



CREATOR

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JENNY'S EARS

*Every good and perfect gift is from above
(James 1:17a).*

We have a body shaped like a snail, but we cannot move. We live at the bottom of a beautiful blue “sea,” deep inside a damp, dark “cave.” Try to sneak up on us and we’ll know you’re there, no matter how quiet you are. Our homes have “windows,” but we have no eyes with which to see. We possess two “drums,” but can’t play a note of music. Our “arms”—fashioned by Christ Jesus—allow us to reach part-way down the caverns in which we live and sense what’s going on in the light of day. You see, we are Jenny’s ears and are a special gift from God to her.¹

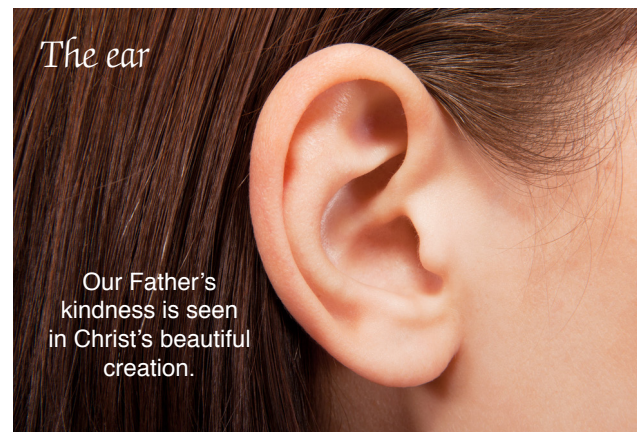
Jenny is surrounded by an ocean of sound waves. Her Heavenly Father loves her and wants her to experience, in wonderful detail, His Son’s beautiful creation (1 Corinthians 8:6) while she lives here on earth. God also wants Jenny to be able to communicate with others, and above all worship Him. This is why He gave her ears.

Hearing begins—but certainly does not end—with sound. A popular riddle illustrates this fact: “If a tree fell in a forest, but no one was around to hear the tree fall, would there be any sound?” This question is philosophical, but hints at a proper sequence of events: sound is *produced* and then *perceived* by

someone or something.

Sounds are *vibrations*. Many things can produce vibrations, and thus make sound.² When Jenny talks, her vocal cords move back and forth very quickly, causing the air coming out of her mouth to resonate. You can prove this by gently placing your hand on the front part of your neck and feeling the vibrations of your own vocal cords when you speak.

Air is not the only thing that carries sound waves. Many solid objects, like rocks or the ground, can vibrate as well. If you’ve ever experienced an earthquake, you know first hand what vibrations in the ground feel like. It’s said that people long ago put their ears to the earth to hear the far-off hoofbeats



¹ Jenny is an eight-year-old girl and fictitious character who has appeared in many previous issues of **CREATOR**.

² Sound waves are not like ocean waves, which roll up and down. Sound vibrations are compression waves that move air back and forth (see **CREATOR** Vol 22 Num 3).

of horses or the rumblings of an approaching steam locomotive.

Even the bones of your skull transmit vibrations. Have you ever wondered why your voice doesn't sound quite right when it's played back on a recording device? Normally when you talk, your voice travels to your ears via two routes: through the air and through your skull. (Remember, sound can travel through solid objects like your skull.) The sound waves traversing the bones of your head change the quality of your voice—as you hear it—deepening it somewhat. Your speech, therefore, sounds a bit high-pitched on a recording, though it is your true voice as heard by everyone else.

The bulk of us is hidden from view inside two caves of bone chiseled out on either side of Jenny's head by the Lord Jesus Christ. From the physician's point of view, we are composed of three parts: the outer ear, the middle ear, and the inner ear. The *outer ear* consists of the *pinna* (PINE - ah)—the visible structure most people call “the ear”—and a one-inch-long tunnel (external auditory meatus or ear canal). The outer ear funnels sound down this curved tube to the eardrum, or *tympanic membrane*. As this happens, certain sounds are doubled in intensity due to the shape of the ear canal, which resembles an organ-pipe.

The eardrum, which is where the *middle ear* begins, vibrates when sound waves hit it. Eardrums are delicately constructed membranes stretched across the ear canal, and are similar to very thin pieces of skin. Their vibrations are like those made on a drum.

Behind each eardrum, Jesus placed three interconnecting bones, called *ossicles*, which make up my “arm”: the hammer (malleus), anvil (incus), and stirrup (stapes).³ They are the smallest bones in Jenny's body. The first tiny bone, the hammer, is attached to the inside of the tympanic membrane. Since the eardrum is in direct contact with

the hammer, sound vibrations hitting the eardrum are passed along to all three ossicles.

Vibrations are then shuttled from the three bones of the middle ear to an incredible organ known as the *cochlea* (COKE - lee - ah). Sound traveling from the eardrum to the inner ear is amplified 50 to 75 times. As a safety device, Jesus connected a tiny muscle to the stirrup and another muscle to the eardrum. If Jenny experiences a very loud sound, these two muscles contract, stiffening the eardrum and ossicles somewhat to help reduce the intensity of the deafening noise Jenny may be experiencing.

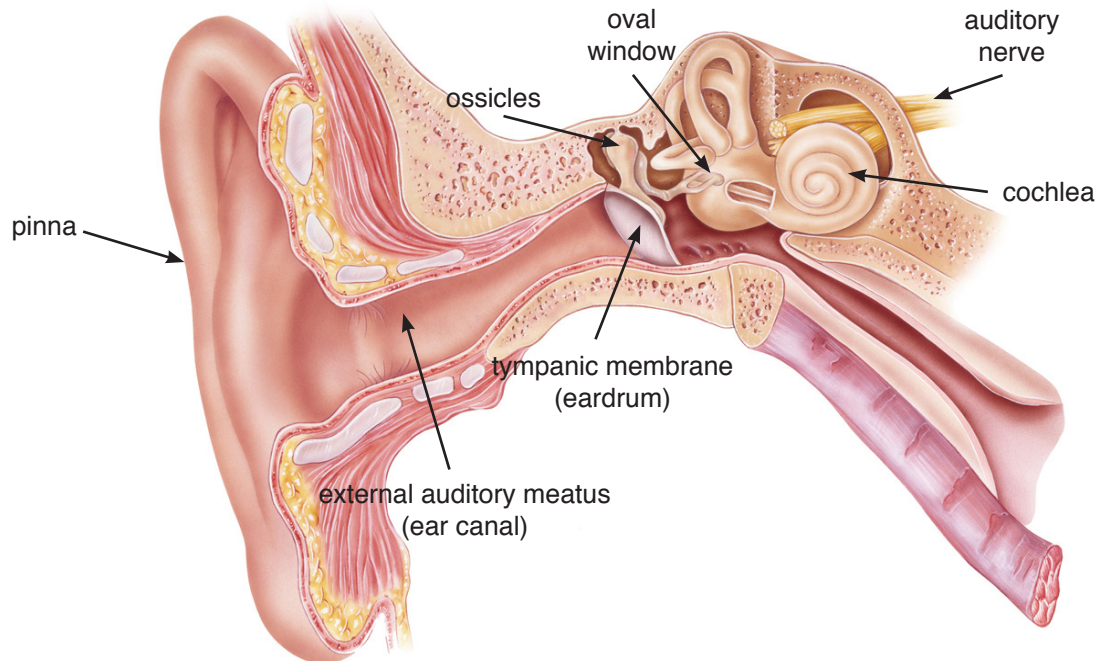
The cochlea is located in the *inner ear* and is responsible for turning sound waves into nerve signals, which Jenny's brain can then interpret. The cochlea has the appearance of a snail's shell and, instead of containing air, is filled with fluid. (As we mentioned earlier, air is not the only thing through which sound can travel. Water and other fluids transmit vibrations quite well.)⁴ Thus, sound waves pass from the stirrup through something called the *oval window* and into the watery world of the inner ear.

Inside the cochlea is a membrane lying on top of thousands of minute upright “hairs.” These hairs of the cochlea, however, are not the same as the hair on Jenny's head. They are the extremely sensitive ends of nerve fibers that send electrical signals to her brain when they are the least bit stimulated. Even the slightest movement of the cochlear membrane, in response to vibration of the fluid, stimulates these unique nerve endings that line the inside of the cochlea. Sound waves roll over this special membrane, exciting the hair cells that lie just beneath its surface. Different frequencies of sound excite different types of hair cells. A sound's intensity (loudness) and quality (timbre) are also determined by the activation of these hairs.

3 Stapes is pronounced STAY - peez.

4 Sound travels approximately four times faster in water than in air.

Cross-section of Human Ear



We now understand the basics of hearing. Well, not quite. Ears are very important in the detection and amplification of sound; however Jenny's hearing does not stop with us. If this was all there was to hearing, Jenny would be receiving garbled messages at best, similar to static on a radio.

In order for sound waves, such as those produced by a falling tree, to have any meaning for Jenny, she must have a way of understanding them. It is at this point that we hand off the job to her brain, for hearing involves both her ears and her mind.

Sound information travels from Jenny's ears to her brainstem through the auditory nerves, and are then relayed to the left side of her brain. It is in Jenny's temporal lobe that our Creator, Christ Jesus, does something incomprehensibly great and quite mysterious. He translates the highly complex signals coming from her ears into ideas and words she can understand.

God created her brain with the ability to decode a truly confusing and jumbled mass of information. Her mind takes the sounds she

hears and compares them to sounds she has heard in the past, by quickly checking the "sound memory bank" or "word library." This library is located in a part of Jenny's temporal lobe called *Wernicke's* (VER - neh - key's) *area*. It is here that she is able to truly hear. Her mind can easily identify the bark of a neighborhood dog or the voice of her best friend, knowing that it is her friend and not the sound of a stranger. And her brain is able to do this with such incredible speed that she is usually not aware of any delay in the recognition of a sound.

Sometimes, however, Jenny has to work hard to understand who is talking with her. Have you ever answered the phone and been confronted with the question, "Guess who?" and not been able to immediately recognize the caller? This is because a telephone significantly alters the caller's voice, eliminating lower and higher frequencies, and making the voice pattern more difficult to identify. The cheaper the phone, the poorer the reproduction of the other person's speech, and the longer it takes your brain to figure

out who in the world is talking to you. It's like trying to recognize the complete picture of a jigsaw puzzle when three quarters of the pieces are missing! It is truly an amazing testimony to our Creator's greatness—that your mind is still able to accomplish this task.



There is another part of Jenny's brain, known as the R.A.S. (Reticular Activating System) that screens out unwanted background sounds and noises. Have you ever wondered how you can carry on a meaningful conversation with someone while in a crowded room? How is it that you are able to listen to one person talking and can ignore everyone else's conversation going on at the same time? Located in your brainstem, the R.A.S. filters out sounds and voices you choose not to hear. Actually, we ears are hearing them, but your brain disregards most of the signals we send it. In the same way, when Jenny sleeps at night we are still working. The reason she can sleep and isn't disturbed by noises inside or outside her home is because the R.A.S., again, prevents most sounds from reaching the thinking part of her brain. Our Lord Jesus gave her the ability to program her mind to react to certain disturbances and not others. She may choose not to hear the dog barking down the block or the cars going by on the street in front of her home, but she does hear the sound of her baby sister crying and the alarm

clock going off in the morning.

Jenny may find some sounds pleasing and others annoying. Whatever her experience—melodious music or shrieking siren—it's all possible because of God's incredible design of us (Jenny's ears), and her brain—treasures hidden away inside Jenny by God, the Giver of good gifts!

HEARING CHRIST'S KINDNESS

"But let the one who boasts boast about this: that they have the understanding to know me, that I am the LORD, who exercises kindness, justice and righteousness on earth, for in these I delight," declares the LORD (Jeremiah 9:24).

The following is a series of letters written to Professor Hans Seismo⁵ in response to questions he has asked some of God's creatures. He is conducting research into the nature of animal hearing, and how this might demonstrate Christ's kindness in nature.

Dear Professor Seismo,

I am deeply moved that you would write and ask my opinion; after all, most people see me as just another pesky mosquito. In your letter, you invited me to share the nature and extent of my hearing.

Our Creator gave me "ears," Professor, but they're not like yours. I detect vibrations in the air with *my antennae*. And my hearing is very limited—the main thing that interests me is the sound a female mosquito makes with her wings. Humans find her high-pitched "whine" a bit annoying; but for me, it is a symphony to my ears . . . well, that is, my antennae.

My hearing is so focused on her that I cannot even hear the sound my own wings produce. In this sense, I experience the

5 Professor Seismo (pronounced SIZE - moe) is a fictitious character who has appeared in many previous issues of **CREATOR**.



Male mosquito antennae

kindness of our Lord God because I am not distracted by extraneous noises. My world is filled with the serenade of my sweetheart's music. My eyesight isn't very good, but when I hear her wings beating, I know exactly where to find her.

I hope this helps with your research.
Yours truly,
The Male Mosquito

Dear Dr. Seismo,

Thank you for writing. I am glad to help!

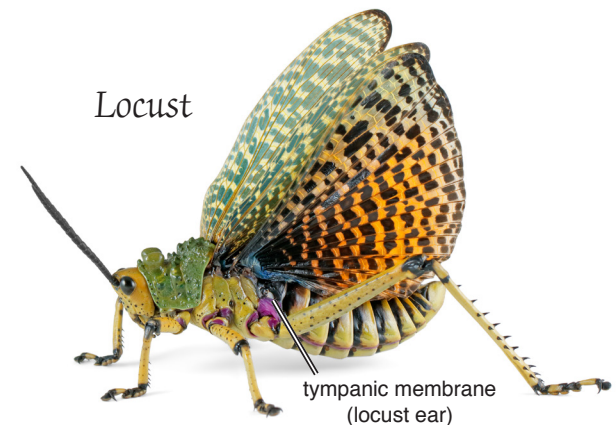
Among locusts, it is the male, rather than the female, who sings. He creates a buzzing sound by rubbing his legs against his wings. Moreover, we locusts often listen to each other in an attempt to sing in chorus—somewhat like the harmony of a church choir.

My ears are located, not on my head, but on the sides of my body beneath my wings. (I've included a photo of myself to show you.) Our Master, Christ Jesus, has been very kind to us locusts—He has given us lowly creatures ears that rival yours, Dr. Seismo. Our hearing is incredibly complex.

Locusts possess a structure similar to an ear canal. We have an eardrum and a thickened area next to the drum that has an uncanny similarity to the bones of the human ear, although this thickening is not ossified (that is, we insects do not have bones). Also,

the sensory hairs inside our *tympanic organs* (what scientists call our ears) are not unlike the hairs found in the *cochlea* of a person's inner ear. The extent of God's kindness to us includes tympanic muscles that help prevent damage to our ears when we're exposed to loud noises.

Like many insects, we locusts can produce and hear much higher-frequency sounds than humans can. In fact, some insects detect sounds up to 200,000 hertz,⁶ which is ten times higher than you can perceive, Dr. Seismo. It seems obvious that the "hand" of Jesus' creative touch is seen in the similarity of ears in two creatures (humans and locusts) who otherwise are *very different* from each other. He has been so kind to us both, don't you think?! Sustained by one and the same Creator,
The Locust



Locust

P.S. Like humans, most insects—including locusts—have just two ears. But the mind of our Creator is not so easily understood. Amazing as it might seem, God has blessed some grasshoppers and the praying mantis with *multiple ears*. Why? I don't know.

Dear Hans,

Your gentleness and thoughtfulness are well-known to my family, and I am delighted to help you. Lacking ears, we ants don't hear

⁶ 6 Hertz is the measure of the frequency of sound. One hertz equals one cycle, or vibration of the sound wave, per second. Two hundred thousand hertz means that the sound wave is vibrating at a frequency of 200,000 times each second.

as crickets, locusts, and katydids do. Along with honeybees, we are considered deaf because we lack ears. But Jesus has built



special organs (subgenual⁷ organs) into our legs that allow us to detect vibrations in the ground . . . they're kind of like *seismographs*.⁸

Aside from touch and smell, the main way we communicate with each other is by tapping. Recently, a friend of mine was trapped in a collapsed tunnel. Through our legs, we "heard" her tapping on the rocks that surrounded her, and were able to dig her out. God's kindness extends to us all, doesn't it Hans?!

Your faithful servant,
The Ant

Seismo,

Excuse my gruffness. It seems that not many of your kind tolerate spiders. However, you have always treated us with fairness and I will help you the best I can.

Our Maker gave me two means of detecting lower-frequency sounds. The first is very similar to the organs that ants and other insects use to hear ground vibrations. I, too, have numerous "seismographs" in my legs. It's very difficult to surprise a spider.

In addition, my body is covered with thousands of hairs, many of which can detect a limited range of sounds. Scientists call these hairs *trichobothria*⁹—I possess about 100 per leg. Even on a dark night, I can "hear" a buzzing fly a foot away.

Yes, the Maker has been kind to us, too.

7 Pronounced sub - JEN - you - al.

8 Read about seismographs in the previous issue of CREATOR (Vol 22 Num 3).

9 Pronounced TRICK - o - BAH - three - ah.

Despite our numerous eyes, most spiders do not see very well. Using our sound detectors, we can distinguish among a potential meal, an enemy, and a stick being rubbed against the ground. Hope this helps! Gotta go.



Surly as ever,

The Spider

P.S. Why can't you scientists come up with words that are easier to pronounce? Why not call my trichobothria, "hair thingies?" By the way, Seismo, I wouldn't listen to those rumors concerning your voice; I've heard you, and I think you sing just fine! Of course, I can only hear in monotone, so what do I know . . .

To my special friend,

The bat has asked me to respond for the both of us. He's busy looking for bugs.

We dolphins are similar to bats in that we both can use sound to hunt and navigate in the dark. Incidentally, Professor, bats do not possess radar, as some suppose. *Radar* is a means of finding an object using *radio waves*. We both possess *sonar*¹⁰—we use *sound*, not radio waves, to develop a picture of the world around us.

Jesus, the Sustainer of all things, gave bats and dolphins the ability to generate high-frequency squeaks, called *ultrasounds*. We produce anywhere from 200 to 400

10 Sonar stands for **SO**und **N**avigation **A**nd **R**anging.



The dolphin detects sound using its lower jaw.

hypersonic clicks each second, which we bounce off objects in order to identify them. These reflected messages give us a detailed “view” of the world around us. Bats and dolphins can determine the size, texture, distance away, and speed of something—simply using sound!

I produce these high-frequency noises in my blowhole and transmit this sound out through my forehead into the water. By contrast, ultrasounds are broadcast from the bat’s nose into the air.

We are the ultra-sopranos of Christ’s creation. You humans hear frequencies up to 20,000 hertz. (Incidentally, the highest note on a piano is approximately 4,000 hertz.¹¹) Bats and dolphins can detect sounds in the range of 100,000 – 200,000 hertz, well out of the range of your hearing.

In your correspondence to me, you asked if I saw God’s kindness demonstrated in our hearing abilities. I must answer quite affirmatively! A bat’s ears are so fine-tuned to different frequencies that a mother bat can locate her young among a million or more baby bats hanging from the ceiling of a cave—just by listening to its unique cry for her.

We dolphins rarely go hungry because our sonar is so sophisticated that we can detect an object the size of a small coin in a swimming pool while blindfolded. Finding

fish to eat is a cinch.

The one big difference between dolphin-hearing and bat-hearing is that bats, like people, use their ears to capture sound. We dolphins hear the echoes that bounce off underwater objects using our lower jaw. From the jaw, sound waves travel to our middle ear. Isn’t our Creator amazing?!

Sincerely yours,

The Dolphin

P.S. The bat wanted to make you aware of the fact that there are many other animals that can hear ultrasounds, most notably *insects*. The green lacewing has its ears located at the base of its wings, which can easily detect the hunting cries of bats in flight. When a bat approaches, the green lacewing performs an evasive maneuver by folding its wings back and dropping toward the ground.

To the bat’s consternation, the tiger moth, which also hears ultrasounds, can produce the exact frequency of the bat’s calls, effectively jamming its sonar. This obviously doesn’t help the bat, but it does demonstrate Christ’s kindness to these six-legged critters.



A bat produces high-frequency sounds through its nose.

¹¹ A tone of 4,000 hertz (4 kHz) is a sound frequency of 4,000 vibrations each second.

Hi,

I am the greater wax moth (*Galleria mellonella*), and in God's animal kingdom I own the record for detecting high-frequency sounds. I can perceive a pitch as high as 300,000 hertz (300 kHz). That's six times higher than a dog can hear and 15 times higher than you can hear. Our Lord Jesus commands that God's praise be ubiquitous. Therefore, He distributed our particular species over the face of the earth. Male greater wax moths play the "super tenor" and sing to the Creator using a special instrument Christ fashioned out of their exoskeleton. Moths never worship alone, however—always in chorus with other males. I so wish you could hear our music—it's a wonderful thing to experience!

Our ears are located on the underside of our abdomen. This may seem strange to you since you're accustomed to seeing ears on each side of a person's head. Jesus positioned the ears of insects in all different locations, depending upon our need. He's so kind! Always faithful,
The Greater Wax Moth

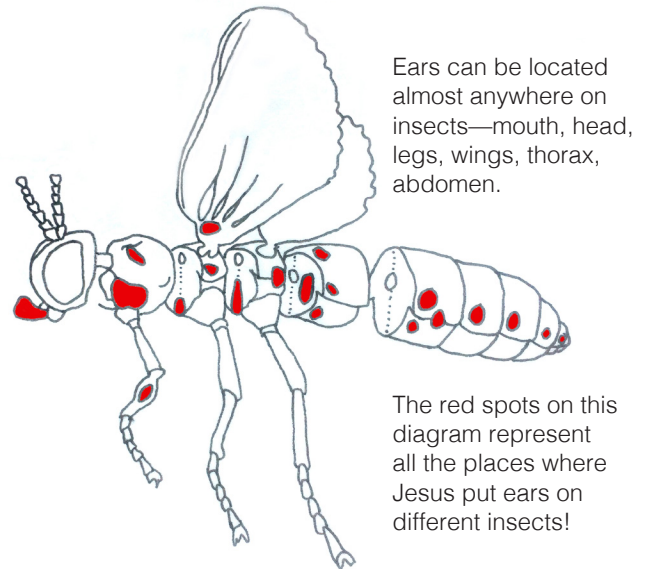
Greater wax moth



This humble little insect hears the highest pitched sounds in nature.

Dear Hans Seismo,

You are correct in saying that we elephants are the ultimate "bass singers" of the natural world, but we are not alone. Many mammals can produce sounds so low in



frequency that you humans simply can't hear them. Elephants, whales, hippos and rhinos all communicate with each other using *infrasounds*—notes well below your hearing range (as low as 14 hertz).

I believe our Creator's kindness is clearly heard in this ability. Unlike normal sounds, the blasts and bellows of infrasonic creatures can travel over great distances. I can "talk" with fellow elephants almost six miles (10 kilometers) away, especially at dusk and dawn when the air is still and cool. Even more incredible are the low-frequency calls of whales that can traverse thousands of miles underwater. (As you know, water is a better conductor of sound than air.) A whale can communicate with another whale clear across the ocean.

Our mighty Creator also produces nonbiological infrasounds via earthquakes, thunderstorms, volcanoes, wind, and ocean waves. But we large mammals are not the only animals that can perceive them. It is the common pigeon that holds the record for detecting low-frequency sounds. A pigeon can hear infrasounds as low as 0.5 hertz. And it is said that some migratory birds actually hear the groaning of mountain ranges as they slowly and imperceptibly push upward. This may help them navigate to their destinations especially at night. Even the octopus and

squid are known to detect low-frequency sounds.

Professor Seismo, please don't feel bad that you humans cannot hear infrasounds. Our Creator gave us this ability because of the special environments in which we live. Your faithful friend,
The Elephant

Dear Hansssss,

It has long been assumed that we snakes are stone deaf because nobody could find our ears. The fact is that King Jesus embedded an inner ear-type organ in our head that's attached to our lower jaw.

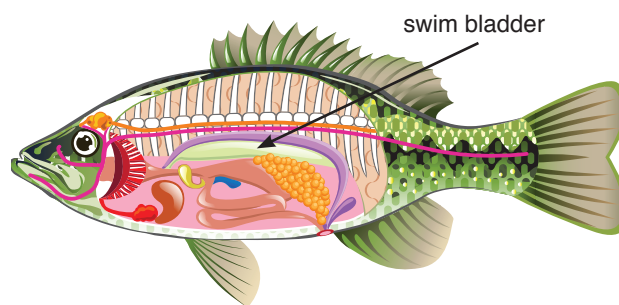
Now, snakes don't hear sounds like most animals do, but we can detect low-frequency ground vibrations. This warns us of approaching danger—a good thing for you humans. The God-given ability to detect footsteps quickly puts the snake on alert, allowing it to slither away to safety. This kindness from Christ helps protect people, too. It reduces the risk of you startling a venomous snake, for instance, and becoming the victim of a snake bite. So when you're out in snake country, remember Hansssss, *walk with a heavy foot*.

Yours,
The Snake

T' me favorite landlubber,

You asked me if we fishies can hear . . . yeah, sure we can. Believe it or not, Doc, fish can chirp, grunt, make hummin' noises, and a whole bunch o' calls that range from a beatin' drum t' one like a boat whistle. This helps us fishies find a mate, keep 'r schools together, and warn others o' danger.

We fishies 'r able t' detect underwater sound in two ways. It's true we don't got ears, but we can hear using 'r swim bladder. (I've included a picture fer ya.) The swim bladder's an organ filled with air that's usually located in the middle o' 'r bodies. Its main function is t' keep us from sinkin' or risin' in the water. Like yer eardrum, however, the swim bladder



can also pick up vibrations and pass 'em along t' 'r inner ear. (It's recently bin discovered that frogs can detect sound through thar lungs, like we use 'r swim bladders. Pretty neat, huh?)

There's another way we "hear" sound in the sea around us. You've probably noticed, Doc, that most fish got a stripe runnin' the length of thar body on either side. This is called the *lateral line*, and it's akin t' the little snail thing¹² ya got in yer ears, 'cept that it's uncoiled and laid out along 'r bodies. The lateral line's really good at detectin' the movement o' other fish. The Good Lord shows His kindness t' us because even at night we fishies 'r able t' stay close together. It's the lateral lines o' fish that allow us t' form well-organized schools which help protect us from 'r enemies.

Wet as ever,
The Fish

ETERNAL KINDNESS

"Salvation is found in no one else, for there is no other name under heaven given to mankind by which we must be saved." (Acts 4:12).

The Bible clearly proclaims to us that Jesus formed the universe (John 1:3) and that His character as God is seen throughout creation (Romans 1:20). I hope our whimsical presentation on *ears and hearing* has helped you better understand just how kind God is! Do you hear the kindness of Christ our

12 The "snail thing" the fish is referring to is the cochlea (KOKE - lee - ah). Read about the lateral line in **CREATOR** Volume 18 Number 4.

Creator in the things He has made?

Scripture further tells us, sadly, that we have all rebelled against God's kindness, sinned, and fallen short of His glory (Romans 3:23). Tragically, many today—even in the church—are saying that God will overlook our sins and gladly welcome us into Heaven no matter what we believe . . . because He is so kind. But that is *not what He says*—"For the wages of sin is death, but the gift of God is eternal life in Christ Jesus our Lord" (Romans 6:23).

This unavoidable death impacts us in two ways: 1) because we are sinners, we all die physically, and 2) if we die in our sin, then we will go to Hell to await God's judgment. When most people hear this second point, they are tempted to conclude that God is not so kind after all. Many want to receive our Lord's kindness, but on their terms. Jesus' message was otherwise: "Repent and believe the good news!" (Mark 1:15).

"Repent" means we understand that we have rebelled against divine authority and must turn back to God in submission. "Believe the good news," or "Gospel," means that we are to embrace the reality that Jesus—truly God and truly man—died on a cross that our sins would be forgiven and that we would be made right before God. Our Triune God is kind, but He is also just and must have His justice satisfied. Christ's great sacrifice does just that! Do you hear kindness in this message? On our own, we don't have the ability to repent or believe. But in our Lord's kindness, He supplies us the necessary grace to repent, believe, obey, and love Him.

Please allow me to close with a hymn, originally penned as a poem titled "O Store Gud" (O Great God) by Carl Gustav Boberg of Sweden in 1885. Consider carefully these words, for in them you will hear the kindness of Christ both as Creator and as Savior. God's kindness is found in *no one else!*

How Great Thou Art

O Lord my God, When I in awesome wonder,
Consider all the worlds Thy Hands have made;
I see the stars, I hear the rolling thunder,
Thy power throughout the universe displayed.

When through the woods, and forest glades I wander,
And hear the birds sing sweetly in the trees.
When I look down, from lofty mountain grandeur
And see the brook, and feel the gentle breeze.

And when I think, that God, His Son not sparing;
Sent Him to die, I scarce can take it in;
That on the Cross, my burden gladly bearing,
He bled and died to take away my sin.

When Christ shall come, with shout of acclamation,
And take me home, what joy shall fill my heart.
Then I shall bow, in humble adoration,
And then proclaim: "My God, how great Thou art!"

Then sings my soul, My Saviour God, to Thee,
How great Thou art, How great Thou art.
Then sings my soul, My Saviour God, to Thee,
How great Thou art, How great Thou art!



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