

The Ear

Parts, Functions and Hearing Process

MMHS

Advanced Biomedical Science

Hearing Attributes

- The senses of **equilibrium** and hearing are provided by the inner ear, a receptor complex located in the temporal bone of the skull.
- The basic receptors, or hair cells, are **simple mechanoreceptors**.

Functions of The Ear

→ The Ear provides input for 2 senses:

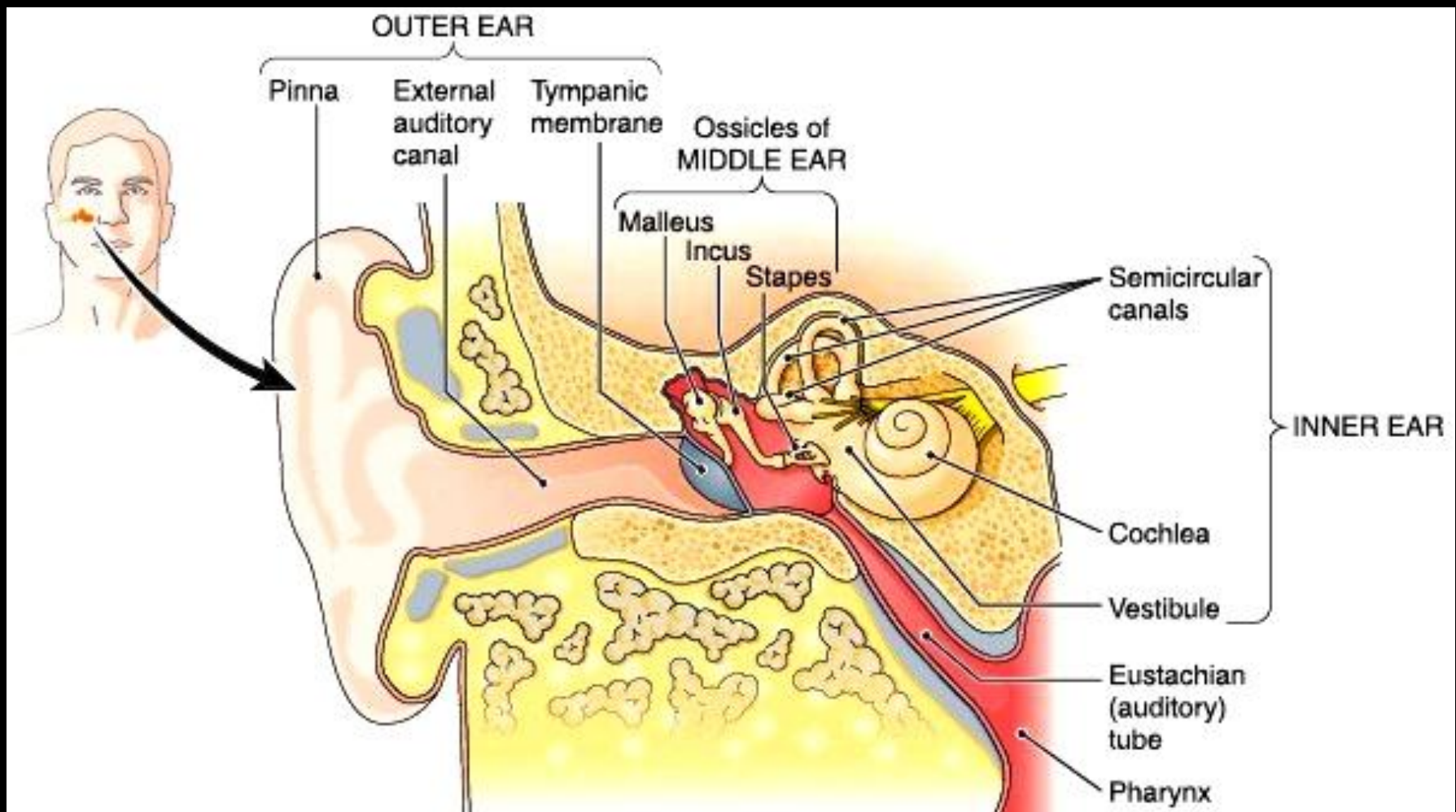
1. **Equilibrium**- which informs us of the position of the body in space by monitoring gravity, linear acceleration, and rotation.
2. **Hearing**- which enables us to detect and interpret sound waves.

Regions of the Ear

The ear is divided into three anatomical regions:

1. The External ear (gathering sound)
2. The Middle ear (producing sound)
3. The Inner ear. (interpreting sound)

Regions of the Ear



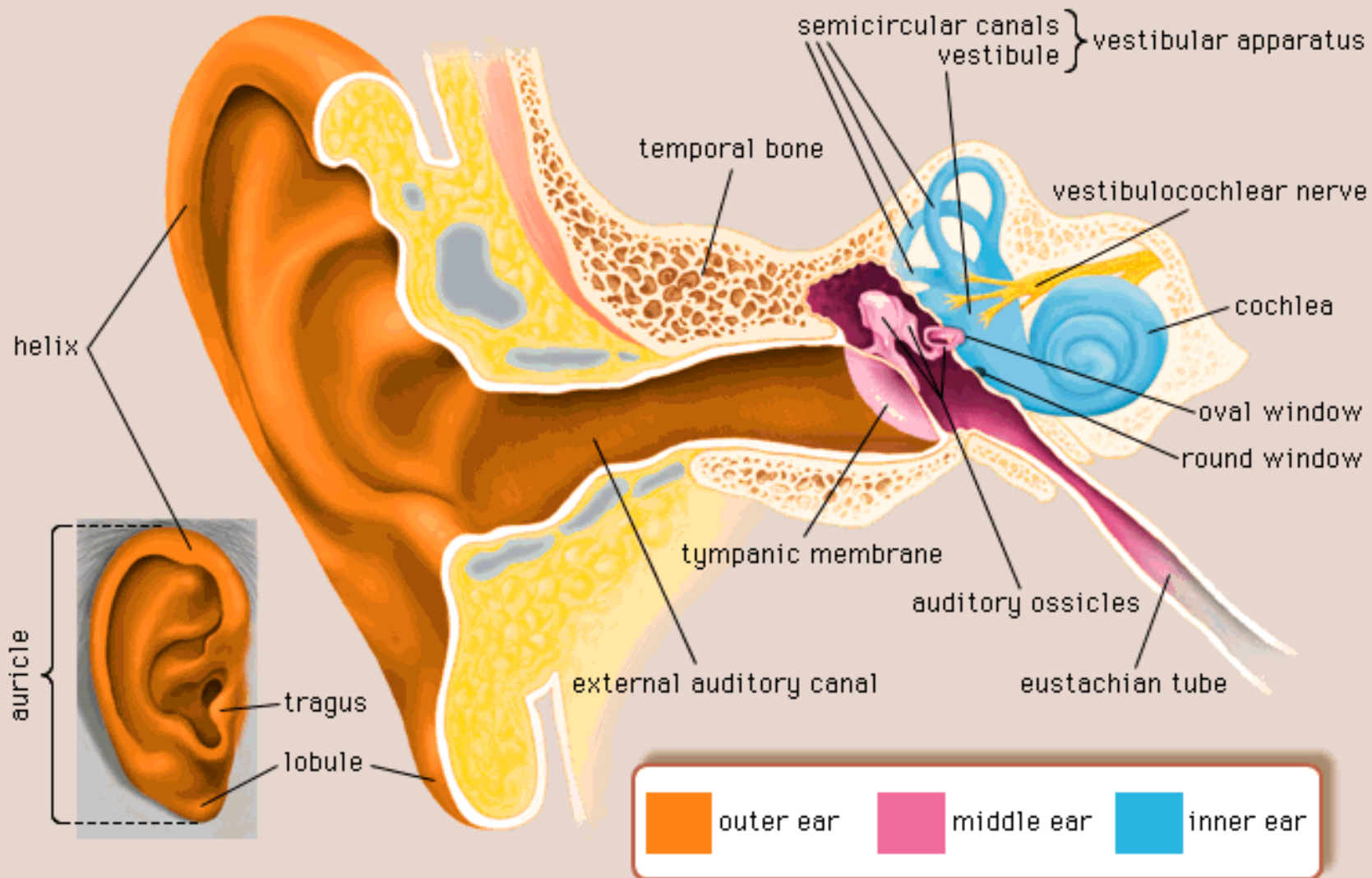
The External Ear

External ear- is the visible portion of the ear.

Fnxn: collects and directs sound waves to the eardrum.

Parts of the External Ear:

- Pinna- outer portion of the ear
- External auditory canal- the passage way for sound to the ear drum
- Tympanic membrane- ear drum



The Middle Ear

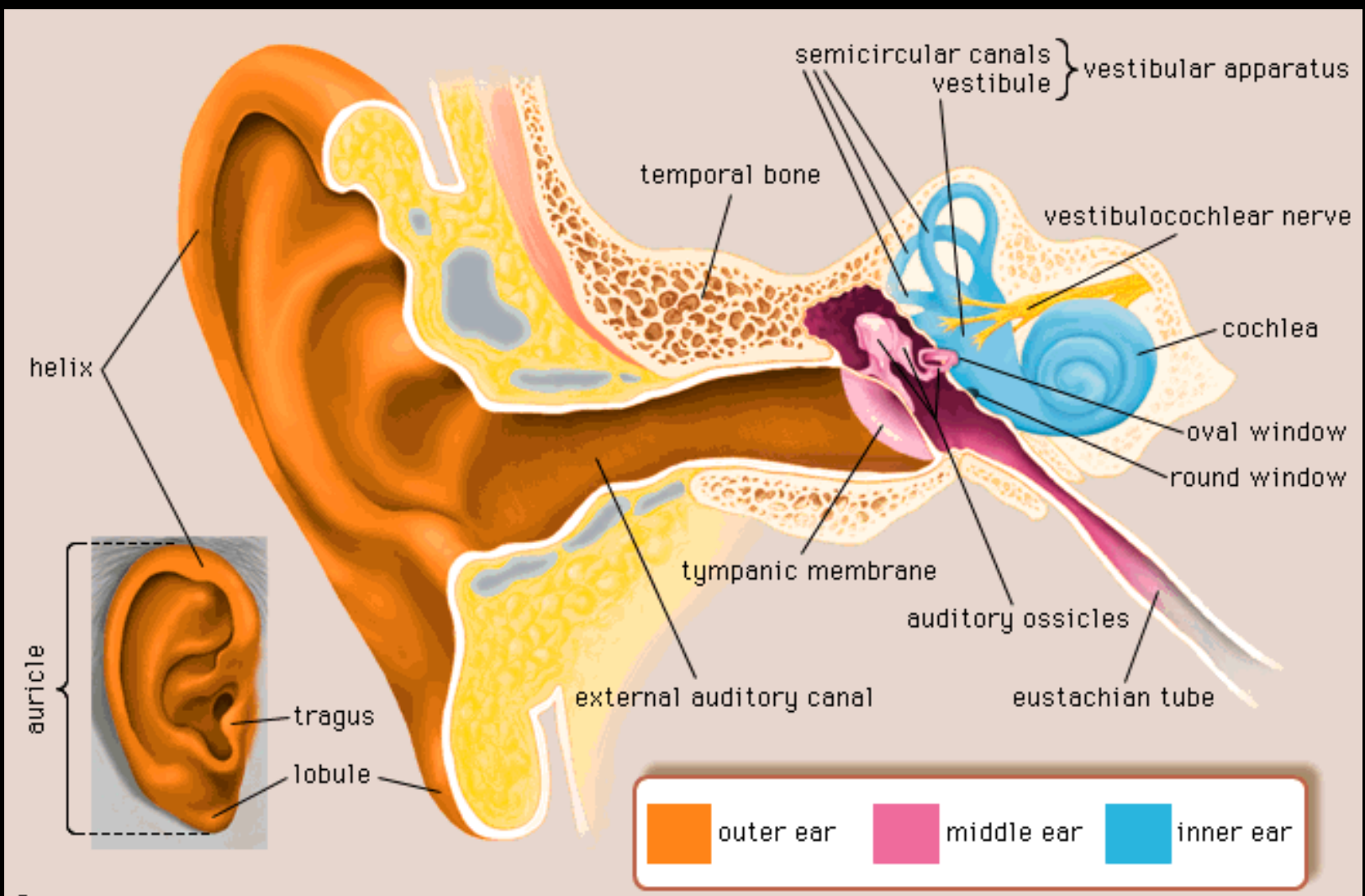
Middle ear- is a chamber located in a thickened portion of the temporal bone,

Fnxn: collects and amplifies sound waves and transmit them to a portion of the inner ear.

Parts of the Middle Ear:

Auditory ossicles- the bones of the middle ear.

- Malleus- called hammer, first bone attached to the eardrum.
- Incus- called anvil, middle ear bone
- Stapes- called the stirrup, attaches to the oval window



The Inner Ear

Inner ear- concerned with hearing and equilibrium.
Receives input from the middle ear.

Fnxn: contains the sensory organs responsible for equilibrium sensations.

Parts:

Membranous labyrinth- contains the receptors

Bony labyrinth- is a shell of dense bone that surrounds and protects the membranous labyrinth.

1. Vestibule- contains two sacs called saccule and utricle that contains receptors that provide sensation of gravity and linear acceleration.

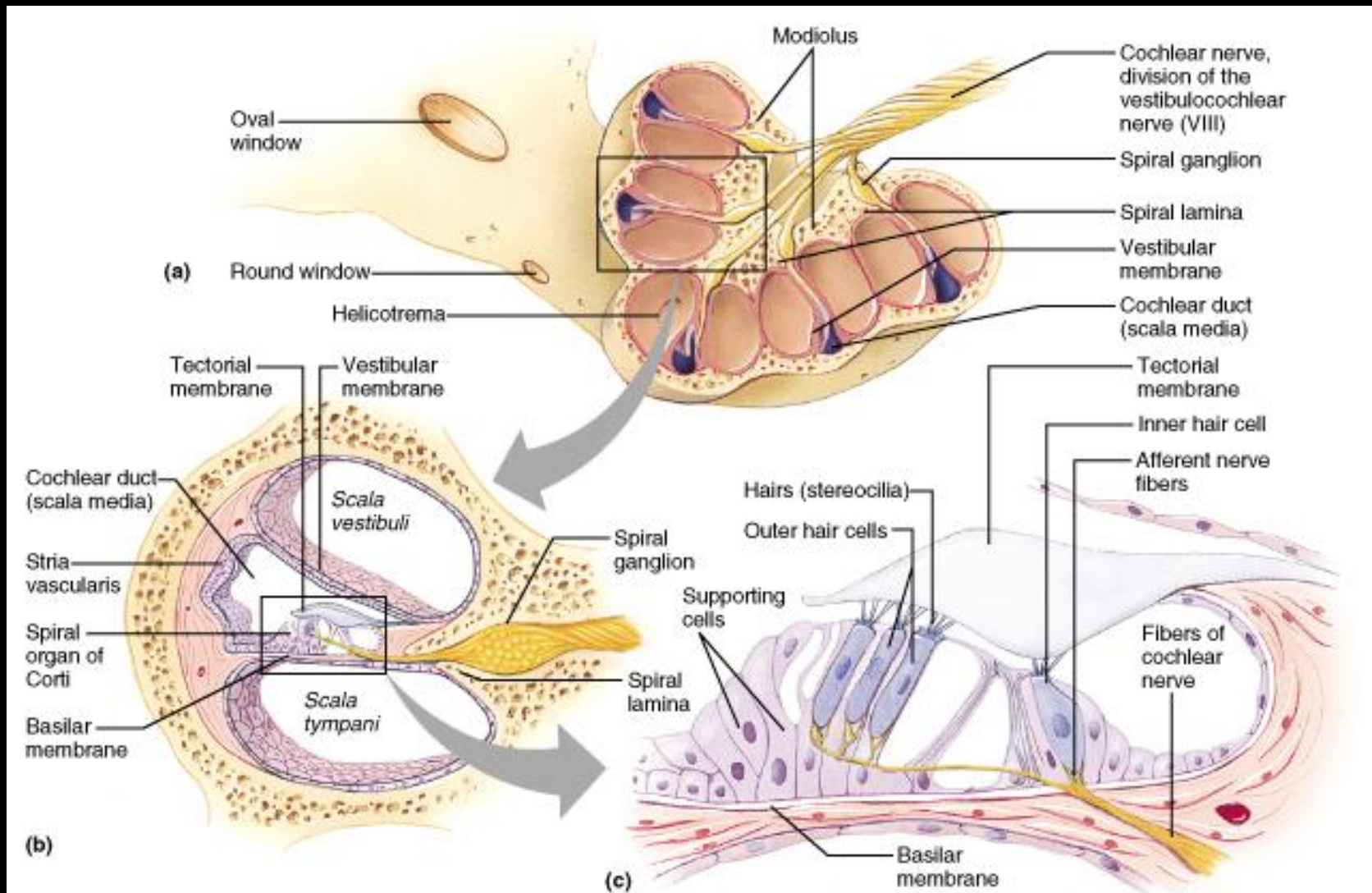
Inner Ear Continued

Parts of the Inner Ear:

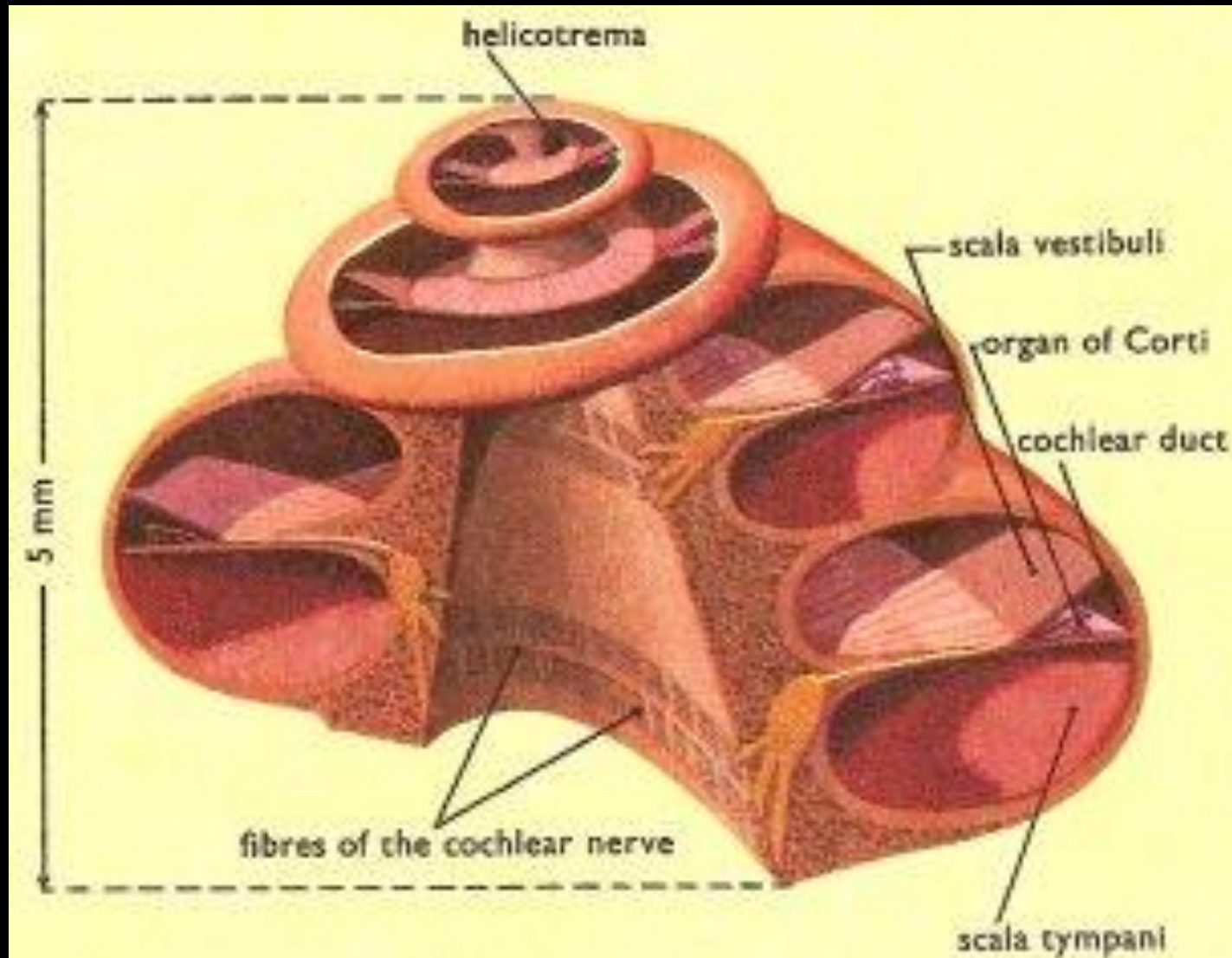
2. Semicircular canals- stimulated by rotation of the head or dynamic equilibrium.
3. Cochlea- provides the sensation of hearing.

Hair cells- line the inner ear, communicates with a sensory neuron by continually releasing small quantities of neurotransmitter.

The Internal Cochlea

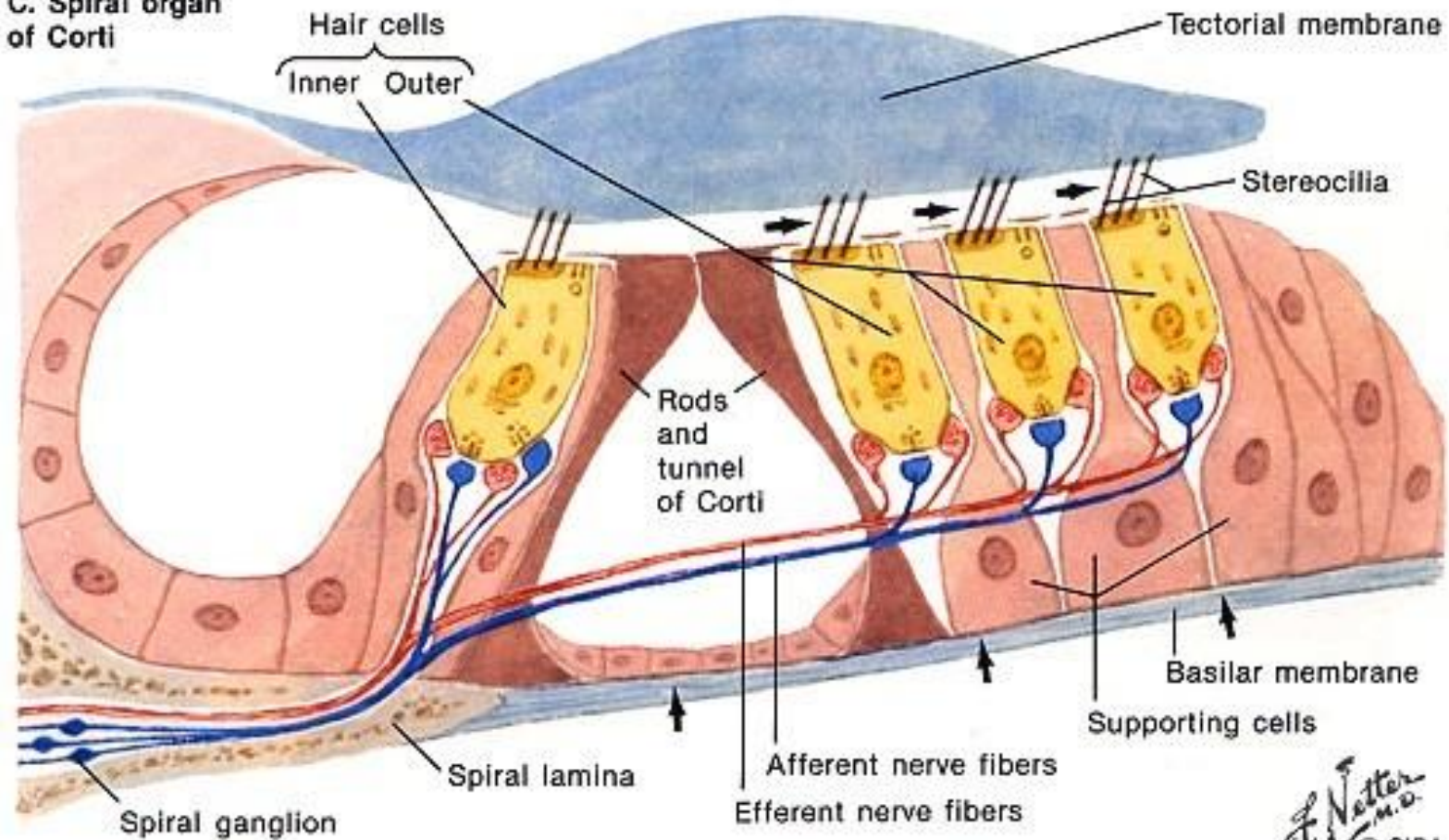


Cochlea and Organ of Corti

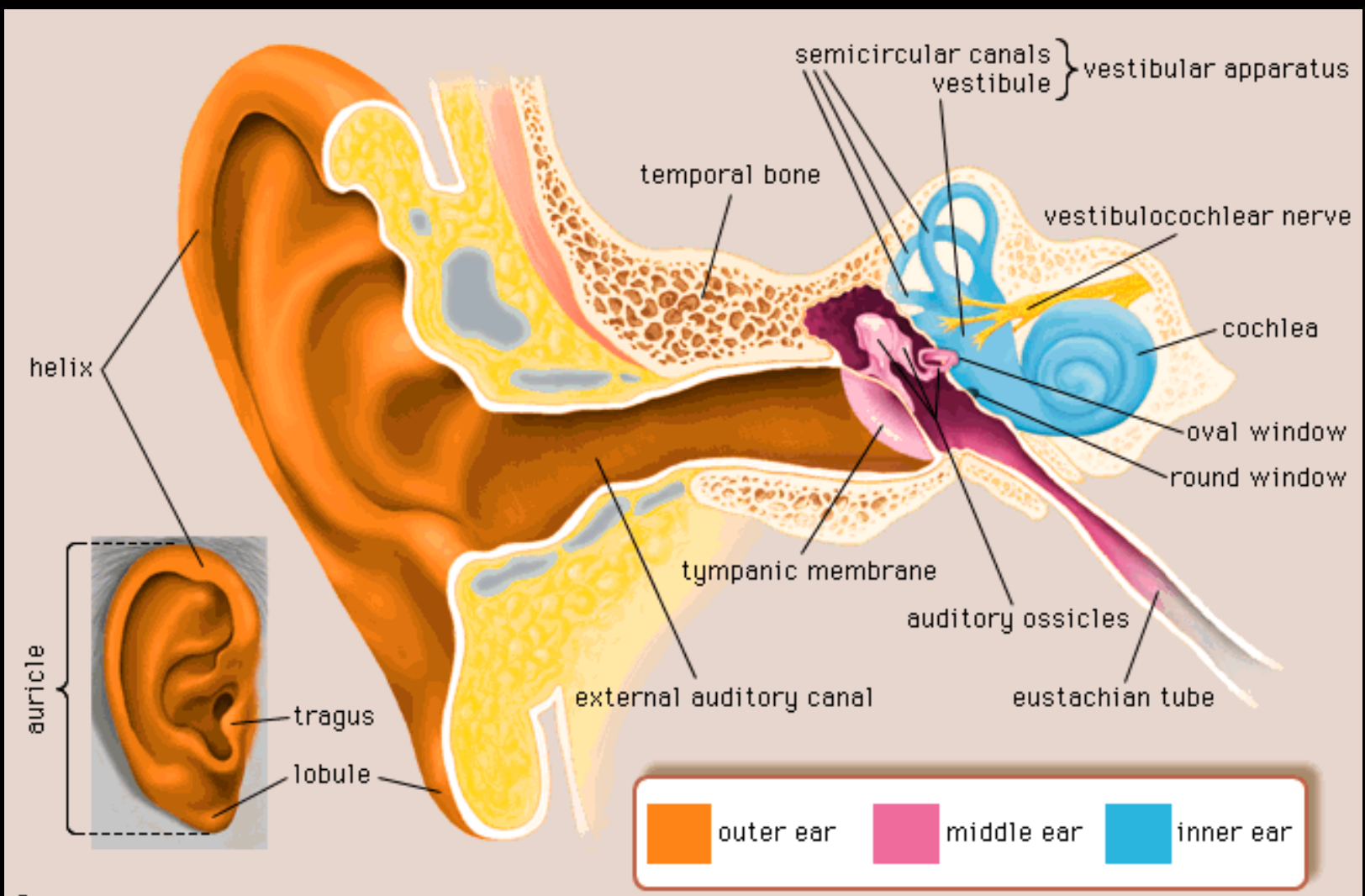


Basilar/Tectorial Membrane

C. Spiral organ of Corti



As basilar membrane moves up, hairs are deflected outward causing depolarization of hair cells and increased firing of afferent nerve fibers



What is Dynamic and Static Equilibrium?

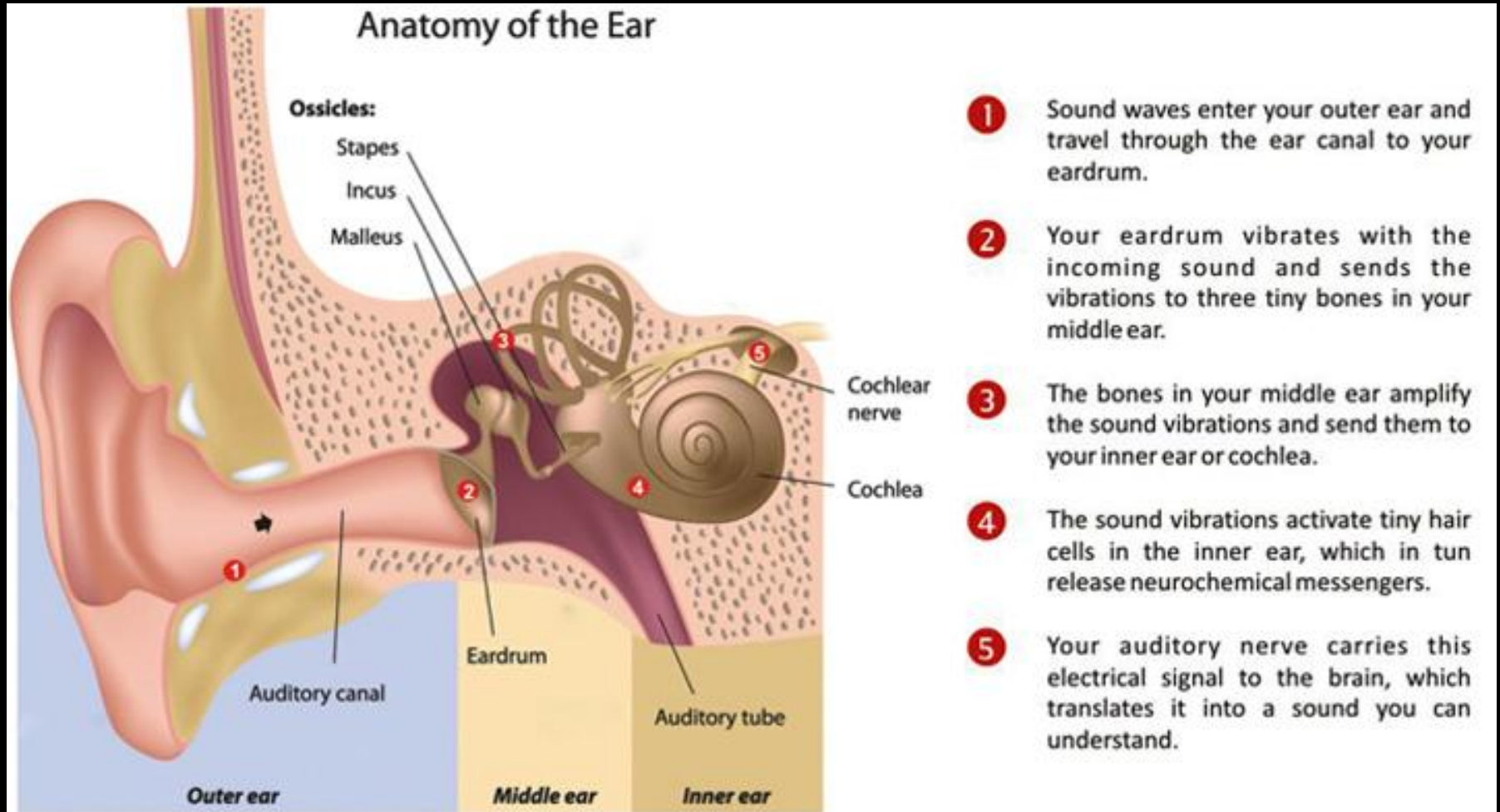
Dynamic equilibrium- refers to when the head and body are moved suddenly.

Static equilibrium- maintains our posture and stability when the body is motionless.

The Process of Hearing

1. **Sound waves arrive at the tympanic membrane or eardrum**
2. The vibration of the tympanum causes movement of the auditory ossicles.
3. **The movement of the stapes at the oval window establishes pressure waves in the perilymph of the vestibular duct.**
4. The pressure waves distort the basilar membrane on their way to the round window of the tympanic duct.
5. **The vibration of the basilar membrane causes the vibration of hair cells against the tectorial membrane.**
6. Information about the region and intensity of stimulation is relayed to the CNS over the cochlear branch of the cranial nerve VIII.

The Process of Hearing



The Process of Hearing

