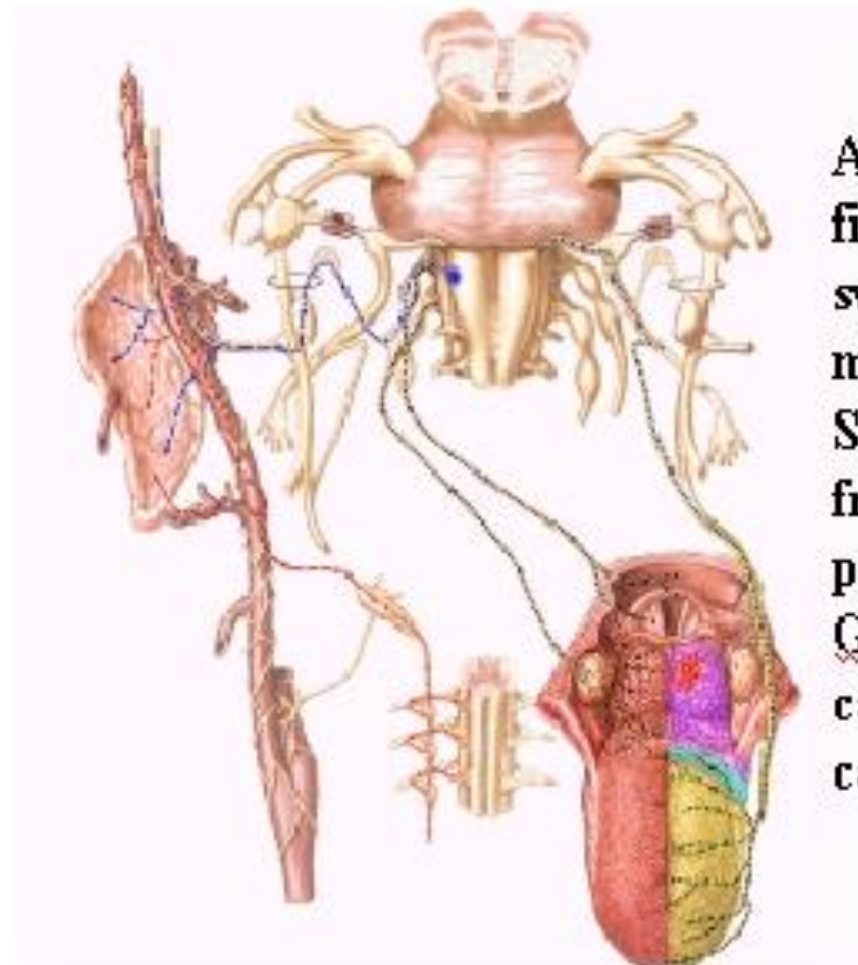


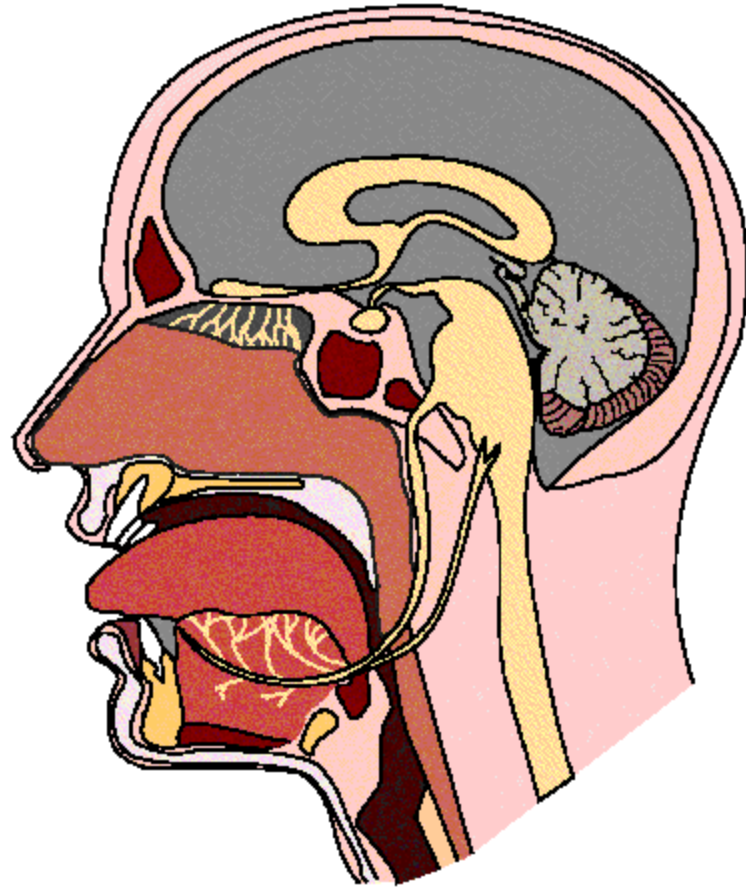
# **Cranial Nerve IX - Glossopharyngeal**

# Glossopharyngeal Nerve and Branches

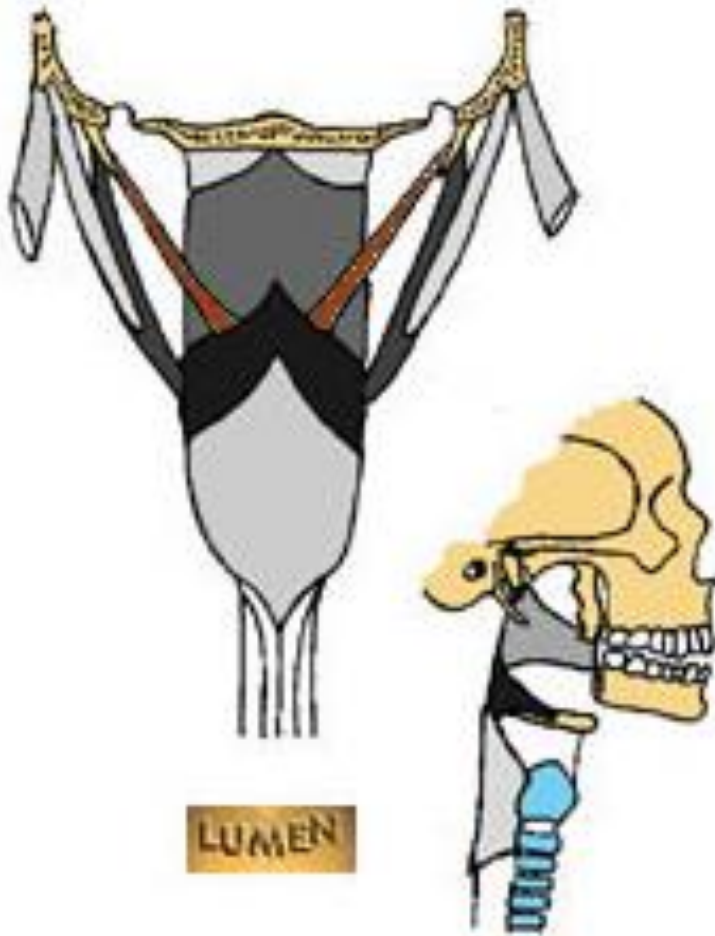


A mixed nerve, it carries motor fibers to pharyngeal muscles for swallowing and parasympathetic motor fibers to salivary glands. Sensory fibers carry messages from the pharynx, tonsils, posterior of tongue (taste). Glossopharyngeal fibers also carry afferent messages from the carotid sinus baroreceptors.

The glossopharyngeal nerve consists of five components with distinct functions:



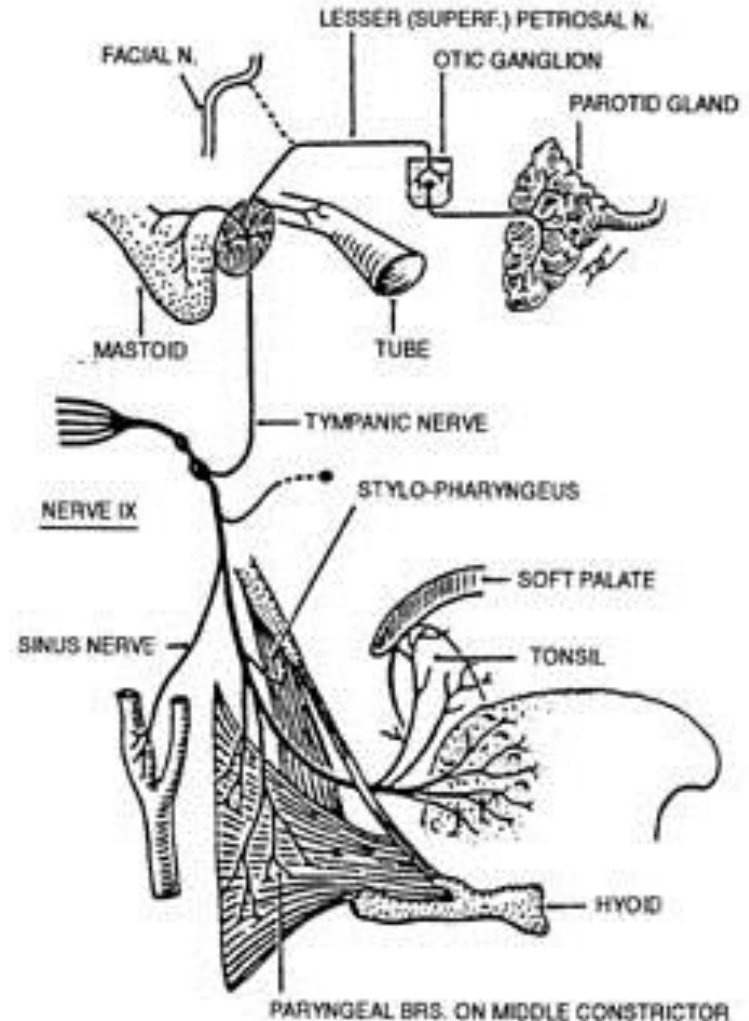
# Somatic motor



- The somatic motor component of CN IX provides voluntary control of the **stylopharyngeus muscle** which elevates the pharynx during swallowing and speech.

# Visceral motor

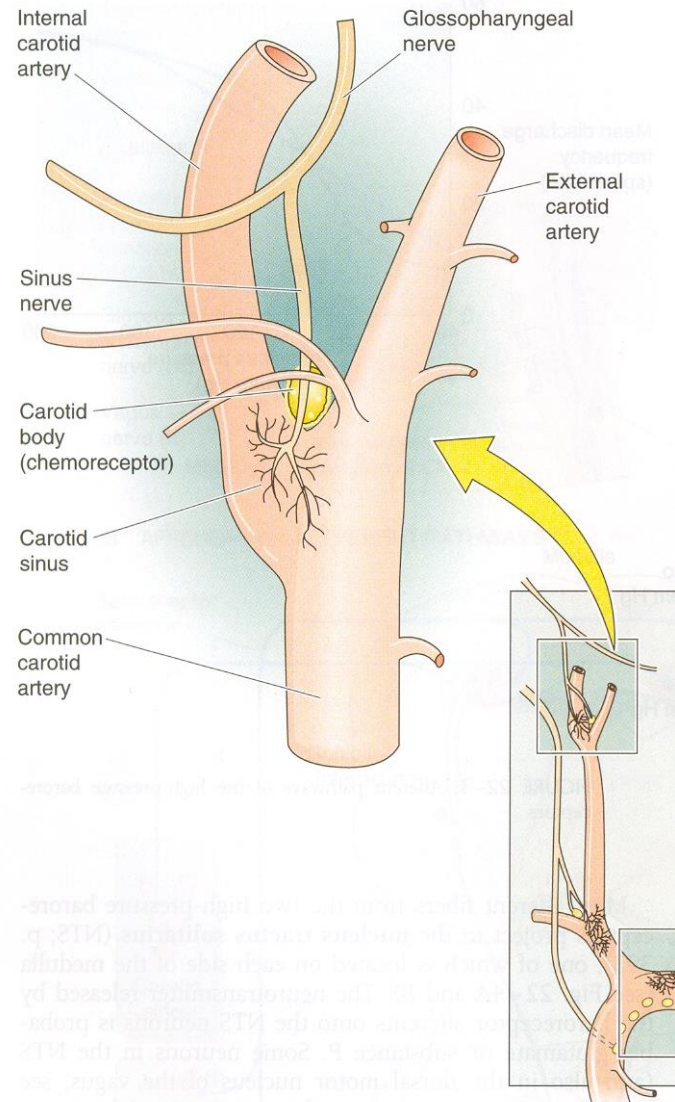
- Parasympathetic innervation of the smooth muscle and glands of the pharynx, larynx



# Visceral sensory

- Carries visceral sensory information from the carotid sinus and body.

A INNERVATION OF CAROTID SINUS AND BODY

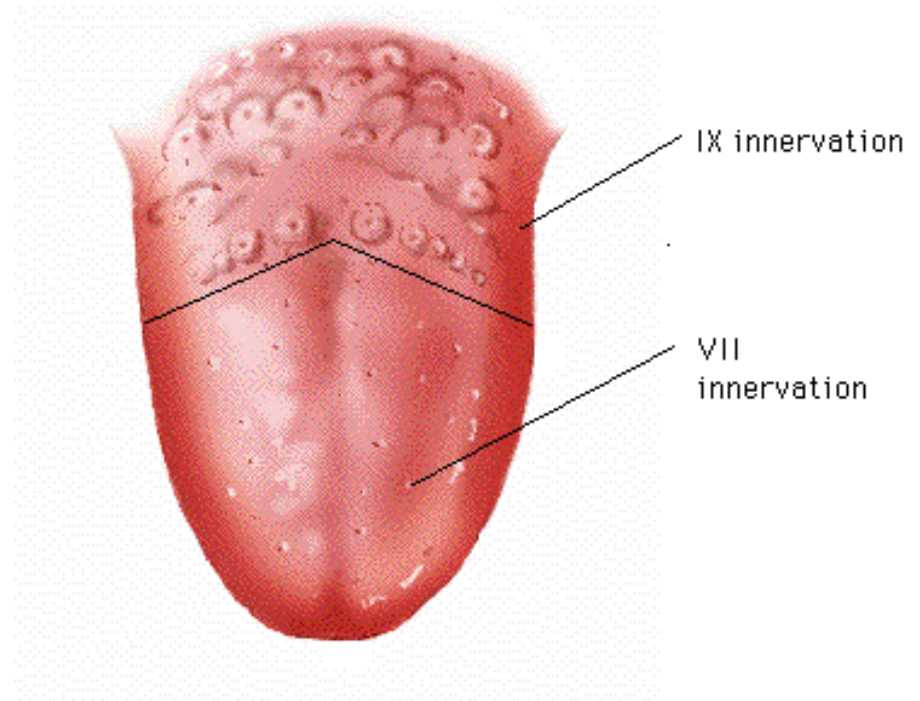


# General sensory

- Provides general sensory information from the skin of the external ear, internal surface of the tympanic membrane, upper pharynx, and the posterior one-third of the tongue.

# Special sensory

- Provides taste sensation from the posterior one-third of the tongue.

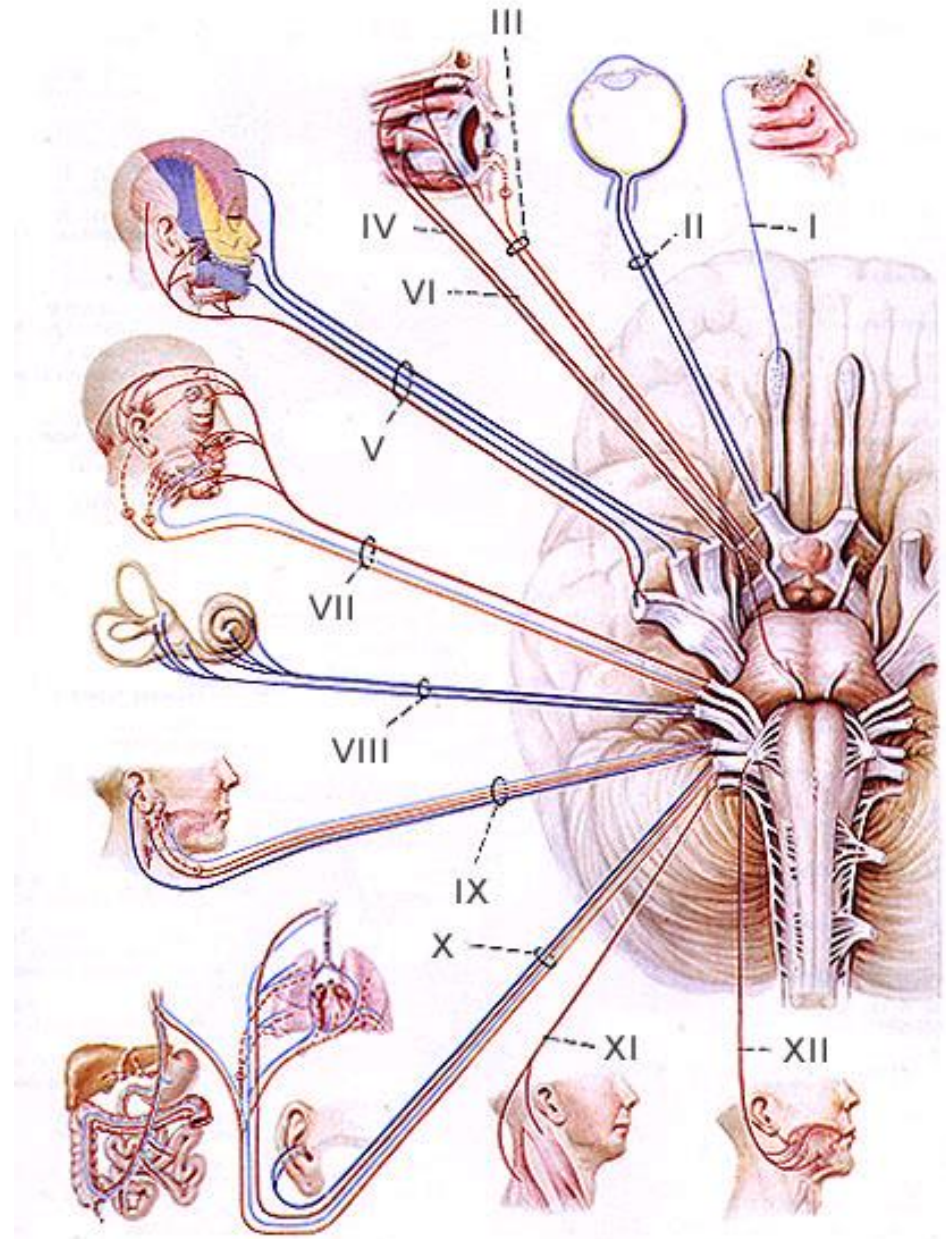




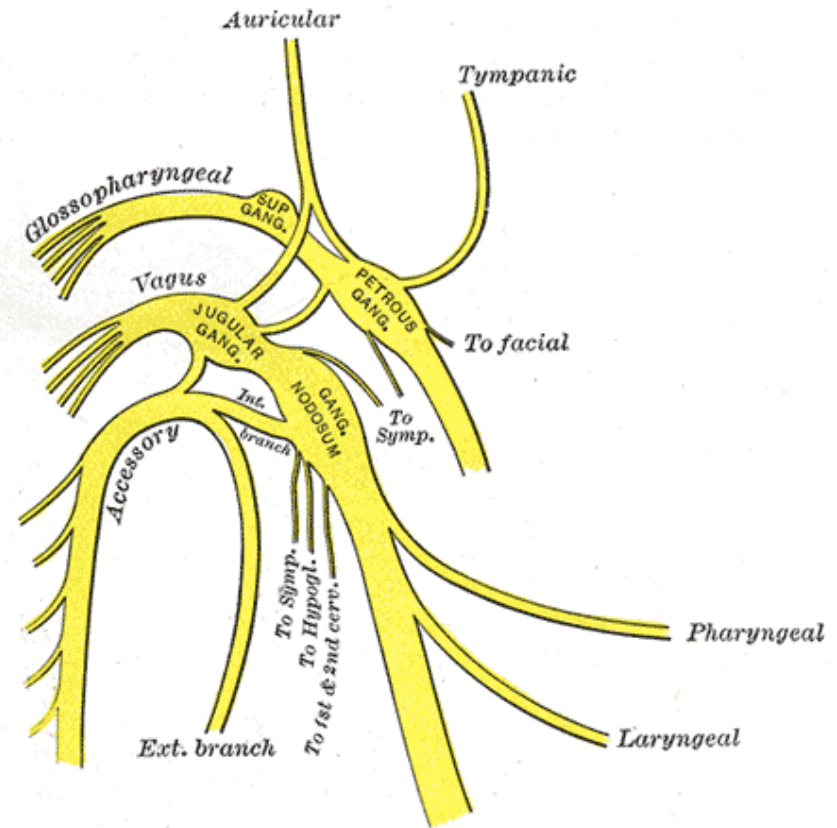
# Origin and Central Course - Somatic Motor Component

- The branchial motor component originates from the nucleus ambiguus in the reticular formation of the medulla.
- Fibers leaving the nucleus ambiguus travel anteriorly and laterally to exit the medulla, along with the other components of CN IX, between the olive and the inferior cerebellar peduncle.

- Upon emerging from the medulla the somatic motor component joins the other components of CN IX to exit the skull via the jugular foramen.



- The glossopharyngeal fibers travel just anterior to the cranial nerves X and XI which also exit the skull via the jugular foramen.



# Extra-cranial course and final innervation

- Upon exiting the skull the branchial motor fibers descend deep to the styloid process and wrap around the posterior border of the stylopharyngeus muscle before innervating it.

# Overview of visceral motor component

- Parasympathetic component of the glossopharyngeal nerve which innervates the ipsilateral parotid gland.
- The preganglionic nerve fibers originate in the inferior salivatory nucleus and exit the brainstem with the other components of CN IX.

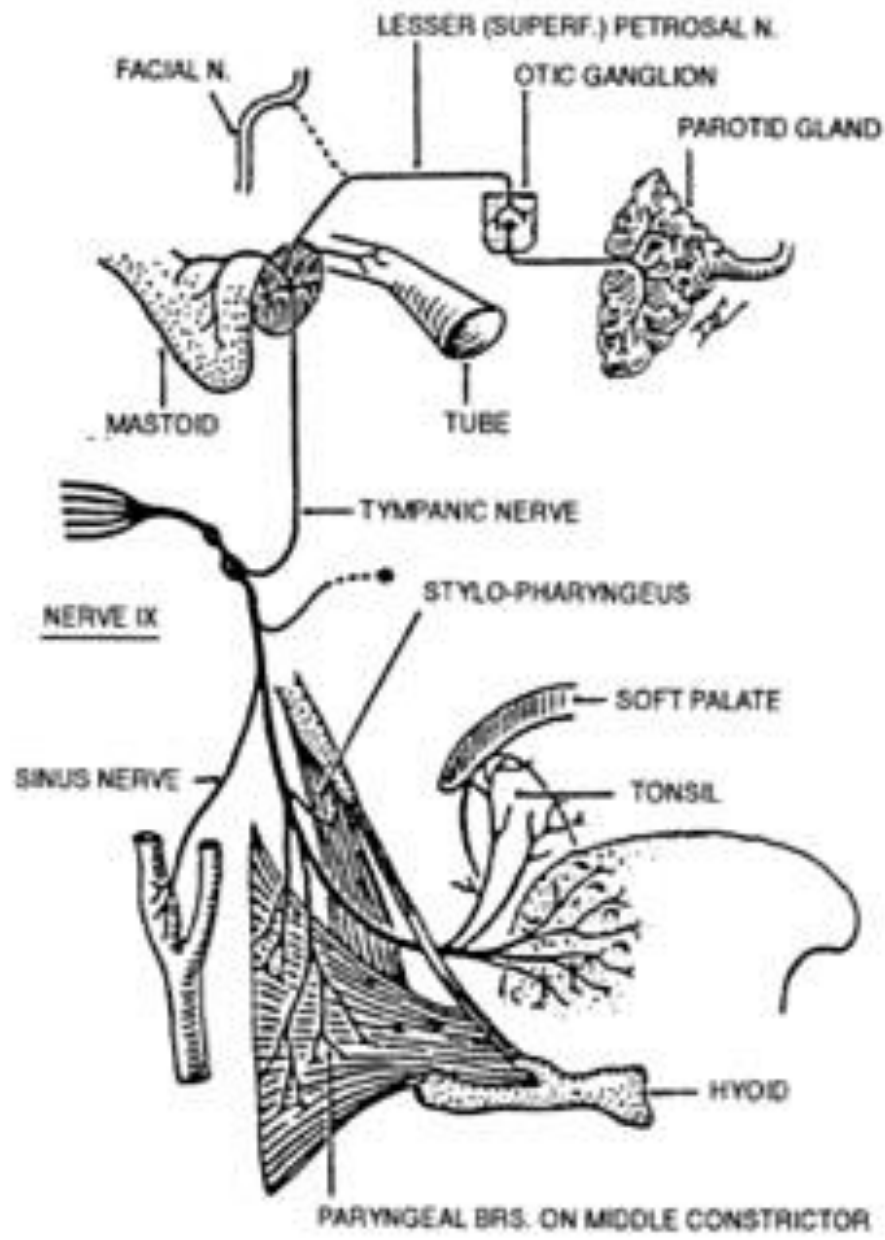
# Intracranial course - visceral motor component

- Within the jugular foramen there are two glossopharyngeal ganglia which contain nerve cell bodies which mediate general, visceral, and special sensation. The visceral motor fibers pass through both ganglia without synapsing and exit the inferior ganglion with CN IX general sensory fibers as the tympanic nerve.

Before exiting the jugular foramen, the tympanic nerve enters the petrous portion of the temporal and ascends via the inferior tympanic canaliculus to the tympanic cavity.

Within the tympanic cavity the tympanic nerve forms a plexus on the surface of the promontory of the middle ear to provide general sensation. The visceral motor fibers pass through this plexus and merge to become the lesser petrosal nerve.

The lesser petrosal nerve re-enters and travels through the temporal bone to emerge in the middle cranial fossa just lateral to the greater petrosal nerve. It then proceeds anteriorly to exit the skull via the foramen ovale along with the mandibular component of CN V (V3).



# **Visceral motor component Extra-cranial course and final innervations**

- Upon exiting the skull, the lesser petrosal nerve synapses in the otic ganglion which is suspended from the mandibular nerve immediately below the foramen ovale.

Postganglionic fibers from the otic ganglion travel with the auriculotemporal branch of CN V3 to enter the substance of the parotid gland.



# Overview of visceral sensory component

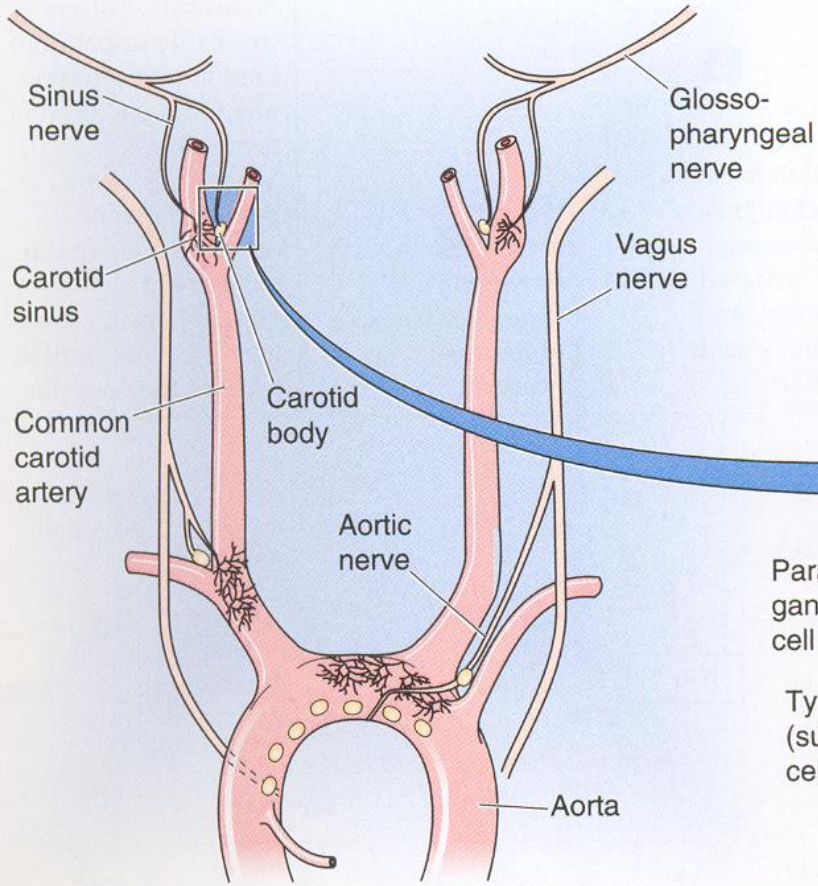
- This component of CN IX innervates the baroreceptors of the carotid sinus and chemoreceptors of the carotid body.

Sensory fibers arise from the carotid sinus and carotid body at the bifurcation of the common carotid artery, ascend in the sinus nerve, and join the other components of CN IX at the inferior hypoglossal ganglion.

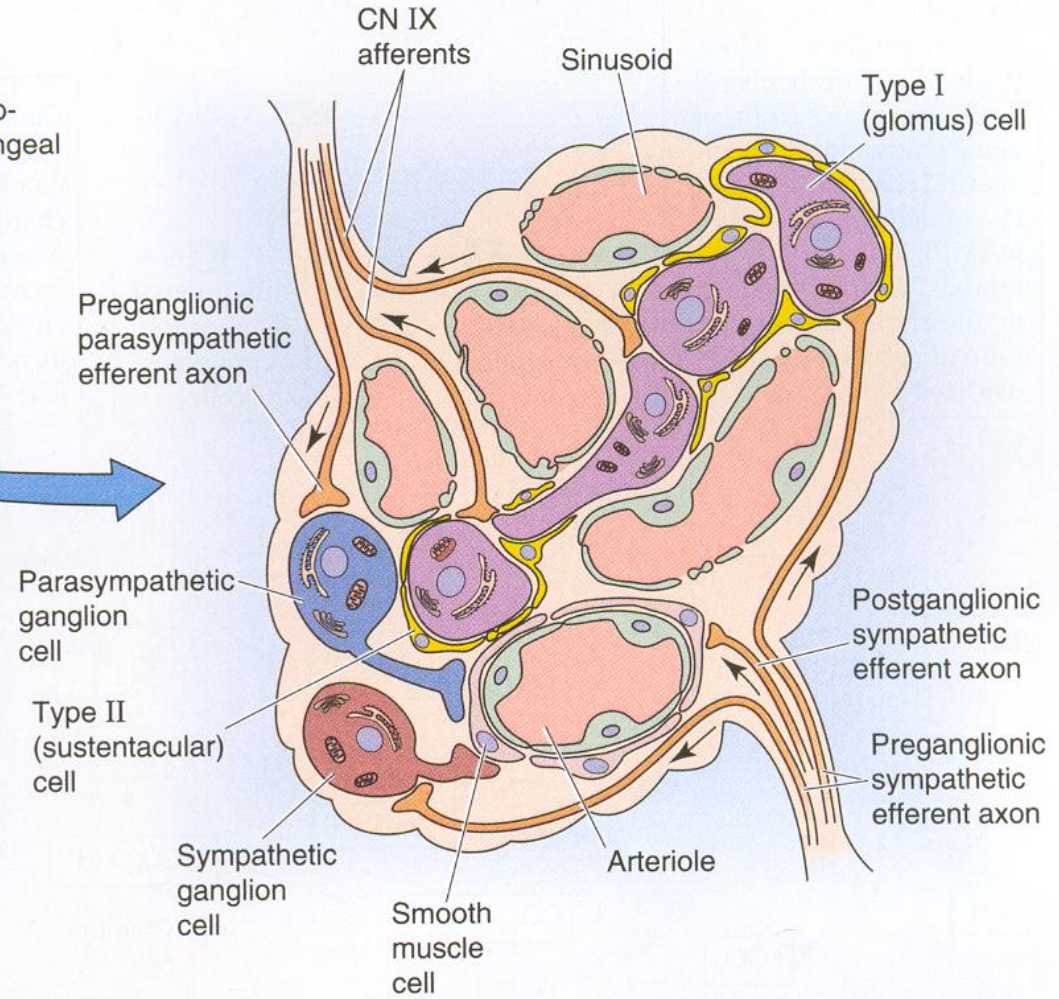
The cell bodies of these neurons reside in the inferior ganglion.

The central processes of these neurons enter the skull via the jugular foramen.

### A LOCATION OF CAROTID AND AORTIC BODIES

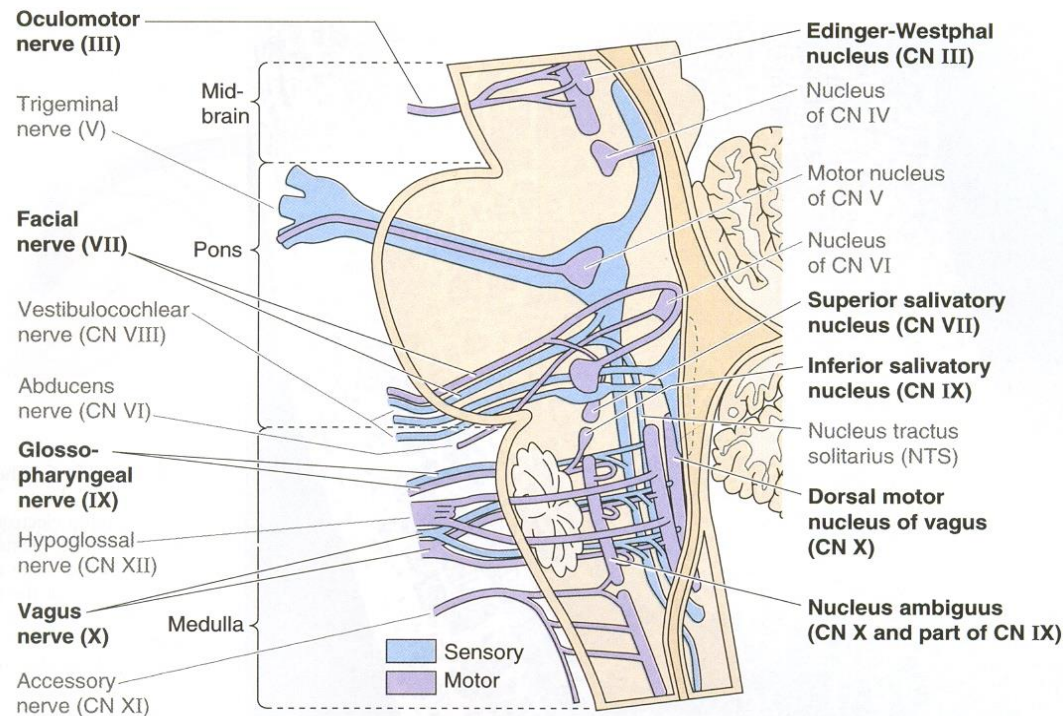


### B MICROSCOPIC ANATOMY OF CAROTID BODY



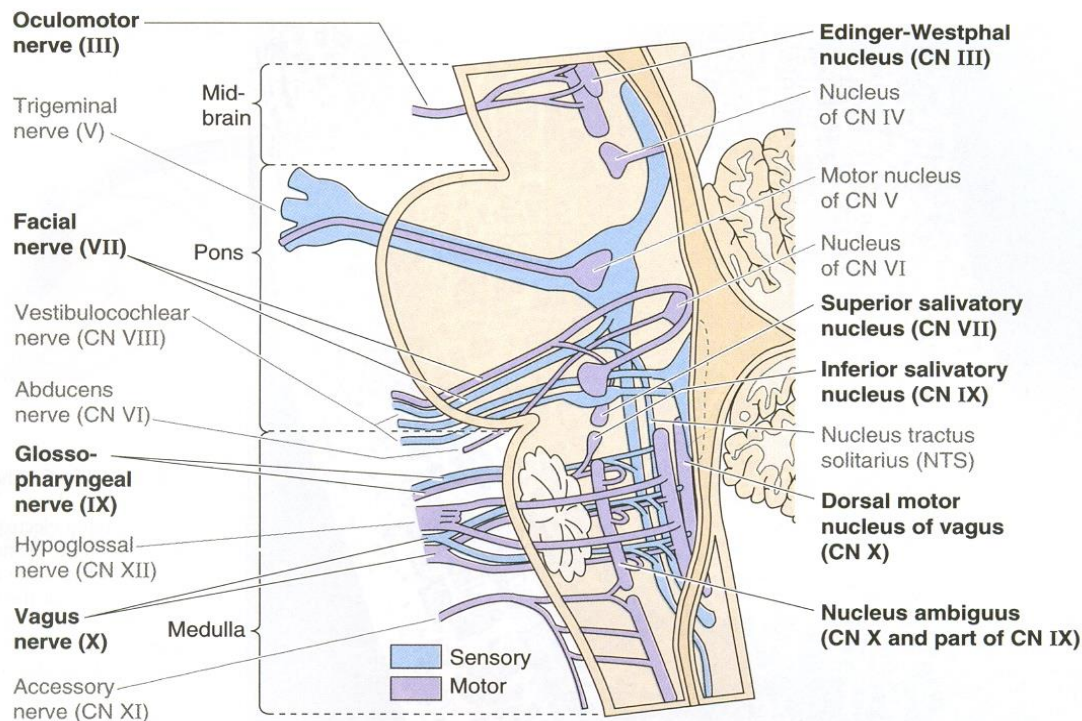
# Central course - visceral sensory component

- Once inside the skull, the visceral sensory fibers enter the lateral medulla between the olive and the inferior cerebellar peduncle and descend in the tractus solitarius to synapse in the caudal nucleus solitarius.



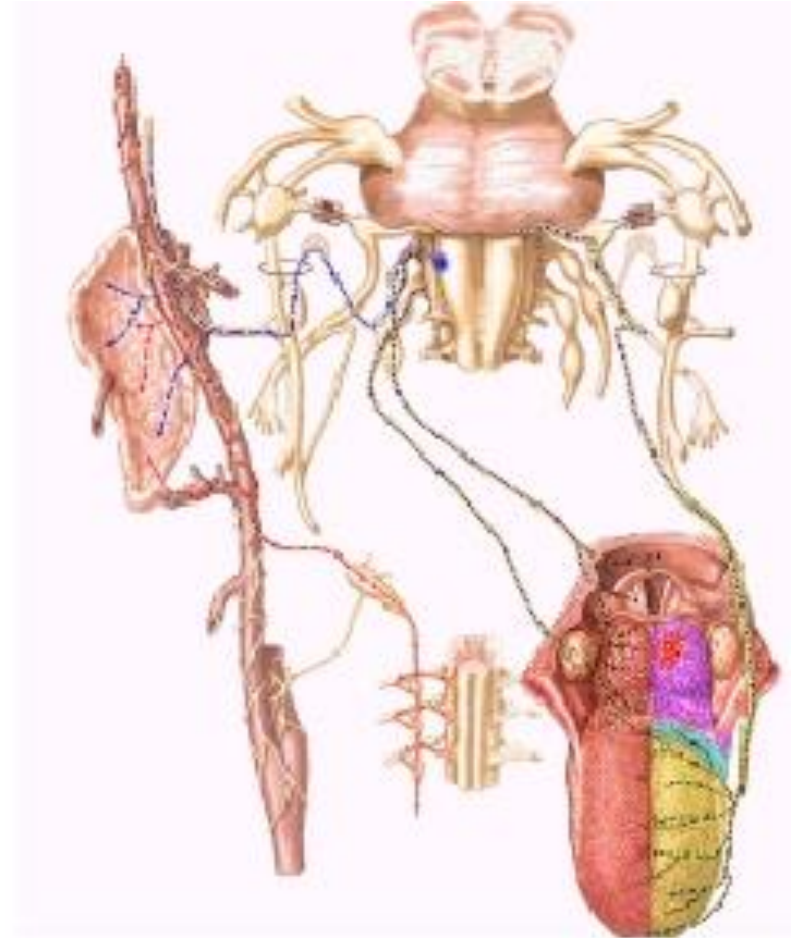
# Central course - visceral sensory component

- From the nucleus solitarius, connections are made with several areas in the reticular formation and hypothalamus to mediate cardiovascular and respiratory reflex responses to changes in blood pressure, and serum concentrations of CO<sub>2</sub> and O<sub>2</sub>.



# Overview of general sensory component

- This component of CN IX carries general sensory information (pain, temperature, and touch) from the skin of the external ear, internal surface of the tympanic membrane, the walls of the upper pharynx, and the posterior one-third of the tongue.



# Peripheral course - general sensory component

- Sensory fibers from the skin of the external ear initially travel with the auricular branch of CN X, while those from the middle ear travel in the tympanic nerve as discussed above (CN IX visceral motor section).

General sensory information from the upper pharynx and posterior one-third of the tongue travel via the pharyngeal branches of CN IX.

These peripheral processes have cell their cell body in either the superior or inferior glossopharyngeal ganglion.

# Central course - general sensory component

- The central processes of the general sensory neurons exit the glossopharyngeal ganglia and pass through the jugular foramen to enter the brainstem at the level of the medulla.

Upon entering the medulla these fibers descend in the spinal trigeminal tract and synapse in the caudal spinal nucleus of the trigeminal.

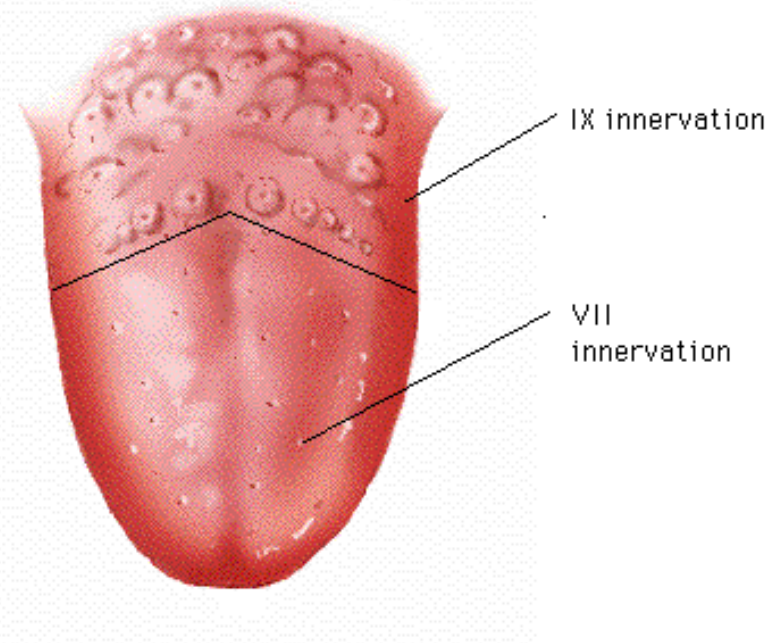
# Clinical correlation

- The general sensory fibers of CN IX mediate the afferent limb of the pharyngeal reflex in which touching the back of the pharynx stimulates the patient to gag (i.e. the gag reflex). The efferent signal to the musculature of the pharynx is carried by the branchial motor fibers of the vagus nerve.



# Overview of Special Sensory Component

- The special sensory component of CN IX provides taste sensation from the posterior one-third of the tongue.
- Special sensory fibers from the posterior one-third of the tongue travel via the pharyngeal branches of CN IX to the inferior glossopharyngeal ganglion where their cell bodies reside.



# Central course - special sensory component

- The central processes of these neurons exit the inferior ganglion and pass through the jugular foramen to enter the brainstem at the level of the rostral medulla between the olive and inferior cerebellar peduncle.

Upon entering the medulla these fibers ascend in the tractus solitarius and synapse in the caudal nucleus solitarius. Taste fibers from CN VII and X also ascend and synapse here.

