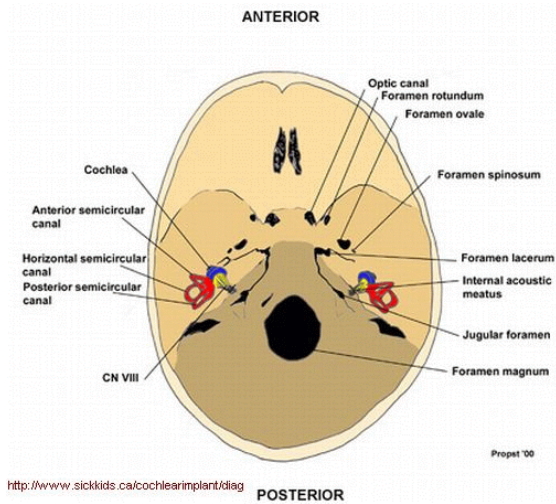
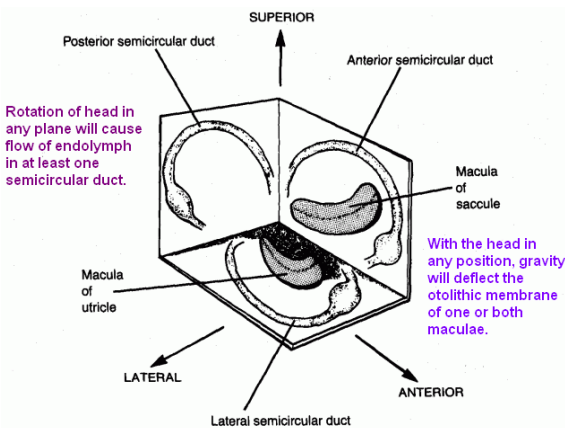
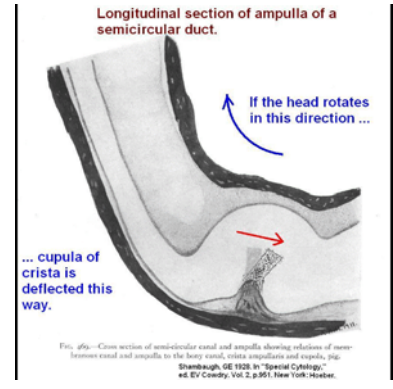
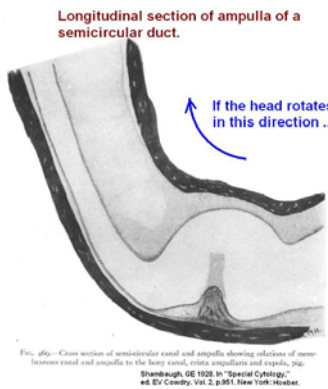
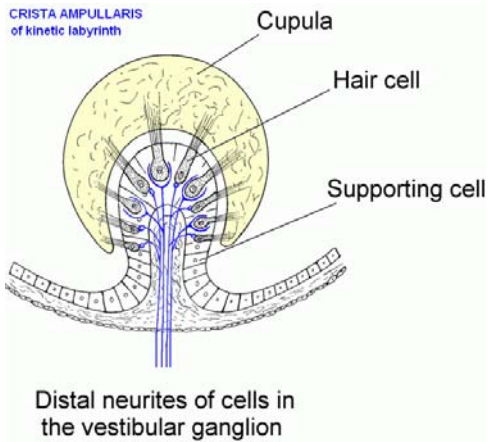
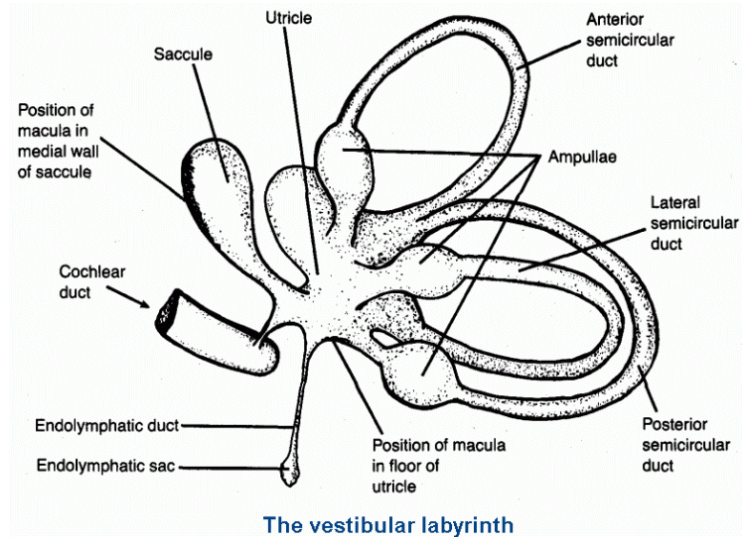


# VESTIBULAR SYSTEM



**3** Position of the inner ear apparatus in the petrous part of the temporal bone.



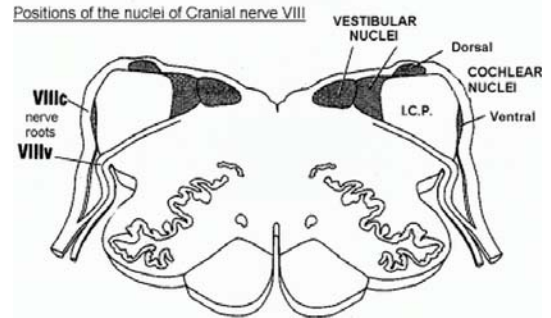
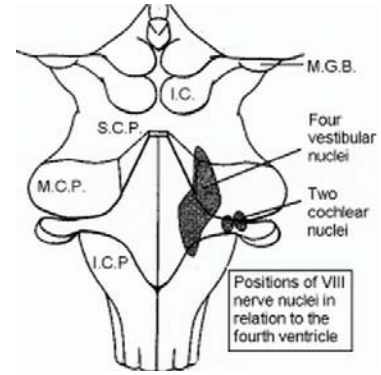
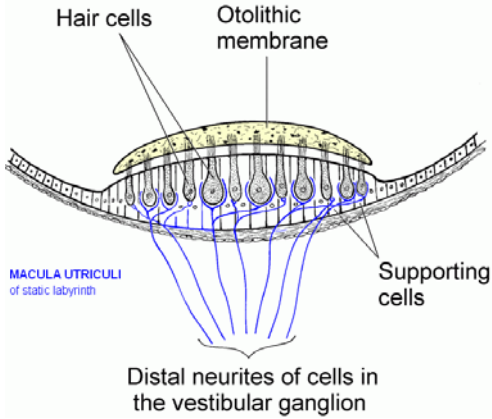
The approximate orientations of the receptors of the right vestibular apparatus. The three semicircular ducts lie in mutually perpendicular planes. One macula is horizontal, the other vertical.

## KINETIC LABYRINTH

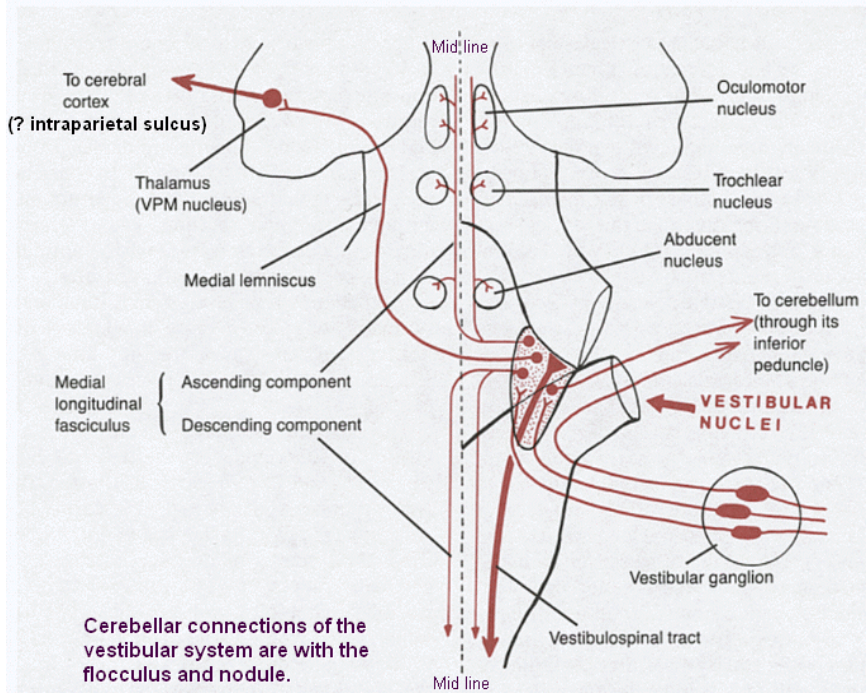
Receptors in semicircular ducts respond to rotary movement of the head.

## STATIC LABYRINTH

Otolithic receptors in saccule and utricle respond to the pull of gravity; also to acceleration and deceleration.



**Central connections of the vestibular system**



**VESTIBULO-OCULAR REFLEX**

When the head rotates slowly, the eyes move through an equal angle in the opposite direction.



## VESTIBULAR NYSTAGMUS

**Physiological.** Spin rapidly, then stop suddenly. Momentum of endolymph makes it flow past and deflect cupula. This causes a sensation of rotation in the opposite direction (dizziness, vertigo).

For a few seconds there are alternating fast and slow conjugate eye movements in the plane of rotation: **nystagmus**.

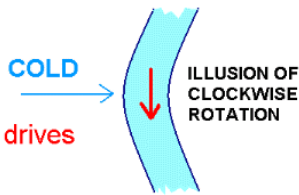
The slow component is driven by signals from the vestibular nuclei, by way of the medial longitudinal fasciculus (MLF) to the ocular motor nuclei (III, IV & VI).

The fast component is a correction, originating in the visual cortex. The fast component of vestibular nystagmus does not occur in comatose subjects.

**Caloric testing.** The lateral semicircular duct is very near the medial wall of the middle ear cavity. Irrigation of the external ear with cold or warm water induces a convection current (down or up, respectively) in the endolymph. The current deflects the cupula in the ampulla.

### For example:

Supine subject, head inclined 30°. Cold water in left ear.



Vestibulo-ocular reflex drives eyes slowly to the left.

#### Comatose patient.

Eyes move to left (no nystagmus). Indicates integrity of brain stem structures.

#### Conscious patient.

Nystagmus, named for its fast component (i.e. a right nystagmus).

Mnemonic – **COWS**