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**QUESTION**

**With the aid of a diagram, write on the organ of corti.**

[**Organ of Corti**](https://www.britannica.com/science/organ-of-Corti)

Arranged on the surface of the basilar membrane are orderly rows of the sensory hair cells, which generate nerve impulses in response to [sound](https://www.britannica.com/science/sound-physics) vibrations. Together with their supporting cells they form a complex neuroepithelium called the basilar papilla, or organ of Corti. The organ of Corti is named after Italian anatomist [Alfonso Corti](https://www.britannica.com/biography/Alfonso-Marchese-Corti), who first described it in 1851. Viewed in [cross section](https://www.britannica.com/science/cross-section-physics), the most striking feature of the organ of Corti is the arch, or tunnel, of Corti, formed by two rows of pillar cells, or rods. The pillar cells furnish the major support of this structure. They separate a single row of larger, pear-shaped [inner hair cells](https://www.britannica.com/science/inner-hair-cell) from three or more rows of smaller, cylindrical [outer hair cells](https://www.britannica.com/science/outer-hair-cell). The inner hair cells are supported and enclosed by the inner phalangeal cells, which rest on the thin outer portion, called the tympanic lip, of the spiral limbus. On the inner side of the inner hair cells and the cells that support them is a curved furrow called the inner sulcus. This is lined with more or less undifferentiated cuboidal cells.



**Structure of the organ of Corti.**

Each outer hair cell is supported by a phalangeal cell of Deiters, or supporting cell, which holds the base of the hair cell in a cup-shaped depression. From each Deiters’ cell a projection extends upward to the stiff membrane, the reticular lamina, that covers the organ of Corti. The top of the hair cell is firmly held by the lamina, but the body is suspended in fluid that fills the space of Nuel and the tunnel of Corti. Although this fluid is sometimes referred to as cortilymph, its [composition](https://www.merriam-webster.com/dictionary/composition) is thought to be similar, if not identical, to that of the perilymph. Beyond the hair cells and the Deiters’ cells are three other types of epithelial cells, usually called the [cells of Hensen](https://www.britannica.com/science/cells-of-Hensen), Claudius, and Boettcher, after the 19th-century anatomists who first described them. Their function has not been established, but they are assumed to help in maintaining the composition of the endolymph by [ion](https://www.britannica.com/science/ion-physics) transport and absorptive activity.

Each hair cell has a [cytoskeleton](https://www.britannica.com/science/cytoskeleton) composed of filaments of the protein actin, which imparts stiffness to structures in which it is found. The hair cell is capped by a dense cuticular plate, composed of actin filaments, which bears a tuft of stiffly erect [stereocilia](https://www.britannica.com/science/stereocilium), also containing actin, of graded lengths arranged in a staircase pattern. This so-called hair bundle has rootlets anchored firmly in the cuticular plate. On the top of the inner hair cells 40 to 60 stereocilia are arranged in two or more irregularly parallel rows. On the outer hair cells approximately 100 stereocilia form a W pattern. At the notch of the W the plate is incomplete, with only a thin [cell membrane](https://www.britannica.com/science/cell-membrane) taking its place. Beneath the membrane is the basal body of a [kinocilium](https://www.britannica.com/science/kinocilium), although no motile ciliary (hairlike) portion is present as is the case on the hair cells of the [vestibular system](https://www.britannica.com/science/vestibular-system).

The stereocilia are about 3 to 5 μm in length. The longest make contact with but do not penetrate the [tectorial membrane](https://www.britannica.com/science/tectorial-membrane). This membrane is an acellular gelatinous structure that covers the top of the spiral limbus as a thin fibrillar layer, then becomes thicker as it extends outward over the inner sulcus and the [reticular lamina](https://www.britannica.com/science/reticular-lamina). Its fibrils extend radially and somewhat obliquely to end at its lateral border, just above the junction of the reticular lamina and the [cells of Hensen](https://www.britannica.com/science/cells-of-Hensen). In the upper turns of the cochlea, the margin of the membrane ends in fingerlike projections that make contact with the stereocilia of the outermost hair cells.

The [myelin](https://www.britannica.com/science/myelin)-ensheathed fibres of the [vestibulocochlear nerve](https://www.britannica.com/science/vestibulocochlear-nerve) fan out in spiral fashion from the modiolus to pass into the channel near the root of the osseous spiral lamina, called the canal of Rosenthal. The bipolar cell bodies of these [neurons](https://www.britannica.com/science/neuron) [constitute](https://www.merriam-webster.com/dictionary/constitute) the spiral ganglion. Beyond the ganglion their distal processes extend radially outward in the bony lamina beneath the limbus to pass through an array of small pores directly under the inner hair cells, called the habenula perforata. Here the fibres abruptly lose their multilayered coats of myelin and continue as thin, naked, unmyelinated fibres into the organ of Corti. Some fibres form a longitudinally directed bundle running beneath the inner hair cells and another bundle just inside the tunnel, above the feet of the inner pillar cells. The majority of the fibres (some 95 percent in the human ear) end on the inner hair cells. The remainder cross the tunnel to form longitudinal bundles beneath the rows of the outer hair cells on which they eventually terminate.

The endings of the nerve fibres beneath the hair cells are of two distinct types. The larger and more numerous endings contain many minute vesicles, or liquid-filled sacs, containing [neurotransmitters](https://www.britannica.com/science/neurotransmitter), which mediate impulse transmission at neural junctions. These endings belong to a special bundle of nerve fibres that arise in the brainstem and constitute an efferent system, or feedback loop, to the cochlea. The smaller and less numerous endings contain few vesicles or other cell structures. They are the terminations of the afferent fibres of the cochlear nerve, which transmit impulses from the hair cells to the brainstem (*see* [The physiology of hearing: Cochlear nerve and central auditory pathways](https://www.britannica.com/science/ear/Cochlear-nerve-and-central-auditory-pathways#ref65053)).

The total number of outer hair cells in the cochlea has been estimated at 12,000 and the number of inner hair cells at 3,500. Although there are about 30,000 fibres in the cochlear nerve, there is considerable overlap in the innervation of the outer hair cells. A single fibre may supply endings to many hair cells, which thus share a “party line.” Furthermore, a single hair cell may receive nerve endings from many fibres. The actual distribution of nerve fibres in the organ of Corti has not been worked out in detail, but it is known that the inner hair cells receive the majority of afferent fibre endings without the overlapping and sharing of fibres that are characteristic of the outer hair cells.

Viewed from above, the organ of Corti with its covering, the reticular lamina, forms a well-defined mosaic pattern. In humans the arrangement of the outer hair cells in the basal turn of the cochlea is quite regular, with three distinct and orderly rows; but in the higher turns of the cochlea the arrangement becomes slightly irregular, as scattered cells form fourth or fifth rows. The spaces between the outer hair cells are filled by oddly shaped extensions (phalangeal plates) of the supporting cells. The double row of [head](https://www.britannica.com/science/head-anatomy) plates of the [inner](https://www.britannica.com/science/inner-hair-cell) and outer pillar cells cover the tunnel and separate the inner from the [outer hair cells](https://www.britannica.com/science/outer-hair-cell). The reticular lamina extends from the inner border cells near the inner sulcus to the Hensen cells but does not include either of these cell groups. When a hair cell degenerates and disappears as a result of aging, disease, or noise-induced injury, its place is quickly covered by the [adjacent](https://www.merriam-webster.com/dictionary/adjacent) phalangeal plates, which expand to form an easily recognized “scar.”

[**Endolymph**](https://www.britannica.com/science/endolymph)**and**[**perilymph**](https://www.britannica.com/science/perilymph)

The perilymph, which fills the space within the bony labyrinth surrounding the membranous labyrinth, is similar, but not identical, in [composition](https://www.merriam-webster.com/dictionary/composition) to other extracellular fluids of the body, such as [cerebrospinal fluid](https://www.britannica.com/science/cerebrospinal-fluid). The concentration of [sodium](https://www.britannica.com/science/sodium) ions in the perilymph is high (about 150 milliequivalents per litre), and that of [potassium](https://www.britannica.com/science/potassium) ions is low (about 5 milliequivalents per litre), as is true of other extracellular fluids. Like these fluids, the perilymph is apparently formed locally from the [blood plasma](https://www.britannica.com/science/plasma-biology) by transport mechanisms that selectively allow substances to cross the walls of the capillaries. Although it is anatomically possible for cerebrospinal fluid to enter the cochlea by way of the perilymphatic duct, experimental studies have made it appear unlikely that the cerebrospinal fluid is involved in the normal production of perilymph.

The membranous labyrinth is filled with endolymph, which is unique among extracellular fluids of the body, including the perilymph, in that its [potassium](https://www.britannica.com/science/potassium) ion concentration is higher (about 140 milliequivalents per litre) than its sodium ion concentration (about 15 milliequivalents per litre).

The process of formation of the endolymph and the maintenance of the difference in ionic composition between it and perilymph are not yet completely understood. The [Reissner membrane](https://www.britannica.com/science/Reissners-membrane) forms a selective barrier between the two fluids. Blood-endolymph and blood-perilymph barriers, which control the passage of substances such as [drugs](https://www.britannica.com/science/drug-chemical-agent) from the blood to the [inner ear](https://www.britannica.com/science/inner-ear), appear to exist as well. Evidence indicates that the endolymph is produced from perilymph as a result of selective ion transport through the epithelial cells of the Reissner membrane and not directly from the blood. The secretory tissue called the [stria vascularis](https://www.britannica.com/science/stria-vascularis), in the lateral wall of the cochlear duct, is thought to play an important role in maintaining the high ratio of potassium ions to sodium ions in the endolymph. Other tissues of the cochlea, as well as the dark cells of the vestibular organs, which must produce their own endolymph, are also thought to be involved in maintaining the ionic composition of the endolymph. Because the [membranous labyrinth](https://www.britannica.com/science/membranous-labyrinth) is a closed system, the questions of flow and removal of the endolymph are also important. The endolymph is thought to be reabsorbed from the endolymphatic sac, although this appears to be only part of the story. Other cochlear and vestibular tissues may also have important roles in regulating the [volume](https://www.britannica.com/science/loudness) and maintaining the composition of the inner-ear fluids.