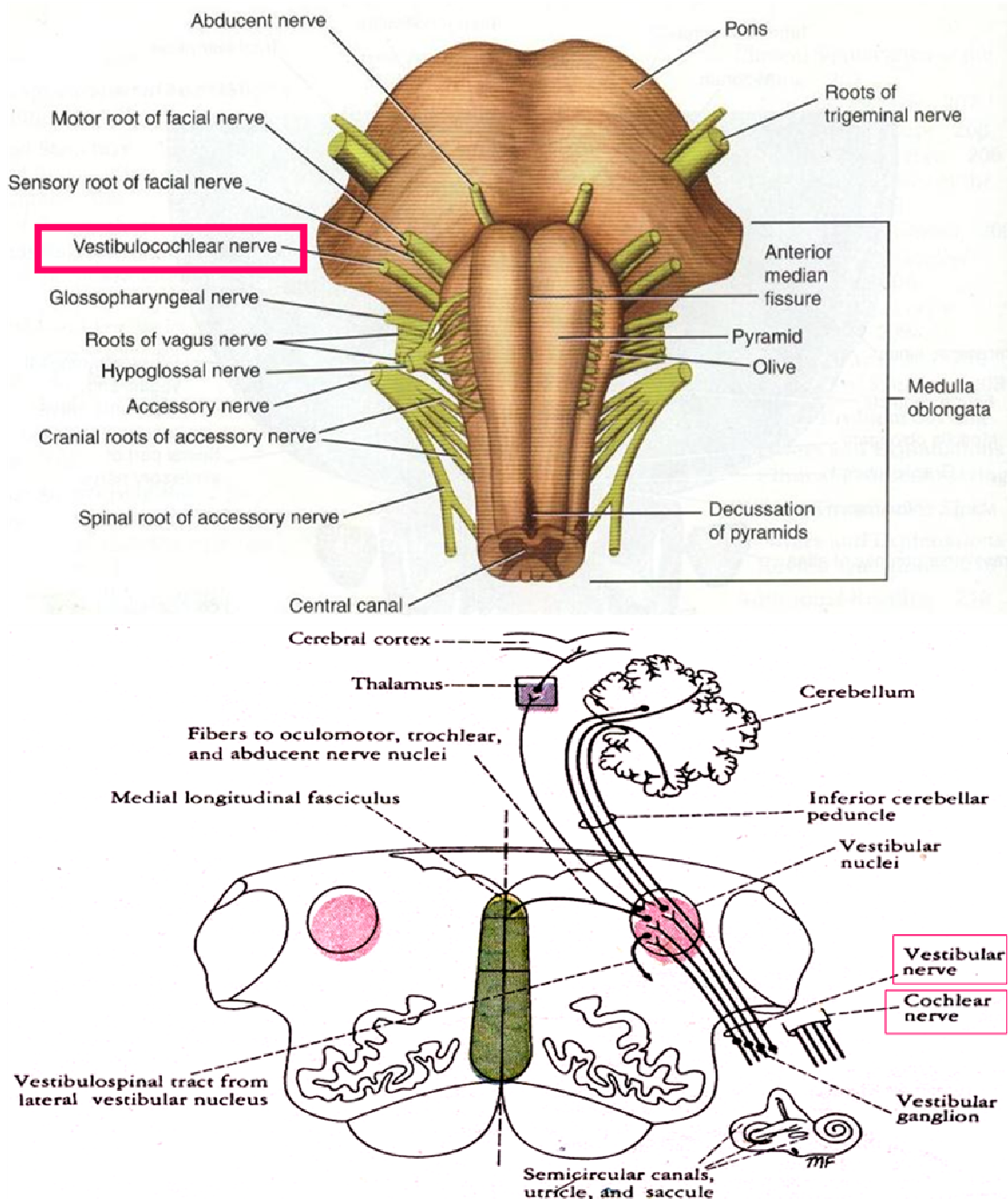


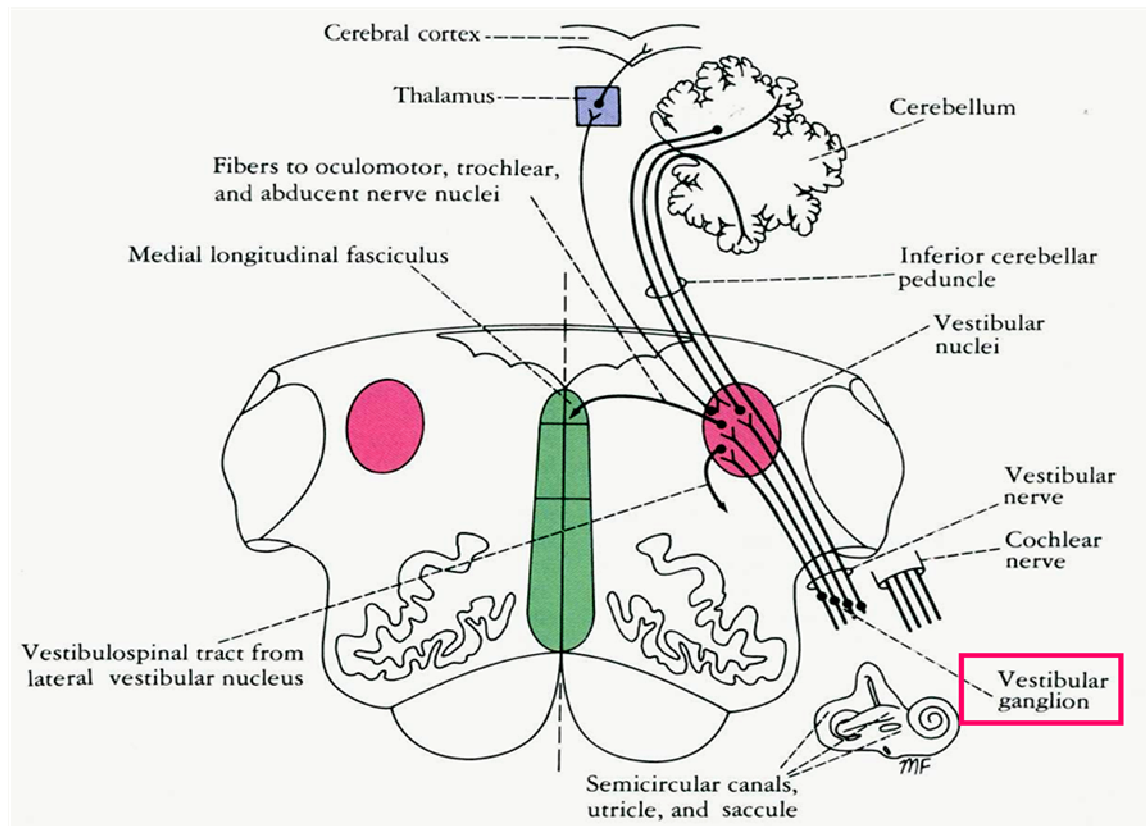
OLFACTORY & VESTIBULOCOCHLEAR PATHWAYS

VESTIBULOCOCHLEAR :

- It is a sensory nerve.
- Conveys impulses from the inner ear to nervous system.
- Attached to the brain stem at the junction of pons & medulla (cerebellopontine angle).
- *Has two components :*
 - **Vestibular** related to position & movement of the head.
 - **Cochlear** carries auditory information.
- Both divisions contain the axons of first-order sensory neurones, the dendrites of which make contact with **hair cells** of either the vestibular or auditory apparatus of the inner ear.
- Both divisions pass through internal auditory meatus with the facial nerve.

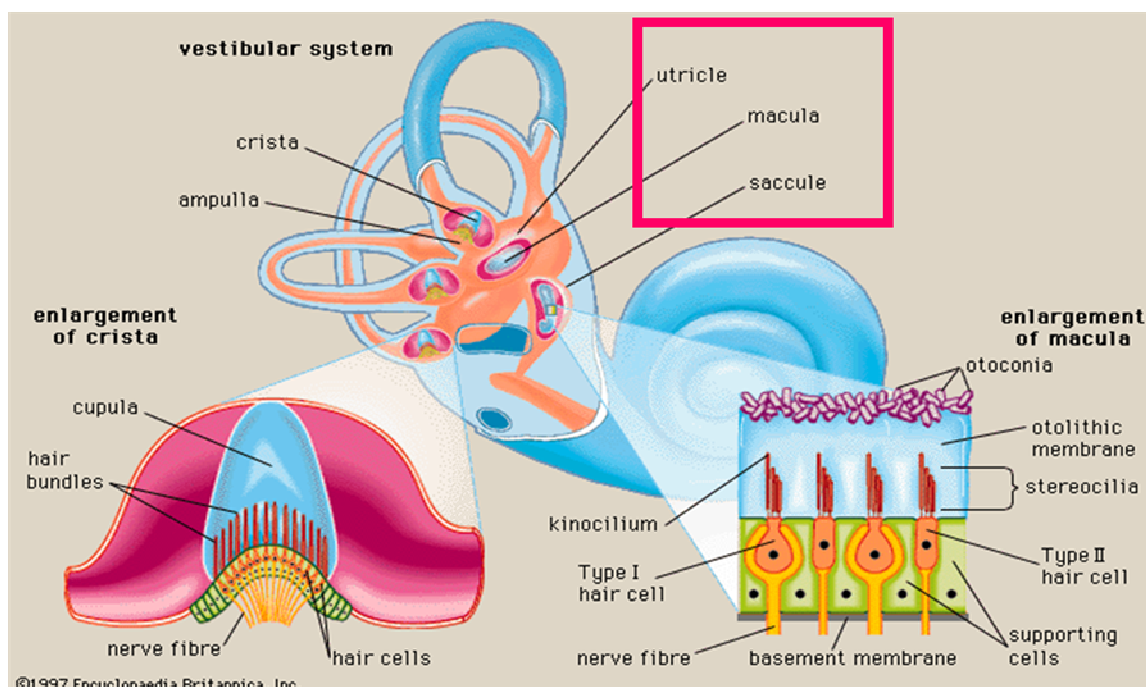


- The vestibular nerve fibers make dendritic contact with hair cells of the vestibular portions of the membranous labyrinth, and are the central processes of nerve cells located in the **vestibular ganglion**, which is situated in the **internal acoustic meatus** and contain its cell bodies.
- They enter the anterior surface of the brainstem in a groove between the lower border of the pons and the upper part of the medulla oblongata. They end in the vestibular nuclei of the rostral medulla.

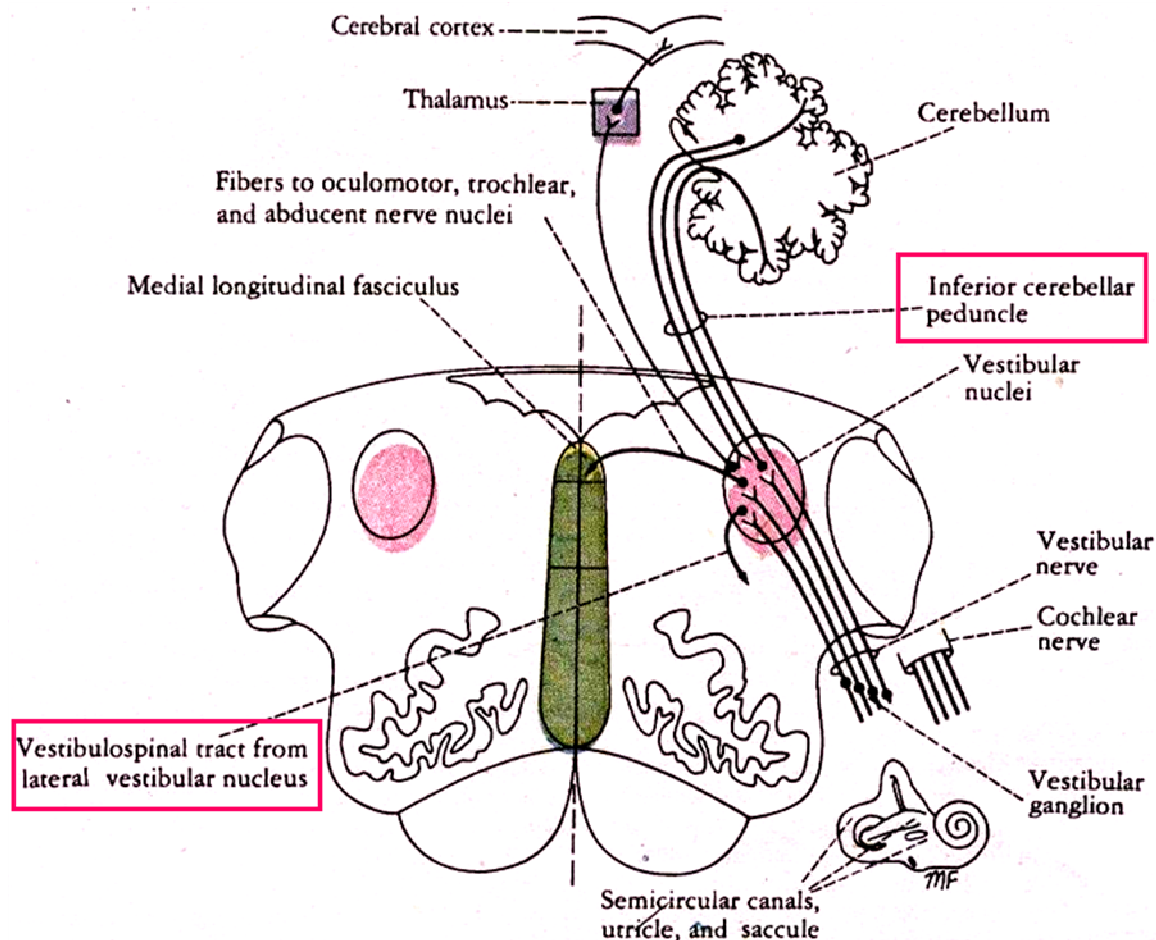


VESTIBULAR NERVE :

- The vestibular nerve conducts nerve impulses from the **utricle** and **sacculle** that provide information concerning the position of the head.
- The nerve also conducts impulses from the semicircular canals that provide information concerning movements of the head.

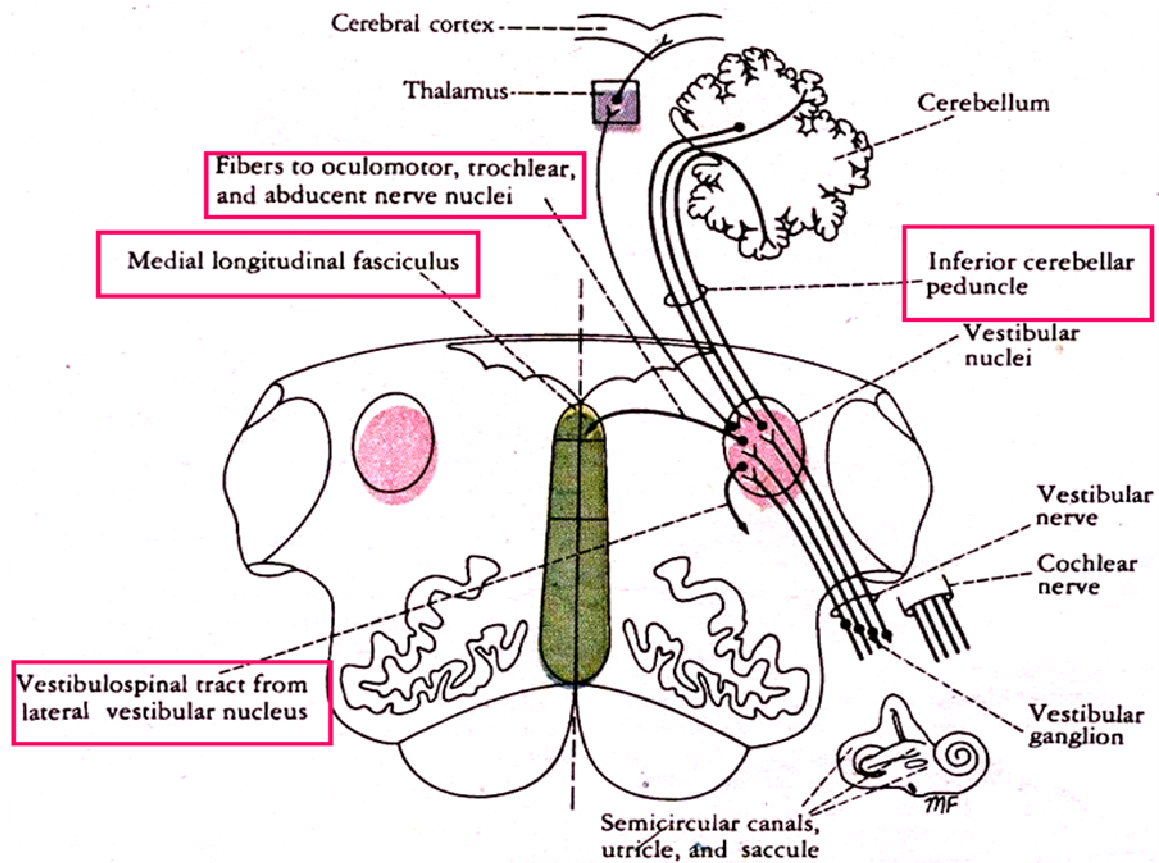


- When they enter the vestibular nuclear complex, the fibers divide into short ascending and long descending fibers; a small number of fibers pass directly to the cerebellum through the inferior cerebellar peduncle, bypassing the vestibular nuclei.

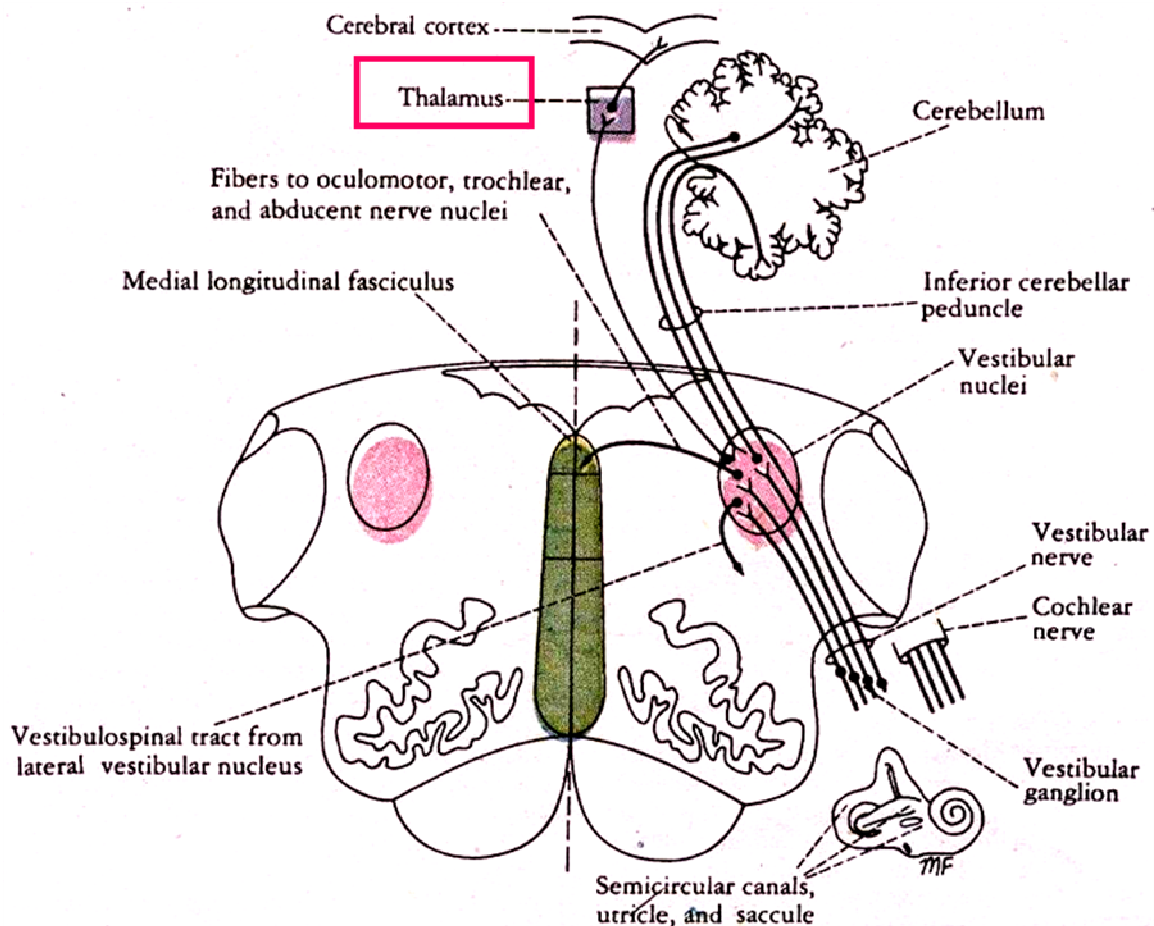


THE VESTIBULAR NUCLEAR COMPLEX :

- This complex consists of a group of nuclei situated beneath the floor of the fourth ventricle.
- Four nuclei may be recognized :
 1. The lateral vestibular nucleus,
 2. The superior vestibular nucleus,
 3. The medial vestibular nucleus, and
 4. The Inferior vestibular nucleus.
- Efferent fibers from the vestibular nuclei pass to the flocculonodular lobe of the **cerebellum** through the inferior cerebellar peduncle. Concerned with the control of equilibrium.
- Efferent fibers also descend uncrossed to the spinal cord from the **lateral vestibular (Deiters') nucleus** and form the **vestibulospinal tract**.
- In addition efferent fibers pass to the nuclei of the oculomotor trochlear and abducent nerves through the **medial longitudinal fasciculus**. This extends throughout the brainstem and into the spinal cord.
- Its descending part is known as the medial vestibulospinal tract. They generally influence the activity of spinal motor neurons concerned with the control of body posture and balance.
- These connections enable the movements of the head and the eyes to be coordinated so that visual fixation on an object can be maintained in addition, information received from the internal ear can assist in maintaining balance by influencing the muscle tone of the limbs and trunk.



- Ascending fibers also pass upward from the vestibular nuclei to the cerebral cortex, to the vestibular area in the postcentral gyrus, just above the lateral fissure.
- These fibers are thought to relay in the ventral posterior nuclei of the thalamus.
- The cerebral cortex probably serves to orient the individual consciously in space.

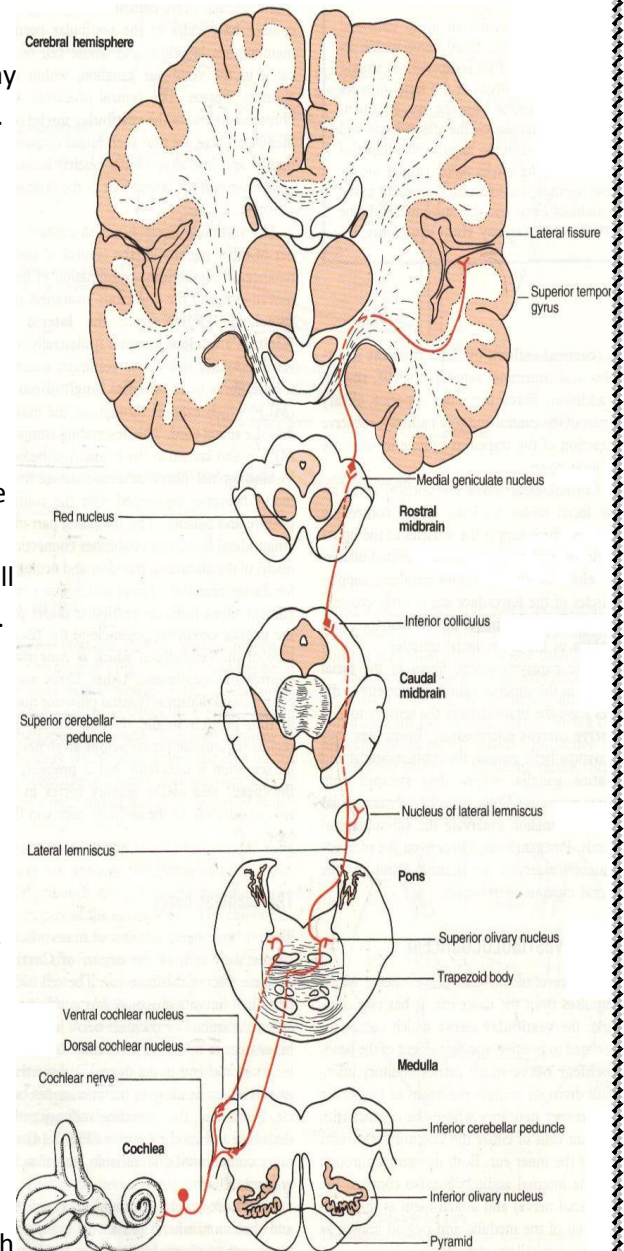


COCHLEAR NERVE :

- Dendrites from organ of Corti.
- The cell bodies lie within the cochlea collectively called (spiral ganglion).
- Nerve joins the brain stem at the level of the rostral medulla.
- The fibers bifurcate & end in the **dorsal & ventral cochlear nuclei** which lie close to the inferior cerebellar peduncle.
- The ascending auditory pathway to the thalamus and cerebral cortex is somewhat more complicated and variable than other general senses.

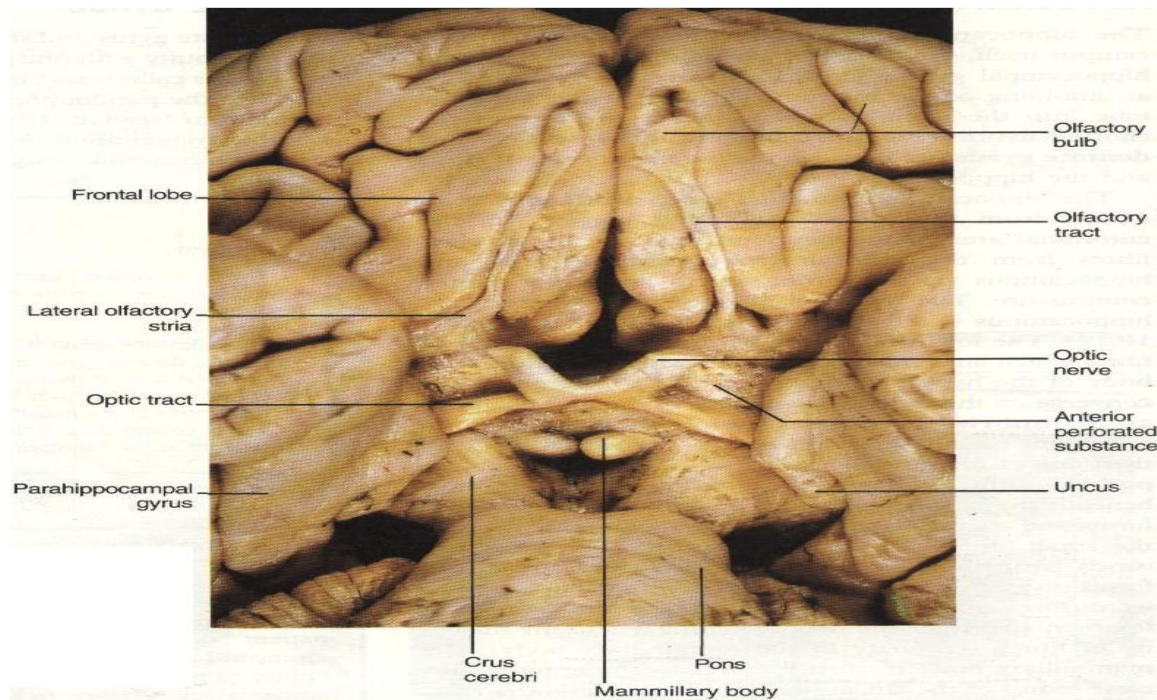
ASCENDING AUDITORY PATHWAY :

- Between the medulla and thalamus, all fibres in the pathway do not behave in the same manner and axons may synapse.
- From the cochlear nuclei, second-order neurones ascend into the pons, some of them crossing to the other side of the pontine tegmentum as the **trapezoid body**.
- At this level, some fibres may terminate in the **superior olivary nucleus**. This nucleus is the origin of olivocochlear fibers which leave the brainstem in the VIII CN and end in the organ of Corti.
- They are inhibitory and modulate auditory info.
- From the superior olivary nuclei, ascending fibres constitute the lateral lemniscus to end in the **inferior colliculus**.
- Some axons within the lateral lemniscus terminate in a small pontine nucleus called the **nucleus of the lateral lemniscus**.
- The superior olivary nucleus and the nucleus of the lateral lemniscus are thought to establish reflex connections with motor neurones of the trigeminal and facial motor nuclei, mediating contraction of the tensor tympani and stapedius muscles in response to loud noise.
- The inferior colliculus in turn sends axons to the **medial geniculate** nucleus of the thalamus.
- From here the fibers pass through the **acoustic radiation of internal capsule** to the **primary auditory cortex** of the temporal lobe.
- This is located in **Heschl's gyrus** which are located on the dorsal surface of the superior temporal gyrus. Therefore largely hidden in the lateral fissure.
- Throughout the ascending auditory projection there exists a so-called 'tonotopical' representation of the cochlea which is analogous to the 'somatotopic' organization of the pathways for general sensation.
- Within the brain stem, some ascending fibres decussate whilst others do not.
- The representation of the cochlea is therefore essentially bilateral at all levels rostral to the cochlear nuclei.
- The region of the temporal lobe surrounding the primary auditory cortex is known as the auditory association area or '**Wernick's area**' where auditory info is interpreted and processed .



OLFACTORY NERVE :

- Olfactory receptors are specialized, ciliated nerve cells which lie in the olfactory epithelium of the **nasal cavity**.
- Their axons assemble into numerous small fascicles (**the true olfactory nerves**), which enter the cranial cavity through the foramina of the cribriform plate of the ethmoid bone and then attach to the **olfactory bulb** on the inferior surface of the frontal lobe.



- Preliminary processing of olfactory information occurs within the **olfactory bulb**, which contains interneurons and large **mitral cells** whose axons leave the bulb in the **olfactory tract**.
- The olfactory tract passes backwards on the basal surface of the frontal lobe and, just before reaching the level of the optic chiasma, the majority of olfactory tract fibres are deflected laterally, in the lateral **olfactory stria**.
- These fibres pass into the depths of the lateral fissure which they cross to reach the temporal lobe and terminate in the **primary olfactory cortex of the uncus** and on the inferomedial aspect of the temporal lobe, and in the adjacent amygdala.
- Adjacent to the uncus, the anterior part of the parahippocampal gyms, or entorhinal area constitutes the (**olfactory association cortex**).
- The primary and association cortices are also collectively referred to as the **pyriform cortex** and are responsible for the appreciation of olfactory stimuli.
- The olfactory projection is unique among the sensory systems in that it consists of a sequence of only two neurones between the sensory receptors and cerebral cortex and does not project via the thalamus.

THE END

LoveTomy Team 426

Team leader : Dr. hams

Dr. S Dr. noop Omar H

ابن سم !! همي بروحي

M.A.M Abo Slo7 Cute Killer



SELF QUIZ

1- Regarding the vestibulochoclear nerve, all are true EXCEPT :

- a. Both divisions pass through internal auditory meatus with the abducent nerve.
- b. Attached to the brain stem at the junction of pons & medulla.
- c. Both divisions contain the axons of first-order sensory neurons.
- d. It is a sensory nerve.
- e. It conveys impulses from the inner ear to nervous system.

2- All of these nuclei constitute the vestibular nuclear complex EXCEPT :

- a. Lateral vestibular nucleus.
- b. Inferior vestibular nucleus.
- c. Dorsal vestibular nucleus.
- d. Medial vestibular nucleus.
- e. Superior vestibular nucleus.

3- Regarding the connections of the vestibular nuclei, all are true EXCEPT :

- a. Efferent fibers pass to the nuclei of the oculomotor trochlear and abducent nerves through the medial longitudinal fasciculus.
- b. Efferent fibers from the vestibular nuclei pass to the floclunodular lobe of the cerebellum through the middle cerebellar peduncle.
- c. These connections enable the movements of the head and the eyes to be coordinated so that visual fixation on an object can be maintained.
- d. The cerebral cortex probably serves to orient the individual consciously in space.
- e. Ascending fibers pass upward from the vestibular nuclei to the cerebral cortex, to the vestibular area in the postcentral gyrus.

4- Regarding the choclear nerve, all are true EXCEPT :

- a. The cell bodies lie with in the cochlea collectively called the spiral ganglion.
- b. The fibers bifurcate and end in the dorsal and ventral cochlear nuclei.
- c. It makes dendritic contacts with hair cells of the organ of corti.
- d. Nerve joins the brain stem at the level of the caudal medulla.
- e. The ascending auditory pathway is more complicated and variable than other general senses.

5- Regarding the olfactory nerve, all are true EXCEPT :

- a. Preliminary processing of olfactory information occurs within the olfactory bulb.
- b. The majority of olfactory tract fibres are deflected laterally before reaching the level of the optic chiasma.
- c. The anterior part of the parahippocampal gyms constitutes the olfactory association cortex.
- d. The pyriform cortex is responsible for the appreciation of olfactory stimuli.
- e. The olfactory projection consists of a sequence of two neurones between the sensory receptors and cerebral cortex projecting via the thalamus.

1. a	2. c	3. b	4. d	5. e
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