The vestibular system is important for (1) sensing motion of the head, (2) maintaining posture control and for the (3) stability of images during motion.

The membranous labyrinth of the organ is filled with endolymph and contains three semicircular canal ducts, an endolymphatic duct, and the ductus reuniens. The membranous labyrinth is suspending in perilymph inside the osseous labyrinth (the skeleton of the vestibular system.

The bony (osseous) labyrinth of the organ contains the cochlea, vestibule and the three semicircular canals; horizontal/lateral, posterior/inferior, superior/anterior. The SCCs are responsible for sensing balance and posture with angular acceleration/head rotations. The SCCs for both ears are paired in coplanar pairs, the right anterior with the left posterior (RALP) and the left anterior with the right posterior (LARP). These SCCs have ampulla which contain cristae ampullaris structures which are connected to the utricle. The cristae ampullaris contain many stereocilia and one kinocilium which are embedded in the cupula and respond to angular acceleration/deceleration.

When one rotates their head, the endolymph moves in the opposite direction and pushes on the cupula causing the ciliary tufts on the cristae ampullaris to bend and open their K+ channels for an exchange of ions and therefore a release of neurotransmitter followed by an action potential.

There are two types of vestibular hair cells; (1) type I, which are flask shaped with large synaptic endings and (2) type II which are columnar shaped with normal bouton type nerve terminals. When the stereocilia bend towards the kinocilium it causes excitation and when it bends away from it, it causes inhibition.

The vestibule contains perilymph and is part of the bony portion of the inner ear and contains the saccule and utricle. The saccule and utricle contain maculae which help in maintaining equilibrium and linear acceleration. The maculae contain otoconia which add weight to the otolithic membrane enabling it to respond to tilts and rapid linear movements of the head.

The vestibular portion of the auditory nerve has two branches (1) the superior portion that innervates the horizontal and anterior SCC and utricle and (2) the inferior portion that innervates the posterior SCC and saccule. The posterior SCC may have double innervation from both branches of the vestibular nerve.