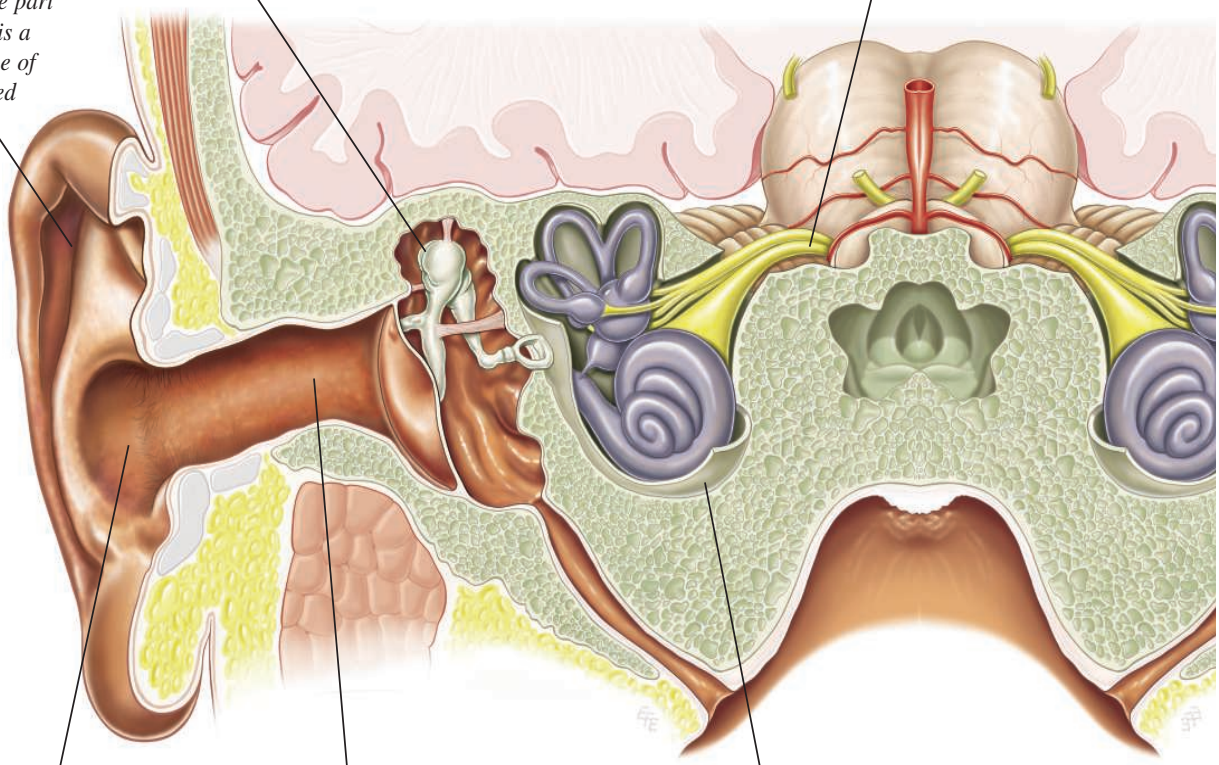
Your ears and hearing

The main job of your ears is to detect sound. They collect the **energy** of vibrating air and change it into electrical signals, which are sent to your brain. Each ear has three main parts — the outer ear, the middle ear and the inner ear. Each part has its own special job to do.

Middle ear
*The middle ear contains the three smallest bones in your body. Together, they are known as the **ossicles**. These tiny bones send **vibrations** from the **eardrum** to the inner ear. They also make the vibrations larger. One of the ossicles (the stirrup) presses against a thin layer of skin called the **oval window** at the entrance to the inner ear.*

Auditory nerve
*Nerves from the **receptors** in the **cochlea** merge to form this large nerve that sends signals to the brain.*

Auricle
The outside part of the ear is a spongy type of tissue called cartilage.



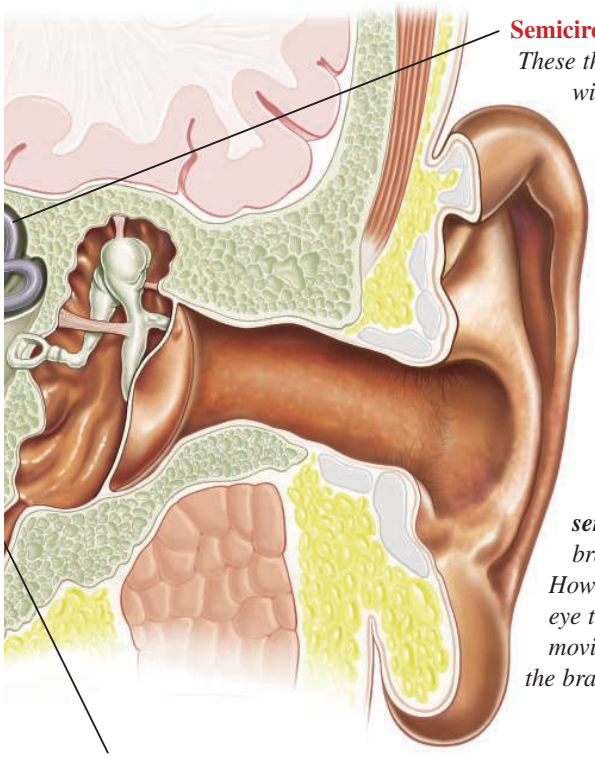
Outer ear
*The outer ear collects the energy of the vibrating air and funnels it along the **ear canal**. The air along the ear canal vibrates. That makes the eardrum vibrate. High-pitched sounds make the eardrum vibrate quickly. Low-pitched sounds make the eardrum vibrate slowly.*

Ear canal
The ear canal contains wax and tiny hairs to trap dust so that it doesn't get to your eardrum. Don't try to remove the wax. It's there to protect your eardrum. If it builds up enough to block your ear canal, a doctor can remove it for you.

Inner ear
*The inner ear is filled with fluid. The vibrations are passed along the fluid into a snail-shaped tube called the cochlea. The inside of the cochlea is lined with millions of tiny hairs. Each hair is attached to a receptor. When the fluid vibrates, the hairs move. The receptors change the energy of the moving hairs into electrical energy and send signals through the **auditory nerve** to the brain. You interpret those signals as sound.*

Aye-aye

The aye-aye is a rare animal that lives on the island of Madagascar. It feeds at night and has goggle eyes and huge ears. The aye-aye searches for food by tapping one of its stick-like fingers on tree trunks. It listens to the sound as vibrations go through the wood. The sound tells it where gaps, cracks and hollows are under the bark and where tasty grubs are hiding. Then it chews through the wood and hooks out the grub with its long middle finger.



Semicircular canals

These three tubes have nothing to do with hearing. They control your sense of balance. When you move, fluid in the tubes flows past cells that sense the movement. These cells send signals to the brain. The signals tell you when you are moving and whether you are up, down or on your side. When you move around in circles quickly, the fluid moves quickly — even for a while after you stop. The messages from the cells in the ***semicircular canals*** *tell your brain that you are still moving. However, the messages from your eye tell the brain that you are not moving. These mixed messages to the brain make you feel dizzy.*

Eustachian tube

This tube joins the middle ear to the nose and throat. It is usually closed. When the air ***pressure*** *on the eardrum is not the same on both sides, the tube opens. Air then moves either into or out of the middle ear until the pressure is balanced again.*

When the air pressure on one side of the eardrum changes quickly, you can feel a 'pop' as the ***Eustachian tube*** *opens and air rushes through it. This happens when you are in a plane that is climbing steeply. The air pressure in the plane becomes less than the air pressure in your middle ear. The Eustachian tube then opens and some air moves from the middle ear to the nose and throat so that the air pressure on your eardrum is balanced. You can also feel the 'pop' just before you land, because the air pressure in the plane increases. The tube opens again and air rushes into your middle ear from your nose and throat to balance the pressure outside your eardrum.*

Activities

REMEMBER

1. Why does the ear canal contain wax and hairs?
2. What does the outer ear do?
3. How do the ossicles change vibrations?
4. In which part of the inner ear are the receptors for hearing?
5. How do receptors in the inner ear detect the vibrations that arrive from the outer ear?
6. Part of the inner ear has nothing to do with hearing.
   (a) Which part is it?
   (b) What important job does this part do?

THINK

7. Why shouldn't you try to remove wax from your ear canal yourself?
8. Why do you think there are three semicircular canals rather than just one?

DESIGN AND CREATE

9. Design an experiment to find out the direction from which a sound is coming. Try your experiment with high-pitched sounds and low-pitched sounds to see if the pitch makes any difference.

INVESTIGATE

10. Look at the diagram of the ear on these two pages. Now cover the diagram and make your own sketch of the ear. Add labels and then uncover the diagram to see how accurate you were.
11. Apart from the aye-aye, what animals have big ears? What are they used for apart from hearing?

learning

I CAN:

- ☐ describe the main parts of the human ear and what they do
- ☐ explain how the human ear changes the energy of vibrating air into signals that we hear as sound.