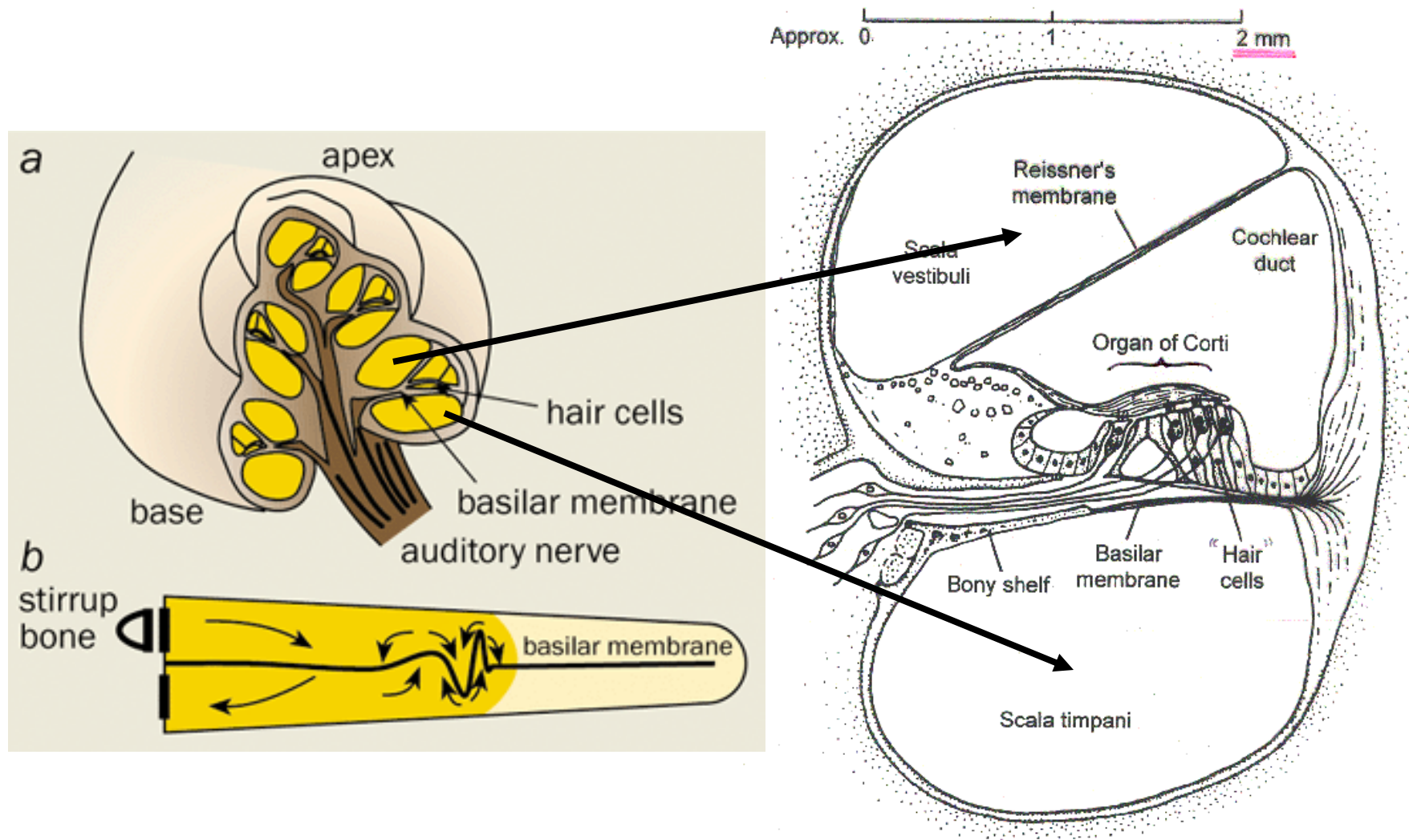


Anatomy of the Ear

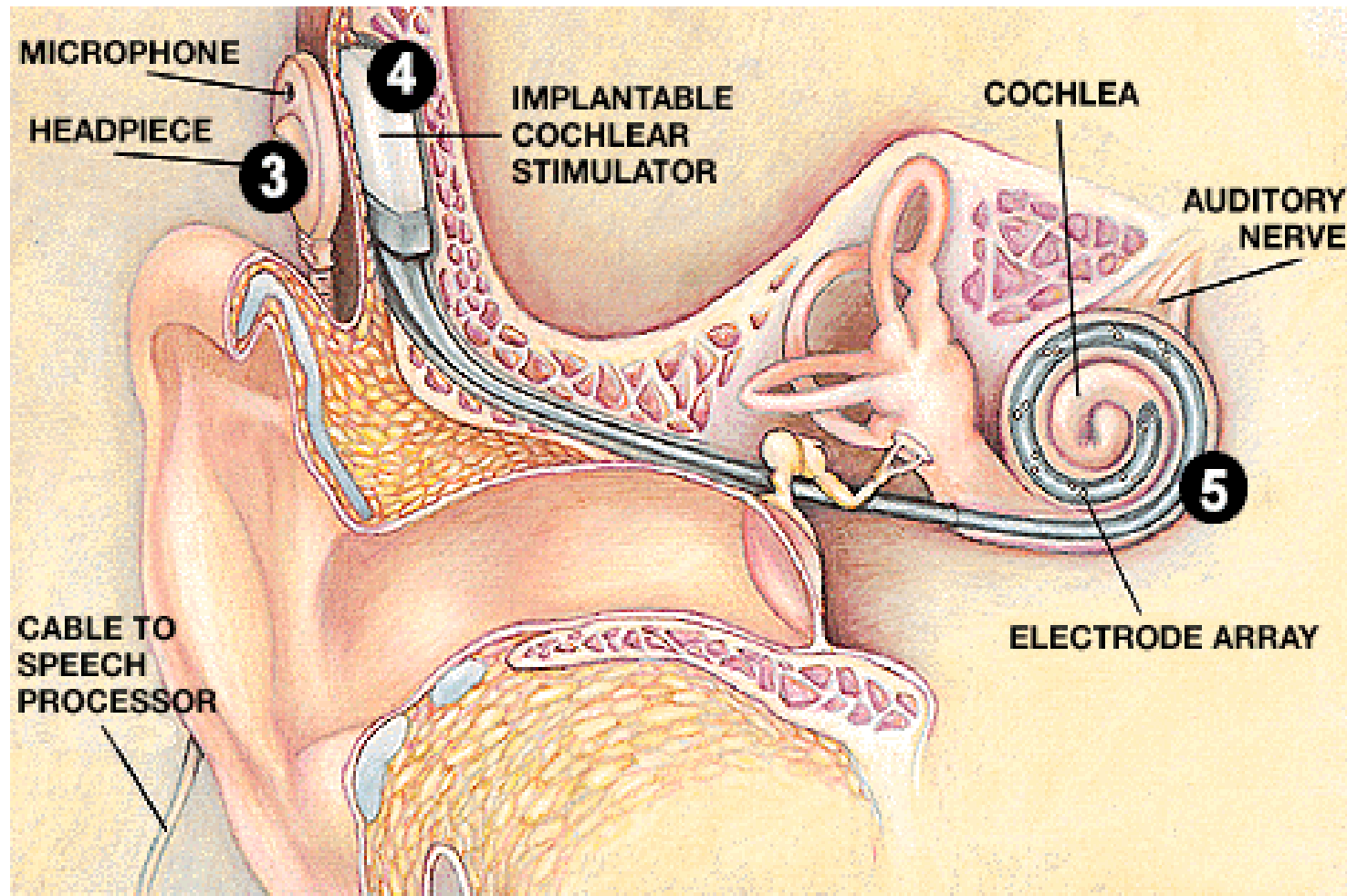
Sound energy enters the ear through the external auditory canal. The energy strikes the tympanic membrane (eardrum) causing the eardrum and the three bones of hearing in the middle ear (ossicles - malleus [hammer], incus [anvil], and stapes [stirrup]) to vibrate. The stapes bone acts like a piston, whose pulsations initiate waves down the fluid-filled cochlea (inner ear).

Inside the cochlea, very specialized cells, called hair cells, convert the mechanical energy of the travelling wave into an electric signal. The electric signal then travels down the hearing (auditory) nerve to the brain.



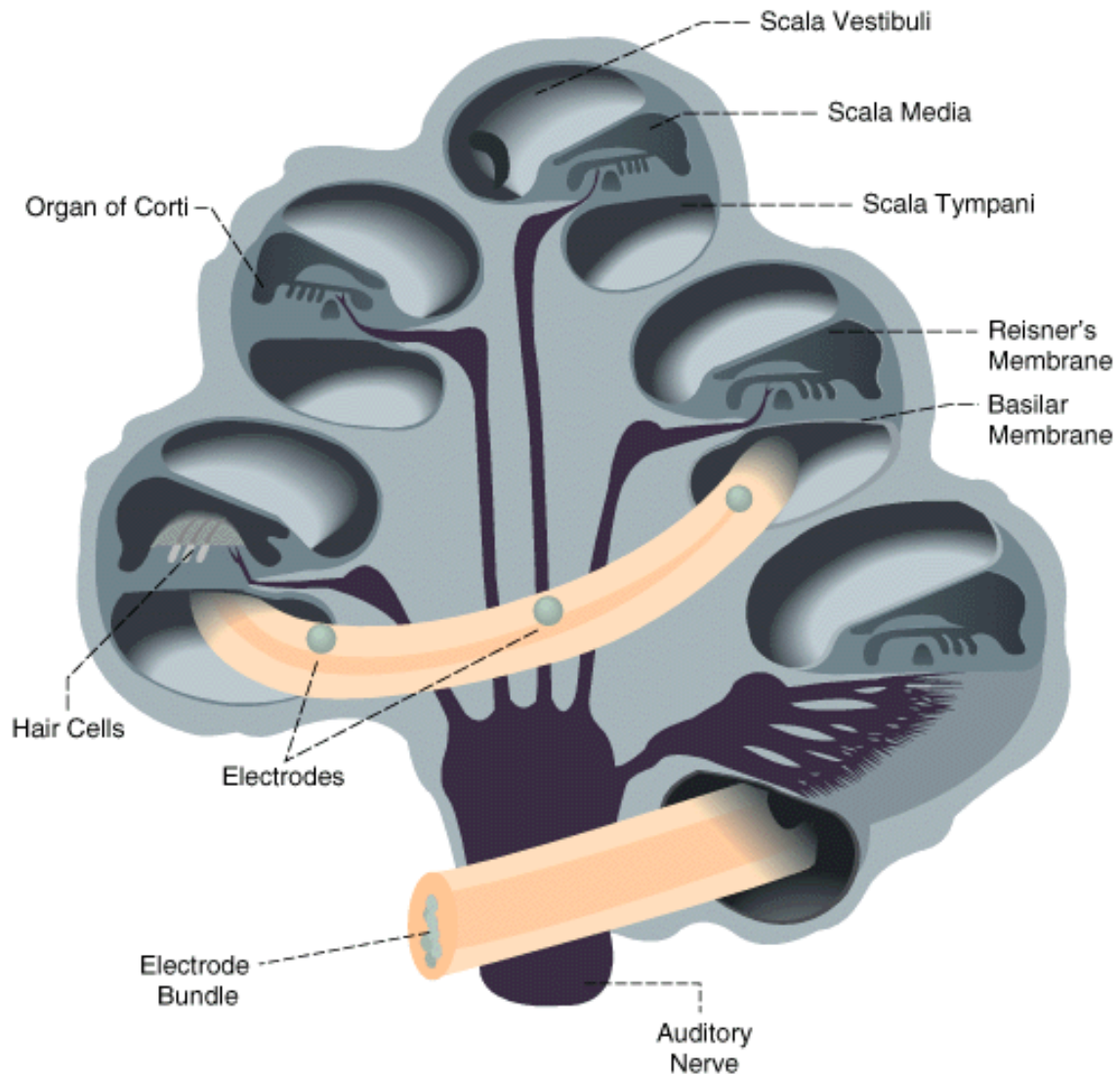
The Cochlea

When the delicate hair cells of the cochlea become injured or deteriorate, we say the patient has a sensorineural, or "nerve" type hearing loss. Hair cells do not regenerate, and if enough hair cells are lost, the patient has a severe or even profound hearing loss.



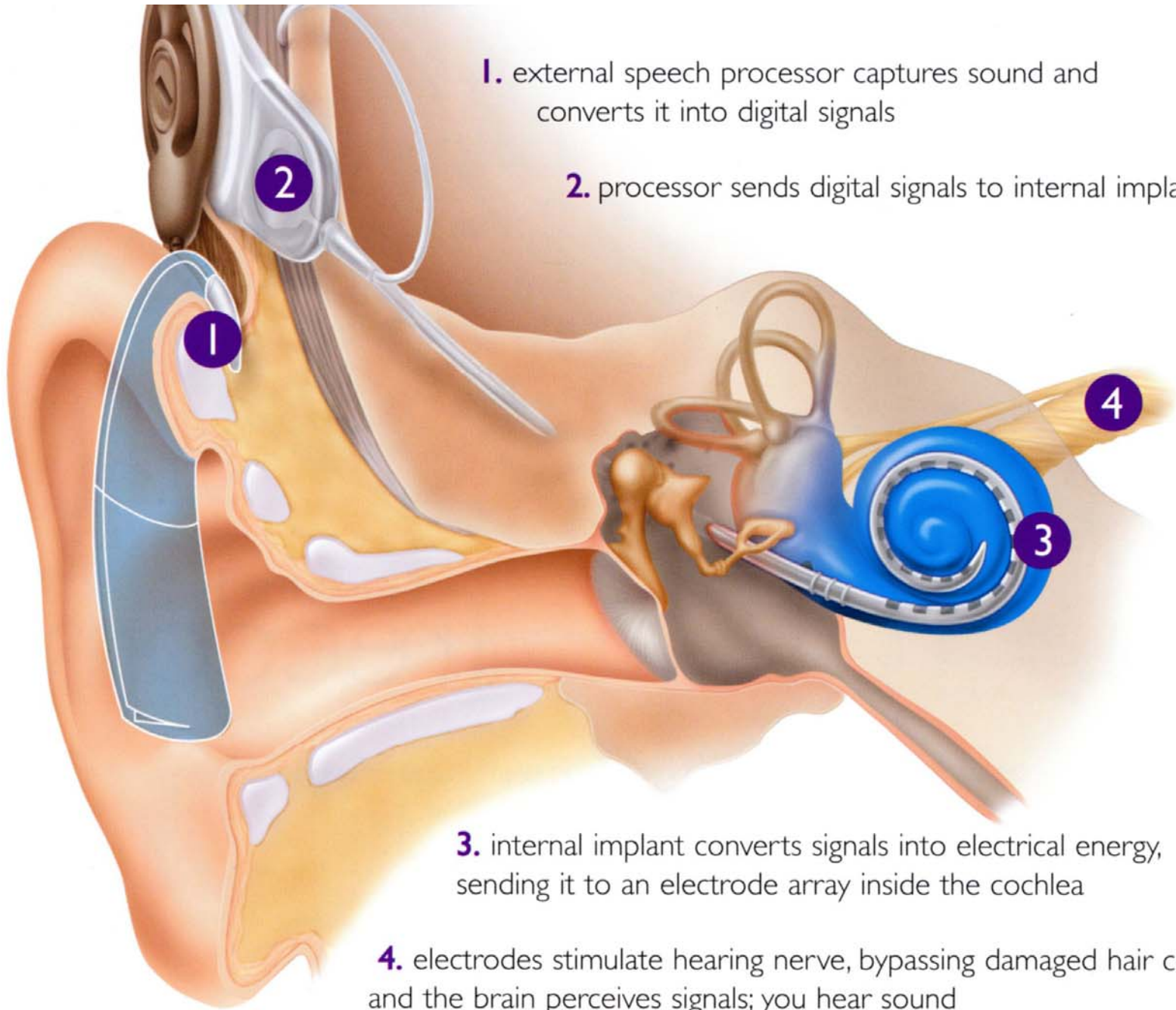
The Cochlear Implant

If a patient loses enough hair cells, he/she may be a candidate for a cochlear implant. A cochlear implant is a device that converts sound energy into an electrical signal and sends the signal down an electrode directly into the cochlea, bypassing the hair cells and stimulating the usually healthy auditory nerve cells.



Surgery for Cochlear Implantation

The operation to place a cochlear implant generally takes 2-3 hours and is often outpatient. An incision is made behind the ear to be implanted, and bone is removed to access the cochlea. The electrode is placed into the cochlea, and a well is created in the side of the skull to house the internal receiver (see previous picture – “implantable cochlear stimulator”). The incision is closed, and a dressing is placed.



1. external speech processor captures sound and converts it into digital signals

2. processor sends digital signals to internal implant

3. internal implant converts signals into electrical energy, sending it to an electrode array inside the cochlea

4. electrodes stimulate hearing nerve, bypassing damaged hair cells, and the brain perceives signals; you hear sound