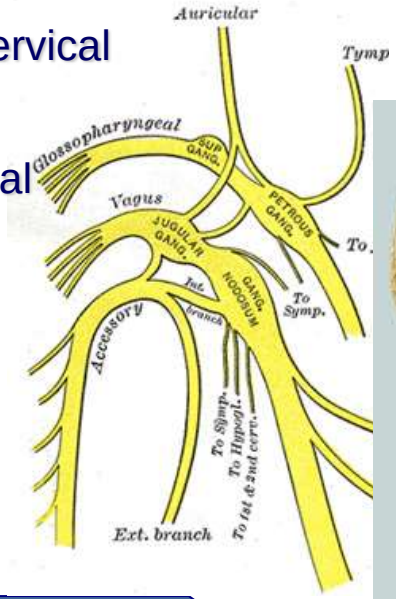
NB: Latin *vagus* means literally "Wandering"

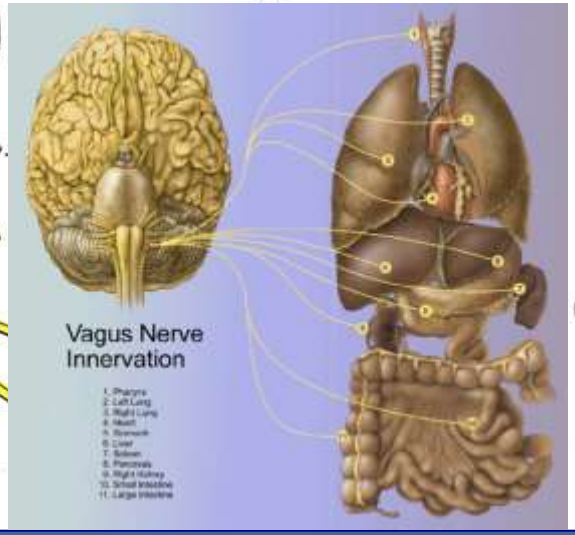
Nuclei and parts of the vagus nerve

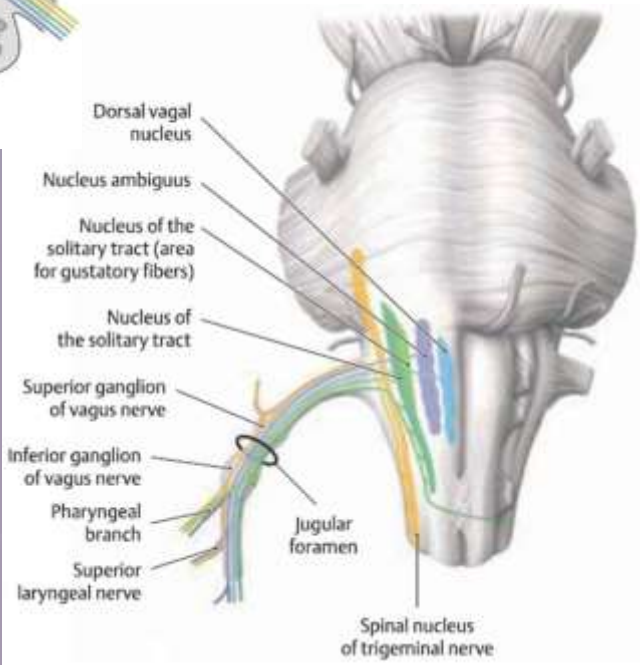
- nuclei – in the medulla oblongata:
  - ✓ motor – nucleus ambiguus (common with nn. IX and XI)
  - ✓ sensory – solitary tract nucleus (common with VII and IX)
  - ✓ parasympathetic – dorsal vagal nucleus
- in *foramen jugulare:*
  - ✓ superior (jugular) ganglion
  - ✓ inferior (nodose) ganglion – C2-C3
- parts:
  - ✓ cranio-cervical
  - ✓ thoracic
  - ✓ abdominal







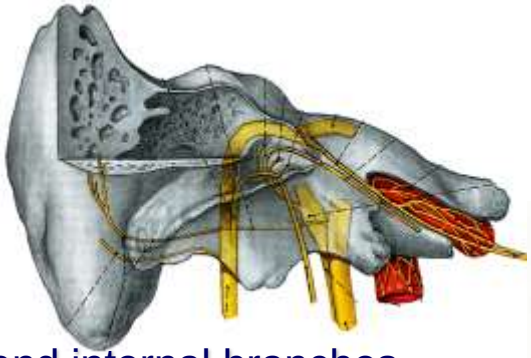


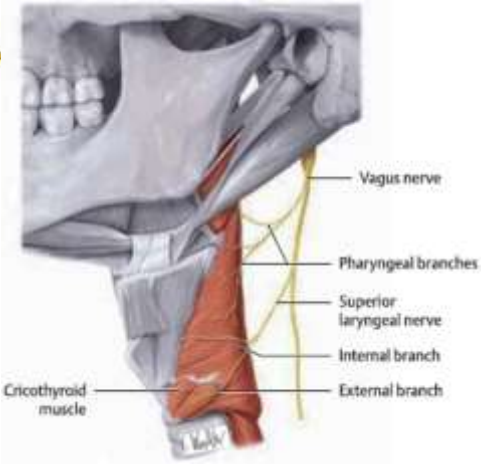


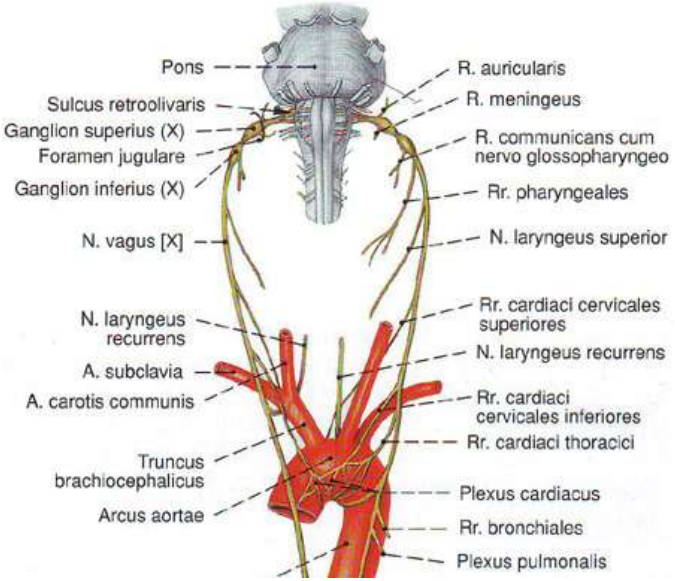
NB: Latin *vagus* means literally "Wandering"

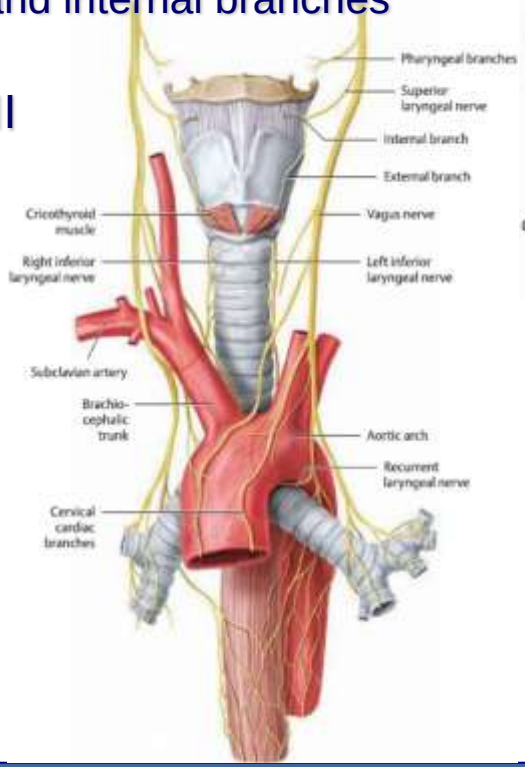
Vagus nerve: cranio-cervical part

- branches in the jugular fossa:
  - ✓ meningeal branches
  - ✓ auricular branch
- branches in the neck:
  - ✓ pharyngeal branch
  - ✓ branches to the carotid body
  - ✓ superior laryngeal nerve – external and internal branches
  - ✓ superior cardiac branches
  - ✓ rami communicantes cum IX, XI, XII



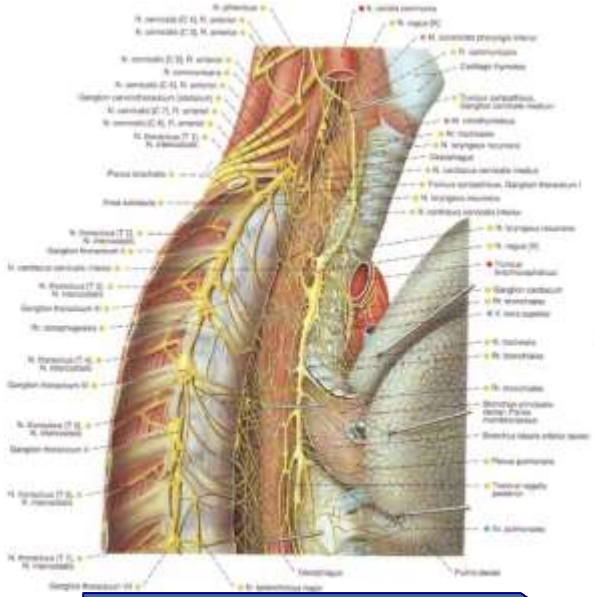


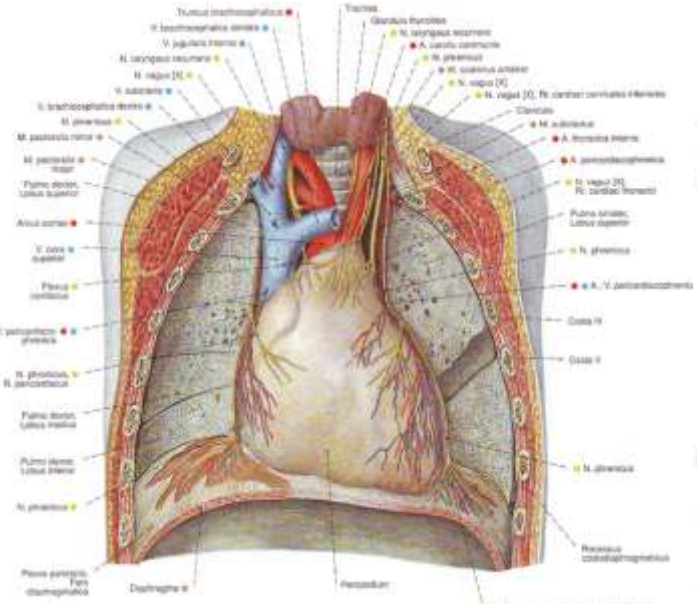


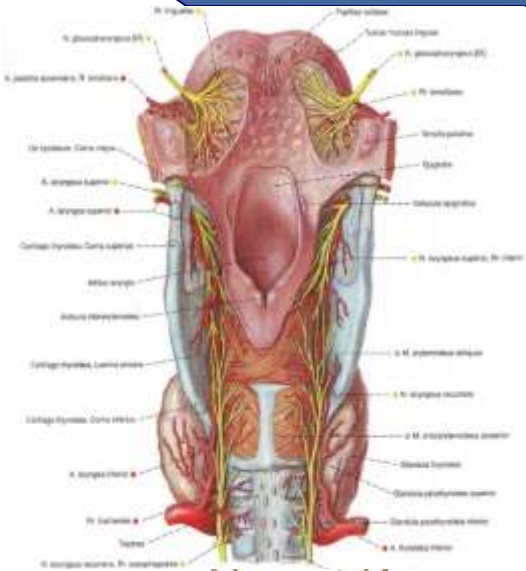


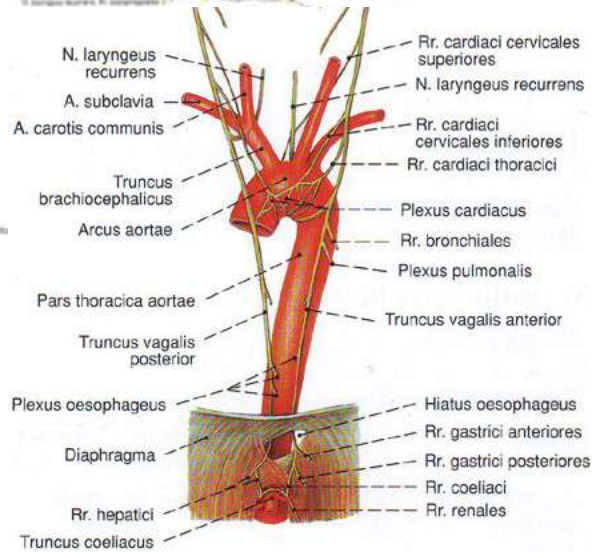
Vagus nerve: thoracic part

- branches in the thorax:
  - ✓ recurrent laryngeal nerve ⇨ inferior laryngeal nerve
  - ✓ inferior cardiac branches
  - ✓ thoracic cardiac branches
  - ✓ oesophageal branches
  - ✓ bronchial and tracheal branches
  - ✓ anterior&posterior pulmonary branches







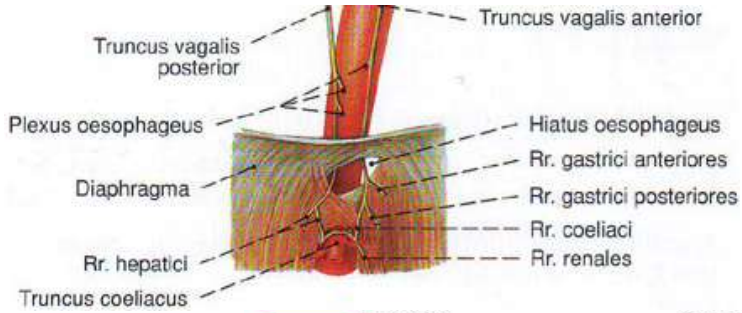


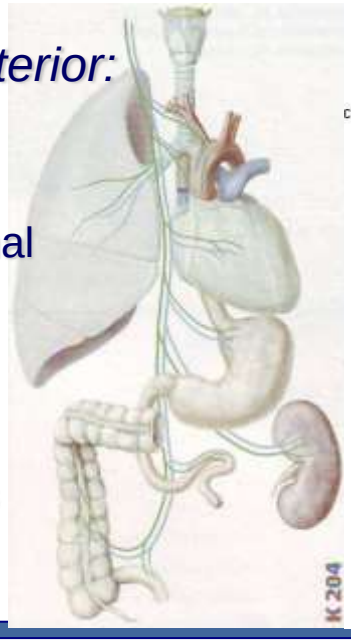
Vagus nerve: abdominal part

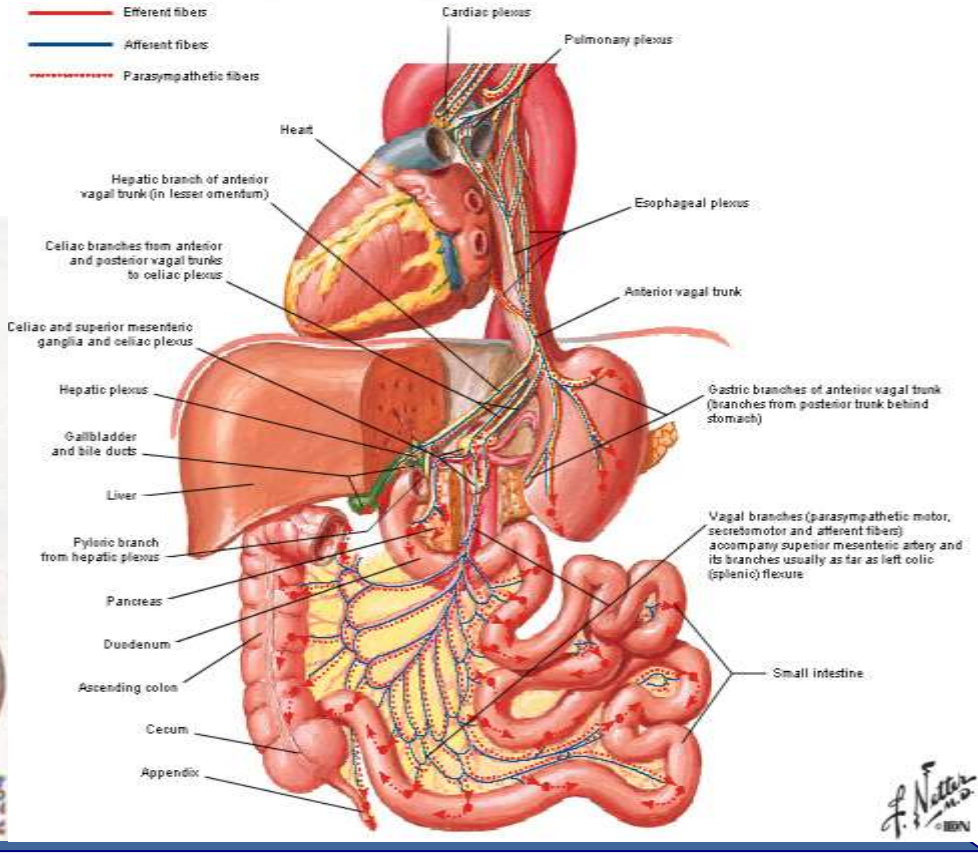
- branches in the abdomen:
  - ✓ anterior vagal trunk ⇨

    plexus gastricus anterior:
    - ➢ gastric branches
    - ➢ hepatic branches
  - ✓ posterior vagal trunk ⇨

    plexus gastricus posterior:
    - ➢ coeliac branches
    - ➢ renal and suprarenal branches
    - ➢ splenic branches
    - ➢ intestinal branches

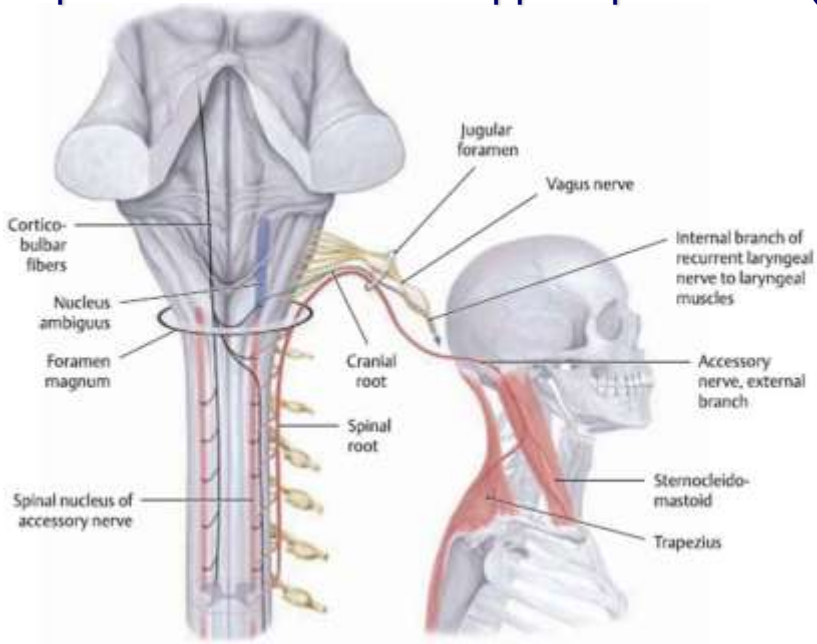


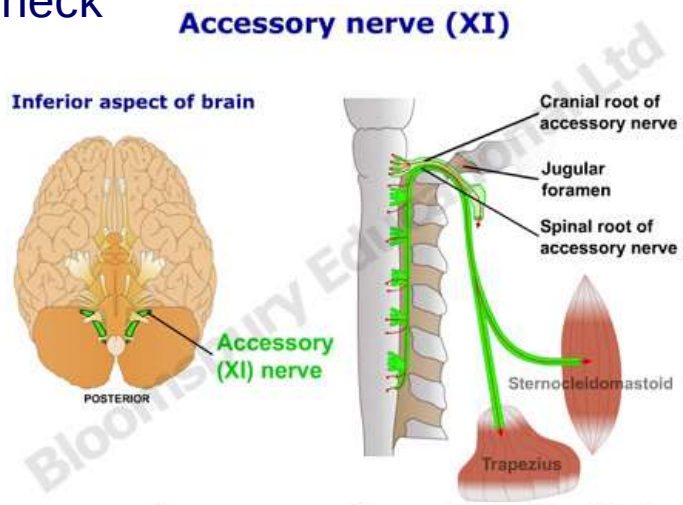


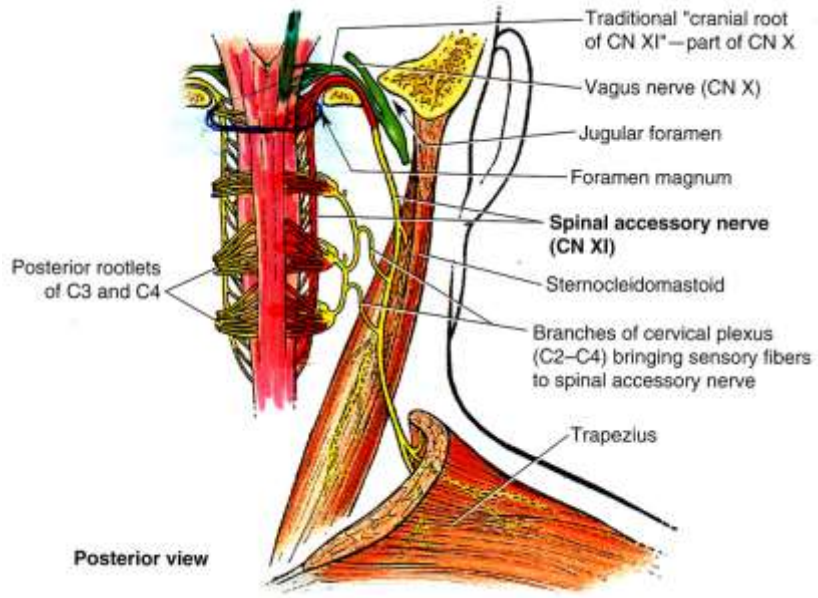


Accessory nerve, *n. accessorius*

- purely motor nerve – controls specific muscles of the neck
- origin:
  - ✓ cranial root – smaller, part of the vagus nerve *(pars vagalis)*
  - ✓ spinal root – *pars spinalis* ⇨ spinal accessory nerve
- nuclei – in the medulla and spinal cord:
  - ✓ *nucleus ambiguus* (common with nn. IX and X)
  - ✓ spinal nucleus – in the upper spinal cord (C1-C5)

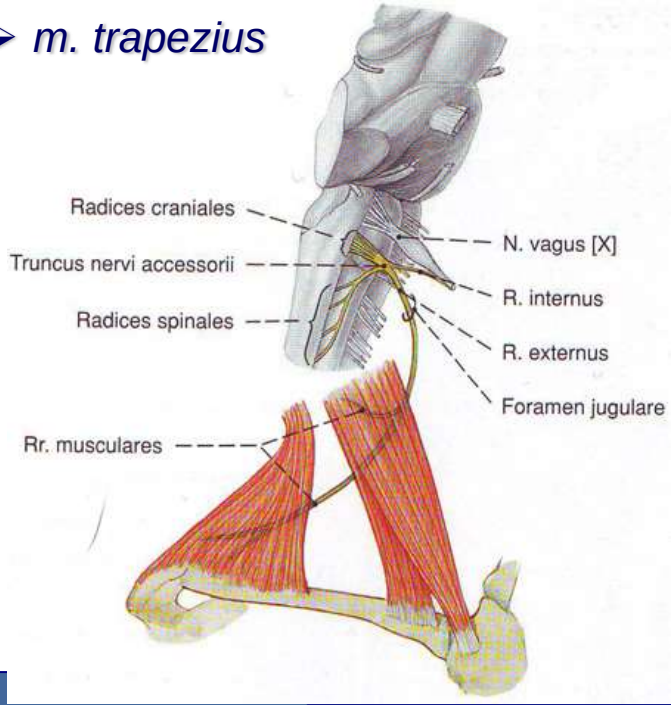


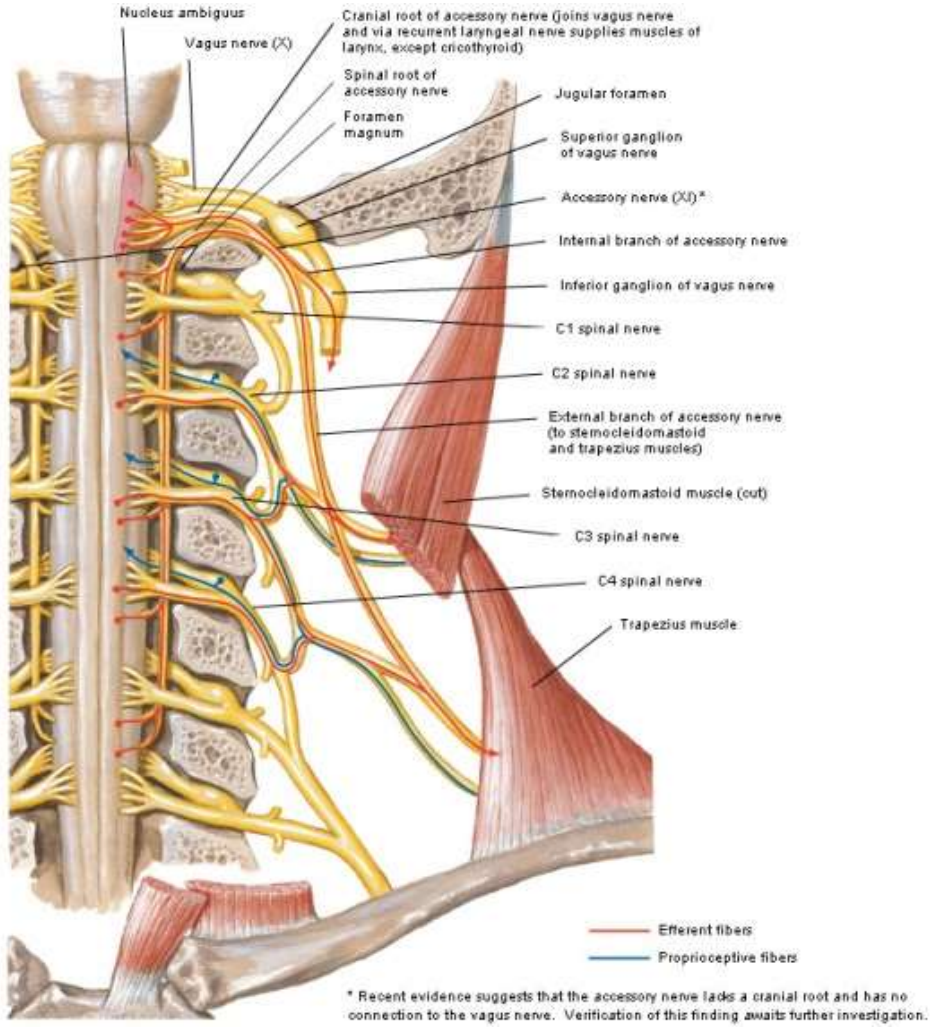




Accessory nerve, *n. accessorius*

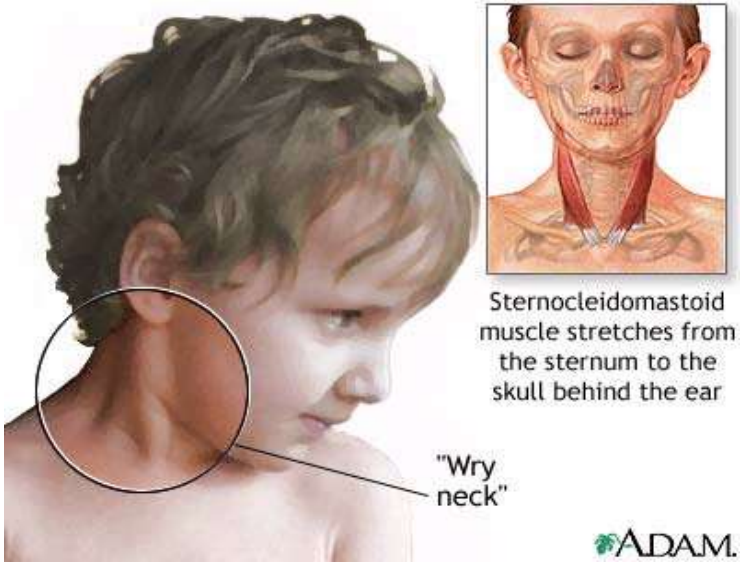
- two parts join in *foramen jugulare*
  - ✓ *truncus nervi accessorii*
- branches:
  - ✓ internal ramus ⇨ *n. vagus*
    ⇨ *n. laryngeus recurrens*
  - ✓ external ramus – motor supply:
    - ➢ *m. sternocleidomastoideus*
    - ➢ *m. trapezius*





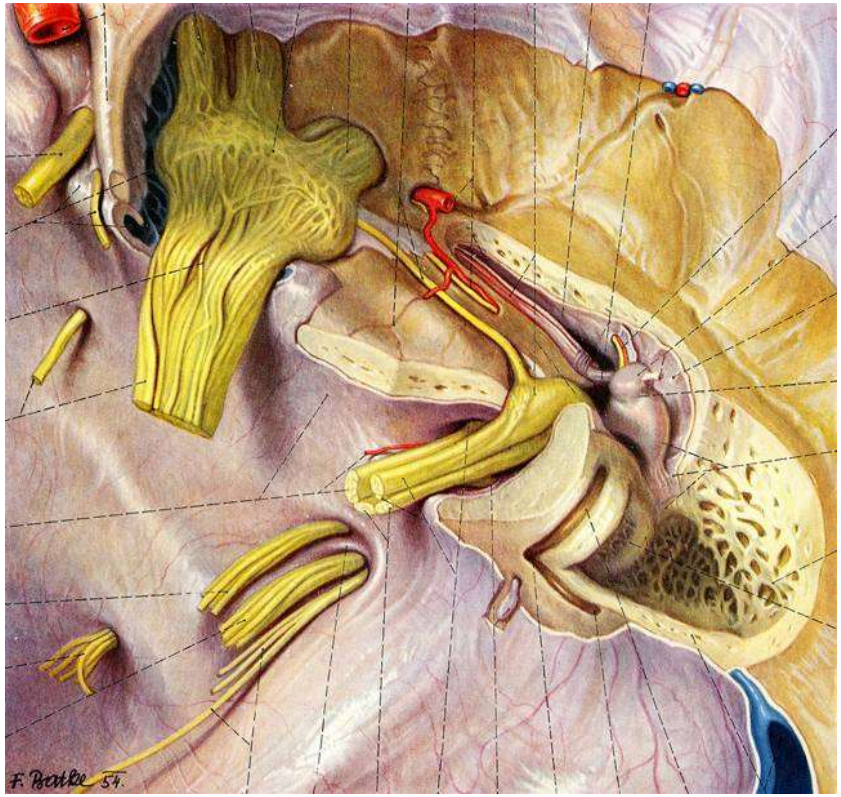
Lesions of the accessory nerve

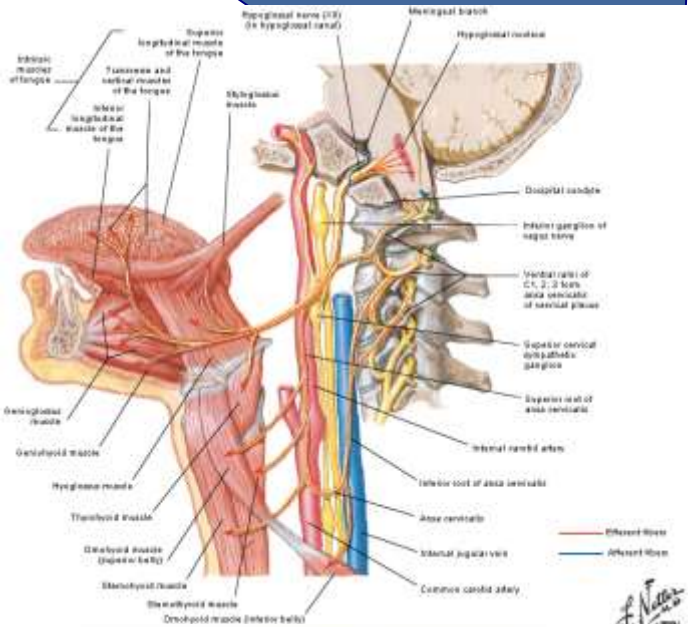
- ✓ paralysis of the trapezius muscle
- ✓ paralysis of the sternocleidomastoid muscle

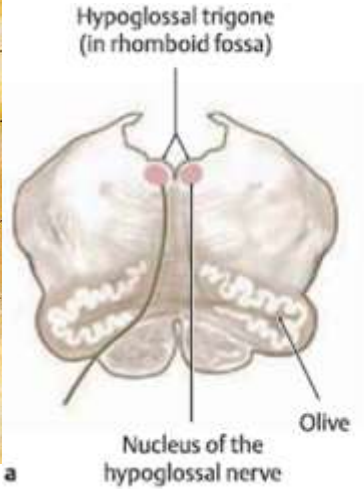


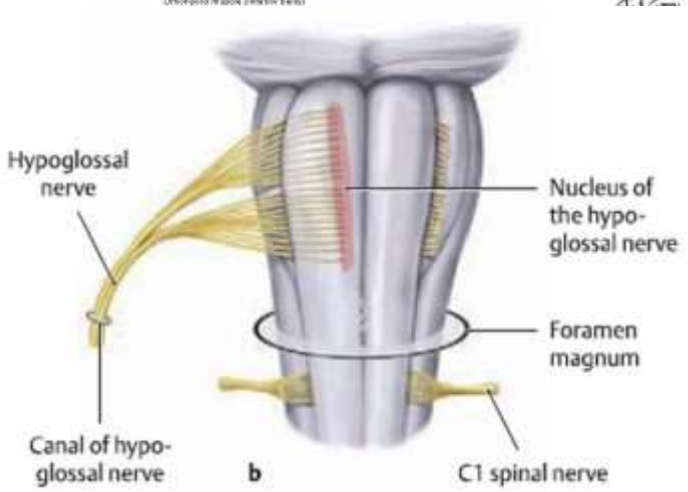
Hypoglossal nerve, *n. hypoglossus*

- purely motor nerve – motor nerve of the tongue
- emergence – with 10-15 rootlets in anterolateral sulcus
- nucleus – in hypoglossal triangle of the fourth ventricle:
  - ✓ hypoglossal nucleus – 2 cm long
- leaves cranium through *canalis nervi hypoglossi*



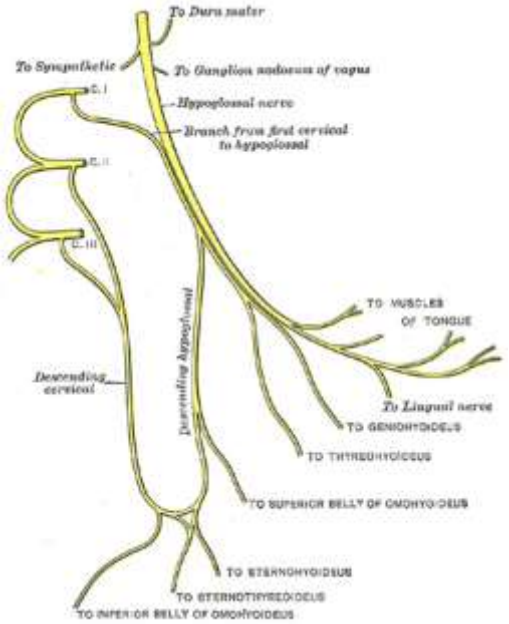


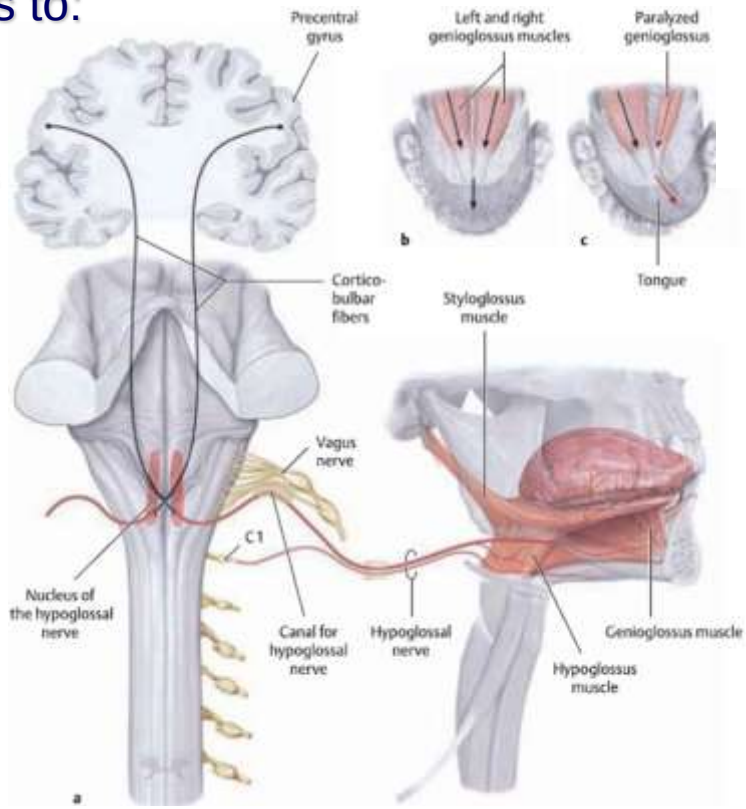


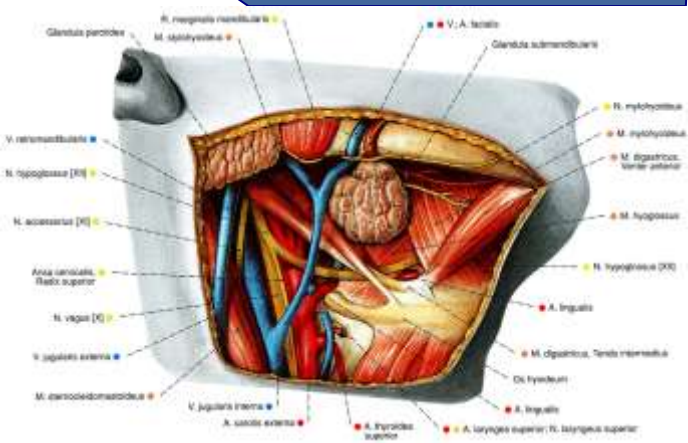


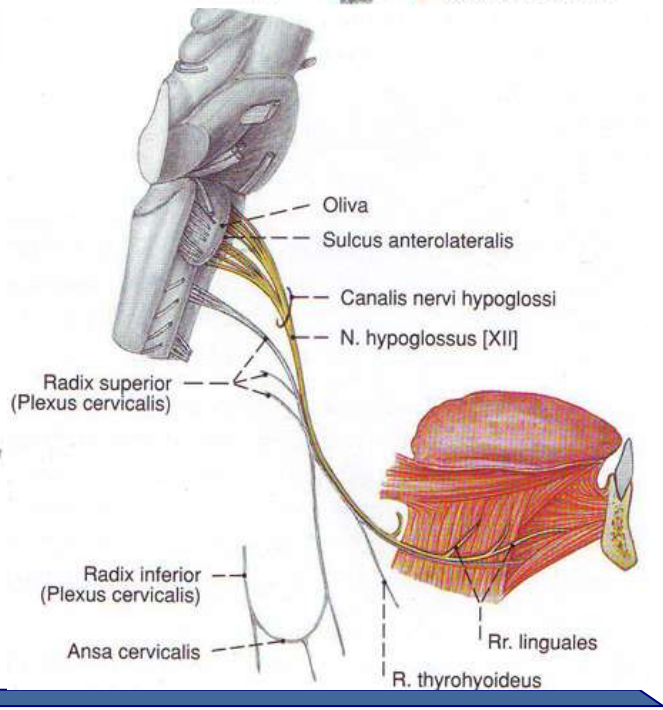
Hypoglossal nerve, *n. hypoglossus*

- branches:
  - ✓ meningeal branch
  - ✓ descending branch *(radix superior ansae cervicalis)*
  - ✓ muscular branches to thyrohyoid&geniohyoid
  - ✓ lingual branches to:
    - ➢ styloglossus
    - ➢ hyoglossus
    - ➢ genioglossus









Thank you…