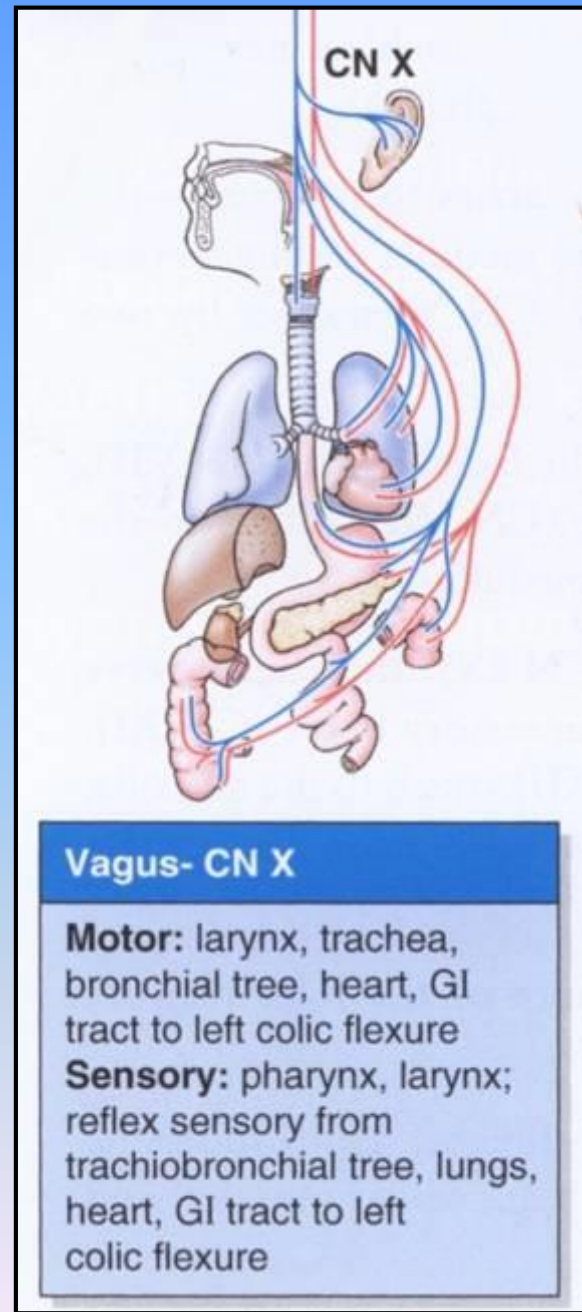
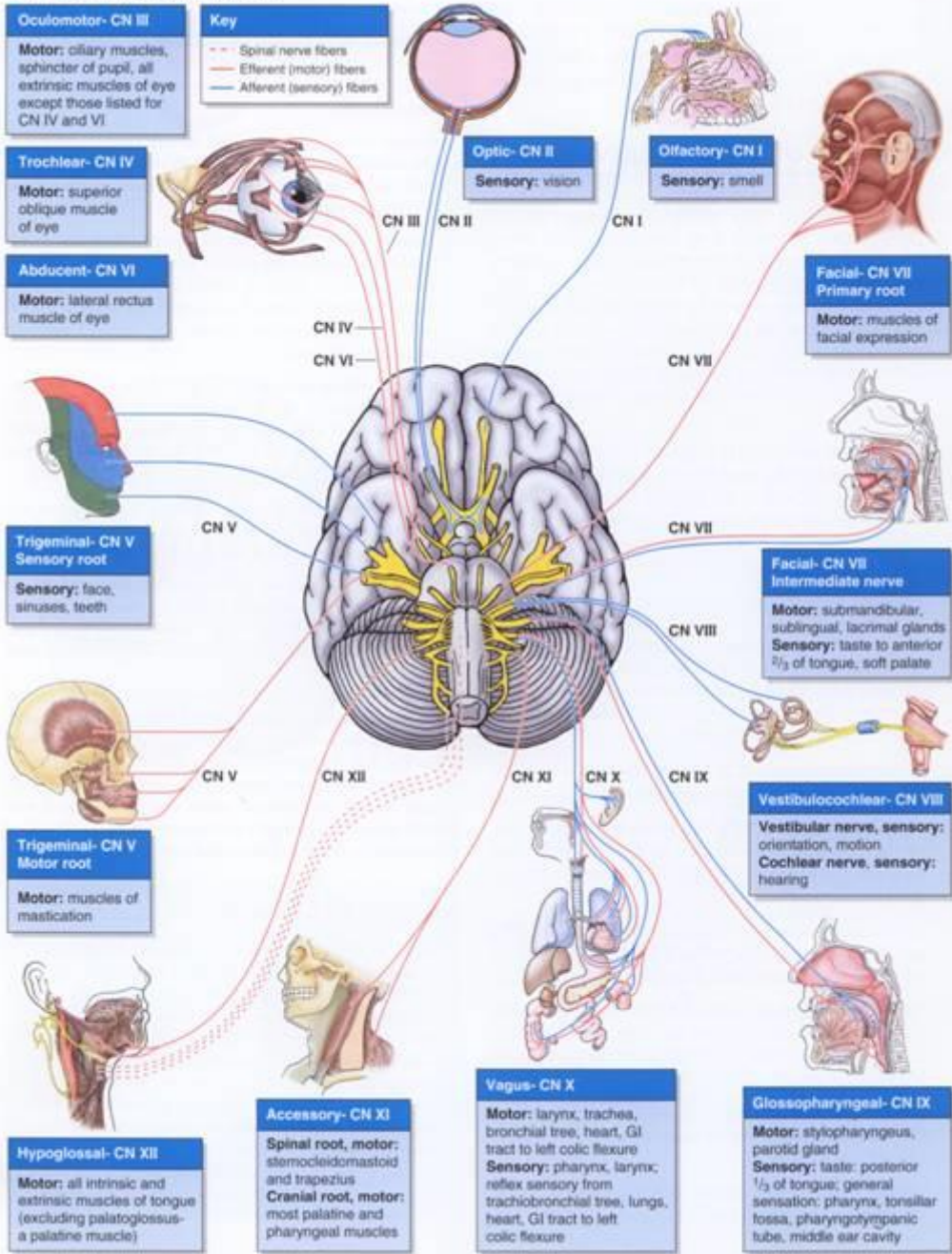


# **Vagus, accessory and hypoglossal nerves.**

**János Hanics M.D.**

**Table 9.1. Summary of Cranial Nerves**



# Functions

## Vagus (CN X.)

### ▪ **Swallowing:**

- levator veli palatini
- mid. and inf. constrictor mm. of pharynx
- muscles of the oesophagus

### ▪ **Phonation:**

- muscles of the larynx

### ▪ **Control of viscera!!!**

### ▪ **Special viscerosensory:**

- the taste buds around the aditus of the larynx

### ▪ **Somatosensory:**

- mucous membrane of the larynx
- mucous membrane of the inferior part of the pharynx
- epiglottic valleculae
- dura mater of the posterior cranial fossa
- posterior part of the skin of the external acoustic meatus

## Accessory (CN XI.)

### ▪ **Phonation:**

- muscles of the larynx (arytenoid m.)

### ▪ **movements of the head and shoulder:**

- sternocleidomastoid m.
- trapezius m.

## Hypoglossal (CN XII.)

### ▪ **movements of the tongue:**

- extrinsic and intrinsic muscles of the tongue

### ▪ **Opening of the mouth and swallowing:**

- geniohyoid m.
- infrahyoid muscles (deep cervical ansa!!!)

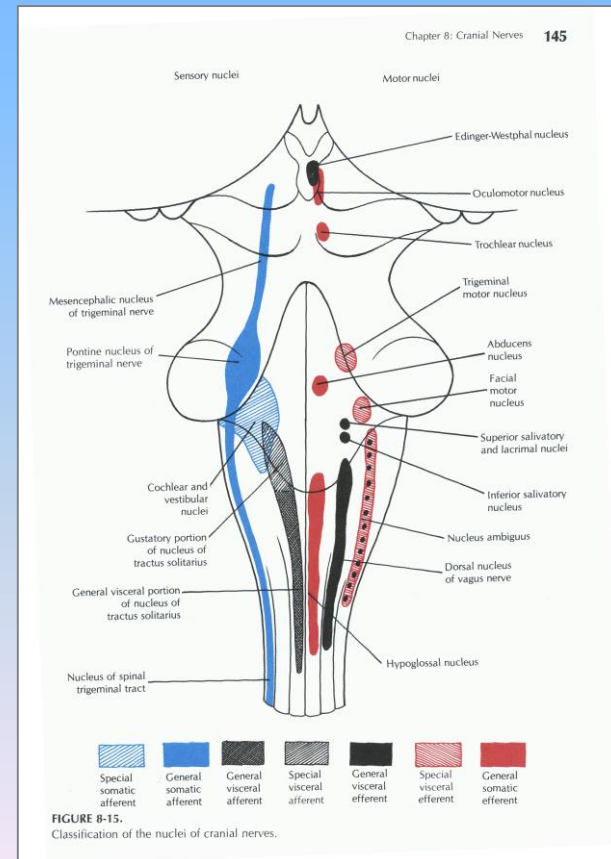


# Branchial apparatus

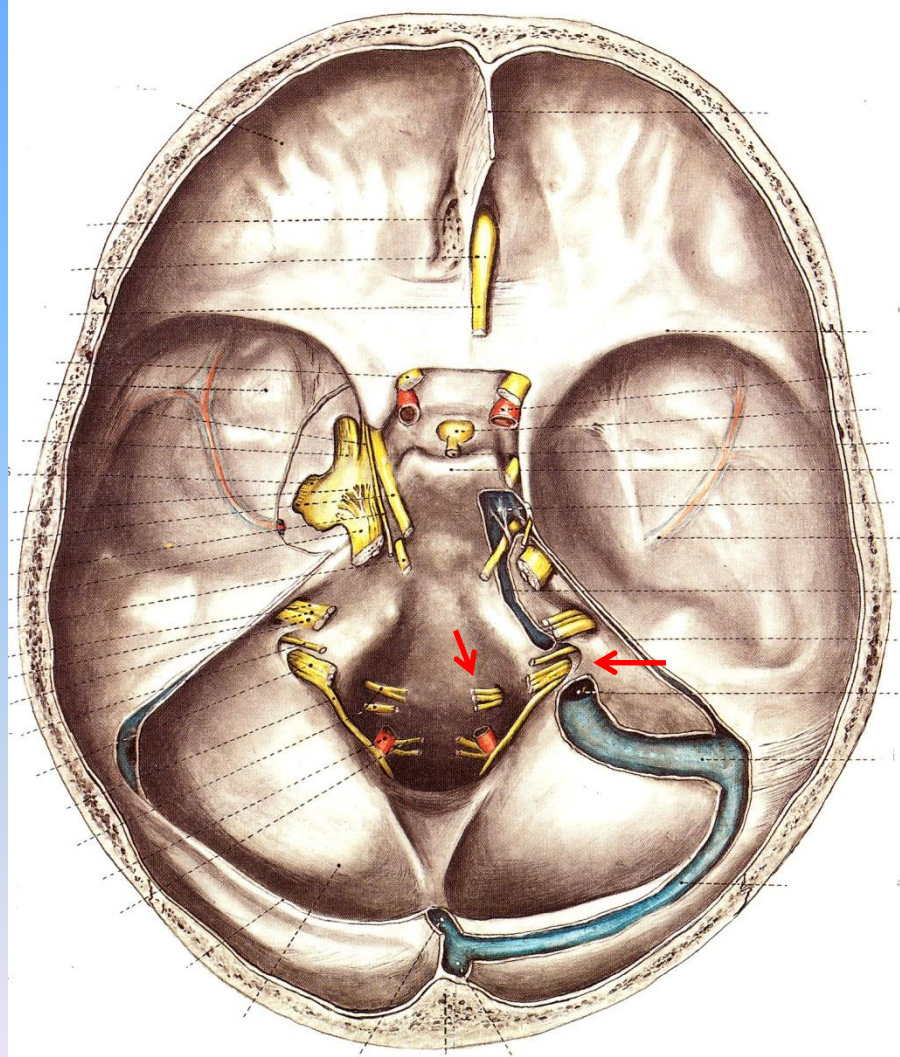
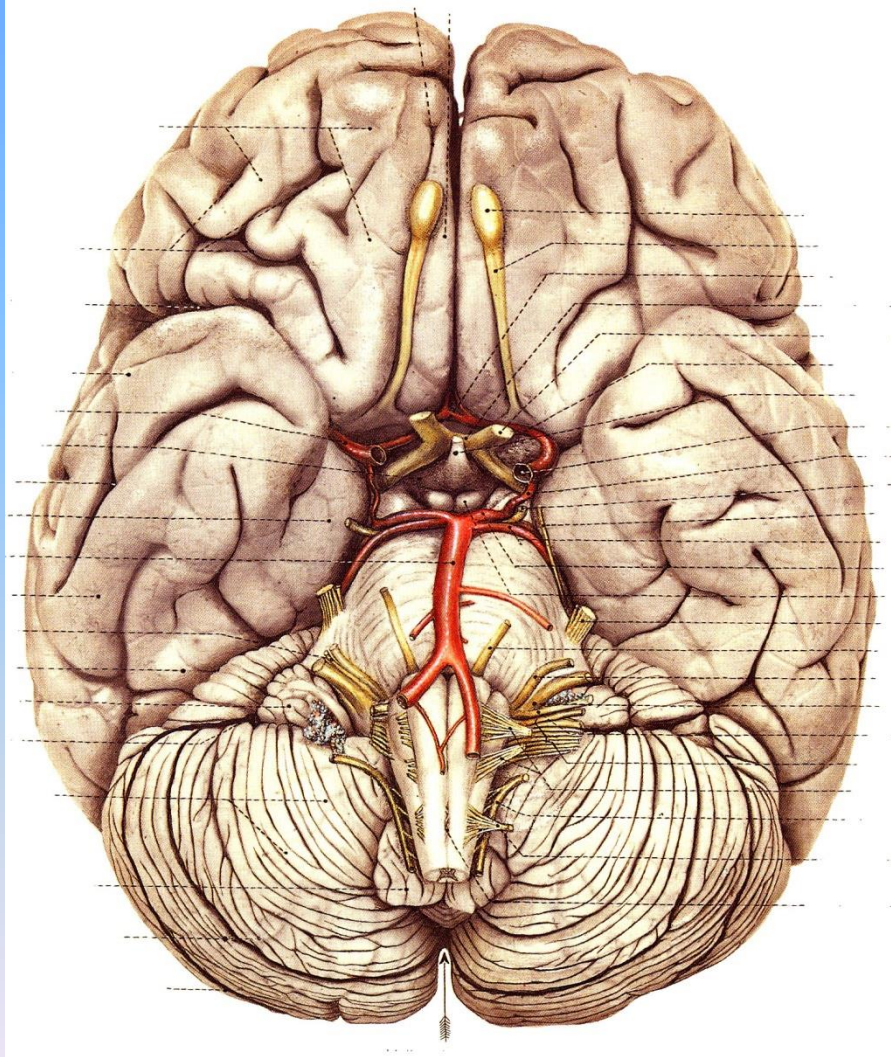
	Mesenchyme					Ectoderm		Endoderm
	Artery	Cartilage <sup>1</sup>	Bone <sup>1</sup>	Ligament <sup>1</sup>	Muscle <sup>2</sup>	Nerve		
<b>Pharyngeal arch</b>							<b>Clefts</b>	<b>Pouches</b>
<b>I. (mandibular)</b>	(Maxillary artery)	Meckel's (as model for mandible)	Mandible (intramembranous ossification); Malleus; Incus; (*)	Sphenomandibular lig.; Ant. lig. of malleus	<b>Mm. of mastication;</b> Tensor tympani; Tensor veli palatini; Mylohyoid; Digastric ant. belly;	Mandibular nerve (V/3.)		
							<b>C1:</b> External ac. meatus; ext. epithelium of tympanic membrane	<b>P1:</b> Auditory tube; Tympanic cavity; Int. epithelium of tympanic membrane
<b>II. (hyoid)</b>	(Stapedial artery; Hyoid artery)	Reichert's	Stapes; Styloid process; Hyoid (lesser horn and upper part of body)	Stylohyoid lig.	<b>Muscles of facial expression;</b> Stylohyoid; Digastric post. belly; Stapedius; Platysma (from Opercular proc.)	Facial nerve (VII.)		
							<b>C2:</b> (Cervical sinus)	<b>P2:</b> Epithelium of tonsillar fossa
<b>III.</b>	Internal carotid (prox. part)		Hyoid (greater horn and lower part of body)		Pharynx (upper part); Stylopharyngeus	Glossopharyngeal nerve (IX.)		
							<b>C3:</b> (Cervical sinus; Cervical vesicula)	<b>P3:</b> (Thymus) Inferior parathyroid glands
<b>IV.</b>	<i>Left:</i> Arch of aorta; <i>Right:</i> Right subclavian artery (prox. part)	Thyroid cartilage			Pharynx (lower part); Larynx: cricothyroid	Vagus nerve (X.) (Superior laryngeal nerve)		
							<b>C4:</b> (Cervical sinus)	<b>P4:</b> Thymus; Superior parathyroid glands
<b>V. (**)</b>		Thyroid cartilage			Pharynx and larynx muscles (n. XI.: arytenoid)	Vagus nerve (X.) + Accessory nerve (XI.)		
								<b>P5:</b> Ultimobranchial body, C-cells in thyroid gland
<b>VI.</b>	Right: Right pulmonary artery; Left: Left pulmonary artery and ductus art. Botalli	Cricoid cartilage (?)			Larynx muscles ('intrinsic')	Vagus nerve (X.) (Recurent laryngeal nerve)		

1: derivatives of neural crest (ecto-mesenchyme); 2: derivatives of paraxial mesoderm or somite (mesoderm); (\*) partially forms the maxilla (from the maxillary process of the first pharyngeal arch); (\*\*) Some authors don't give derivatives for fifth pharyngeal arch but mention them at the sixth pharyngeal arch.

	SM -dorsomedial-	BM (=SVM) -ventrolateral-	GVM (= parasympath.)	GVS (from e.g. baroreceptors, chemoreceptors)	SVS (= taste)	GSS	SSS	
III.	Oculomotor nucl.		Accessory oculomotor nucl. (Westphal-Edinger)					
IV.	Trochlear nucl.							
V.		Motor. trigeminal nucl.				<ul style="list-style-type: none"> <li>• <b>Mesencephalic trigeminal nucl.</b> (<i>ganglion cells in the CNS!</i>) Proprioceptive.</li> <li>• <b>Princeps sensory nucl.</b> (pontine nucl.) of trigeminal nerve. Epicritic.</li> <li>• <b>Spinal trigeminal nucl.</b> (receives fibres from CN V.,VII.,IX.,X.) Protopathic.</li> </ul>		
VI.	Abducent nucl.							
VII.		Facial nucl.	Sup. salivatory nucl.		Solitary tract nucl.	(+)		
VIII.							- Cochlear nuclei (dors. and ventral) - Vestibular nuclei (sup., inf., med., lat.)	
IX.		Ambiguous nucl.	Inf. salivatory nucl.	Lat. ala cinerea nucl.	Solitary tract nucl.	(+)		
X.			Medial ala cinerea nucl. (=dorsal vagal nucl.)		Solitary tract nucl.	(+)		
XI.	(C <sub>1-6</sub> motoneurons)							
XII.	Hypoglossal nucl.							
Spinal n.	+		+	+		+		







# Nuclei of the vagus nerve

spinal trigeminal nucleus  
SS

nucleus ambiguus  
SVM

dorsal nucleus of vagus nerve  
GVM

nucleus of tractus solitarii  
SVS

lateral nucleus of ala cinerea  
GVS

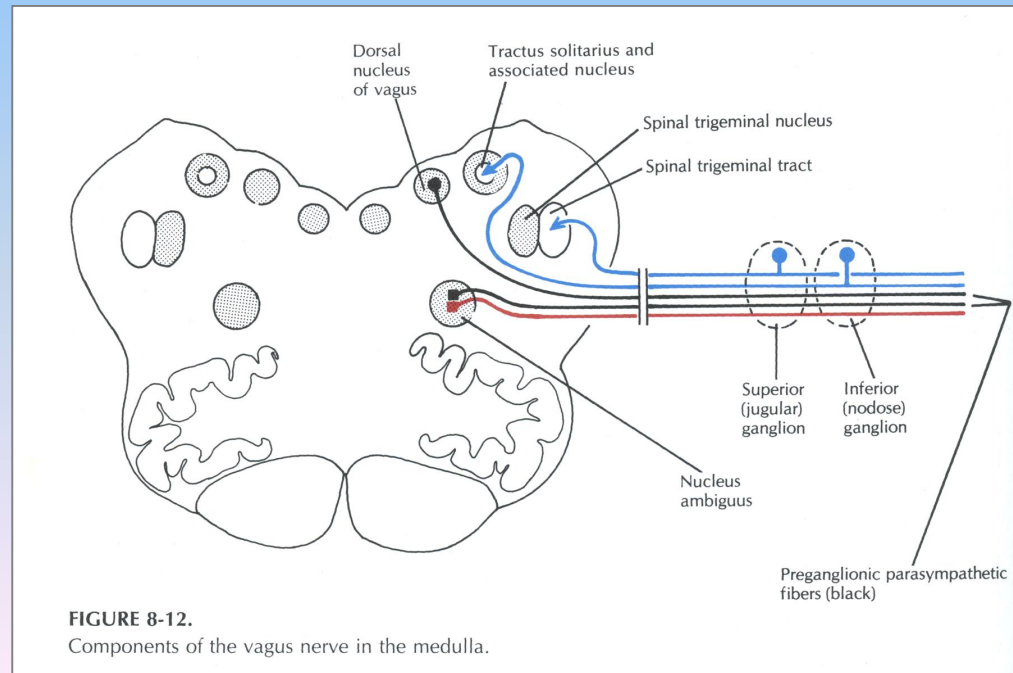
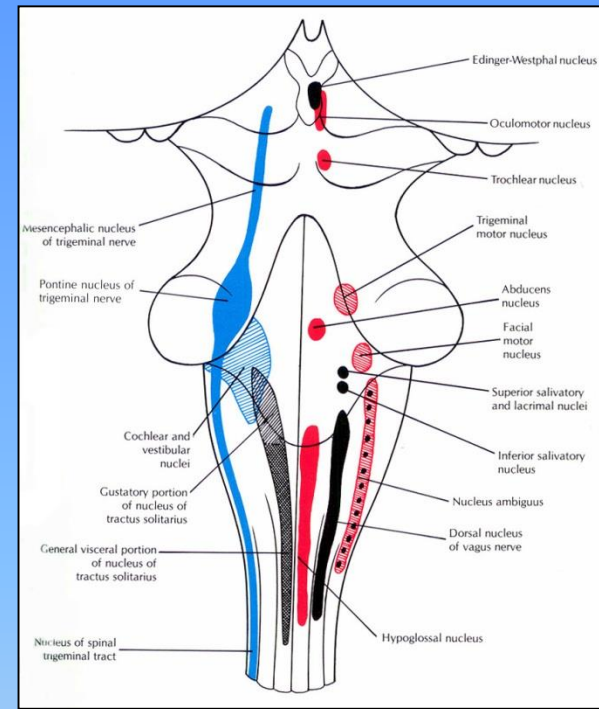
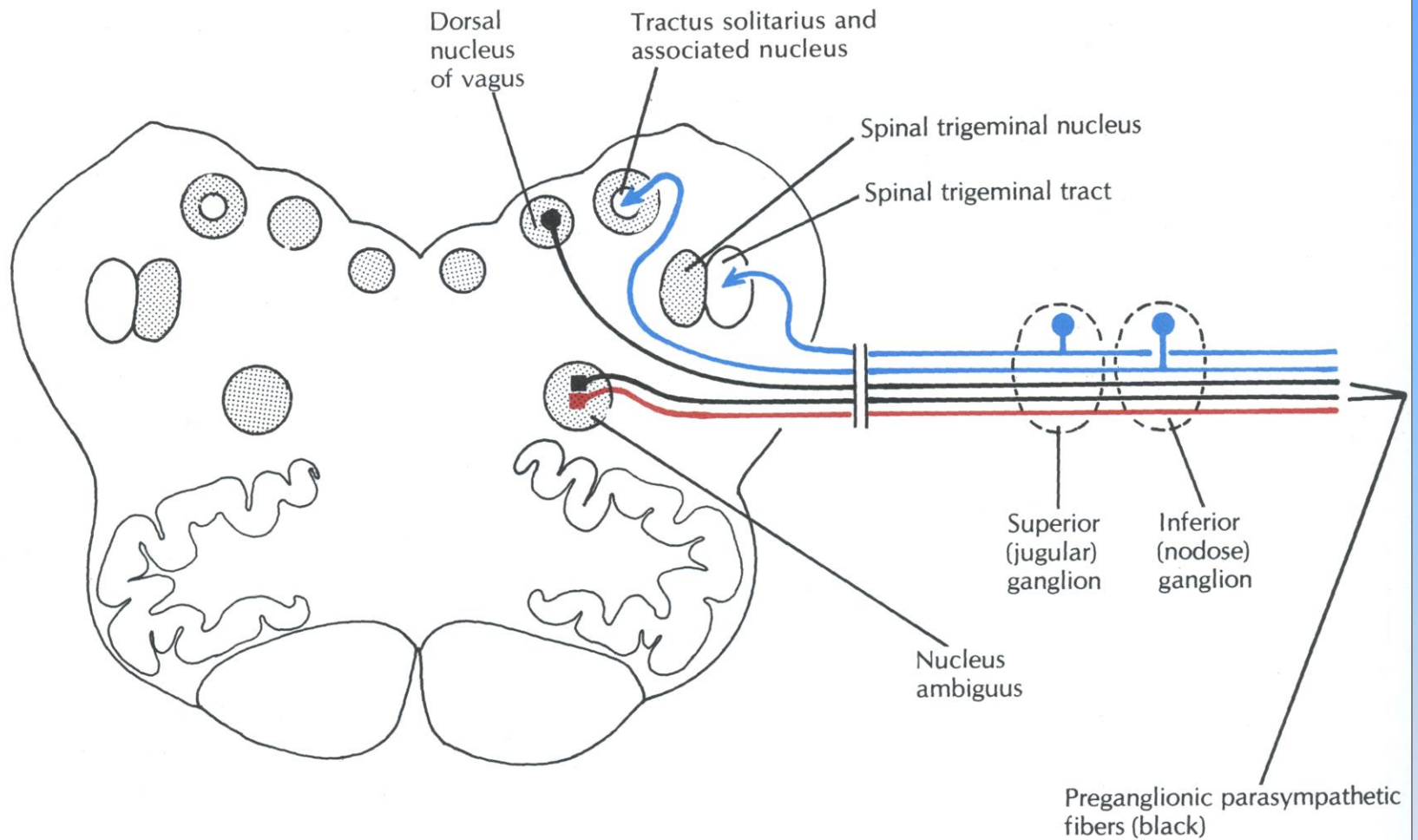


FIGURE 8-12.  
Components of the vagus nerve in the medulla.





**FIGURE 8-12.**  
Components of the vagus nerve in the medulla.

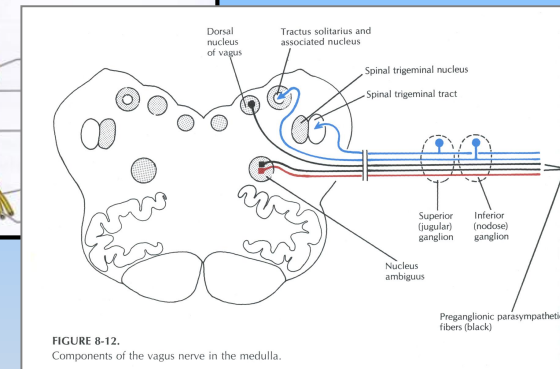
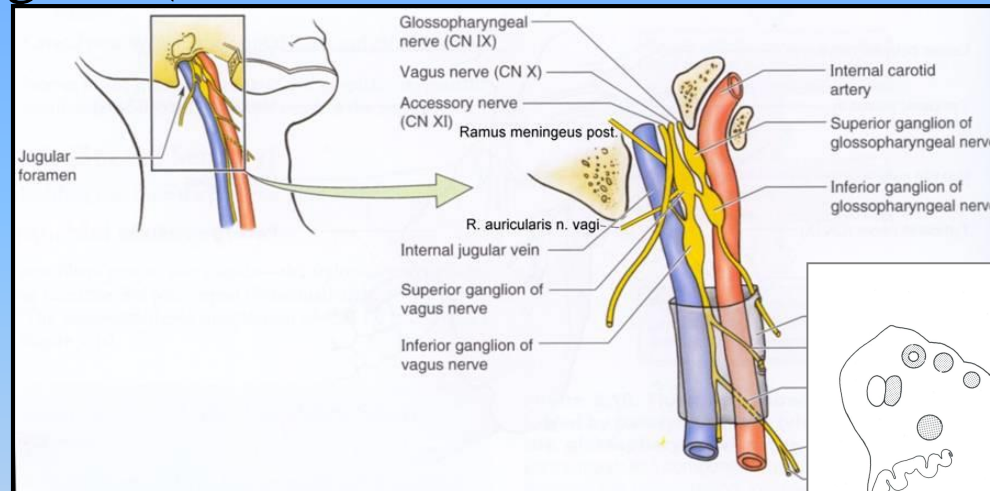
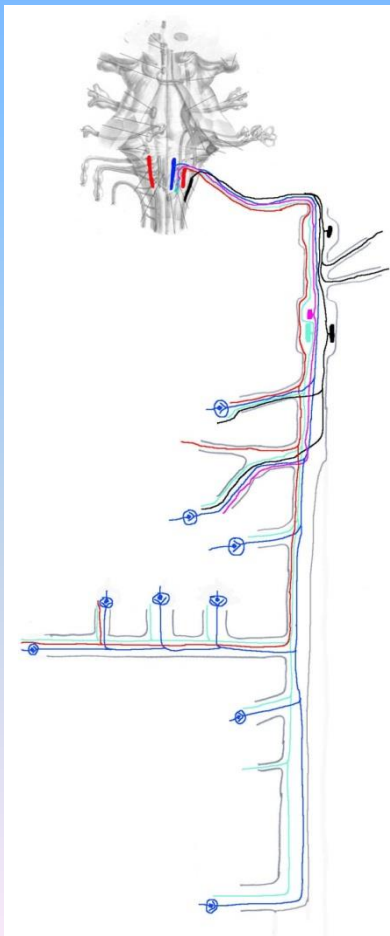


# Ganglia of vagus nerve

## Sensory

superior ganglion (at the jugular foramen)

inferior ganglion (at the level of the 1-2. cervical vertebra)



## Parasympathetic ganglia

intramural ganglia in the wall of the viscera

# Branches of vagus nerve

## Cranio-cervical part

posterior meningeal branch

auricular branch

pharyngeal branches

superior laryngeal nerve

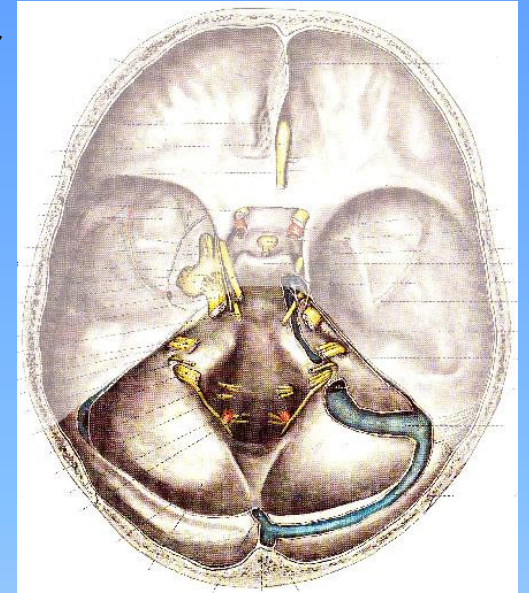
superior cardiac branches

recurrent laryngeal nerve

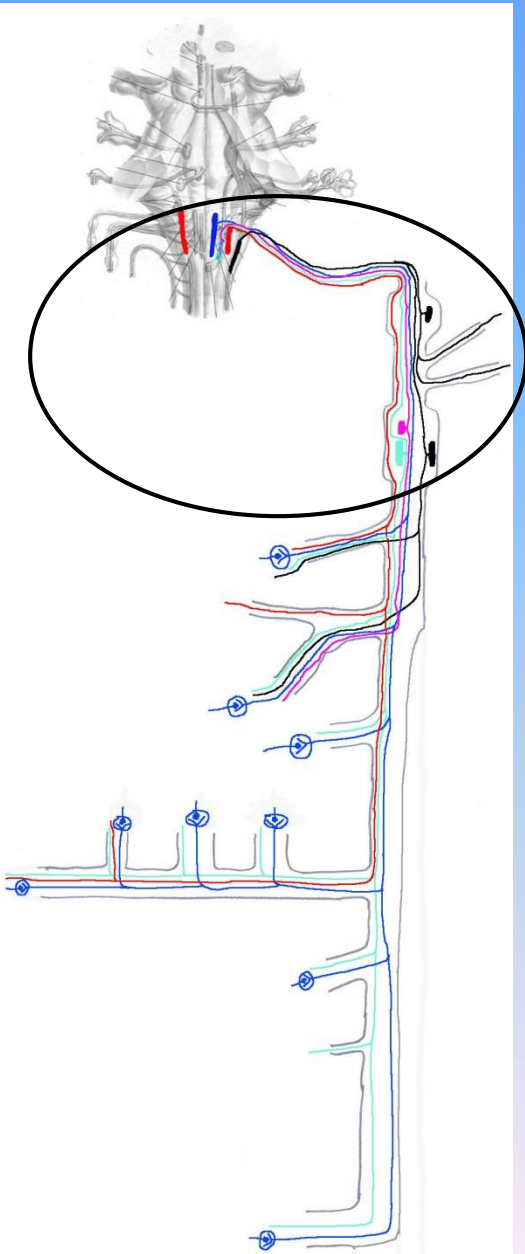
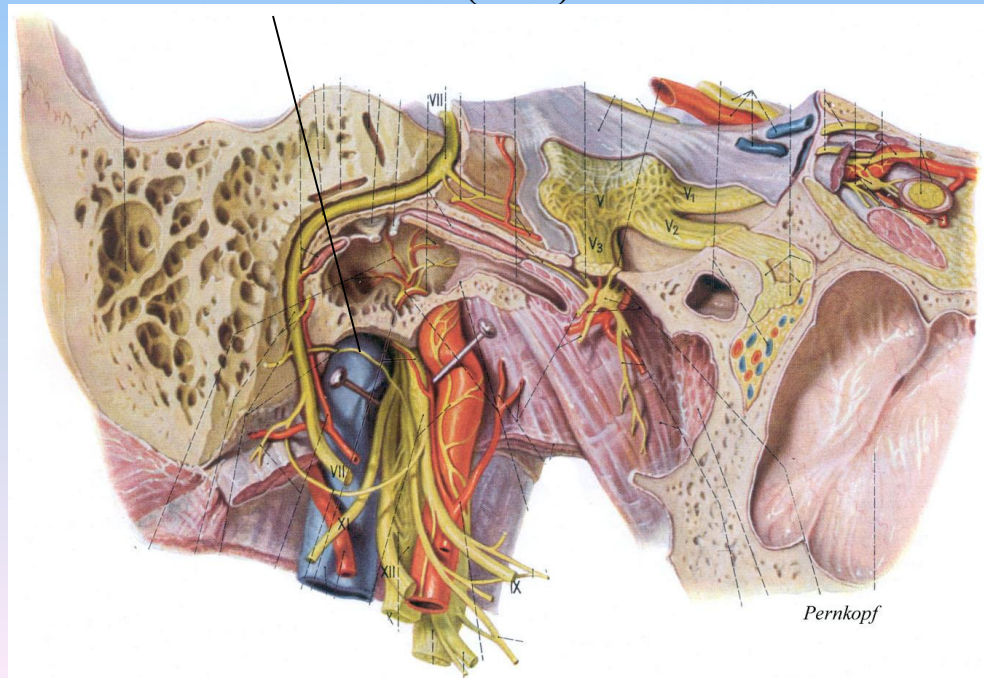
inferior laryngeal nerve,  
inferior cardiac branches,  
tracheal branches  
oesophageal branches

# Cranio-cervical part

Post. meningeal branch (GSS)



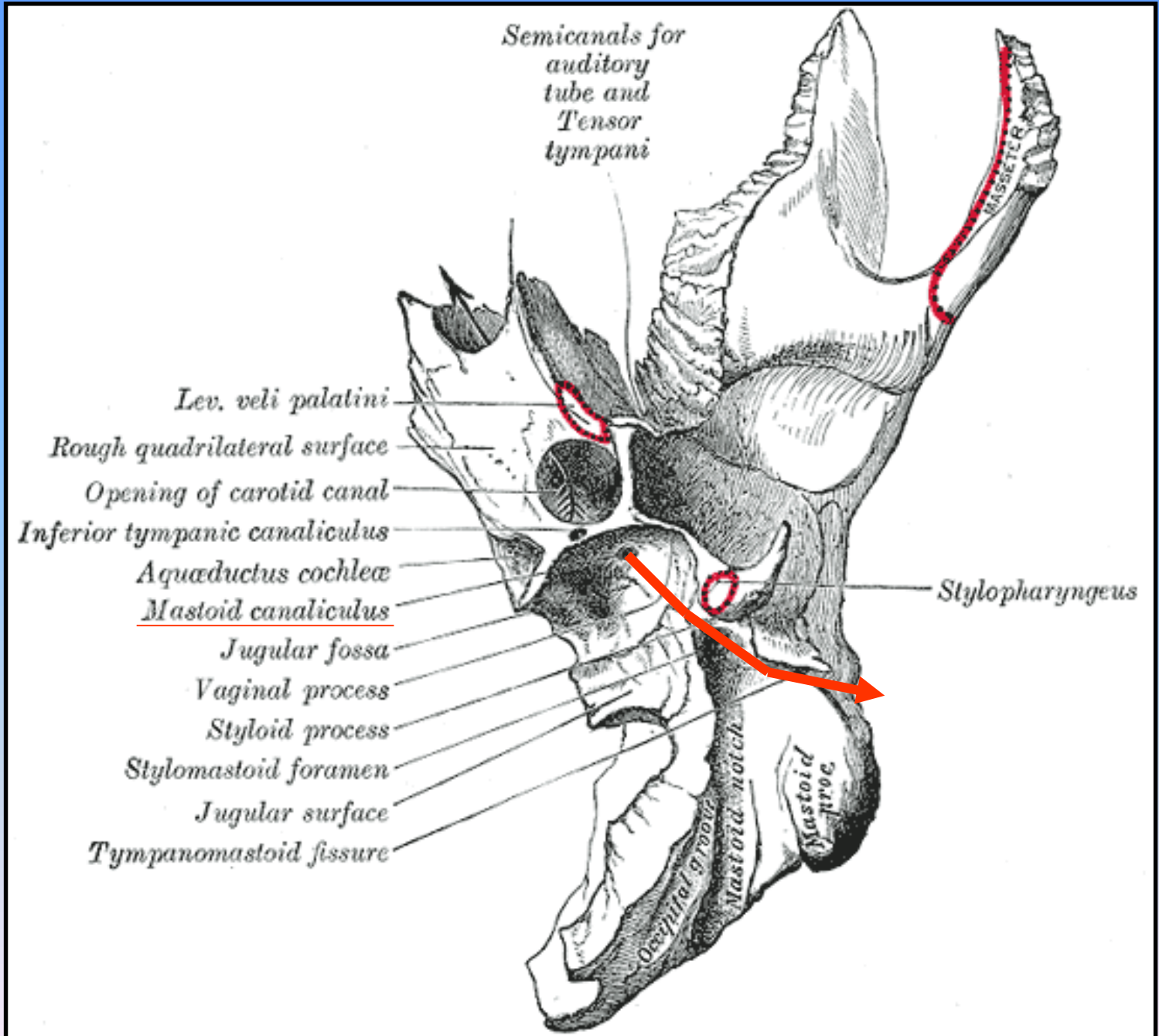
Auricular branch (GSS)



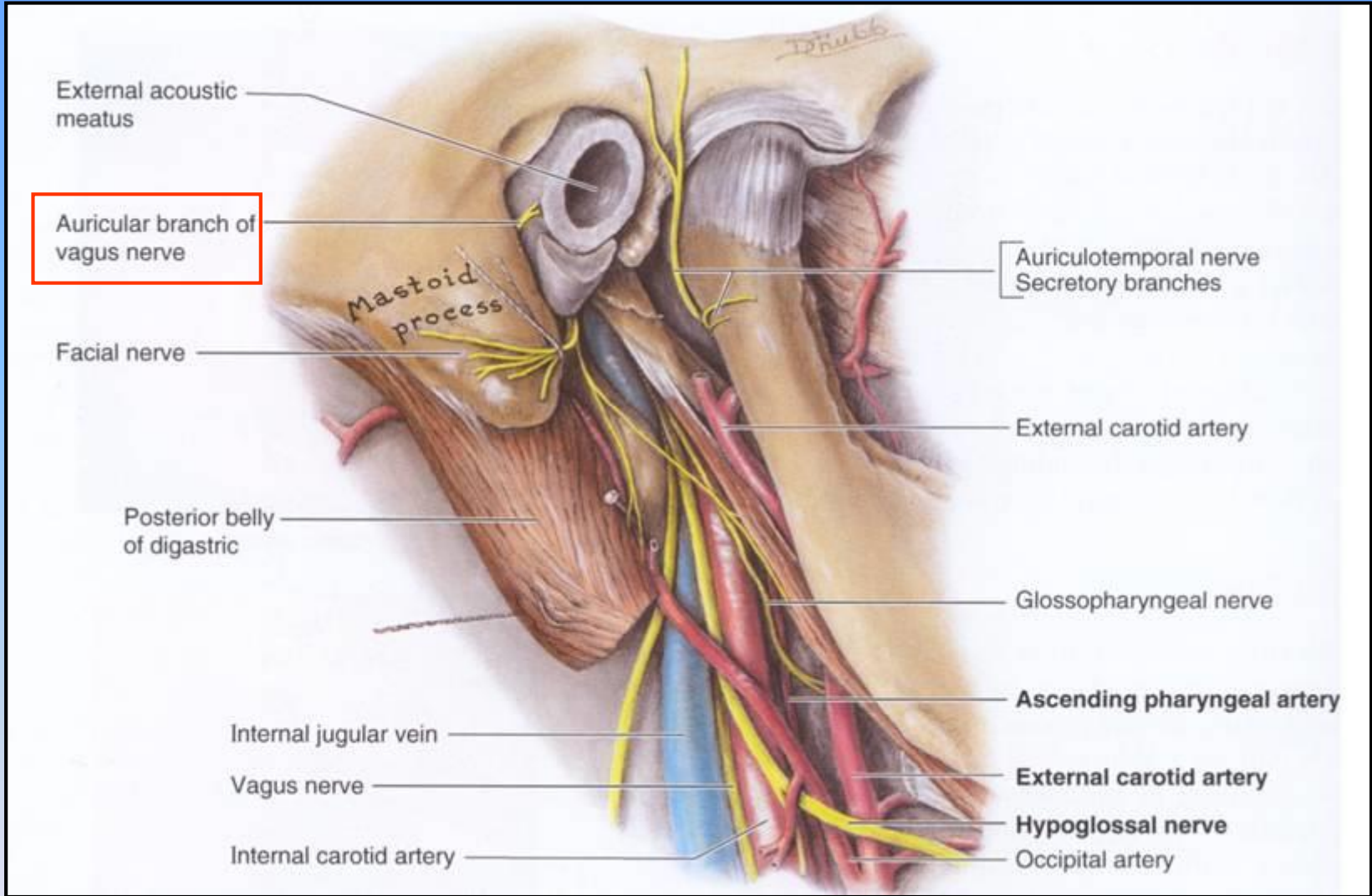
*Semicanals for  
auditory  
tube and  
Tensor  
tympani*

- Lev. veli palatini*
- Rough quadrilateral surface*
- Opening of carotid canal*
- Inferior tympanic canaliculus*
- Aquæductus cochleæ*
- Mastoid canaliculus*
- Jugular fossa*
- Vaginal process*
- Styloid process*
- Stylomastoid foramen*
- Jugular surface*
- Tympanomastoid fissure*

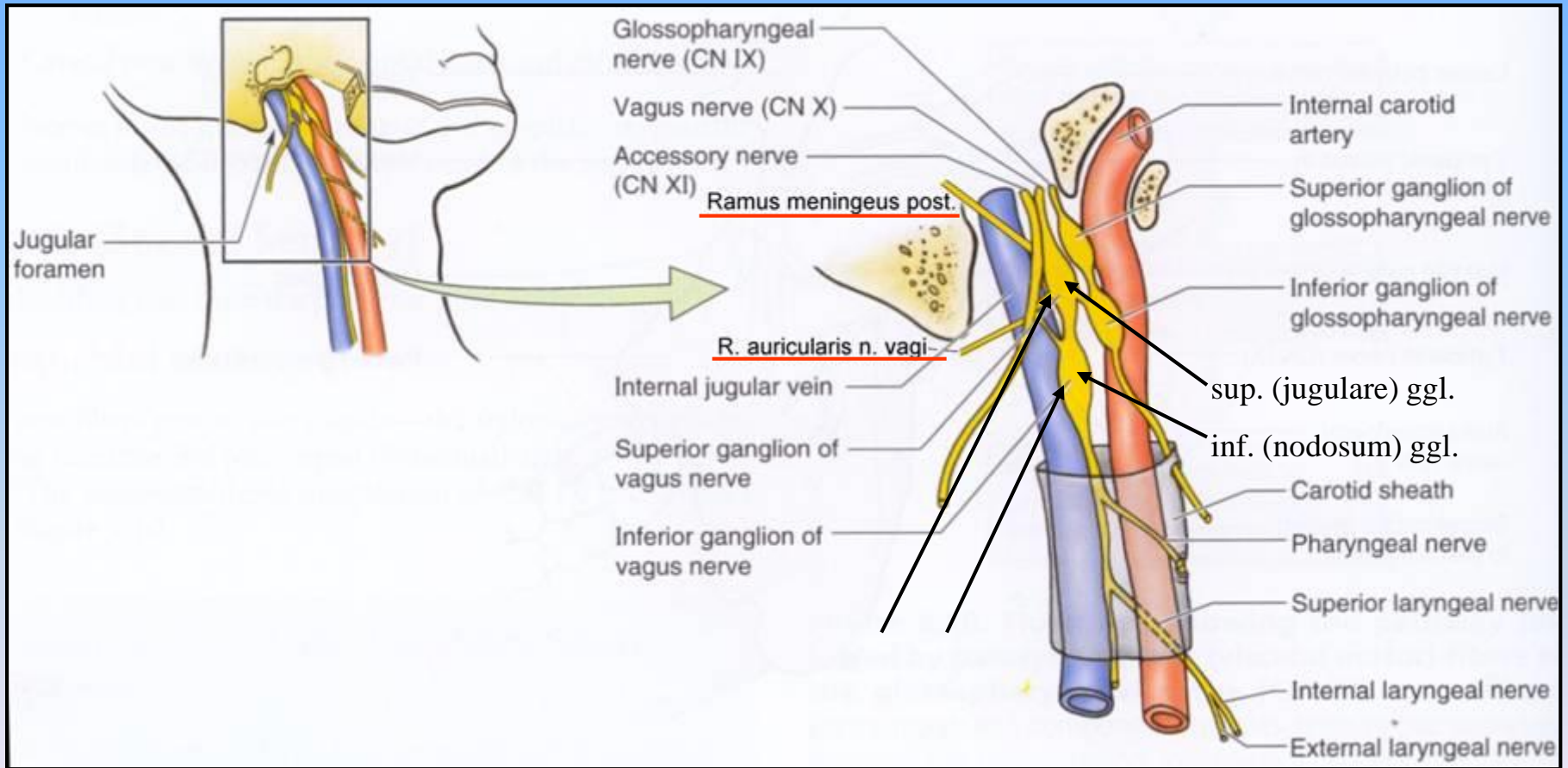
*Stylopharyngeus*





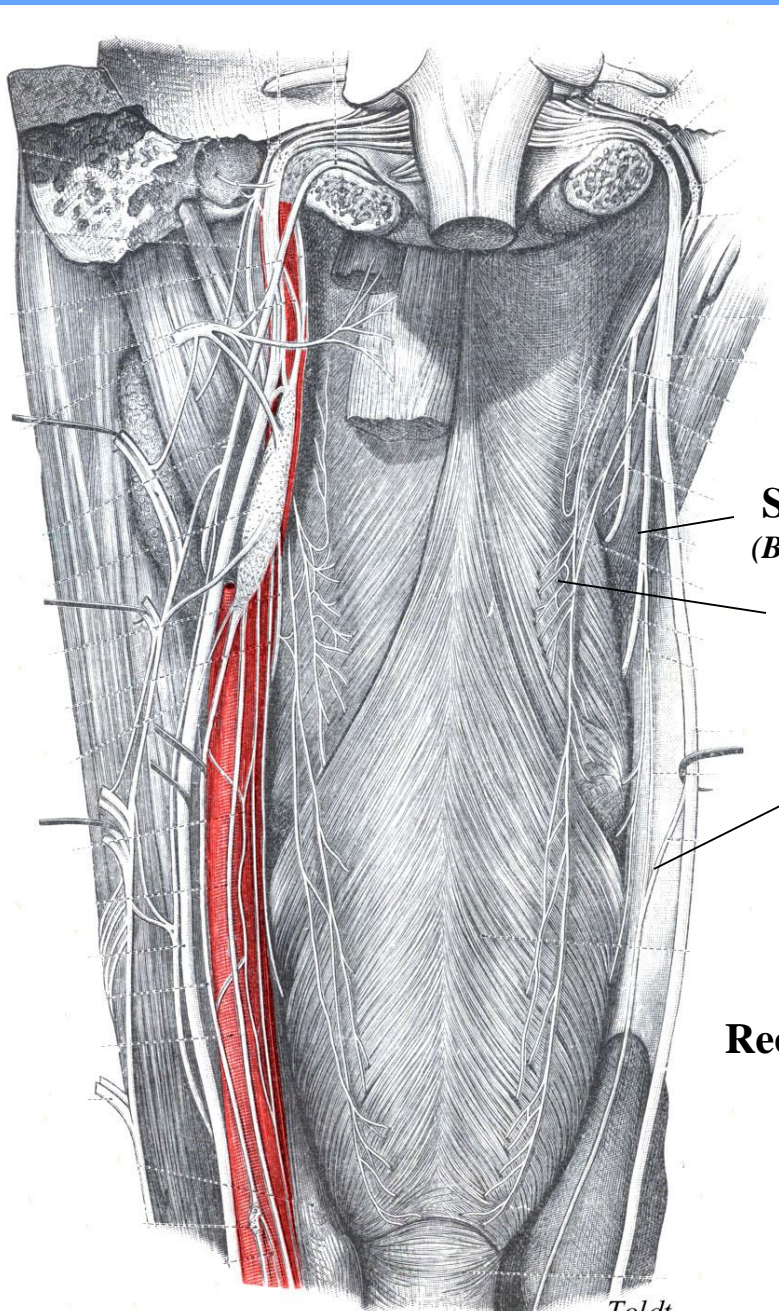


# Cranio-cervical part

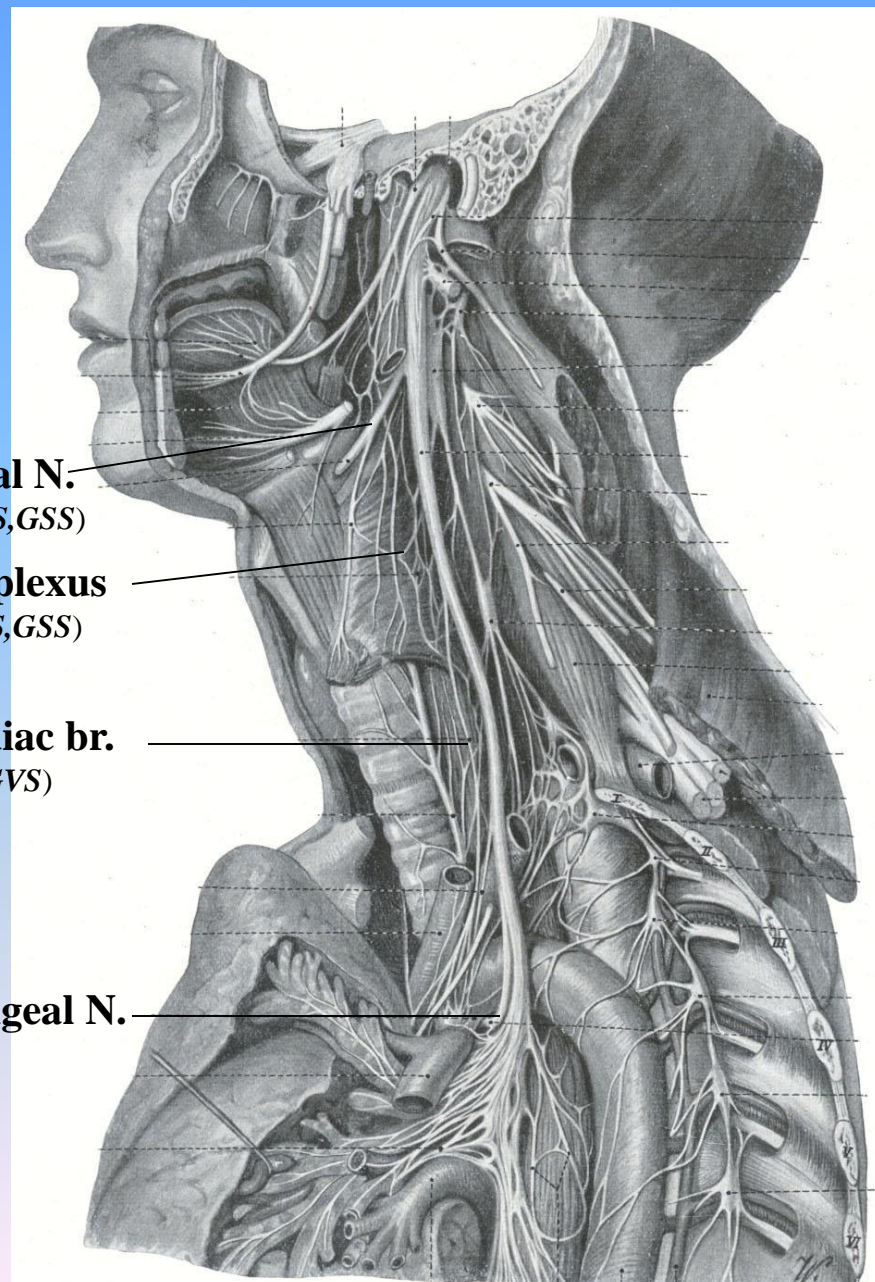




# Cranio-cervical part



Toldt



Rauber-Kopsch

**Sup. Laryngeal N.**  
(BM, GVM, GVS, SVS, GSS)

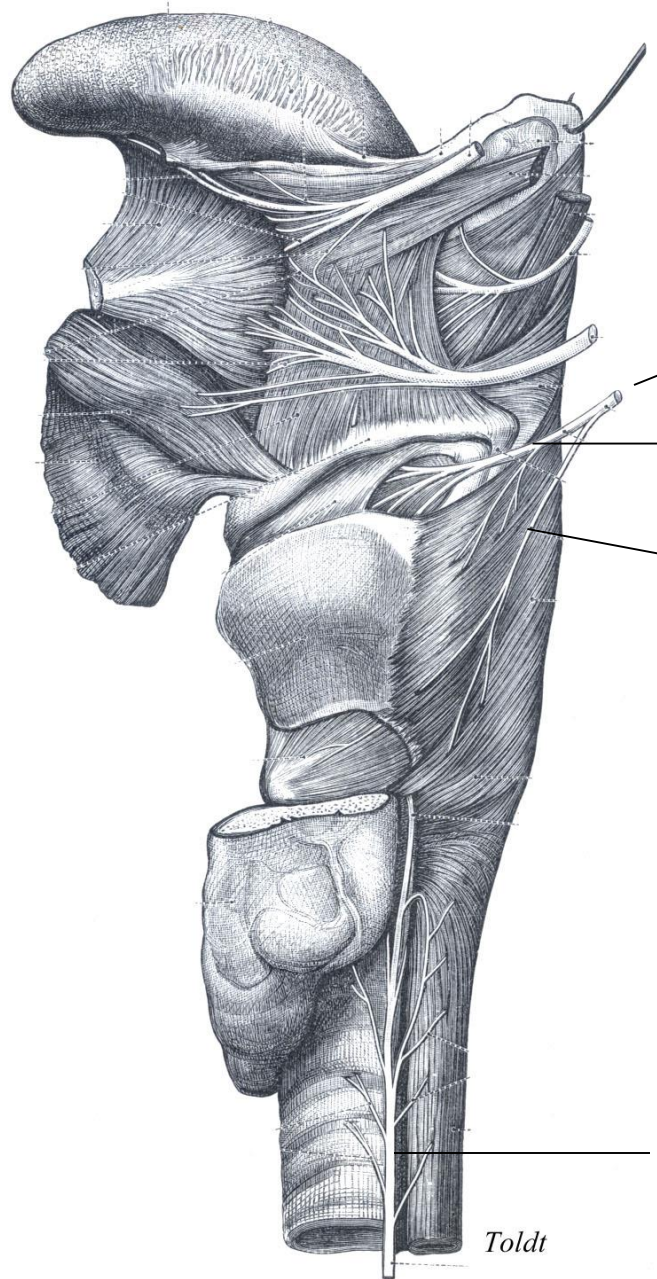
**Pharyngeal plexus**  
(BM, GVM, GVS, GSS)

**Sup. cardiac br.**  
(GVM, GVS)

**Recurrent laryngeal N.**  
(BM, GVM, GVS)



# Caranio-cervical part – laryngeal nerves



**Sup. Laryngeal N.**

*Internal branch*  
(GVM,GVS,SVS,GSS)

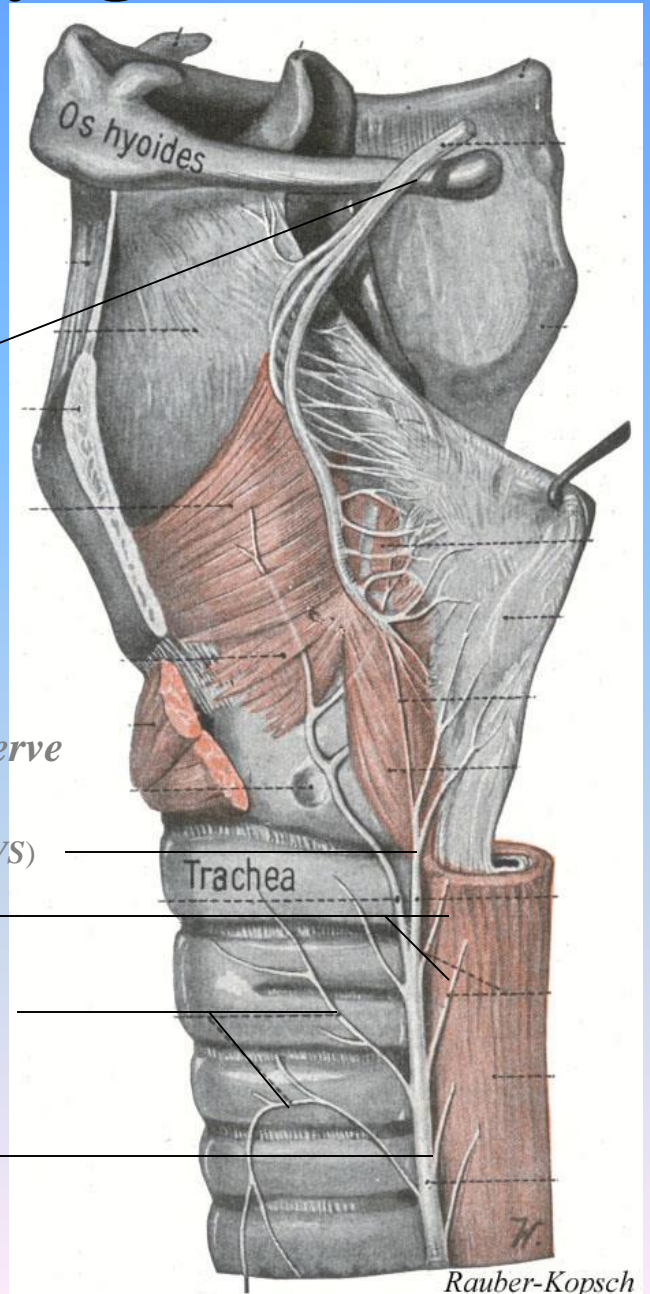
*External branch (BM)*

*Inferior laryngeal nerve*  
(ant. and post.  
branches)(BM,GVM,GVS)

*Oesophageal branches*  
(BM,GVM,GVS)

*Tracheal branches*  
(GVM,GVS)

**Recurrent laryngeal N.**  
(BM,GVM,GVS)



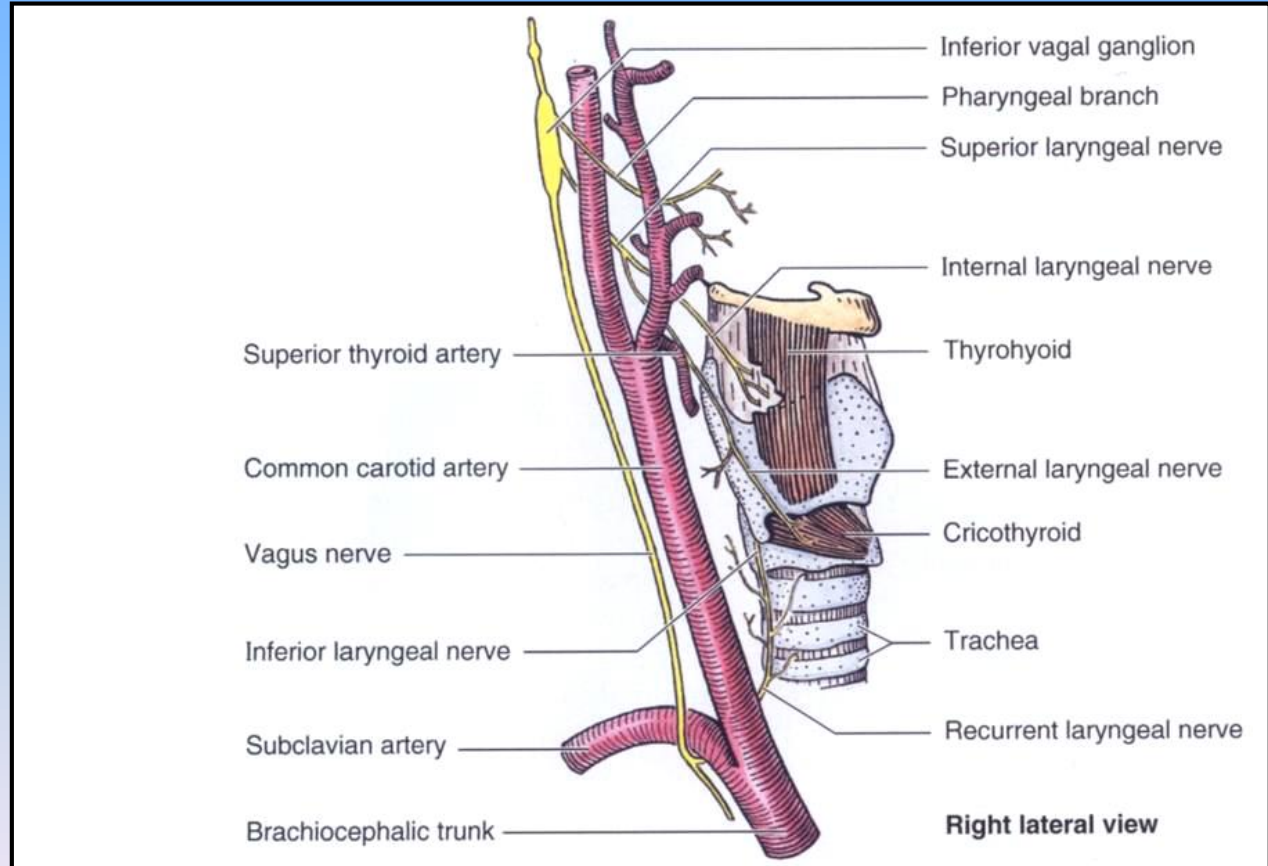
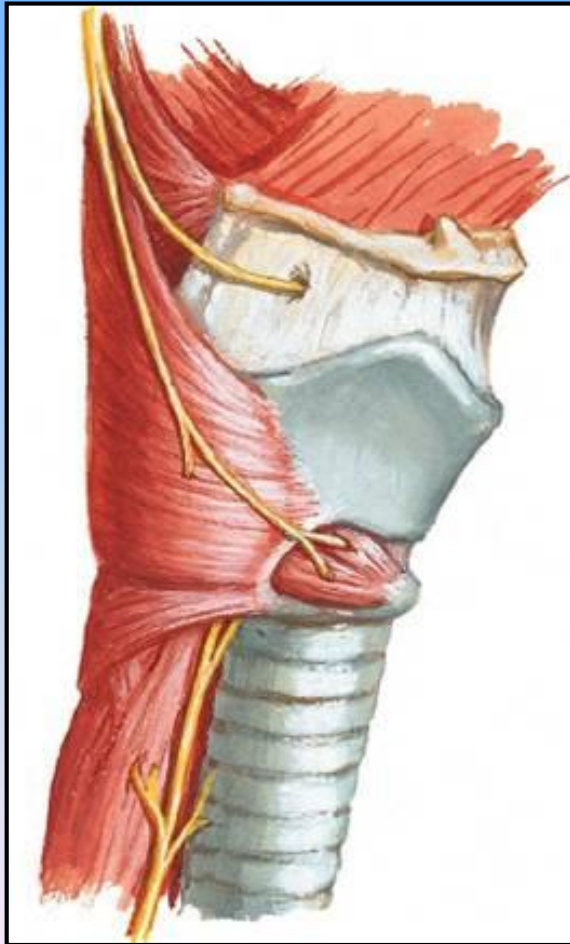


# Sup. laryngeal nerve

r. externus ( cricothyroid m.)

r. internus

# Recurrent and inf. laryngeal nerve



# Branches of vagus nerve

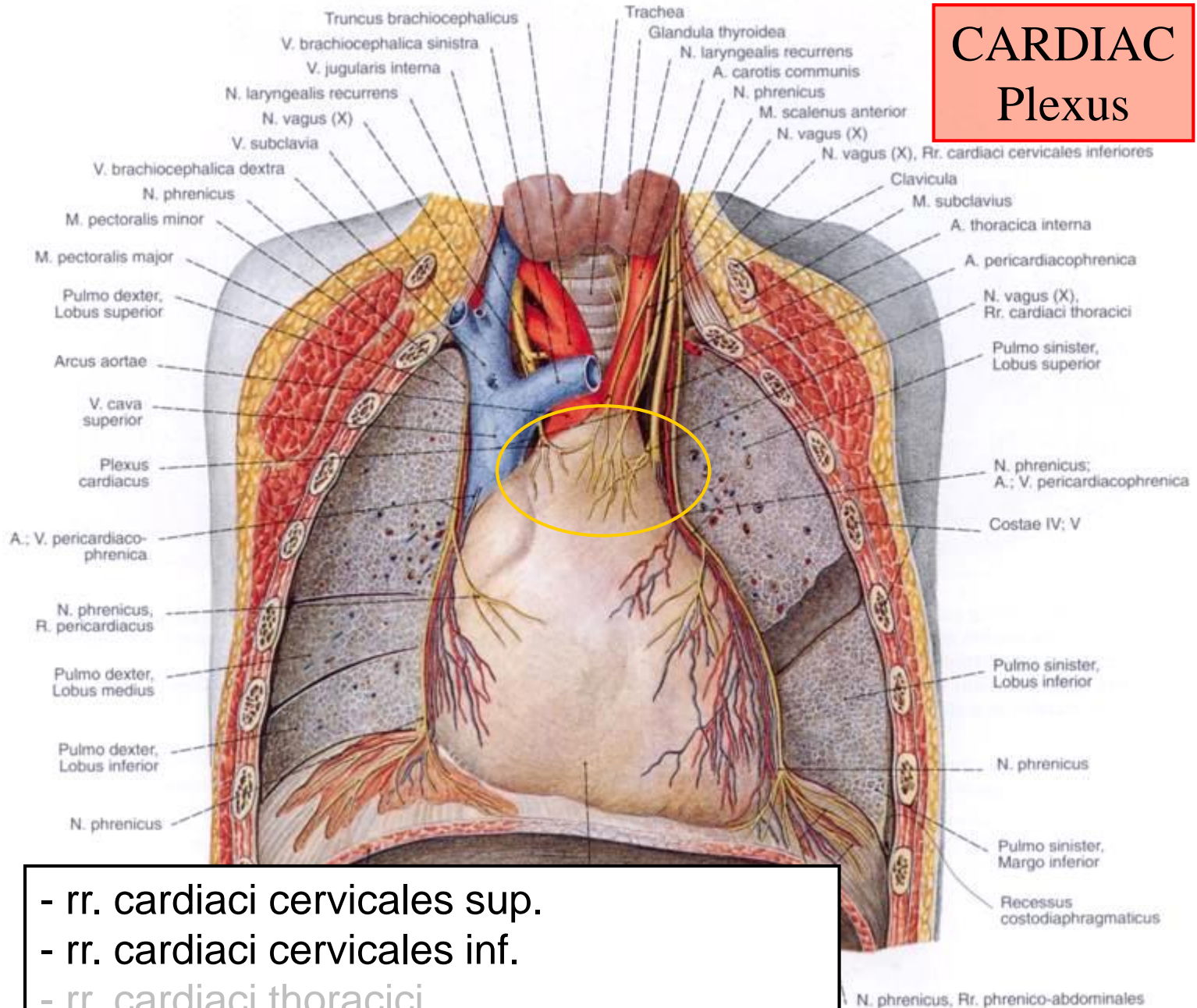
## Thoracic part

- cardiac branches
- bronchial branches
- pericardiac branches
- oesophageal branches

## Abdominal part

- branches for the viscera

# CARDIAC Plexus

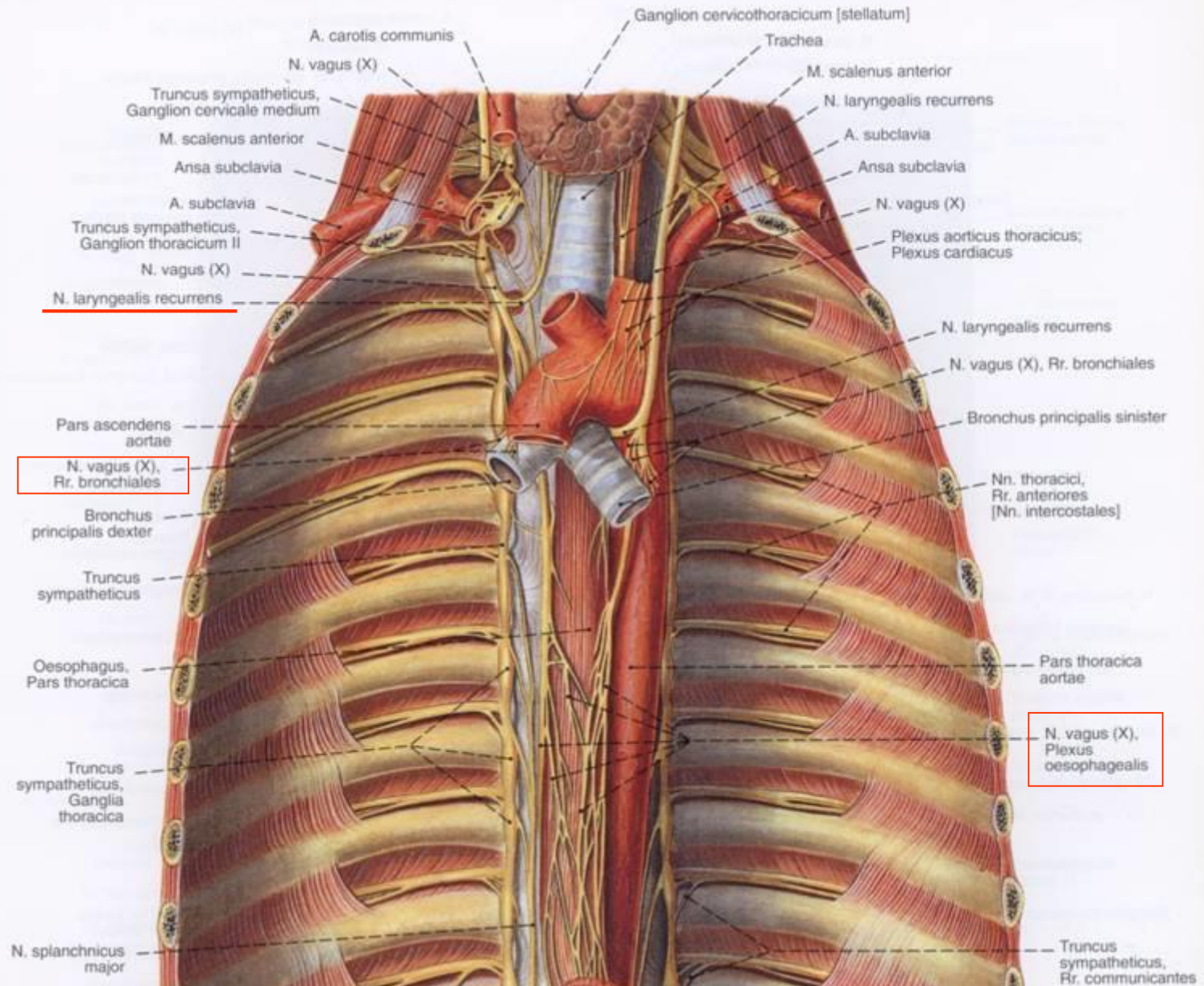


- rr. cardiaci cervicales sup.
- rr. cardiaci cervicales inf.
- rr. cardiaci thoracici



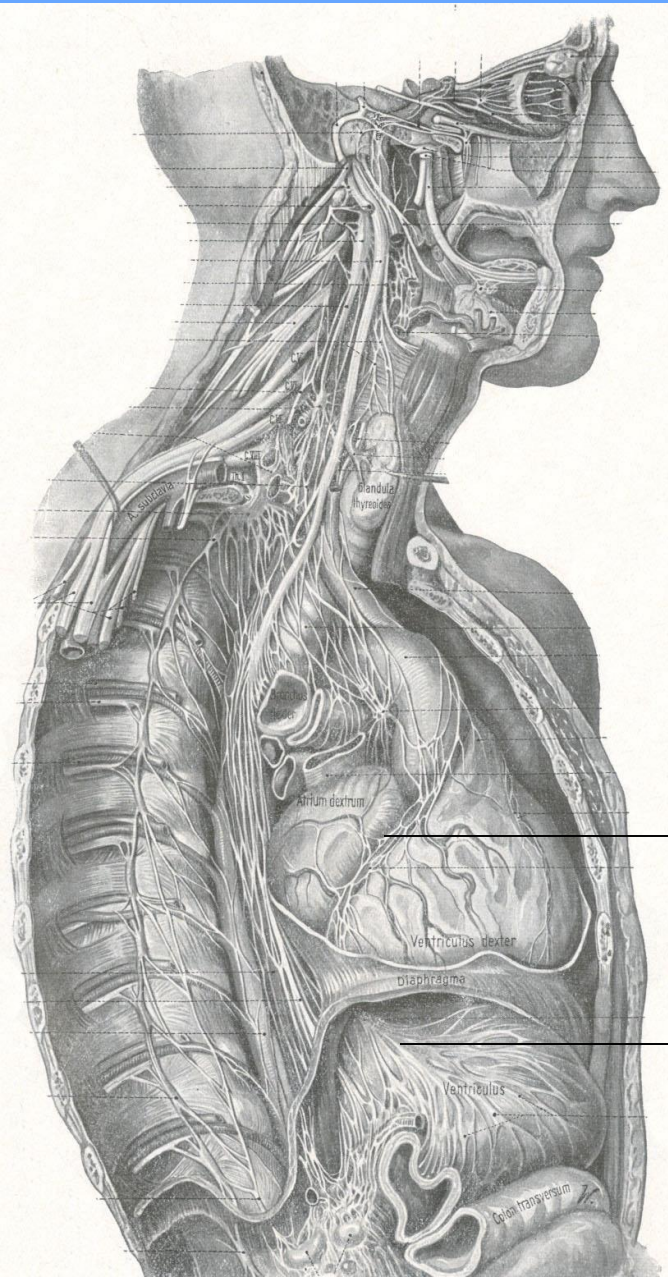
- Rr. bronchiales
- Rr. pericardii
- Rr. oesophagei

# Thoracic part





# Thoracic part



Rauber-Kopsch

**Tracheal branches**  
(GVM, GVS)

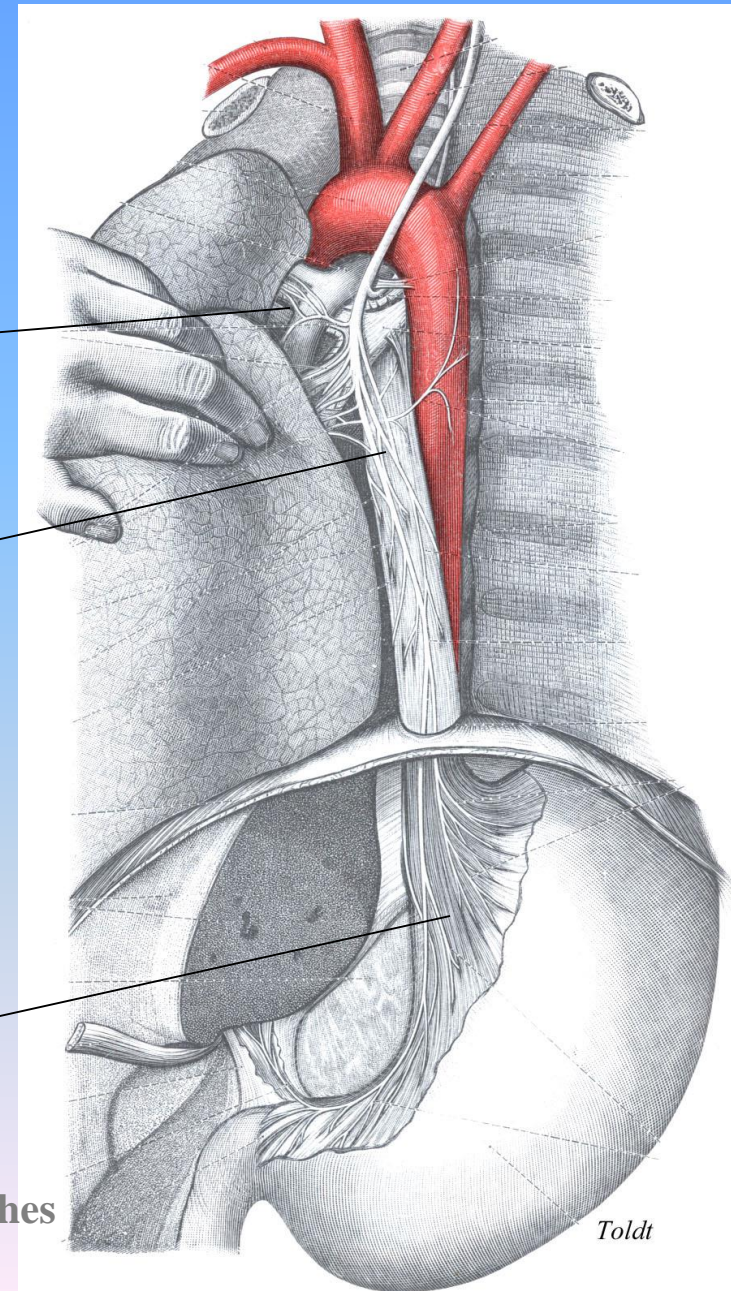
**Bronchial branches**  
(GVM, GVS)

**Oesophageal branches**  
(GVM, GVS)

**Pericardial branches**  
(GVS)

**Gastric branches**  
(GVM, GVS)

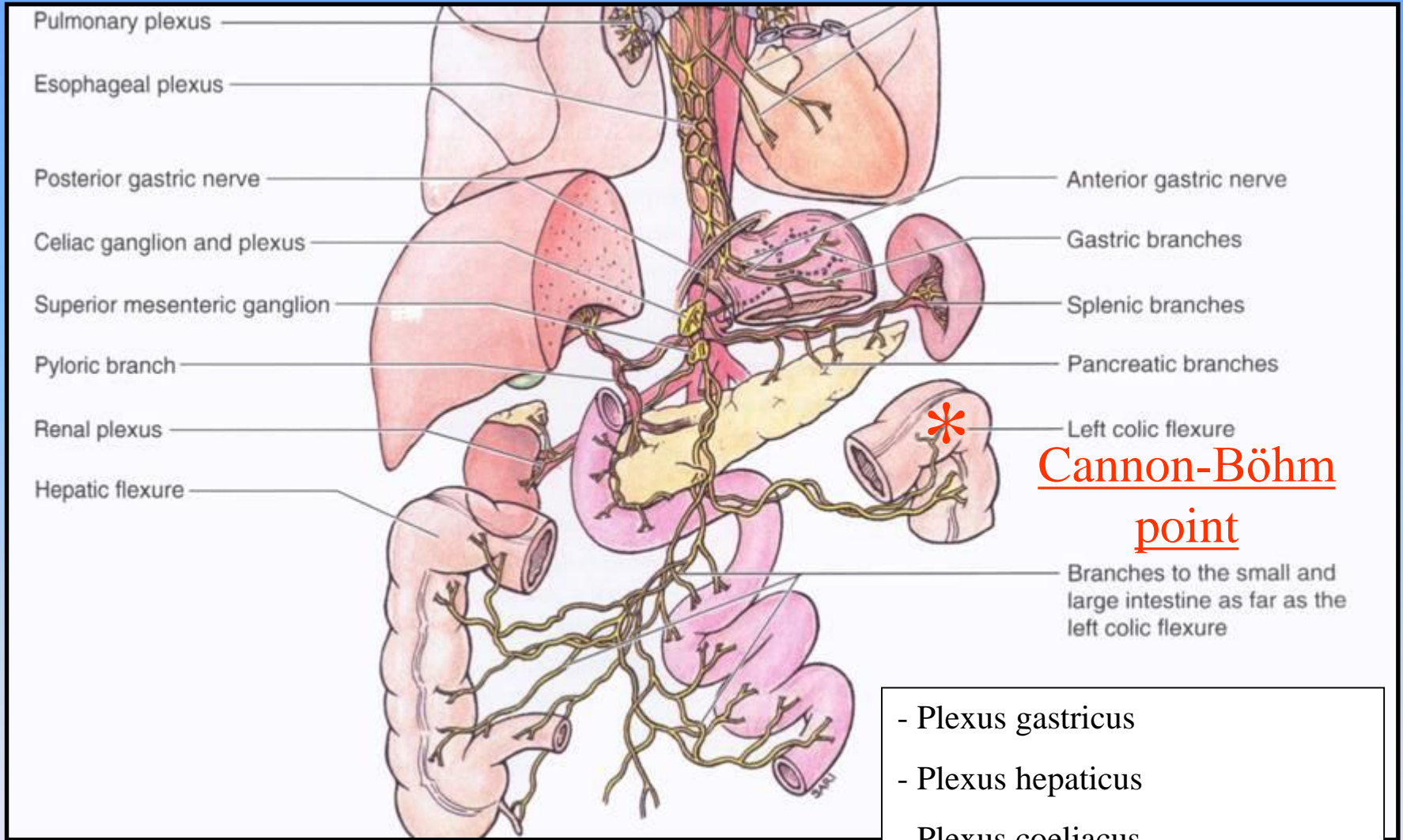
**Hepatic, celiac, renal branches**  
(GVM, GVS)



Toldt



# Abdominal part



# Nuclei of the accessory nerve:

ambiguus nucleus

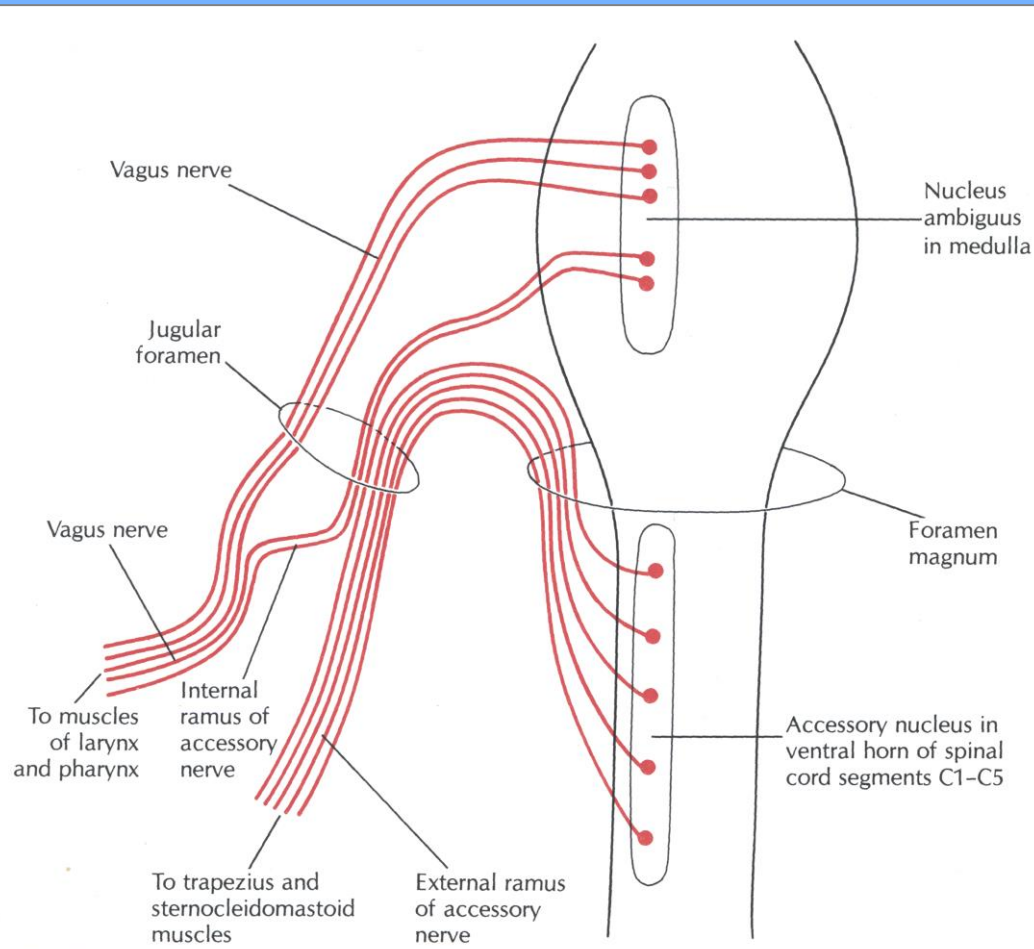
**SVM**

cranial root

motoneurons of the C<sub>1-6</sub>

**SM**

spinal root



**FIGURE 8-13.**  
Spinal and cranial roots of the accessory nerve.

# Accessory nerve

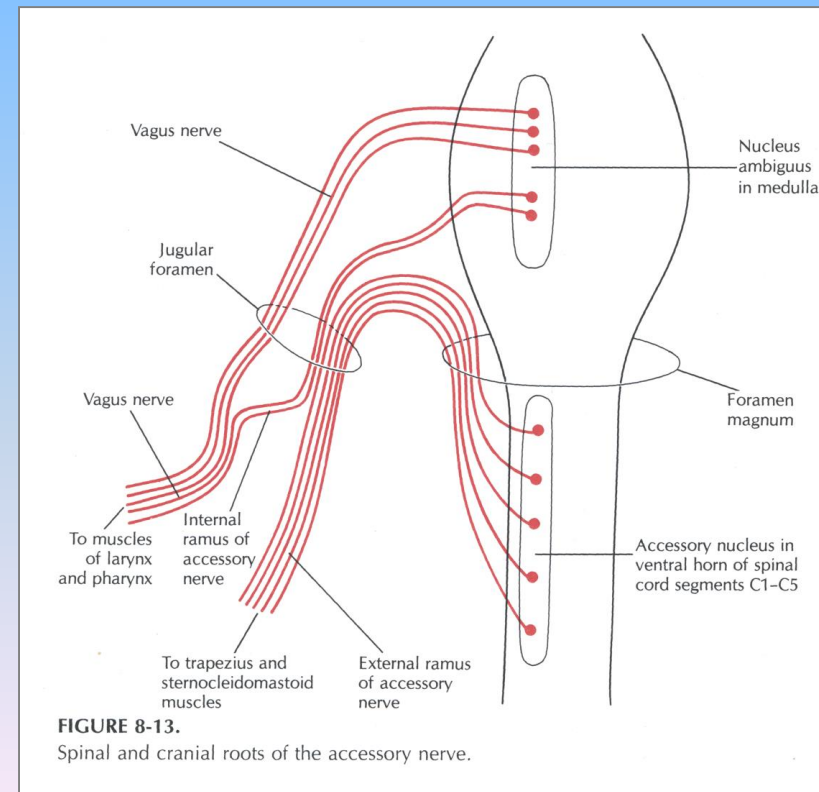
## Branches

### 1. external branch SM

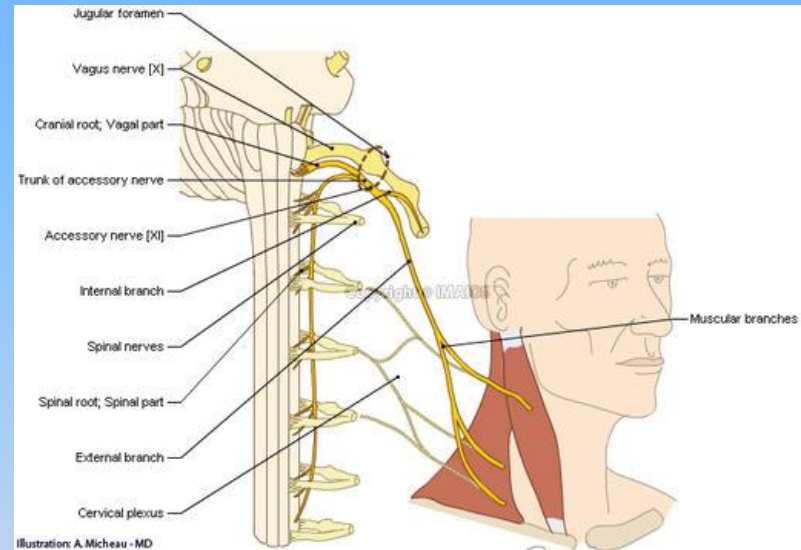
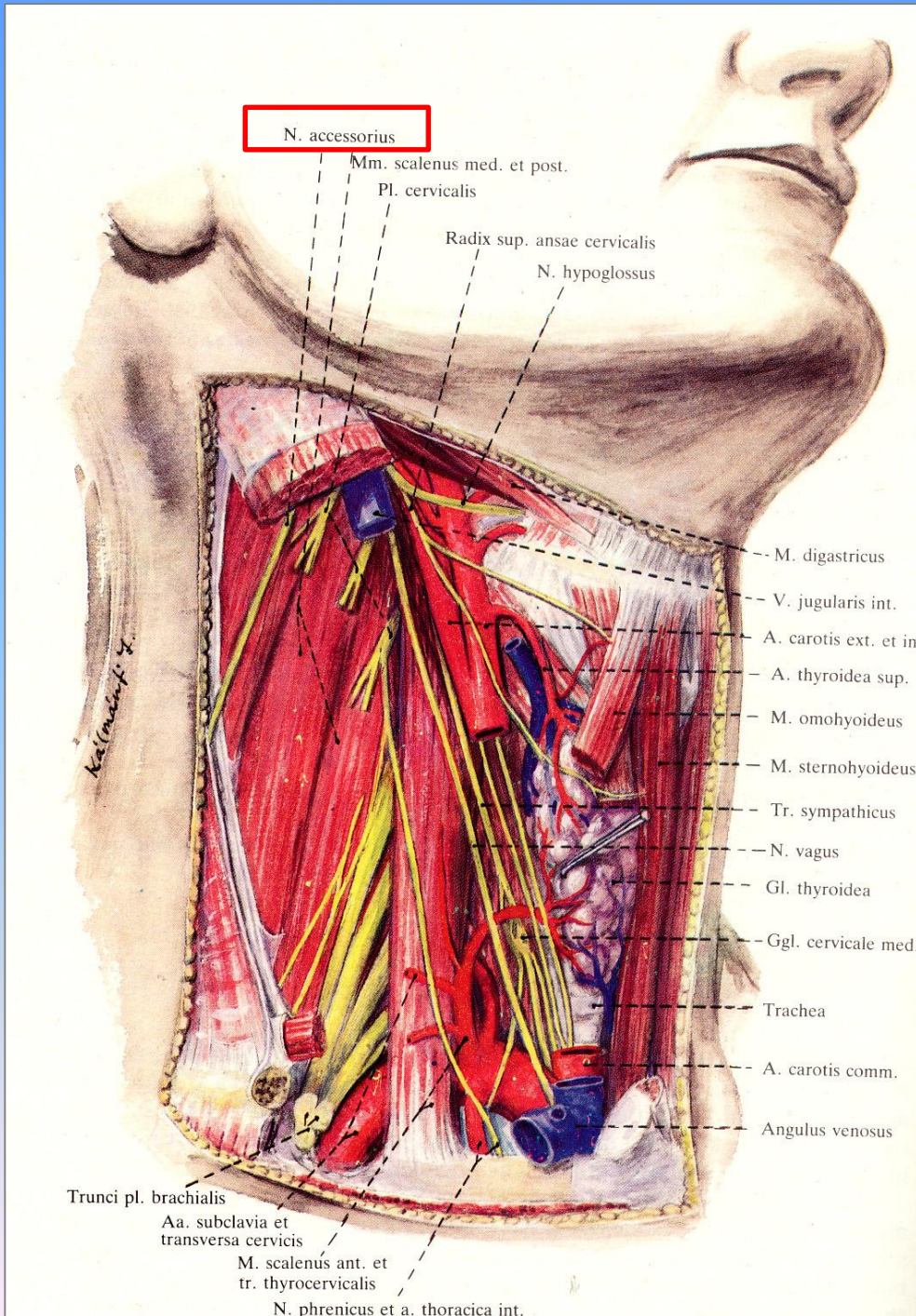
innervates the sternocleidomastoideus and the trapezius muscle

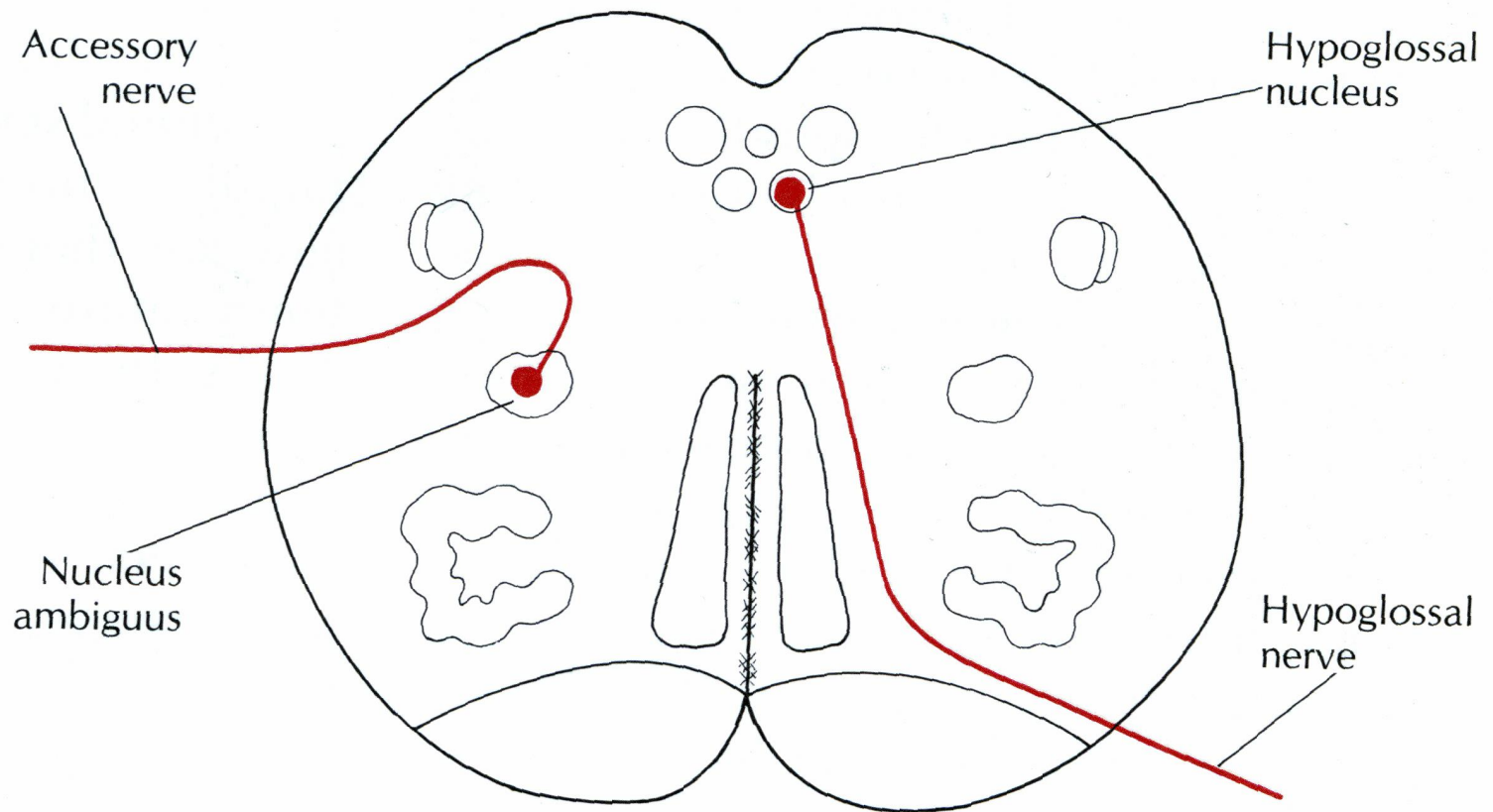
### 2. internal branch

joins to the vagus nerve, and help to innervate the arytenoid muscle







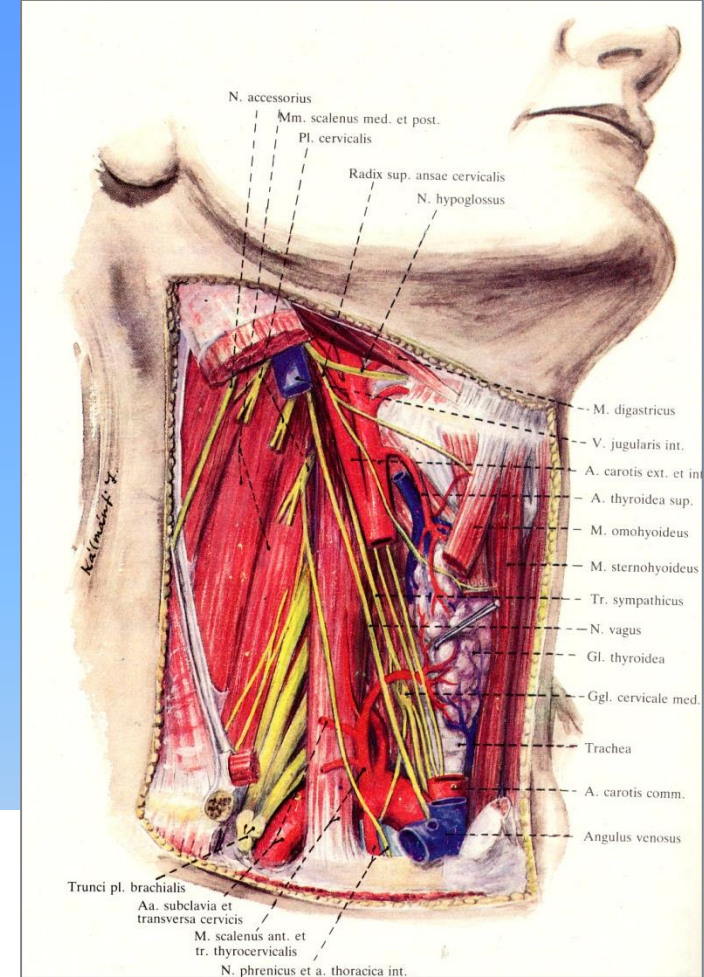
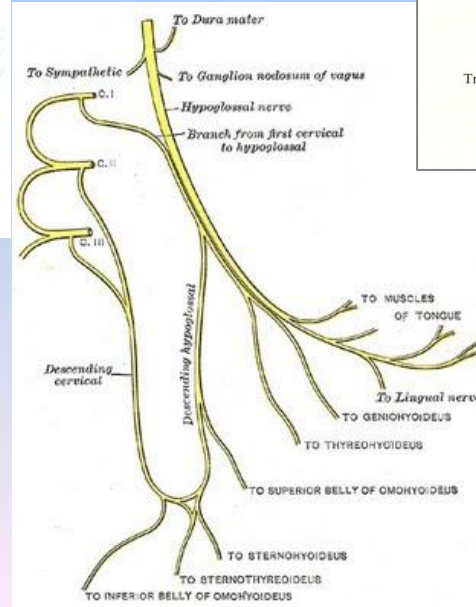
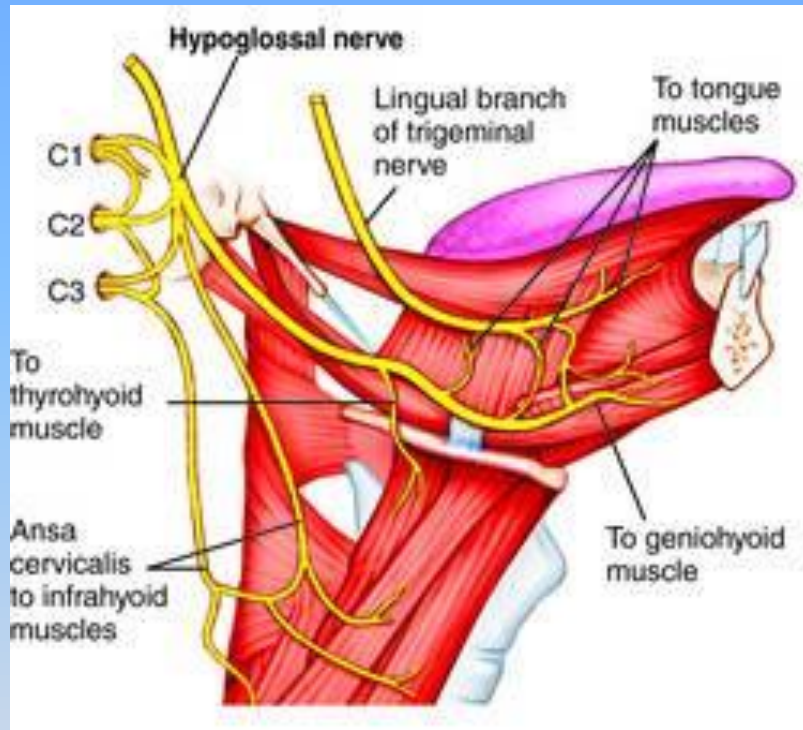


**FIGURE 8-14.**

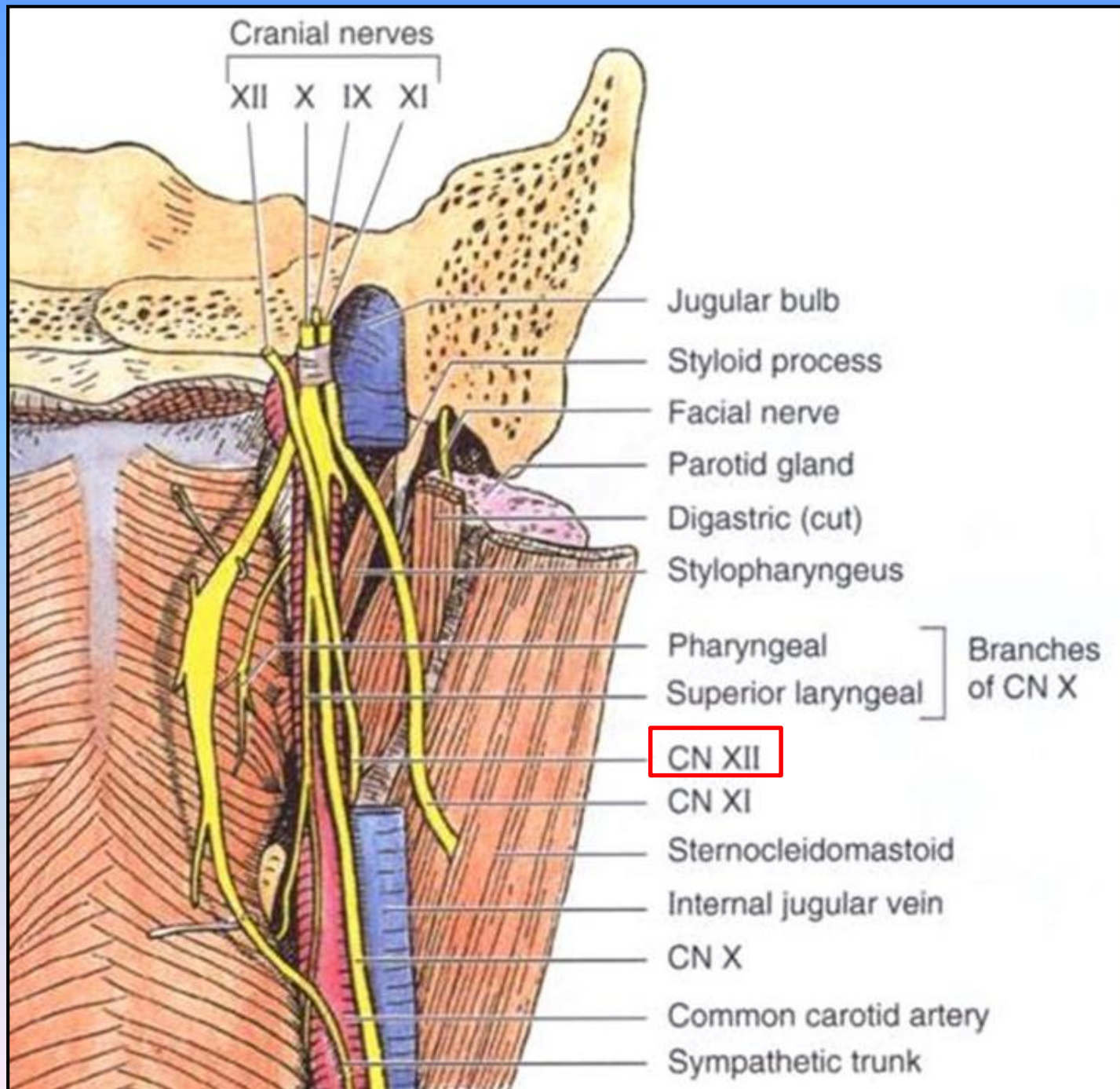
Hypoglossal nerve and origin of the cranial root of the accessory nerve in the medulla.



# Hypoglossal nerve – Deep cervical ansa







# Parapharyngeal region

## Nerves:

**glossopharyngeal n.,  
sympathetic trunk  
vagus n.,  
hypoglossal n.**

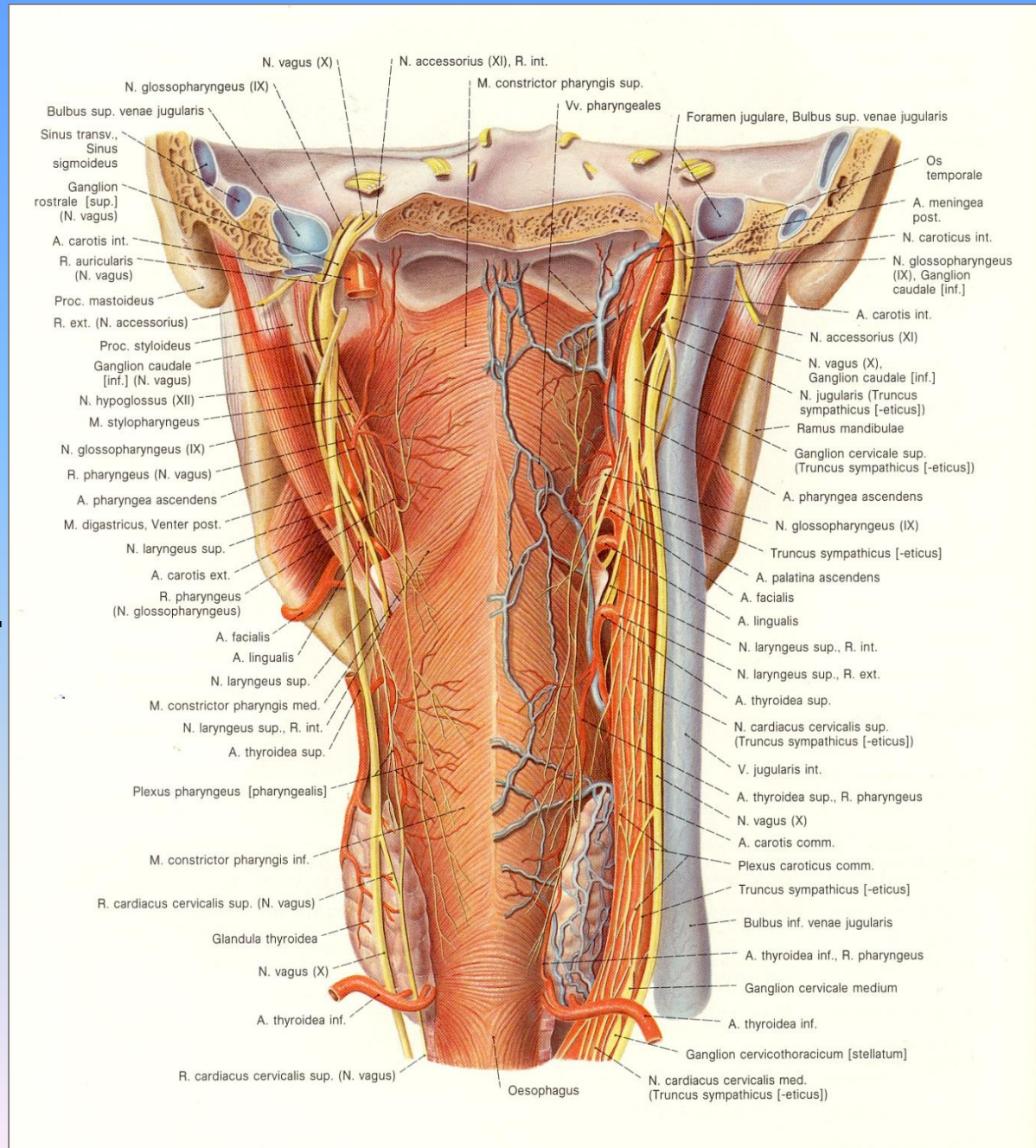
## Vessels:

**common carotid artery:  
int. and ext. carotid a.**

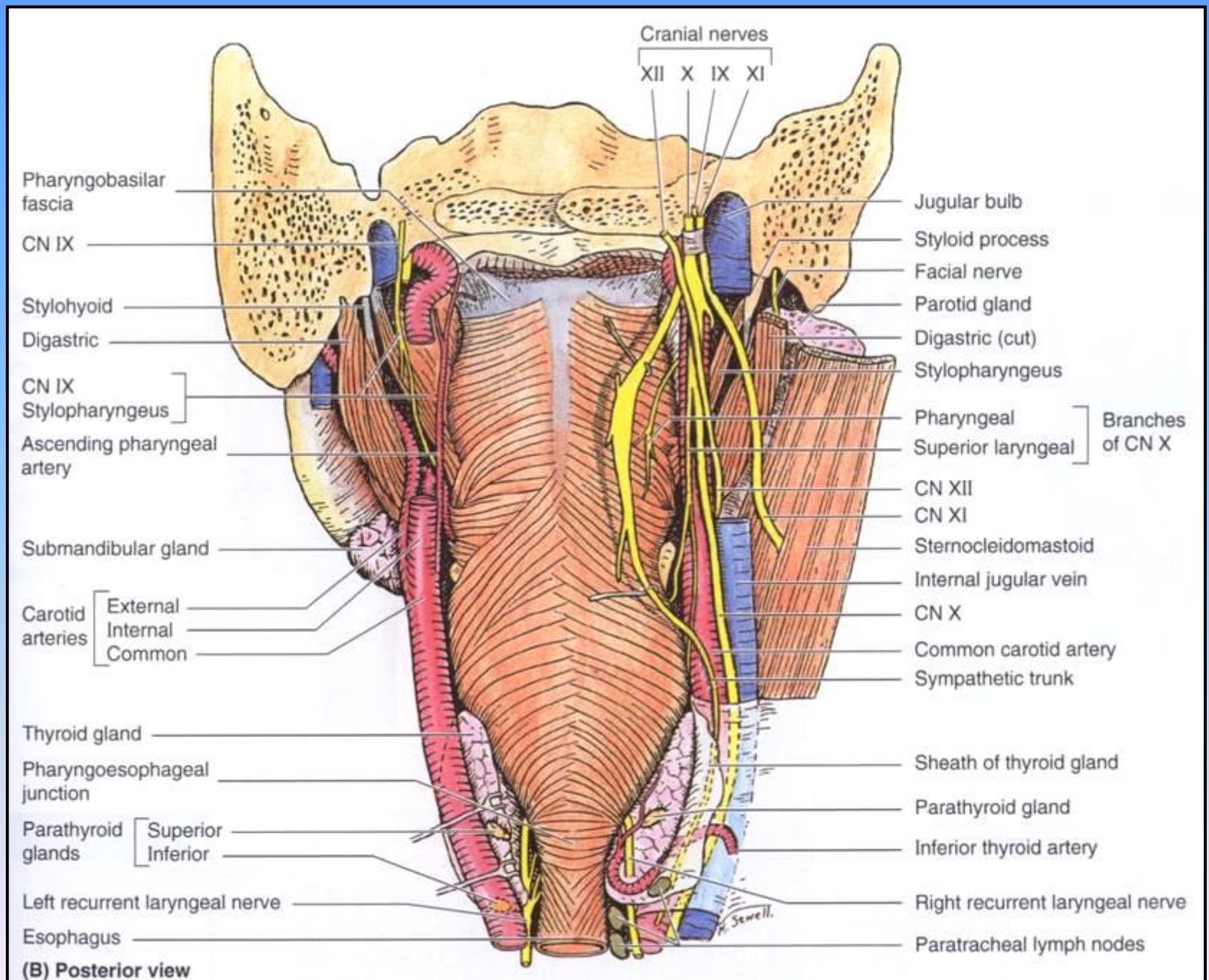
**ascending pharyngeal art.,**

**int. jugular vein,**

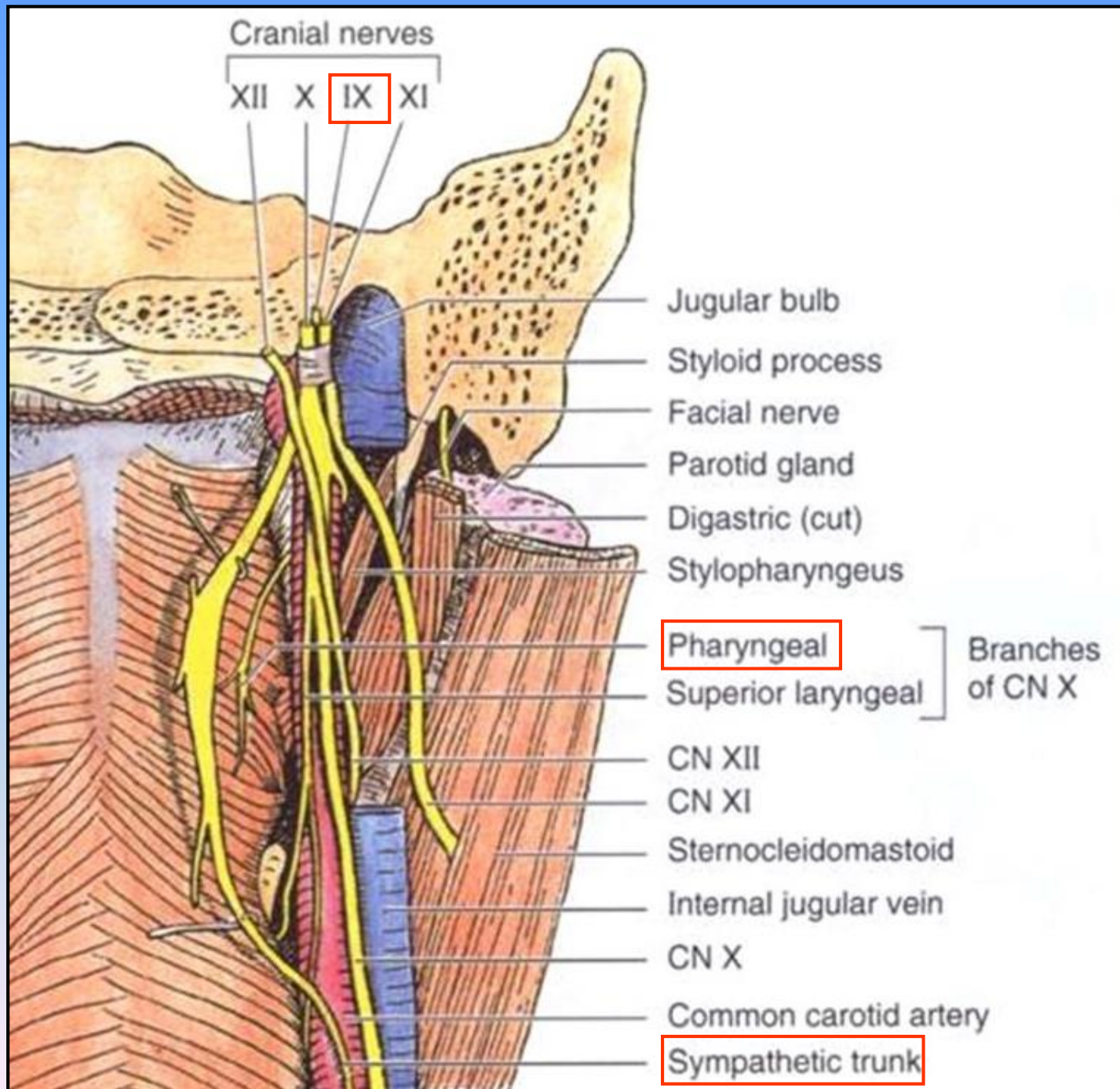
**pharyngeal veins**

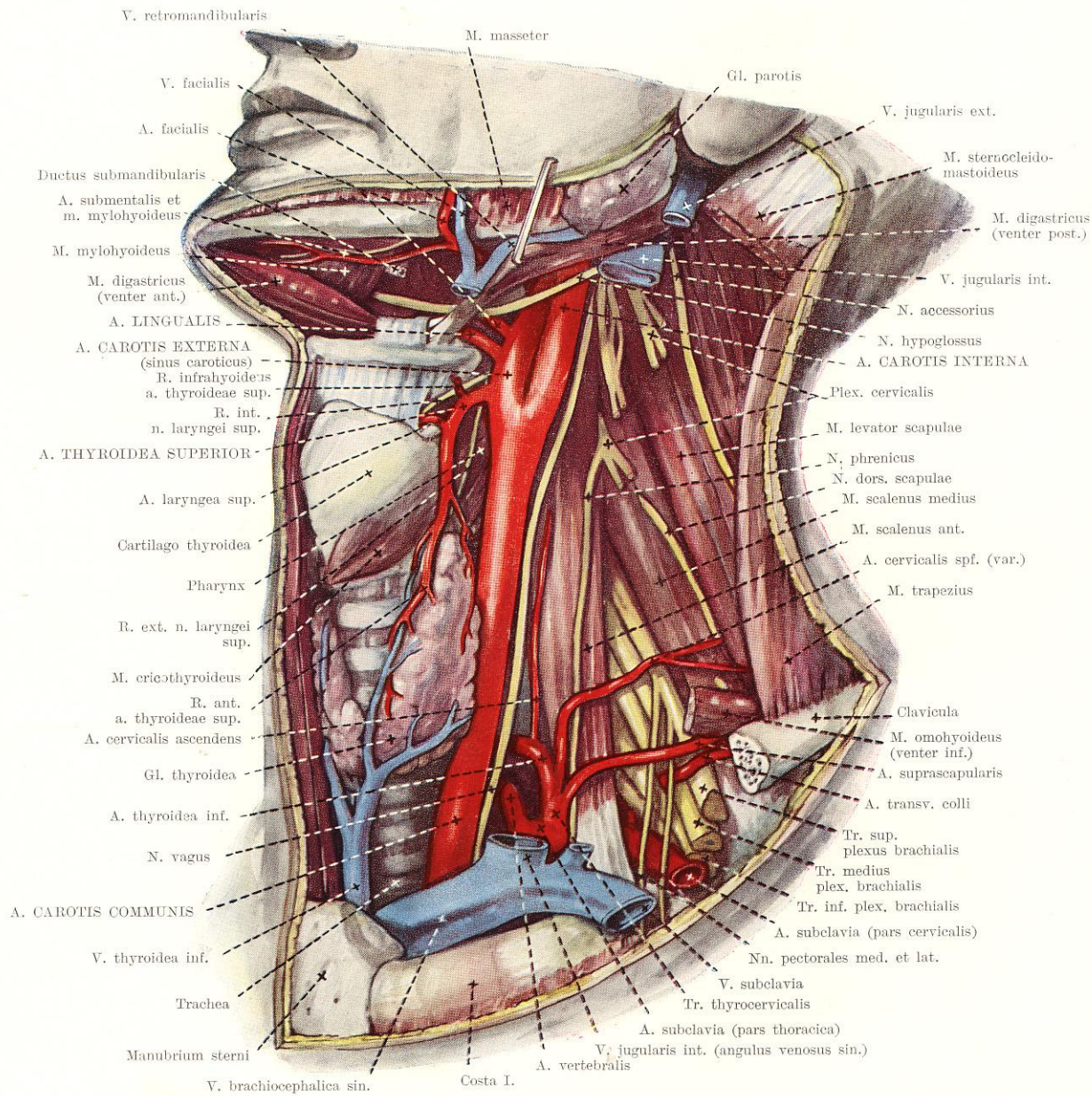




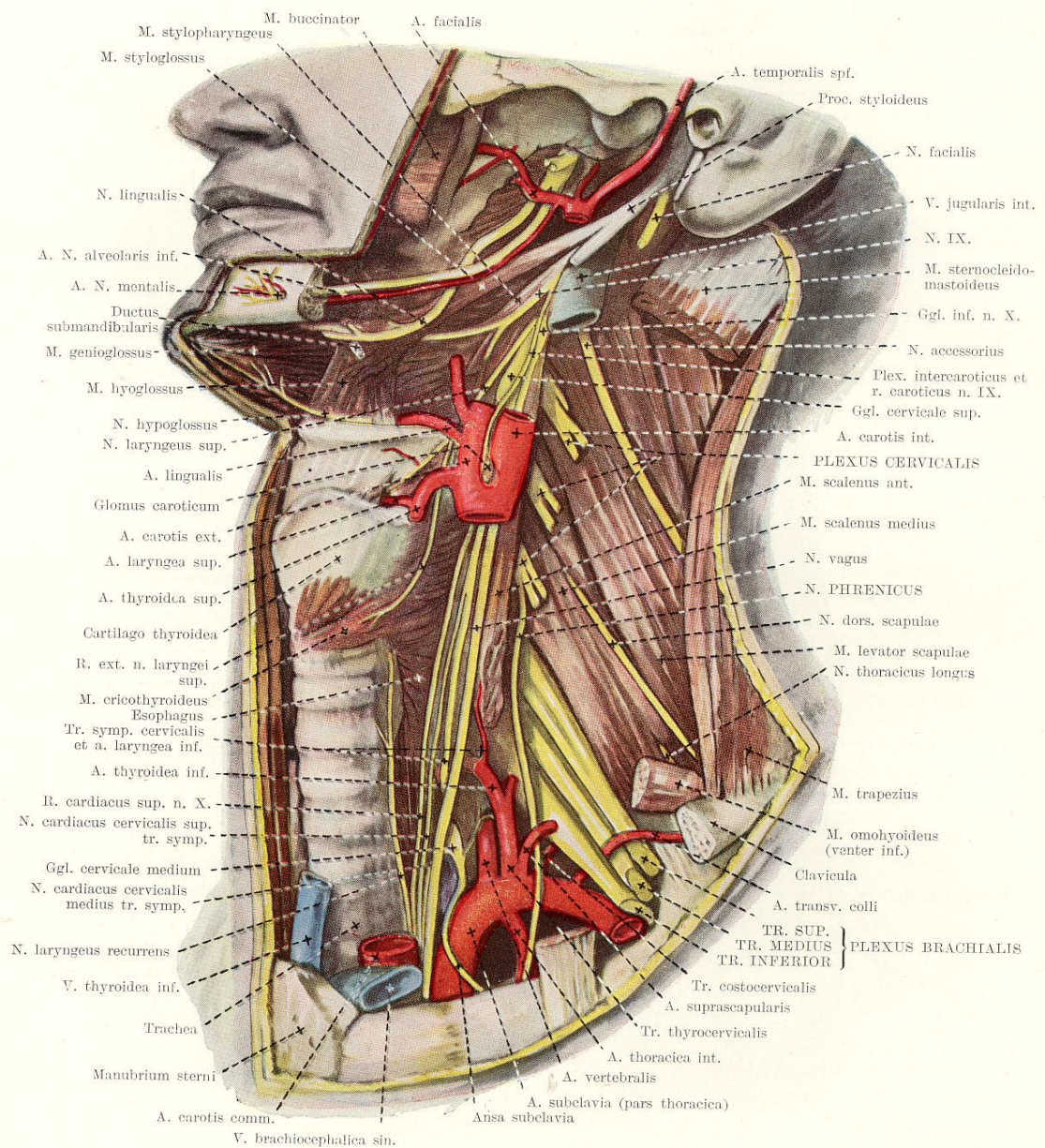












M. buccinator  
 A. facialis  
 M. stylopharyngeus  
 M. styloglossus  
 A. temporalis spl.  
 Proc. styloideus  
 N. facialis  
 V. jugularis int.  
 N. IX.  
 M. sternocleidomastoideus  
 Ggl. inf. n. X.  
 N. accessorius  
 Plex. intercarotius et r. carotici n. IX.  
 Ggl. cervicale sup.  
 A. carotis int.  
 PLEXUS CERVICALIS  
 M. scalenus ant.  
 M. scalenus medius  
 N. vagus  
 N. PHRENICUS  
 N. dors. scapulae  
 M. levator scapulae  
 N. thoracicus longus  
 M. trapezius  
 M. omohyoideus (venter inf.)  
 Clavicula  
 A. transv. colli  
 TR. SUP. } PLEXUS BRACHIALIS  
 TR. MEDIUS }  
 TR. INFERIOR }  
 Tr. costocervicalis  
 A. suprascapularis  
 Tr. thyrocervicalis  
 A. thoracica int.  
 A. vertebralis  
 A. subclavia (pars thoracica)  
 Ansa subclavia  
 A. carotis comm.  
 V. brachiocephalica sin.

M. stylopharyngeus  
 A. N. alveolaris inf.  
 A. N. mentalis.  
 Ductus submandibularis  
 M. genioglossus  
 M. hyoglossus  
 N. hypoglossus  
 N. laryngeus sup.  
 A. lingualis  
 Glomus caroticum  
 A. carotis ext.  
 A. laryngea sup.  
 A. thyroidea sup.  
 Cartilago thyroidea  
 R. ext. n. laryngei sup.  
 M. cricothyroideus  
 Esophagus  
 Tr. symp. cervicalis et a. laryngea inf.  
 A. thyroidea inf.  
 R. cardiacus sup. n. X.  
 N. cardiacus cervicalis sup. tr. symp.  
 Ggl. cervicale medium  
 N. cardiacus cervicalis medius tr. symp.  
 N. laryngeus recurrens  
 V. thyroidea inf.  
 Trachea  
 Manubrium sterni