Vestibular System

To maintain balance and maintenance of gaze (eye position) and posture (skeletal position).

Requires 2 out of 3 components: inner ear, vision, and/or **proprioception** (position of joints, limbs)

Utricle detects linear acceleration, using **otoliths** ("ear stones", calcium carbonate crystals) as inertial mass to detect gravity and starting/stopping during linear motion.

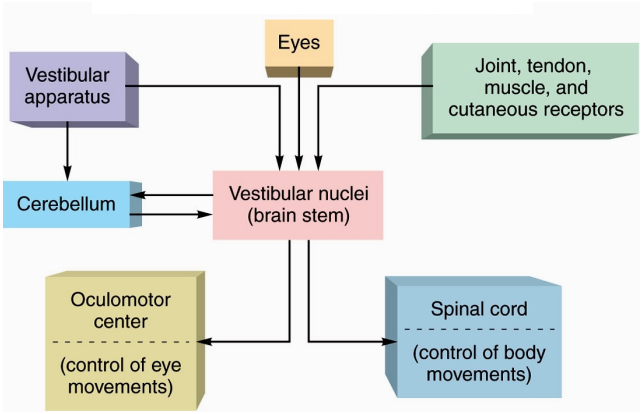
Semicircular Canals detect rotational acceleration in each of 3 planes. Sloshing of endolymph around the canal; deforms **cupula** which bends hair cells.

Loss of inner ears -> inability to detect gravity, rotation.

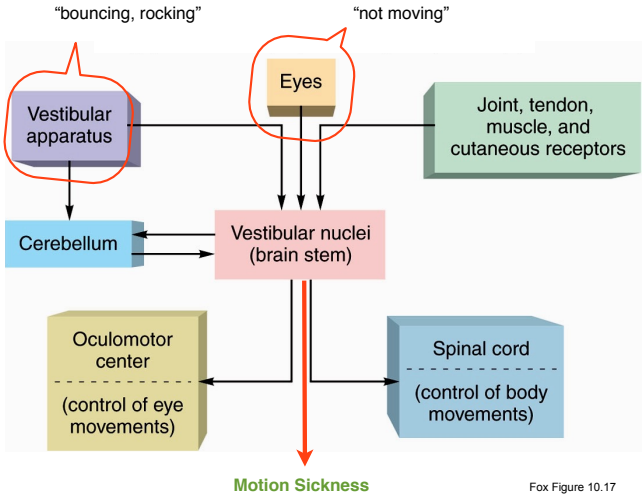
Conflict Hypothesis of Motion Sickness

When inputs to vestibular system don't agree with each other, causes dizzyness and nausea

e.g. reading book in bumpy car: visual field is steady, but inner ear reports accelerations

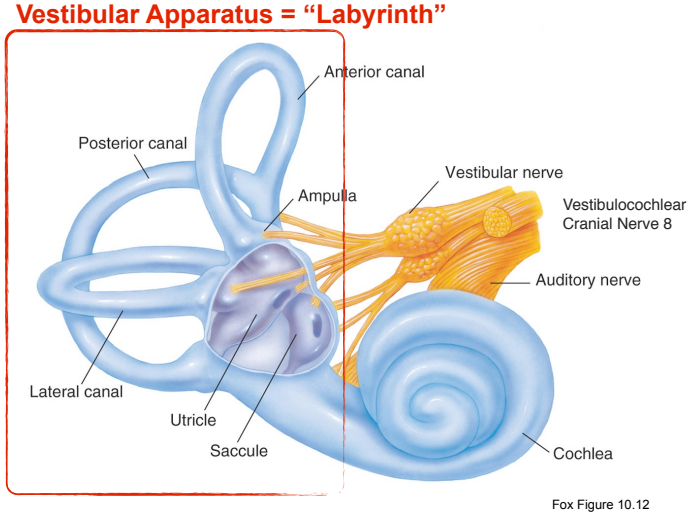


Fox Figure 10.17



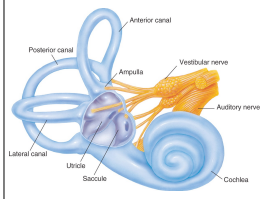
Fox Figure 10.17

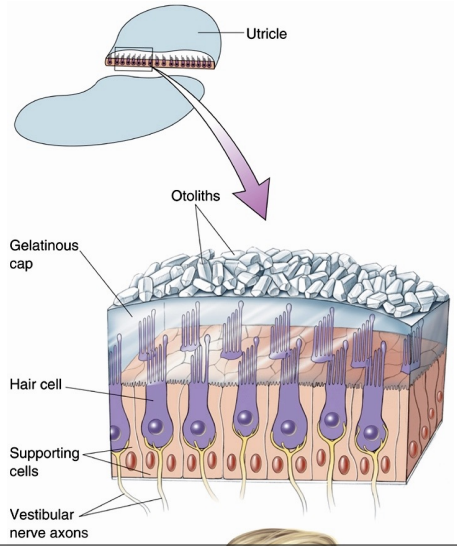
Vestibular Apparatus = “Labyrinth”

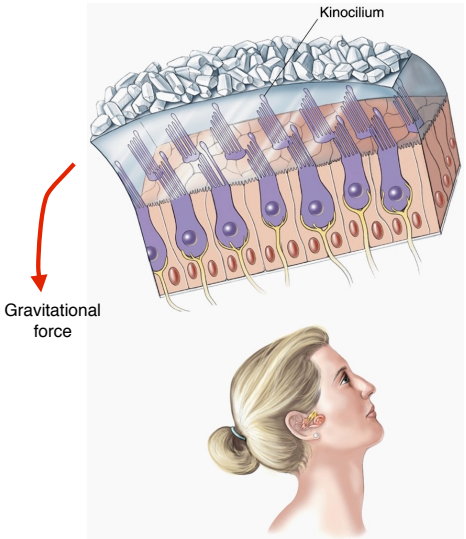


Fox Figure 10.12

Utricle
detection of
linear acceleration

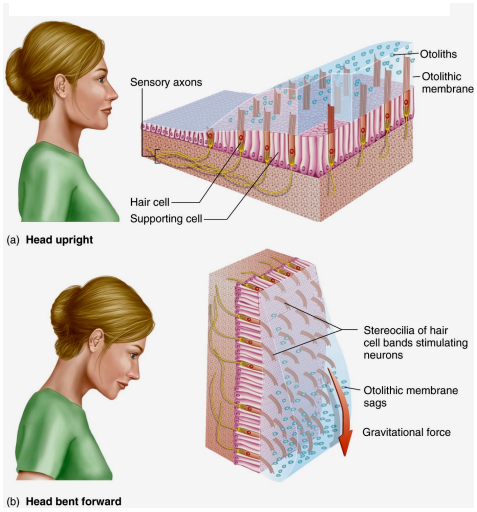






see Fox Figure 10.15

Figure 10.15



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Semicircular Canals
detection of rotational acceleration

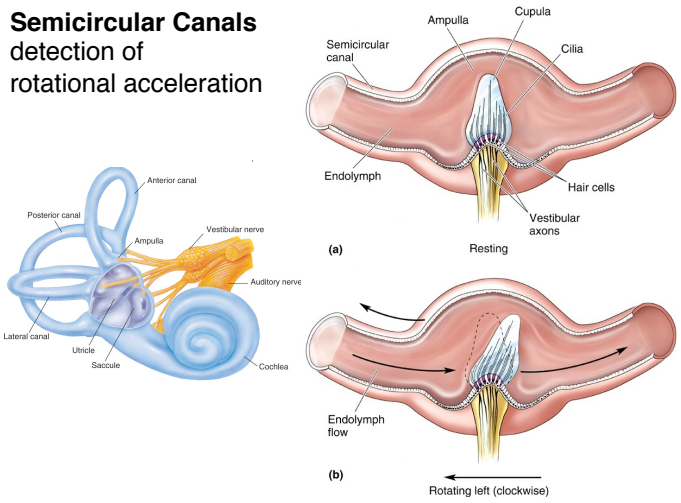
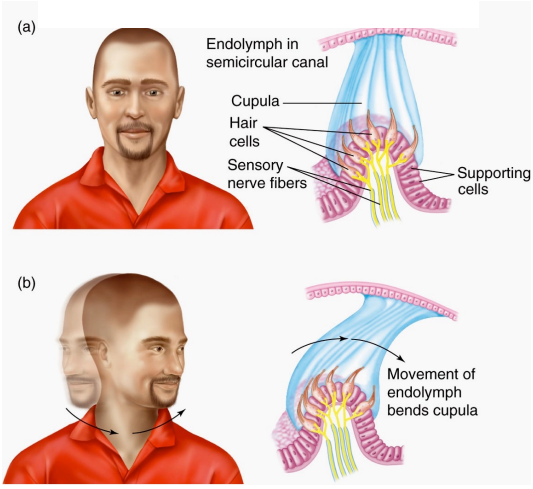
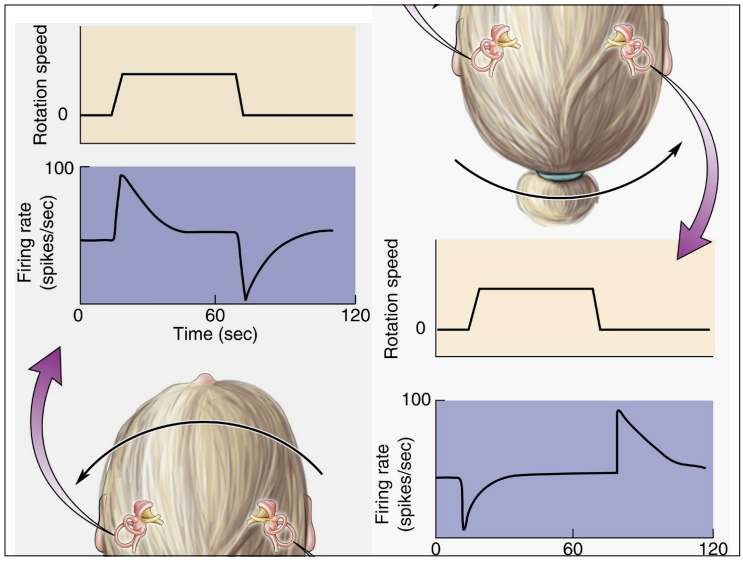


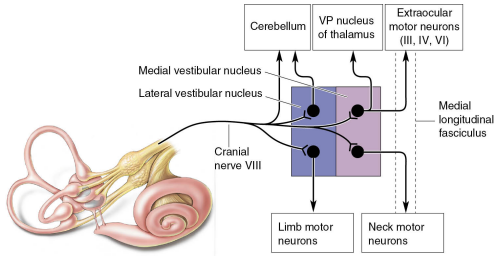
Figure 10.16



9



Central Vestibular Pathway



The Vestibulo-Ocular Reflex (VOR)

- Function: fixate line of sight on visual target during head movement
- Mechanism: senses rotations of head, commands compensatory movement of eyes in opposite direction
- Connections from semicircular canals, to vestibular nucleus, to cranial nerve nuclei → excite extraocular muscles

Vestibular Connections Mediating Horizontal Eye Movements