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**Learning Guide:**

**Inner Ear**

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# **Walkthrough:**



Find the circular spiral. This is the left **cochlea**. Follow the path of the spiral with your finger until you feel 3 bumps. You are now in the **vestibule**. Within the vestibule, the first bump is the **saccule**, the second bump is the **utricle**, and the third bump is the **ampulla** marking the start of the **anterior semicircular canal**. The semicircular canals are the 3 large rings. Trace the anterior semicircular canal until you feel another ring called the **posterior semicircular canal**. The final ring is the **lateral semicircular canal** and it is the smallest and is protruding horizontally.

1. **Cochlea:** The function of the cochlea is to transform sound into neural messages (electrical impulses that allow the brain to communicate with parts of the body). It does so by recognizing the vibrations of cochlear liquids and translating the pattern into a neural message. Some deaf and hard of hearing people may have cochlear implants so they can perceive some sounds. The implant captures sound from the sound processor placed behind the ear and sends those signals to the receiver located under the skin and behind the ear. Then, the receiver relays those electric signals to the brain by directly stimulating the auditory nerve in the cochlea.
2. **Vestibule:** The vestibule is a part of the inner ear and is structured to sense changes in speed and gravity. For example, when one is on an elevator, the vestibule allows the person to sense the change in height. This also occurs when one is in a car that is accelerating because it is the vestibule that allows the body to recognize the change in speed.
3. **Saccule (in the vestibule):** The saccule is made up of sensory cells which detect head movements, specifically in the vertical plane, and transform them into neural impulses. This helps a person balance. The saccule does so through the use of hair cells and calcium carbonate crystals (ear stones). When the ear stones shift, the hair cells are displaced. The displacement of the hair cells trigger receptors, and these receptors transform the movements into neural impulses.
4. **Utricle (in the vestibule):** Like the saccule, the utricle also allows one to stay balanced and oriented. The utricle has a similar structure and function as the saccule, but the difference is that the utricle detects movement on the horizontal plane.
5. **Anterior semicircular canal.** Like the lateral and posterior canal, the anterior semicircular canal has the same structure and processes. The difference between them is that the anterior canal detects front and back head movement, like head nodding.
6. **Ampulla:** The ampulla contains hair cells and their movement notifies the brain of any changes in pressure and where a person is in space (spatial awareness).
7. **Posterior semicircular canal:** The posterior semicircular canal has the exact same structure and process as the lateral semicircular canal. However, the posterior canal senses head tilts (for example moving one’s head to their shoulder) rather than horizontal movement.
8. **Lateral semicircular canal:** The lateral semicircular canal senses any horizontal movement of one’s head, like rocking the head side to side. Cilia (microscopic hairs) line the canal and are filled with endolymph (liquid substance). When one moves their head horizontally, the endolymph moves the cilia, and then the cilia communicates with the brain. This process allows a person to stay balanced.

# **Citations:**



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