

The Brain

Learning Outcomes:

1. Identify the major regions of the brain and identify their functions
2. Compare and contrast the structures that protect and support the brain
3. Identify the anatomical structures that form the thalamus and hypothalamus and list their functions
4. Identify the components of the cerebellum and list their functions

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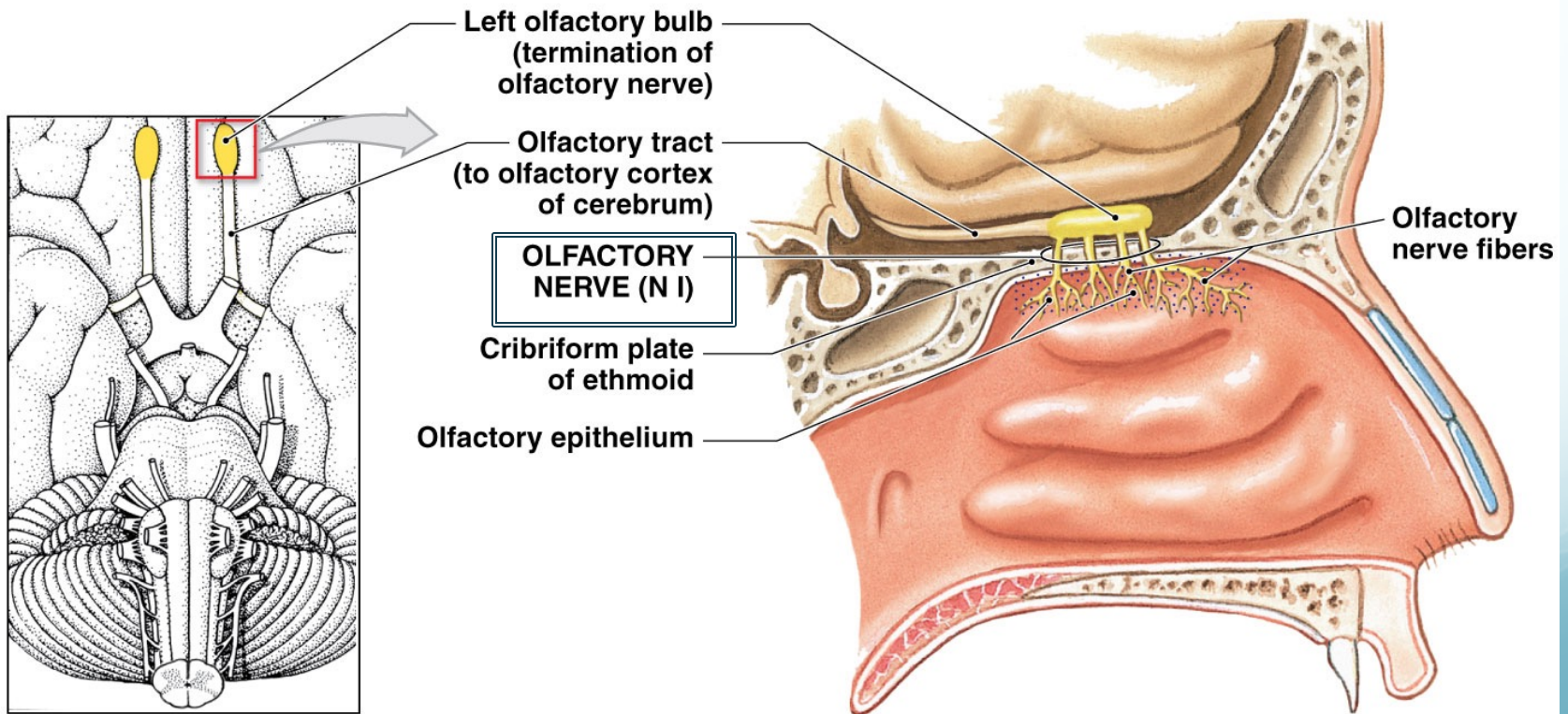
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The Cranial Nerves

- Cranial nerves are components of the peripheral nervous system that connect to the brain rather than to the spinal cord.
 - There are twelve pairs of cranial nerves.
 - Cranial nerves are numbered using Roman numerals.
- Each cranial nerve attaches to the brain near the associated sensory or motor nuclei.

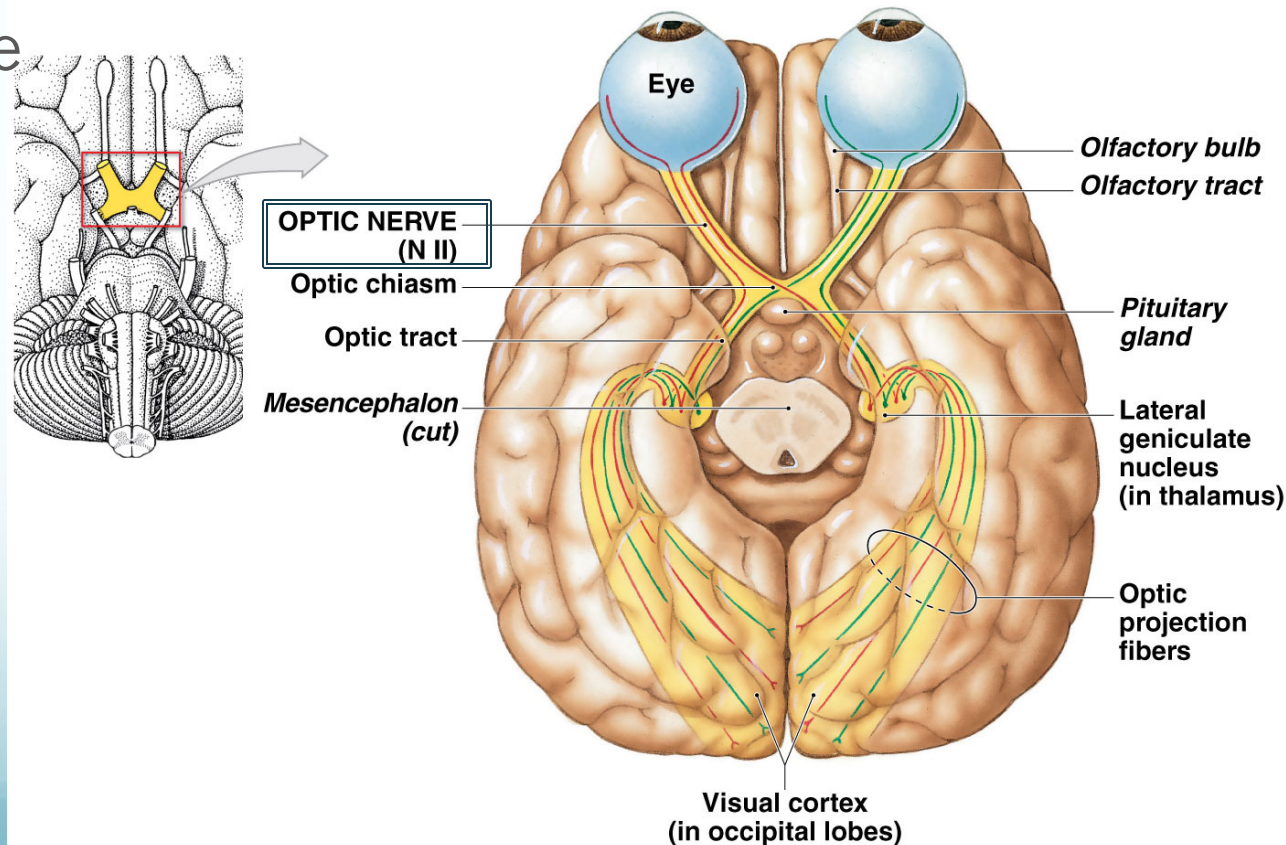
The Olfactory Nerve (N I)

- Primary function:
 - Special sensory (smell)
- Innervation
 - olfactory epithelium



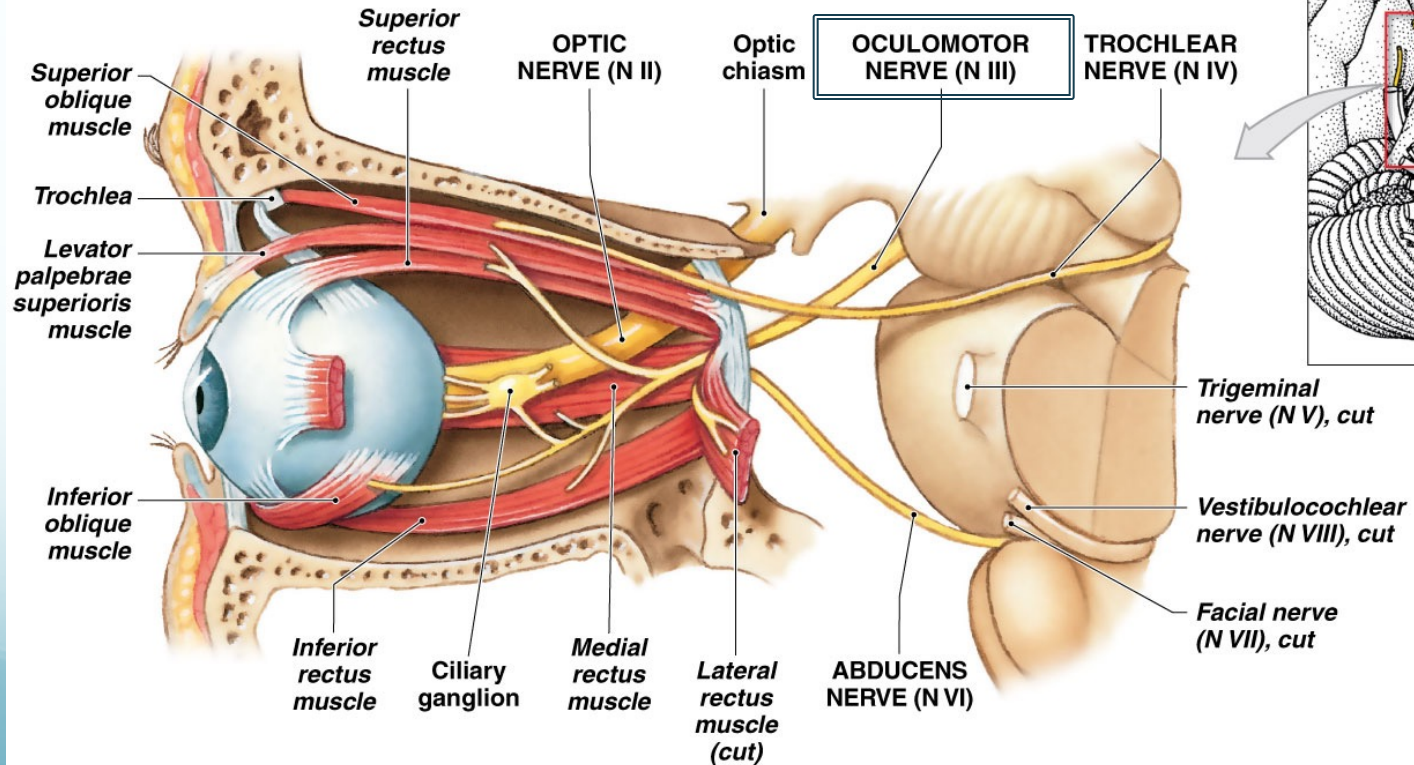
The Optic Nerve (N II)

- Primary function:
 - Special sensory (sight)
- Innervation
 - Retina of eye



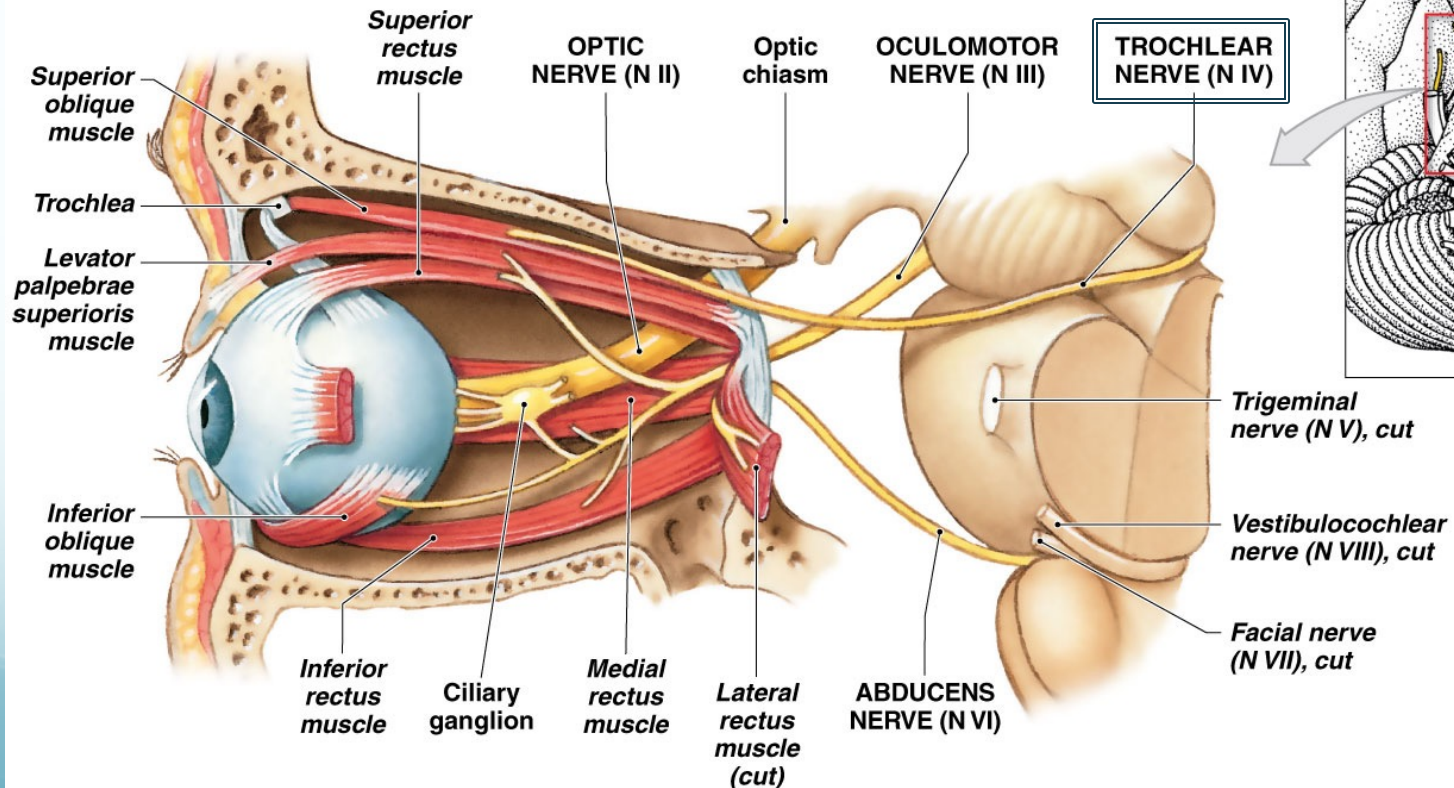
The Oculomotor Nerve (NIII)

- Primary function:
 - Motor (eye movement)
- Innervation
 - Inferior, medial, superior rectus, inferior oblique, and levator palpebrae muscles, intrinsic muscles of eye

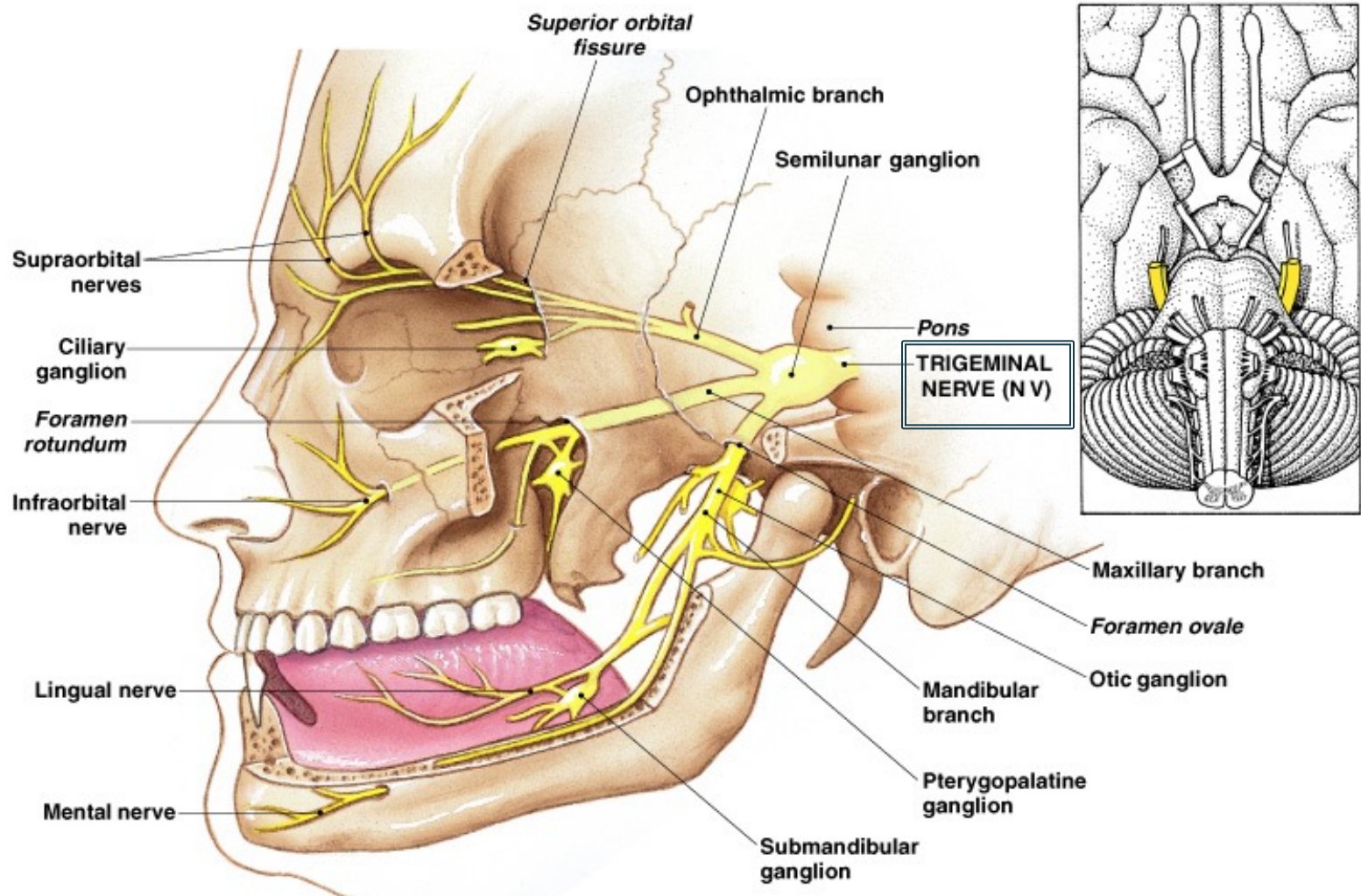


The Trochlear Nerve (N IV)

- Primary function:
 - Motor (eye movement)
- Innervation
 - Superior oblique muscle



The Trigeminal Nerve (N V)

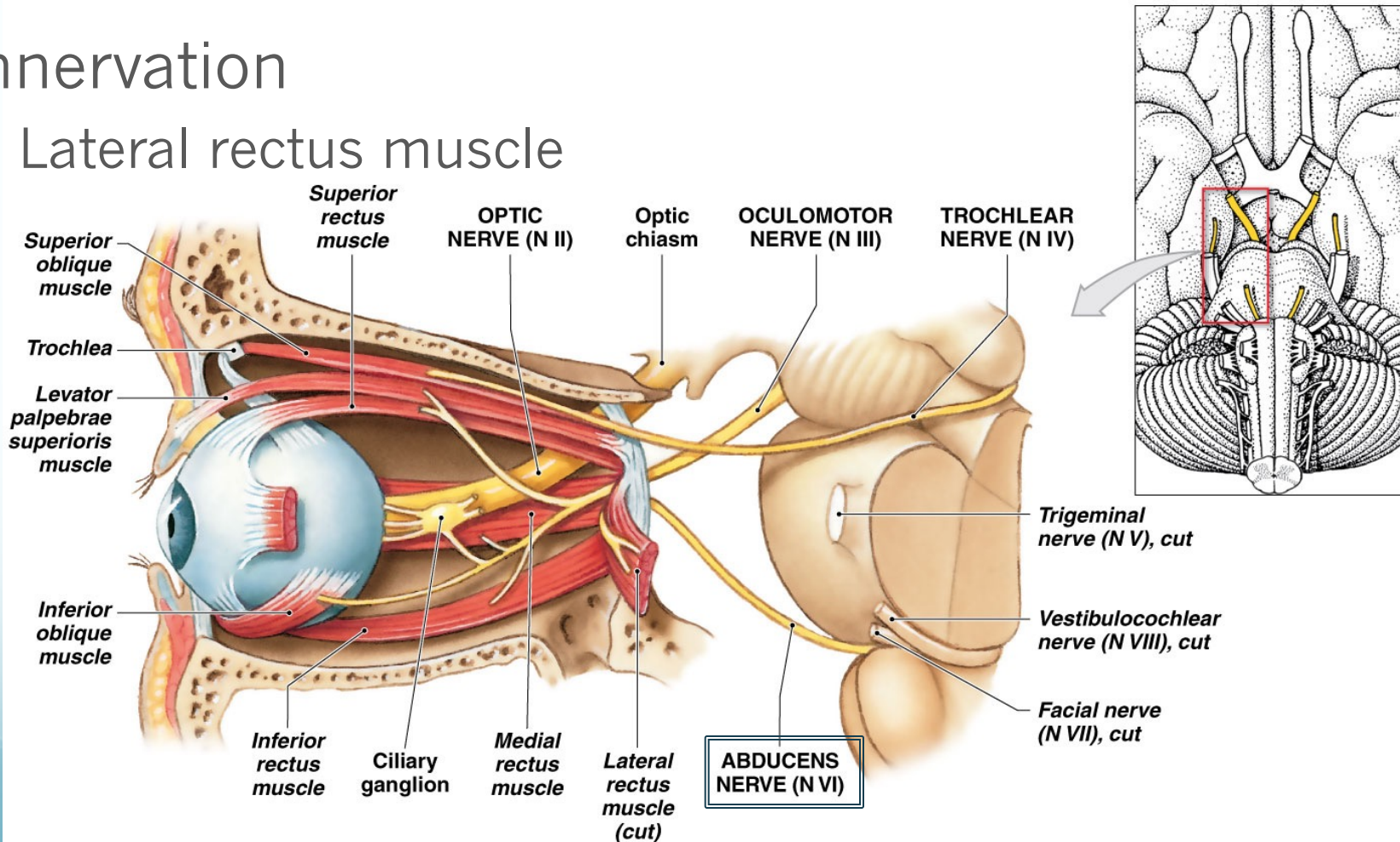


Trigeminal Nerve (NV)

Branch	Primary function	Innervation
	Mixed	Areas associated with the jaws
Ophthalmic	Sensory	Orbital structures, nasal cavity, skin of forehead, upper eyelid, eyebrows, nose (part)
Maxillary	Sensory	Lower eyelid; upper lip, gums and teeth; cheek, nose (part), palate, and pharynx (part)
Madibular	Mixed	Sensory to lower gums, teeth, lips; palate (part) and tongue (part). Motor to muscles of mastication

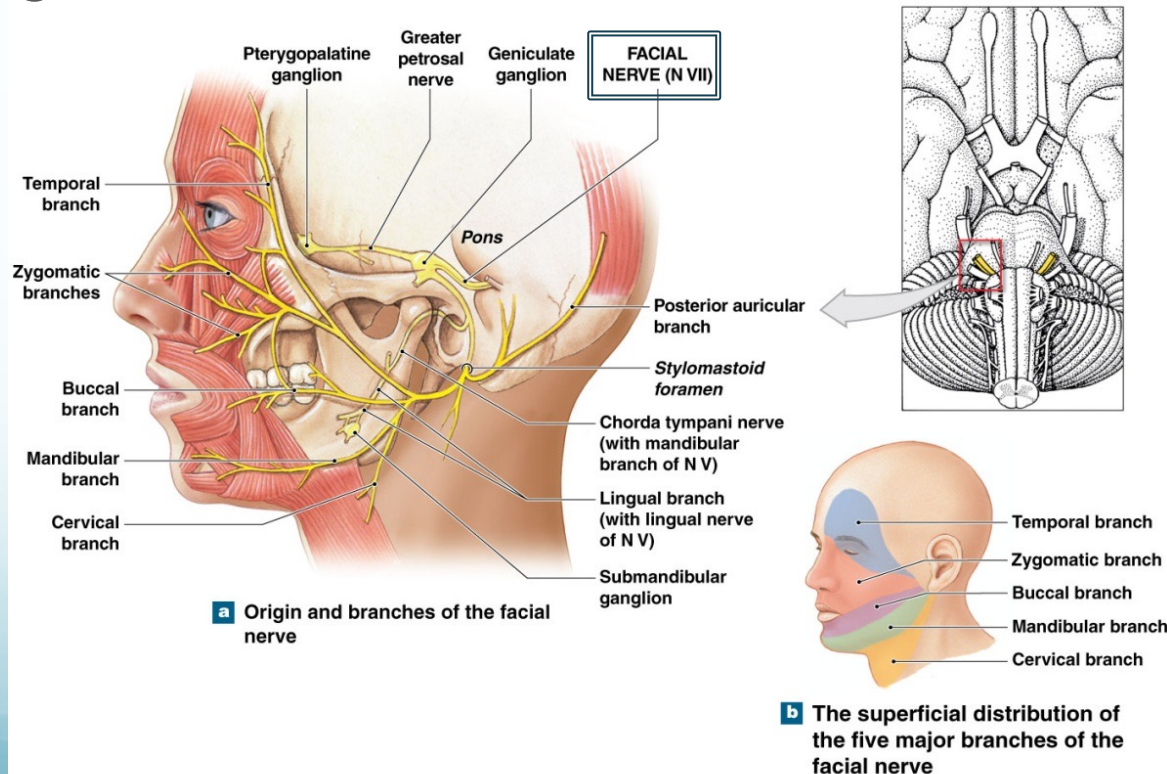
The Abducens Nerve (N VI)

- Primary function:
 - Motor (eye movement)
- Innervation
 - Lateral rectus muscle



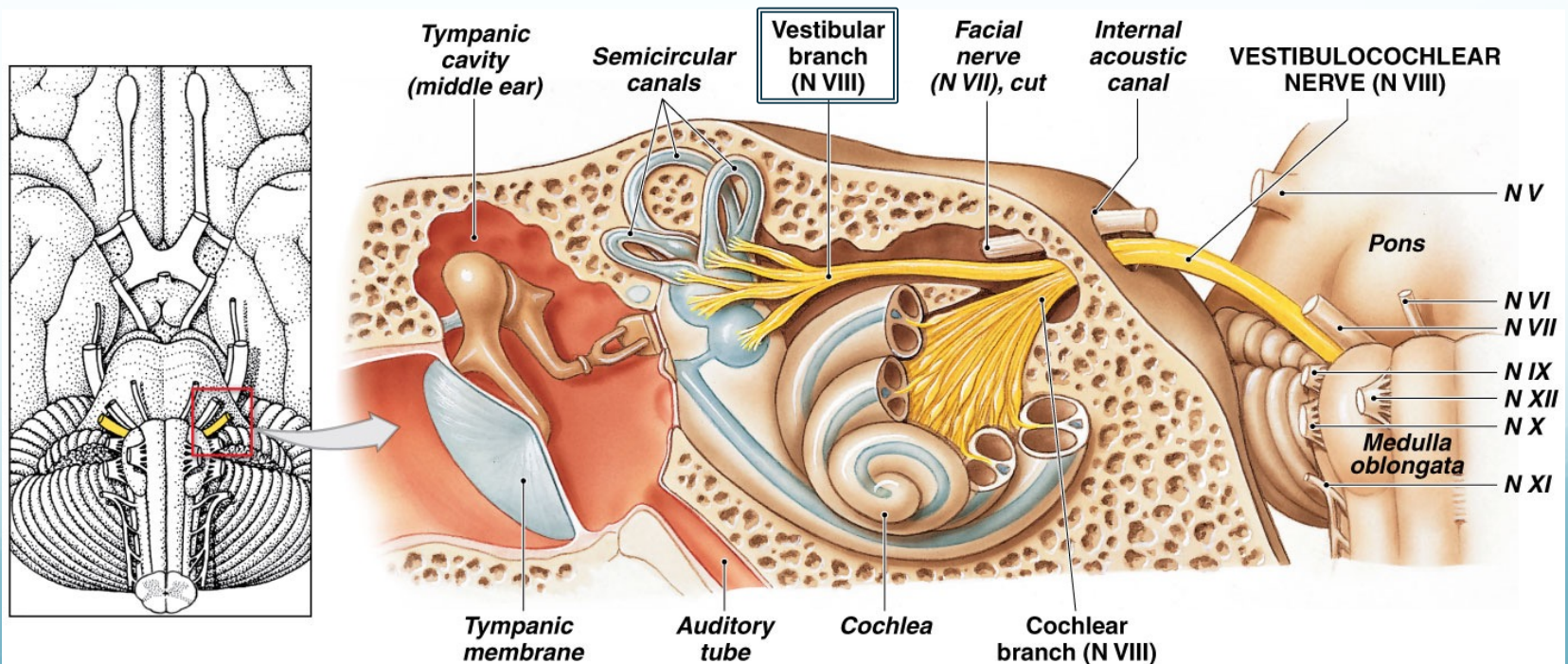
The Facial Nerve (N VII)

- Primary function:
 - Mixed
- Innervation
 - Sensory to taste receptors on tongue
 - Motor to muscles of facial expression, lacrimal gland, submandibular and sublingual salivary glands



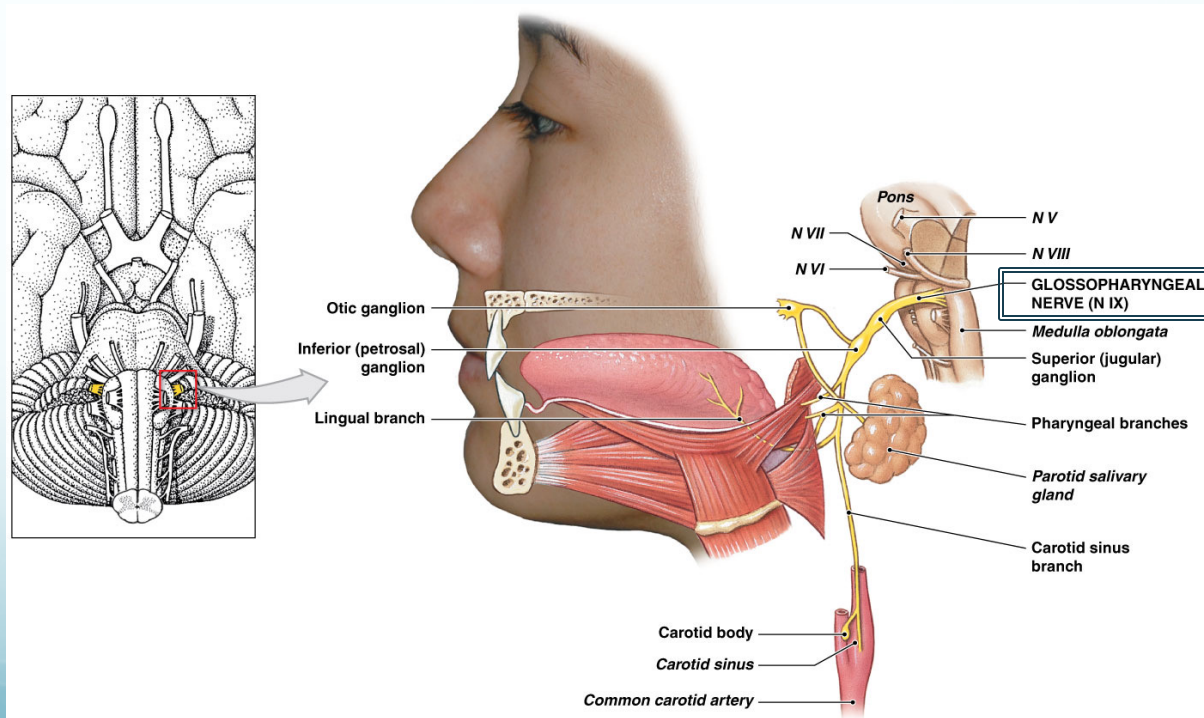
The Vestibulocochlear Nerve (NVIII)

- Primary function:
 - Special sensory - balance and equilibrium (vestibular branch) and hearing (cochlear branch)
- Innervation
 - Cochlea and vestibule



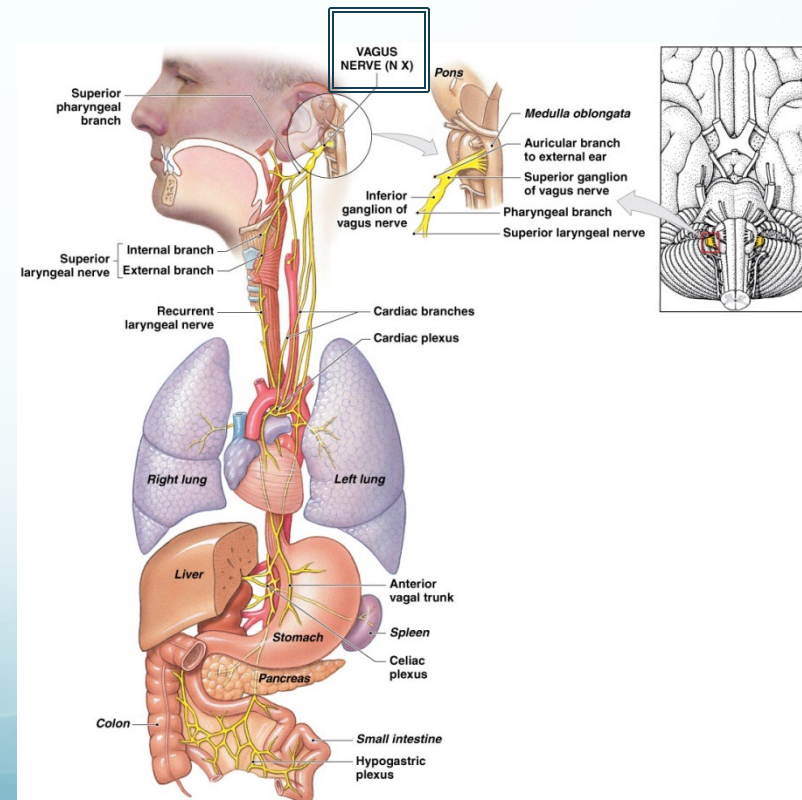
The Glossopharyngeal Nerve (N IX)

- Primary function:
 - Mixed
- Innervation
 - Sensory from tongue, pharynx and palate
 - Motor to pharyngeal muscles, parotid salivary gland



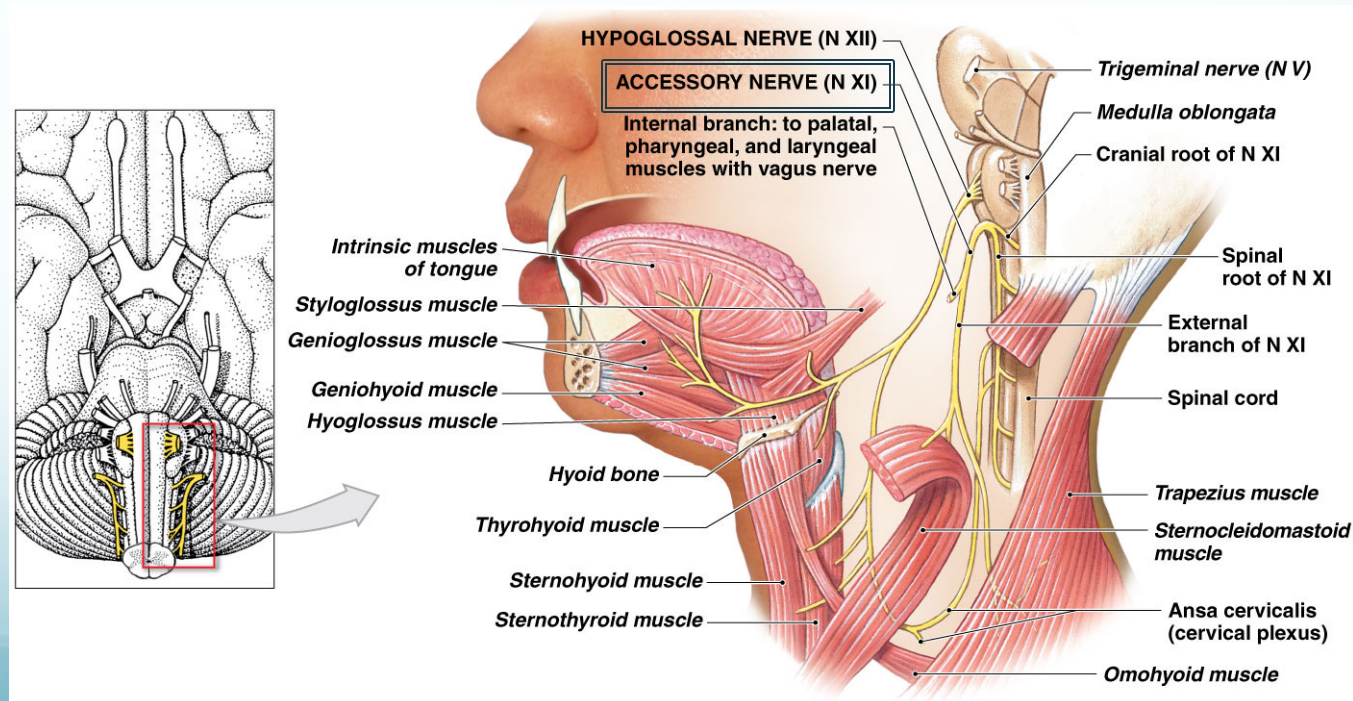
The Vagus Nerve (N X)

- Primary function:
 - Mixed
- Innervation
 - Sensory from pharynx; auricle and external acoustic meatus; diaphragm; visceral organs in thoracic and abdominopelvic cavities
 - Motor to palatal and pharyngeal muscles, and visceral organs in thoracic and abdominopelvic cavities



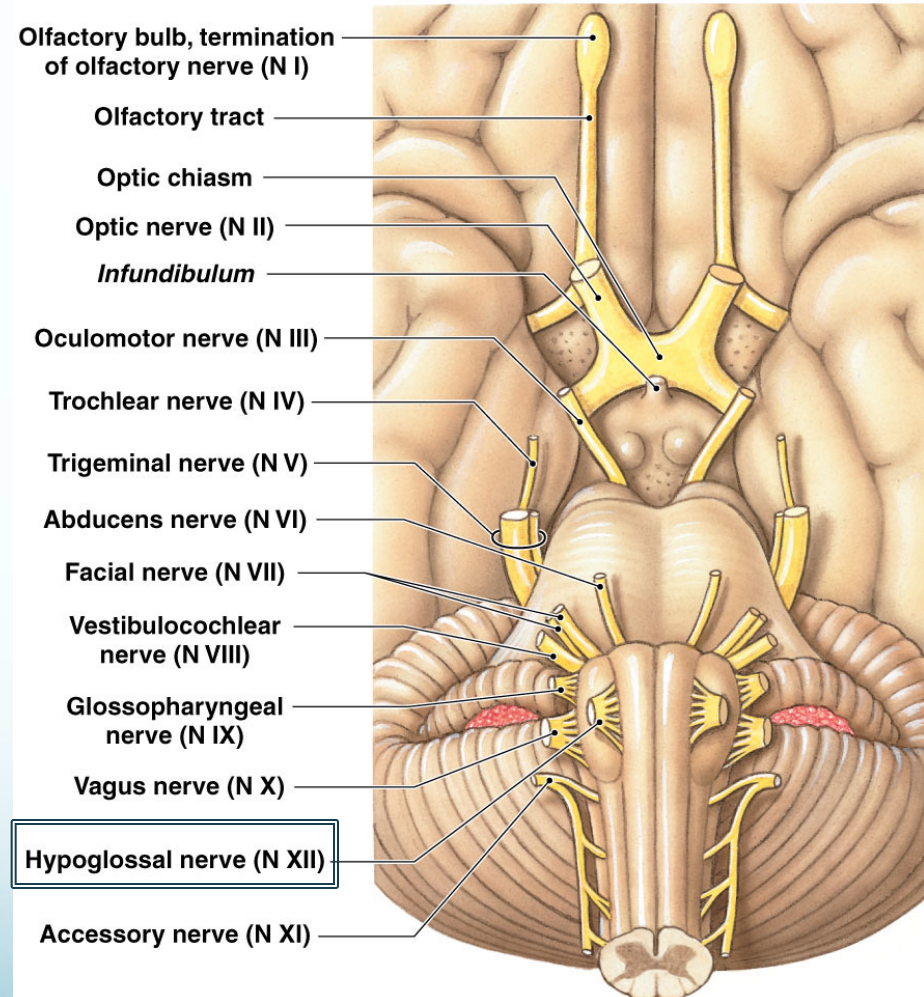
The Accessory Nerve (N XI)

- Primary function:
 - Motor (**internal branch** and **external branch**)
- Innervation
 - **olfactory epithelium of palate, pharynx and larynx**
 - **Sternocleidomastoid and trapezius muscles**



The Hypoglossal Nerve (N XII)

- Primary function:
 - motor
- Innervation
 - Tongue musculature



b Diagrammatic inferior view of the human brain. Compare view with part (a).

The Origins of Cranial Nerves

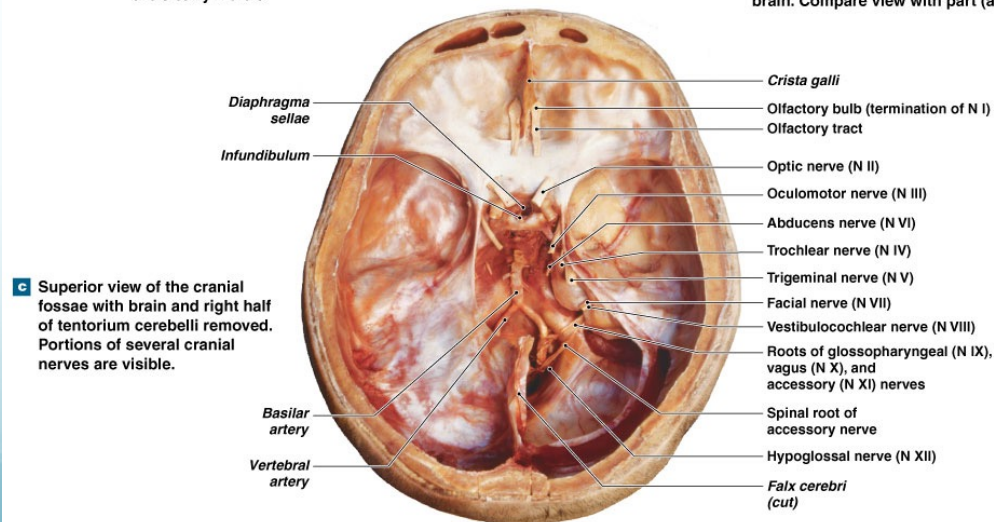
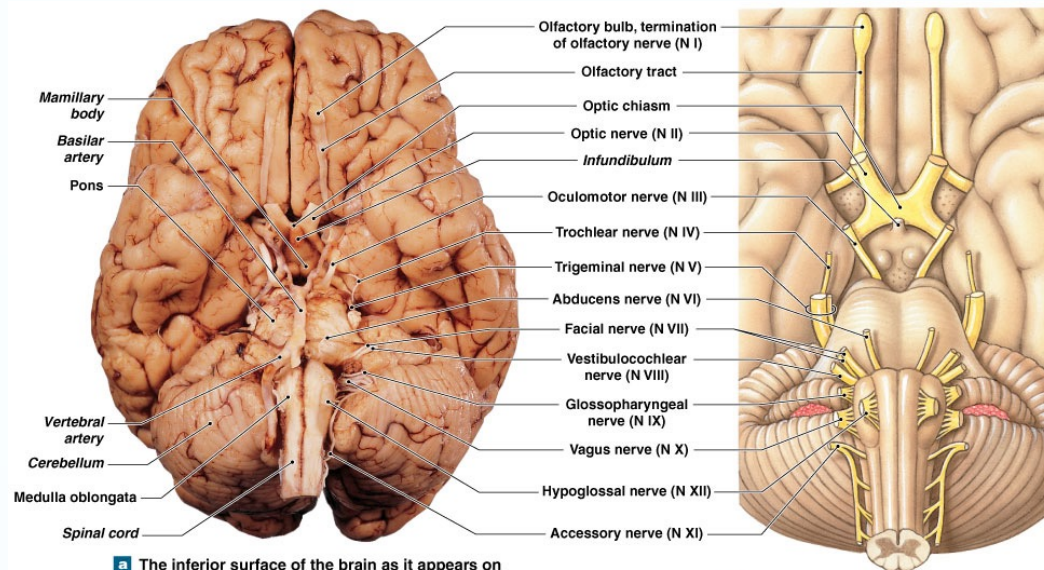


Table 16.12

The Cranial Nerves

Cranial Nerve (#)	Sensory Ganglion	Branch	Primary Function	Foramen	Innervation
Olfactory (I)			Special sensory	Cribriform plate	Olfactory epithelium
Optic (II)			Special sensory	Optic canal	Retina of eye
Oculomotor (III)			Motor	Superior orbital fissure	Inferior, medial, superior rectus, inferior oblique, and levator palpebrae muscles; intrinsic muscles of eye
Trochlear (IV)			Motor	Superior orbital fissure	Superior oblique muscle
Trigeminal (V)	Semilunar		Mixed		Areas associated with the jaws
		Ophthalmic	Sensory	Superior orbital fissure	Orbital structures, nasal cavity, skin of forehead, upper eyelid, eyebrows, nose (part)
		Maxillary	Sensory	Foramen rotundum	Lower eyelid; upper lip, gums, and teeth; cheek, nose (part), palate, and pharynx (part)
		Mandibular	Mixed	Foramen ovale	Sensory from lower gums, teeth, lips; palate (part) and tongue (part). Motor to muscles of mastication
Abducens (VI)			Motor	Superior orbital fissure	Lateral rectus muscle

Table 16.12

The Cranial Nerves

Cranial Nerve (#)	Sensory Ganglion	Branch	Primary Function	Foramen	Innervation
Facial (VII)	Geniculate		Mixed	Internal acoustic meatus to facial canal; exits at stylomastoid foramen	Sensory from taste receptors on anterior two-thirds of tongue; motor to muscles of facial expression, lacrimal gland, submandibular salivary gland, sublingual salivary glands
Vestibulocochlear (Acoustic) (VIII)		Cochlear	Special sensory	Internal acoustic meatus	Cochlea (receptors for hearing)
		Vestibular	Special sensory	As above	Vestibule (receptors for motion and balance)
Glossopharyngeal (IX)	Superior (jugular) and inferior (petrosal)		Mixed	Jugular foramen	Sensory from posterior one-third of tongue; pharynx and palate (part); carotid body (monitors blood pressure, pH, and levels of respiratory gases). Motor to pharyngeal muscles, parotid salivary gland
Vagus (X)	Superior (jugular) and inferior (nodose)		Mixed	Jugular foramen	Sensory from pharynx; auricle and external acoustic meatus; diaphragm; visceral organs in thoracic and abdominopelvic cavities. Motor to palatal and pharyngeal muscles, and visceral organs in thoracic and abdominopelvic cavities
Accessory (XI)		Internal branch	Motor	Jugular foramen	Skeletal muscles of palate, pharynx, and larynx (with branches of the vagus nerve)
		External branch	Motor	Jugular foramen	Sternocleidomastoid and trapezius muscles
Hypoglossal (XII)			Motor	Hypoglossal canal	Tongue musculature

The Cranial Nerves

- Summary of Cranial Nerve Branches and Functions
 - Mnemonic aid
 - Oh, Once One Takes The Anatomy Final, Very Good Vacations Are Heavenly

CN	Name	Motor/sensory	Innervation	Interesting facts
I				
II				
III				
IV				
V				
VI				
VII				
VIII				
IX				
X				
XI				
XII				