

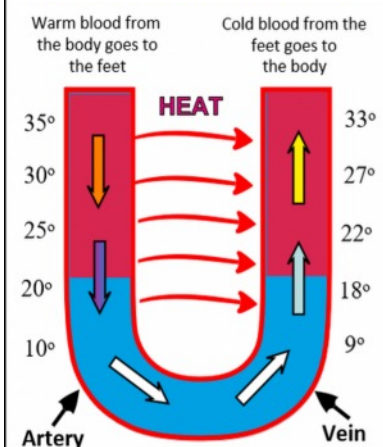


# GOD did it FIRST!

## Heat Exchangers

**H** EAT exchangers are used to warm up cold things, and cool down warm things. Most car engines are cooled by water, but the heat from the engine warms the water, so it has to be cooled by going through a **radiator**. The water is cooled by air passing through as the car moves along. So a radiator is a heat exchanger. Refrigerators have heat exchangers to keep food cool.

### Why birds don't get cold feet



Long before radiators were invented many animals had their own 'heat exchangers.' This is why birds that walk on ice and snow don't get frozen feet. In their legs, warm blood from their body flows through arteries. This warms their feet, but at the same time cools the blood. This cooler blood then flows back to the body through veins which run alongside the arteries (diagram, left). So the birds' feet never get frozen! On page two you can learn how some animals have heat exchangers which work in the opposite way – to keep them cool – just like a car radiator!

**Radiators and other heat exchangers were designed by intelligent people, not by accident. The heat exchangers in the bodies of animals could never have been made by gradual evolution. They had to be working properly from the beginning. We believe they were designed by God the Creator, who cares for all His creatures.**



A Mallard and a Penguin on ice

### A car radiator



Water gets hot as it cools the engine, but is cooled again by air as it passes through pipes in the radiator.

### PUZZLE ANSWERS

#### ANIMAL EARS ANSWERS:

1. Pig. 2. Elephant.
3. Giraffe. 4. Rabbit.
5. Squirrel. 6. Bat. 7. Cat.
8. Horse. 9. Camel.
10. Kangaroo.

#### BIBLE VERSE:

The Lord has made both these things: ears that can hear and eyes that can see. (Proverbs 20: 12)

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# EARS to HEAR

Ears are wonderfully designed!

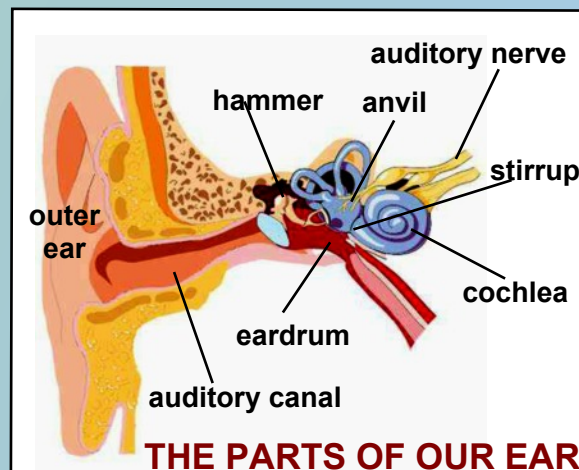
## How our ears work



Our ears have three main parts — the outer, middle and inner ear. The **outer ear** is like a funnel, which catches sounds. These sounds then enter a tube called the **auditory canal**. At the end of this canal is the **eardrum** — a piece of thin, tightly stretched skin.

The sound waves make the eardrum vibrate. This carries the sound to the middle ear, where there are three tiny bones: the **hammer**, the **anvil** and the **stirrup**. These three bones are so important and finely tuned that they stay exactly the same size all our lives. They never grow, like the other bones in our bodies! They carry the sounds into our inner ear to a coiled tube called the **cochlea**, which is filled with liquid. Inside it are 24,000 strings which vibrate like the strings of a piano.

Sound waves are carried from the cochlea through around 30,000 fibres in the **auditory nerve** to the special hearing centre in our brain. Then we **hear** the sounds. This all happens in an instant. Our ears wouldn't work without that special part of our brain. It all had to work together perfectly from the beginning. What an amazing design!



THE PARTS OF OUR EAR

Wikipedia picture by Plantsurfer CC BY-SA 3.0

## LISTEN!



**H** EARING is a wonderful thing. It's very sad to be deaf, and unable to hear all the wonderful and exciting sounds around us — the birds singing, the wind rustling the leaves on the trees, or the waves crashing over the rocks at the seaside.

Our ears are wonderfully designed so that we can enjoy the sounds of God's world. Yet, sadly, there are many people who, although they can hear very well, are completely deaf to the **truth** about the world they live in! They believe it is just a huge accident, and that all the wonderful things which live in the world, along with ourselves, just evolved.

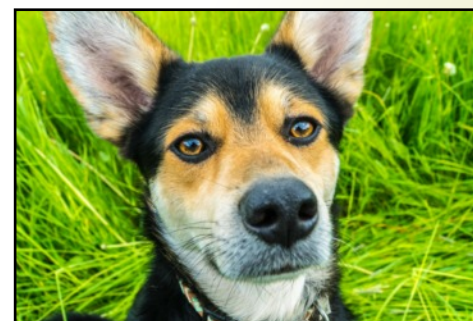
2,000 years ago the Bible said there would come a time when people would "stop listening to the truth. They will begin to follow the teaching of false stories." (2 Timothy 4: 4). We believe that evolution is one of those "false stories", and because of it many people no longer believe in God, who created everything.

The truth is that there is a Creator — God, who made the world and everything in it. He has spoken to us through creation, but also through the Bible, where we read that He loves us all, and sent His Son Jesus to be our Saviour. Jesus died on the cross to take away our sins, and rose from the dead. Jesus promised: "Whoever hears what I say and believes in the One who sent me has eternal life. (John 5: 24).

**Are you listening to the message that God created you and loves you? God is waiting to welcome you. Why not answer His call today!**



God speaks through the Bible



whistle that they can hear but humans can't.

However, bats (right) have the best hearing of all land animals. When flying, they use "echolocation" to detect insects and objects. These sounds — which humans can't hear — bounce back to them. This is a very good design, since they usually fly in the dark!



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## DOGS AND BATS HAVE SUPER HEARING

If you have a dog you will notice that it may sometimes prick up its ears, run towards the door and bark, even though you heard nothing. This is because a dog's sense of hearing is many times better than yours. They can hear sounds four times farther away than you. Their ears are controlled by 18 muscles — we only have six in our ears, and can't really move them. Dog's ears also have a longer **auditory canal** than us, and special muscles which allow them to "tune" it so that it can better tell where the sound is coming from. Dogs can also hear sounds which are too high for us to hear, and are sometimes trained by using a "silent"

### ALSO IN THIS ISSUE:

An ear here, there and everywhere  
**NEW! The Nature Detective**  
Desert animals' ears  
Puzzle Corner  
**God did it first! Heat Exchangers**  
Listen!



## An ear here, there and everywhere!

**INSECTS** have ears in all sorts of places on their bodies. Moths and butterflies (below) have ears almost anywhere on their bodies— even on their mouth! Grasshoppers (right) have ears on their legs! They lift their legs into the air to find out which direction the sound is coming from. Another member of the grasshopper family, the *European Praying Mantis* (lower right), has just **one** ear



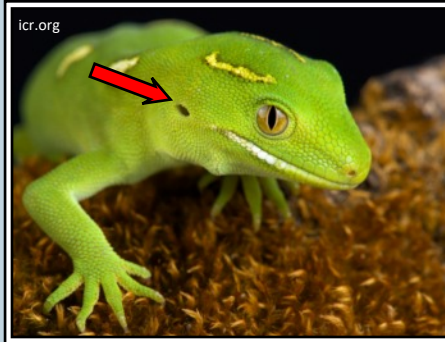
in a groove which runs down its chest! One kind of fly has an ear on each side of its neck, joined together by an 'elastic band'!

Scientists who believe in evolution say that the first insects on earth were deaf, and that they slowly evolved all these different ears. We believe God created them that way.



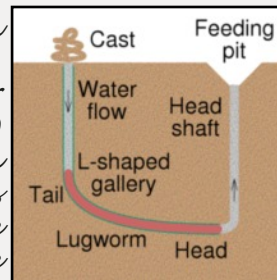
### GECKO'S SPECIAL EARS

Geckos are known for their ability to climb up walls, using their special 'sticky' feet. But did you know that they also have special ears? In fact, no other creature has ears like them. These lizards have a hole on each side of their head with a thin layer of skin over them. They lead to a tube which runs from one side of their head to the other. Geckos don't have earbones. Sound waves make the skin covering the holes vibrate and send the signals to their inner ears. Some scientists say that geckos evolved their special ears, but they don't explain how. It makes more sense to believe God made them that way.



## The Nature Detective's Casebook

Walking along a sandy beach one day, I came across little piles of sand which looked rather like worms (right). What were they? I decided to investigate further. Then I saw a fisherman digging into the sand, and asked him what he was doing. "I'm looking for lugworms for bait," he said. I asked him how he knew there were any lugworms below the sand, and he explained that these piles of sand were a clue. They were 'casts', made by lugworms (below left) which live in burrows in the sand (lower right). They don't often leave their burrows, so are hardly ever seen, except when eggs hatch and the babies dig their own burrows. Lugworms are around 22 cm (9 inches) long. They feed on tiny organisms which live in sea-water. As they feed, waste sand passes through their bodies and ends up as these little worm-shaped piles. You can only see them before



the tide washes them away. Sometimes, when the tide is out, birds will grab the tail of lugworms. But they have a special trick: If the end of their tail breaks off they still survive!

In 2003, scientists made an amazing discovery. Lugworms' blood is special, and can be used to treat humans who have transplants of kidneys and other organs. The hemoglobin in lugworms' blood can be stored as a powder for 5 years. So a tiny worm is saving the lives of humans! I think we should praise our Creator-God for that!

## Big ears help desert animals to hear — and keep cool!

**ANIMALS** that live in the desert need to have a good sense of hearing, because it's not easy for them to hide quickly if another animal tries to attack them. So God has provided many desert animals with large ears so that they can pick up sounds from a distance and either run or hide when in danger.

The **Long-eared Jerboa** is a mouse-like animal with a 160cm (6 ins) long tail — which is longer than its body. It has very large ears, and long hind legs which enable it to jump as high as 1.8 metres (6 feet). These animals live mainly in the deserts of Mongolia and China.



Long-eared Jerboa

**Fennic Foxes**, which live in the deserts of north Africa, are only about 30-40 cm (12-16 ins) long - not including their long tail. Their ears are up to 15 cm. (6ins.) long. They help them to hear small animals that move under the ground, which they eat.



Fennic Desert Fox

**Jack Rabbits** are not really rabbits, but hares. They live in the desert parts of America and Mexico. They can run at 40 mph, and jump 3 meters (10 feet) into the air! Their long ears are full of veins, and they can regulate the flow of blood through their ears by making their blood vessels wider. This allows heat to escape into the air around, cooling the jack rabbit off in the process.

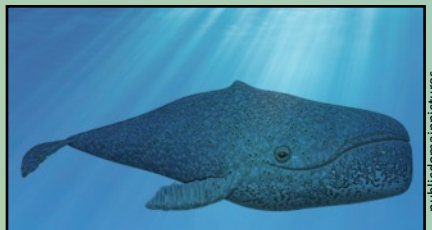
God created these animals so that they would be able to survive in the desert. They didn't get their special ears by accident!



A Jack Rabbit

## Hearing under the water

The evolution theory says that whales evolved from animals that lived on land, but there are no fossils showing this move from land to sea. Lots of changes would have been needed. Sound travels four times faster in water than in the air, so whales needed special ears that are designed to hear under the water — and they have them.



Fish also have special ears, but they are not the same as whales' ears. Fish don't have eardrums, but tiny stones called *otoliths*. When sound waves hit these stones, they vibrate, sending signals to the fish's brain. The fish can then hear the sounds. More special design!

## PUZZLE CORNER

Do you know which animals these ears belong to?



Beginning with the **third** letter, cross out every **third** letter to read a verse from the Bible

THOE LRORED  
HSASM MAKDE  
CBOTTH ETHOESWE  
TIHIBNGYS: EAARHS  
TEHALT CMAN  
SHEKAR BANED  
EZYEVTS TUHAPT  
CIAN ASEOE

(Answers on the next page)