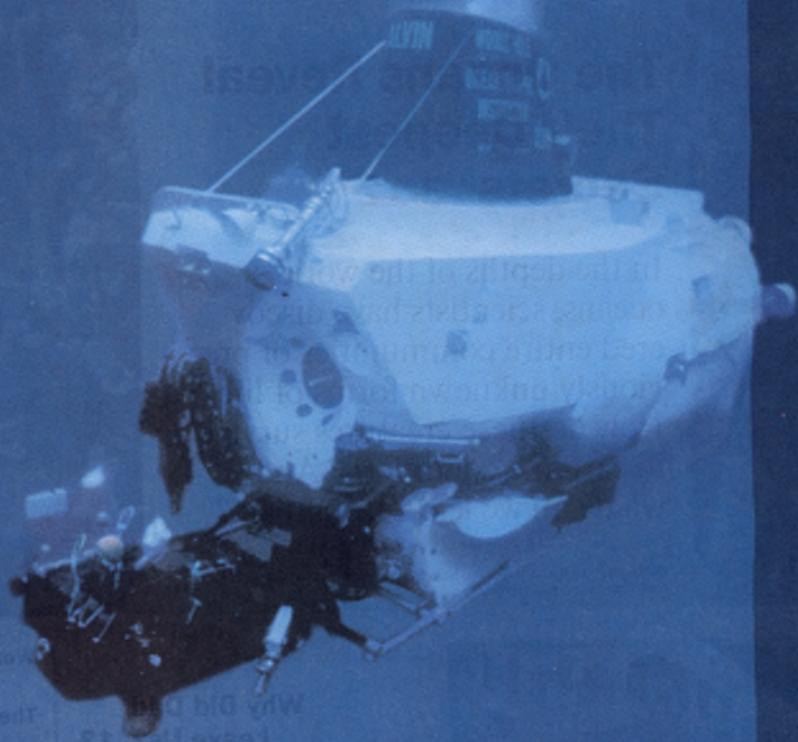


Awake!

November 22, 2000



**THE
OCEANS
Reveal Their
Deepest
Secrets**

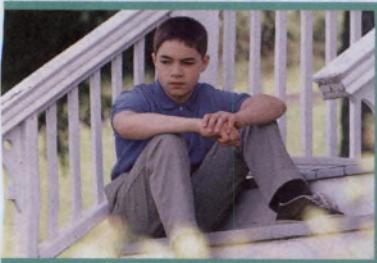
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The Oceans Reveal Their Deepest Secrets 3-12

In the depths of the world's oceans, scientists have discovered entire communities of previously unknown forms of life. How do these creatures survive in extreme conditions? And what can we learn from them?

Photograph by Richard A. Lutz, Rutgers University,
New Brunswick, New Jersey



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WONDERS AND MYSTERIES OF THE DEEP

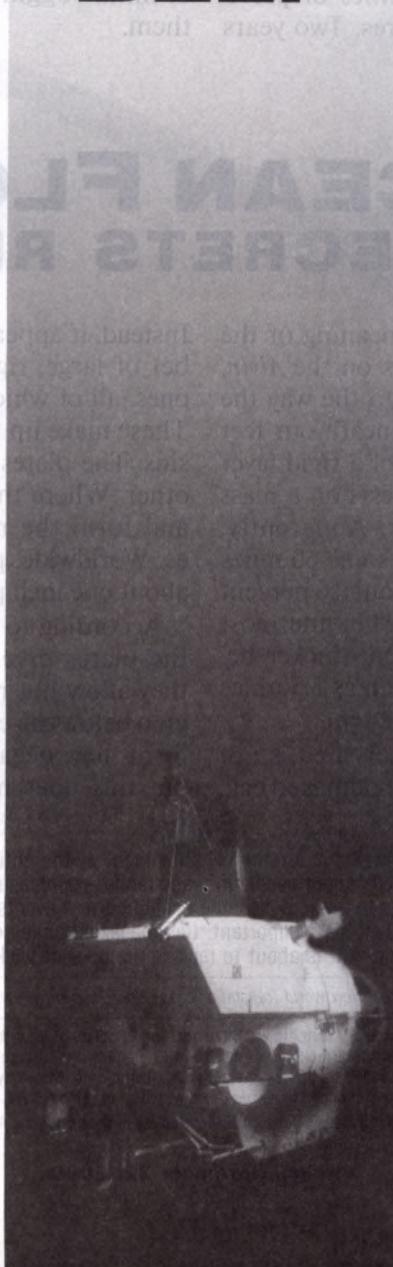
ENCASED in their tiny submersible vessel named *Alvin*, two scientists and their pilot descended into the Pacific Ocean off the coast of Ecuador. Their destination? A place called the Galápagos Rift. Equipped with search-lights, camera, and numerous scientific instruments, the *Alvin* plunged downward through 9,200 feet of liquid space into a world of eternal night never before seen by human eyes.

Have you ever wondered what lies hidden in the mountains, canyons, and rifts beneath the dark depths of the world's oceans? If so, then you will enjoy reading about the discoveries that began in 1977 with the *Alvin*'s pioneering dive mentioned above. What the crew saw may surprise you; even to highly trained scientists, it was like seeing life on another planet.

The objective of the *Alvin*'s mission was to find hydrothermal springs—undersea geysers that shoot jets of heated water into the ocean. The Galápagos Rift was a promising site because it is part of a highly volcanic undersea rift cradled by a complex, globe-encircling chain of

mountain ranges called the mid-ocean ridge system. Over 40,000 miles long, this colossal system weaves around the entire planet like the seam on a tennis ball. Were the oceans stripped away, it would "easily [be] the most dominant feature on the face of the planet, extending over an area greater than that covered by all major terrestrial mountain ranges combined," writes Jon Erickson in his book *Marine Geology*.

A particularly significant feature of the mid-ocean ridge system is that it is essentially a twin system—two mountain ranges running parallel to each other and rising 10,000 feet above the ocean floor. Between the ranges are the greatest chasms on earth—canyons up to 15 miles wide and 4 miles deep—four times deeper than the Grand Canyon of North America! At the foot of these chasms lie highly volcanic rift zones. When scientists first studied the Atlantic segment of the ridge system, called the Mid-Atlantic Ridge, their instruments revealed such intense volcanic activity "that it seemed as though the Earth's insides were coming out," says Erickson.



After a 90-minute descent, the *Alvin* leveled off just above the seafloor, and the men turned on the *Alvin's* searchlights. The scientists could be excused for thinking that they were on a different planet. Their lights revealed a number of shimmering warm-water vents on the seafloor, where the water is normally near freezing. Close to the vents, something even stranger appeared—*entire communities* of previously unknown living creatures. Two years

later, researchers aboard the *Alvin* discovered superheated vents called smokers on the East Pacific Rise off the coast of Mexico. A number of these vents formed ghostly chimneys, some up to 30 feet tall. Many of the same animals seen at the Galápagos Rift were found at this location. In the following article, we will take a closer look at these amazing life-forms and the world of mind-boggling extremes that is home to them.

THE OCEAN FLOOR ITS SECRETS REVEALED

IN ORDER to grasp the meaning of the things seen by researchers on the *Alvin*, we need a little insight into the way the earth is made. The ground beneath our feet is understood to be made up of a rigid layer (called the lithosphere) that rests on a mass of molten, slow-flowing rock. Apparently, this rigid outer layer averages some 60 miles in depth and makes up only about 0.6 percent of the volume of the planet. The outermost part of it, the crust, is uneven, thicker beneath the continents and as thin as 3.5 miles beneath the mid-ocean ridge system.

Furthermore, this solid outer shell is not one piece, like the shell of an undamaged egg.

Instead, it appears to be broken into a number of large, rigid plates and many smaller ones, all of which are called tectonic plates. These make up the continents and ocean basins. The plates move in relation to one another. Where they draw apart, they thin out and form the rifts of the mid-ocean ridges. Worldwide, plates move at an average of about one inch per year.

According to the plate tectonic theory, as the plates diverge along the ridge system, they allow hot rock from the mantle, the region below the crust, to rise. The hot material forms new oceanic crust along the rift zone, but this does not result in the plates' fusing.

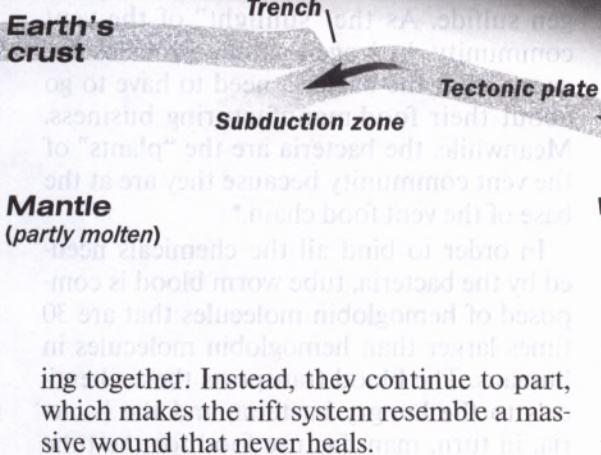
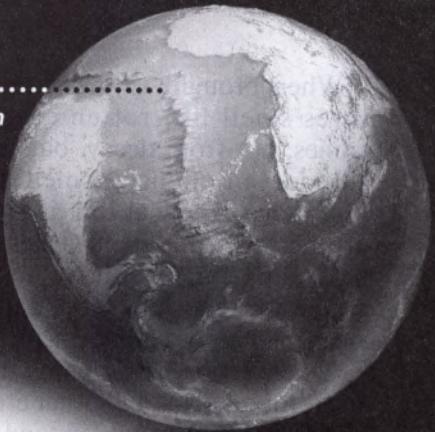
Why Awake! Is Published *Awake!* is for the enlightenment of the entire family. It shows how to cope with today's problems. It reports the news, tells about people in many lands, examines religion and science. But it does more. It probes beneath the surface and points to the real meaning behind current events, yet it always stays politically neutral and does not exalt one race above another. Most important, this magazine builds confidence in the Creator's promise of a peaceful and secure new world that is about to replace the present wicked, lawless system of things.

Unless otherwise indicated, *New World Translation of the Holy Scriptures—With References* is used.

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The mid-ocean ridge system weaves around the earth like the seam on a tennis ball



When plates move apart, rifts form

NOAA/Department of Commerce ▲

An Oasis—Of Toxins!

Because of its highly unstable and volcanic nature, the globe-encircling mid-ocean ridge system is riddled with lava flows and hydrothermal vents. The vents spew out a toxic, superheated concoction of water and dissolved minerals from inside the earth. Yet, amazingly, this inhospitable realm, which is also under pressures hundreds of times greater than those at sea level, does not repel life but, rather, attracts it—and in abundance! The hundreds of species living there include bacteria, giant clams—perhaps a foot in length—and, strangest of all, thickets of crimson-plumed tube worms anchored firmly to the seafloor and standing up to six feet tall.

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When brought to the surface, vent creatures smell like rotten eggs! The stench comes, not from decay, but from hydrogen sulfide—an offensive-smelling and highly poisonous chemical that is abundant in hydrothermal vents. Vent water is also highly acidic and contains many metals, including copper, magnesium, iron, and zinc. But instead of barely coping in this environment—which has been compared to a toxic-waste site—tube worms and other creatures thrive! How? In order to understand, let us take a closer look at the tube worm.

A Living Enigma

When biologists examined the tube worms, they found the animals to be a living enigma. They had no mouth and no digestive system. The question arose, How did they eat and assimilate food? Then came a startling discovery: The worms had red blood—not a bloodlike fluid but actual blood rich in hemoglobin—circulating through their body and featherlike plume.

The mysteries deepened when biologists opened up the flaccid sac of the tube worm's body. Its tissues contained a bacterial culture composed of some 285 billion bacteria per ounce of tissue! In 1980 a biology student theorized that the tube worm lives by means of symbiosis—an arrangement where two species cooperate for mutual benefit. Research confirmed her hypothesis by showing that the tube worm, as host, feeds the bacteria, and the bacteria feed the worm.

Like gills, the plumes of the tube worm gather the ingredients, such as oxygen and carbon, that the bacteria need to manufacture food. The plumes do not wave directly in the searing vent water—that would be suicide—but in the region close to where near-freezing seawater and vent water mix. Of course, this food-manufacturing process requires energy. On the earth's surface—and in the upper part of the ocean—sunlight energizes food production by causing vegetation

to grow. But sunlight comes nowhere near the abyssal home of the tube worm.

Energy From the Belly of the Earth

Ingeniously, the Creator has arranged for the belly of the earth to provide the necessary energy via the hydrothermal vents and that obnoxious-smelling compound hydrogen sulfide. As the “sunlight” of the vent community, hydrogen sulfide provides the energy that the bacteria need to have to go about their food-manufacturing business. Meanwhile, the bacteria are the “plants” of the vent community because they are at the base of the vent food chain.*

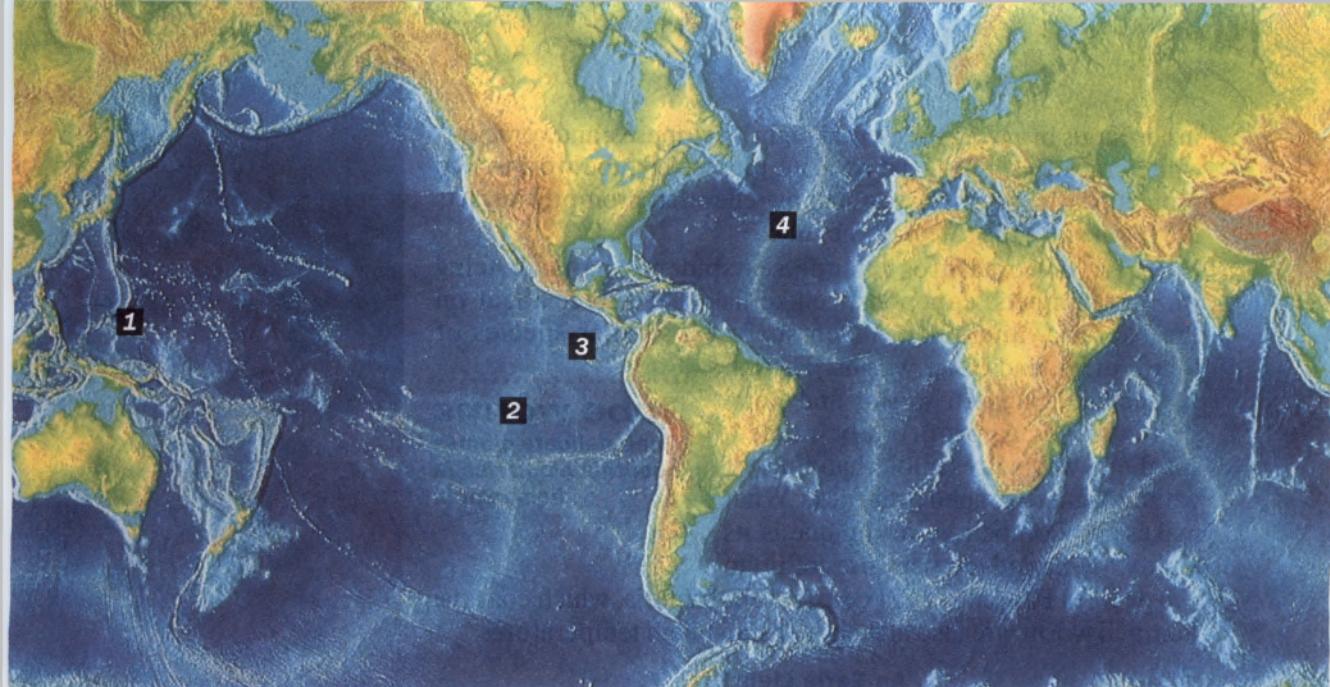
In order to bind all the chemicals needed by the bacteria, tube worm blood is composed of hemoglobin molecules that are 30 times larger than hemoglobin molecules in humans. The blood transports these chemicals to the hungry bacteria, and the bacteria, in turn, manufacture food for the tube worm.

Vent Life—A Zoo of Organisms!

Indeed, no vent creature ought to go hungry, for bacteria blanket practically everything—at times up to inches thick! Even in the warm turbulence above the vents, bacteria sometimes congregate in great blizzards, forming, in effect, a living soup. Like tube worms, some animals enjoy a symbiotic relationship with the bacteria, while others graze directly on these microorganisms. Indeed, vent communities are so productive and energetic that they have been compared to salt marshes, tropical rain forests, and shallow-water coral reefs.

In fact, some 300 new species have already been identified near the vents. These include giant white clams and mussels (pigment is

* The chemical process employed by vent bacteria is called chemosynthesis. The term contrasts with photosynthesis, the light-energized process employed by land vegetation and by phytoplankton. The latter consists of plants or plantlike organisms that are found in the upper, light-bathed part of the ocean.



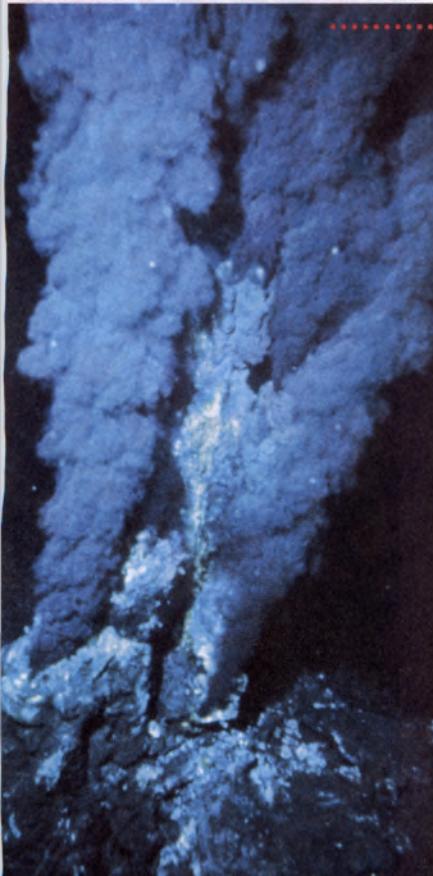
NOAA/Department of Commerce

Major Ocean Rifts and Trenches

P. Rona/OAR/National Undersea Research Program

1. Mariana Trench
2. East Pacific Rise

3. Galápagos Rift
4. Mid-Atlantic Ridge



What Are Hydrothermal Vents?

Along the volcanic mid-ocean ridge system, seawater creeps down through cracks in the crust to areas that are extremely hot. The water then becomes superheated, reacts with rock, and absorbs a number of chemicals. It also becomes more buoyant, rises to the seafloor, and forms hydrothermal vents—hydrothermal springs or geysers. These “easily rival their terrestrial analogs in power and spectacle,” says one reference.

Furthermore, the temperature of these seafloor springs can approach 750 degrees Fahrenheit, which is hotter than molten lead! But because of the pressure exerted by miles of ocean

above, the superheated brew does not turn to steam. Amazingly, less than an inch away from a hot jet, the ambient sea temperature is usually just a few degrees above freezing. Minerals precipitating out of quickly cooling springs settle to the seafloor, where they form mounds and chimneys. The latter may rise to 30 feet. One chimney, in fact, was found to be 150 feet high and nearly 40 feet in diameter, and it was still growing!

Hydrothermal vents can turn on and off sporadically, which makes life around vents a precarious existence. Some creatures, however, may survive by migrating to other vents.

superfluous in a world of eternal night), octopuses, and voracious white crabs that relish the delicate plumes of tube worms. For protection, the worms have a snappy reflex that promptly retracts the plume into the safety of the tube.

Other vent creatures include sea spiders, snails, dancing shrimps, limpets, copepods, eellike fish that slither about on the bacteria- and sulfur-laden surfaces, smaller species of tube worms, and other worms. The latter include spaghetti worms and Pompeii worms. Appropriately named, spaghetti worms resemble handfuls of white spaghetti draped over rocks. What makes the Pompeii worm unique is its ability to tolerate temperatures of up to 176 degrees Fahrenheit! Of course, vent bacteria, which coat the Pompeii worm, are also able to withstand high temperatures.*

An Eerie Light!

In 1985, scientists were surprised when near the vents they found shrimps that have two eyelike organs with light-sensitive chemicals but no lenses. Of course, the first question that came to mind was, What could these animals possibly see in a world of total darkness? In order to find out, researchers made use of a highly sensitive digital camera, such as is used to photograph faint stars. They aimed the camera at a vent, turned off all their lights, and took a picture.

The result was amazing. The picture revealed "a dramatic, unequivocal glow with a sharply defined edge" where the jet of

* In the 1960's, scientists began to study heat-loving bacteria found in hot springs at Yellowstone National Park in the United States. Because of these amazing "borderland ecosystems," says the book *The Deep Hot Biosphere*, "scientists first came to appreciate the extraordinary talents of the earth's seemingly simplest forms of life."

Tube worms

Their delicate plumes contain blood rich in hemoglobin

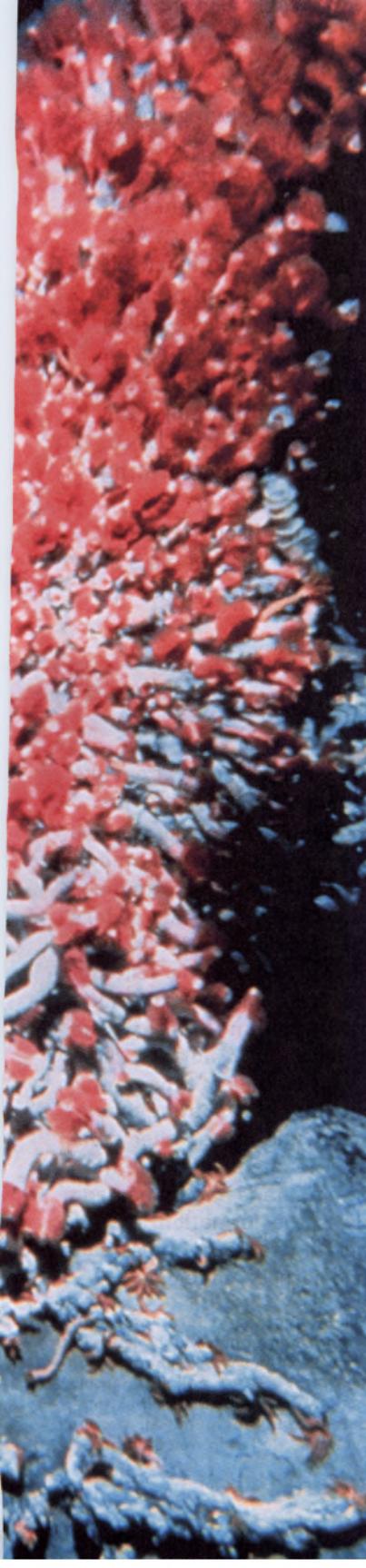


Mussels

Mussels are found at a depth of half a mile in Green Canyon, Gulf of Mexico



J. Brooks/DAR/National Undersea Research Program



OAR/National Undersea Research Program

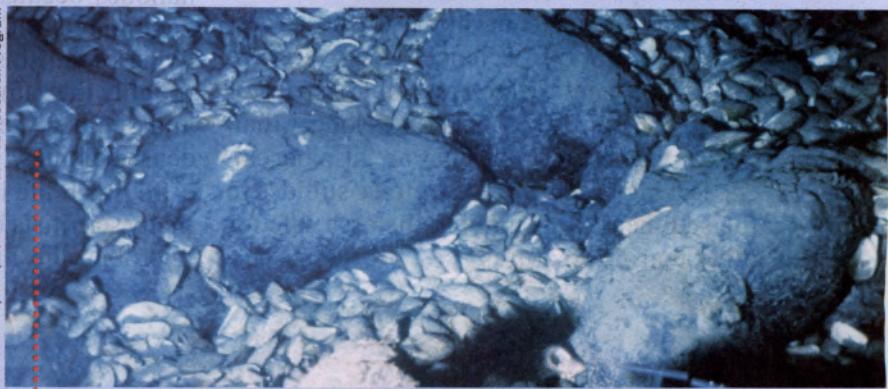
Crabs

These creatures commonly feast on tube worms



I. MacDonald/OAR/National Undersea Research Program

A. Malahoff/OAR/National Undersea Research Program



Giant clams

Perhaps a foot in length, these were found at a depth of 1.7 miles



Photograph by William R. Normark, USGS

Some clams were brought to the surface

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Shrimps

Some have two eyeklike organs. But what can they see in total darkness?



EMORY KRISTOF/NGS Image Collection

hot water left the chimney, says scientist Cindy Lee Van Dover. Do the shrimps exploit this eerie light, which is invisible to human eyes? Whatever the case, the discovery that hydrothermal vents glow "opens up a whole new area of research," adds Van Dover.

The Biggest and the Smallest

Recently, a section of methane-rich seafloor was found to be home to the largest bacteria known to science. Discovered in 1997, these giants, which resemble a string of beads, are from 100 to 200 times longer than the average bacterium. They are also big eaters, leaving barely a trace of toxic sulfides in the sediment, thus making the area safe for other marine creatures.

What may be earth's smallest living organism was also recently found under the sea, although in this case *three miles under the seabed!* A report in *The New York Times* describes the discovery, made off Western Australia, as "so bizarre as to have touched off hot international debate." The main point at issue is whether or not the entities—called nanobes because their size is measured in nanometers, or billionths of a meter—are living organisms. They resemble fungi, are roughly the same size as viruses, have DNA, and seem to reproduce quickly, forming dense colonies.

So much life is now being discovered that many scientists believe that the total mass of microbial life hidden inside the earth's up-

Flammable Ice!

Beginning in the 1970's, scientists working off the North American coast discovered deposits of a remarkable substance called methane hydrate—a combination of frozen water and the flammable gas methane. The methane is given off by microbes in the mud. These microbes eat organic matter that has settled down from the ocean above. The methane then combines with near-freezing water to form crystals of methane hydrate. These crystals are like tiny cages of ice that trap methane inside. For the crystals to form, the water must be just above the freezing point and the seafloor must be under at least 1,600 feet of water. When these conditions are met, crystals of methane hydrate grow, forming an effervescent, snowlike substance. When a lump of it is brought to the sur-



face and ignited, it burns, giving off a reddish flame. Afterward, all that remains is a puddle of water.

Methane hydrate is a rich energy source. Scientists estimate that deposits of it total about twice the reserves of all other fossil fuels combined! (Fossil fuels include coal, oil, and natural gas—of which methane is also a prime component.) So far, though, this enormous resource has been out of reach because methane hydrate readily decom-

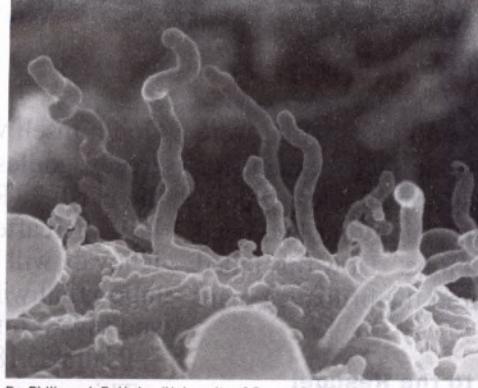
poses when removed from the environment in which it forms.

Methane hydrate beds also contain vents and chimneys, but the fluid gushing from these is cold, unlike the hot springs of the mid-ocean ridge system. However, because the vents release toxic plumes of methane, hydrogen sulfide, and ammonia, they nurture thriving communities of tube worms, clams, chemical-eating bacteria, and numerous other creatures. The chemical waste from these methane-eating bacteria leads to the formation of limestone—the same harmless substance coral is made of.*

* When bacteria oxidize methane, they form a compound called bicarbonate. This combines with calcium ions in the seawater to form calcium carbonate, commonly known as limestone. Limestone can be found all around cold vents as well as in vent chimneys.

per crust may exceed by far the mass of all the surface life! These discoveries are kindling a revolution in scientific thinking. One scientist said: "Dogma in microbiology is out the window in the past few years. The field has rediscovered itself. It's essentially a new science."

What is more, these truly profound discoveries teach us something that transcends science. The Bible captures the essence of this insight: "[God's] invisible qualities are clearly seen from the world's creation onward, because they are perceived by the things made." (Romans 1:20) For instance, God is very concerned about cleanliness. This is evident in the bacteria and other sea



Dr. Philippa J. R. Uwins/University of Queensland

Nanobes
*Are they earth's
smallest form
of life?*

creatures that help to detoxify many potential poisons coming from inside the earth and from decaying matter settling down from the ocean above. Clearly, God is concerned about the health of the planet and of all living things on it. As we will see in the following article, this personality trait of the Creator guarantees a glorious future for all terrestrial life.

THE EARTH A REALM OF LIFE FOREVER

EARTH'S prodigious reservoir of life calls to mind the words of Psalm 104: 24, 25: "How many your works are, O Jehovah! All of them in wisdom you have made. The earth is full of your productions. As for this sea so great and wide, there there are moving things without number, living creatures, small as well as great"—and we might add, even in the most inhospitable places!

Sadly, however, human ignorance and greed have resulted in some life-forms being driven to extinction and others being pushed to the brink. Pollution is one major factor. Hence, some scientists are studying certain toxin- and heat-tolerant organisms—such as those near deep-sea vents and those in hot springs like the ones at Yellowstone National

Park—with a view to using their secrets to clean up pollutants. In the meantime, other scientists are trying to understand more fully how earth's life-support systems work and how humans interact with those systems.

An Experimental Life-Support System

In order to increase their understanding of earth's life-support systems, scientists experimented in the 1990's with a fully enclosed life-support system in Arizona, U.S.A. Hoping that it would be self-sustaining, they called it Biosphere 2 (the earth being "Biosphere 1"). It contained more than 3,000 species of living things, including eight humans. All remained isolated from the outside world for two years. However, Biosphere 2 developed serious problems. "Nearly all

the birds and animals and insects that were supposed to thrive inside died—except for cockroaches and ‘crazy ants,’” said a report, adding that “the noble vision that had been Biosphere 2 became a joke.” How this failed experiment underscored the brilliance manifest in “Biosphere 1”!

The Creator to the Rescue!

The more we learn about the earth and its living marvels, the more we ought to develop a profound respect for this truly dynamic planet and its infinitely wise Creator. Of course, many people demonstrate their love for the earth, perhaps by getting deeply involved in environmental issues. Sadly, however, these people face insurmountable obstacles, including human greed and ignorance, which the noblest intentions cannot eradicate.

Nonetheless, sincerely concerned persons can take comfort in the Bible’s promise that

God himself will soon act by eliminating all greedy, godless individuals who are “ruining the earth.” (Revelation 11:18; 2 Timothy 3:1-5) Thereafter, the Creator, whose name is Jehovah, will institute a program of rehabilitation that will thoroughly cleanse the earth and turn it into a paradisaic fountain of life.—Psalm 83:18; Isaiah 35:1, 2.

This restoration will be accomplished by means of God’s Kingdom—a heavenly government in the hands of Christ Jesus. (Daniel 2:44; Matthew 6:9, 10) Under this rulership, planet Earth will thrive, for it will be cared for by God-fearing humans who delight in Jehovah’s sovereignty and have the deepest respect for all his works. (Psalm 37:10, 11; Revelation 21:3, 4) Why can we be sure of the fulfillment of these promises? Because God’s “invisible qualities,” as revealed both in creation and in the Bible, prove that “with God no declaration will be an impossibility.”—Romans 1:20; Luke 1:37.

Our earth will soon become a paradise



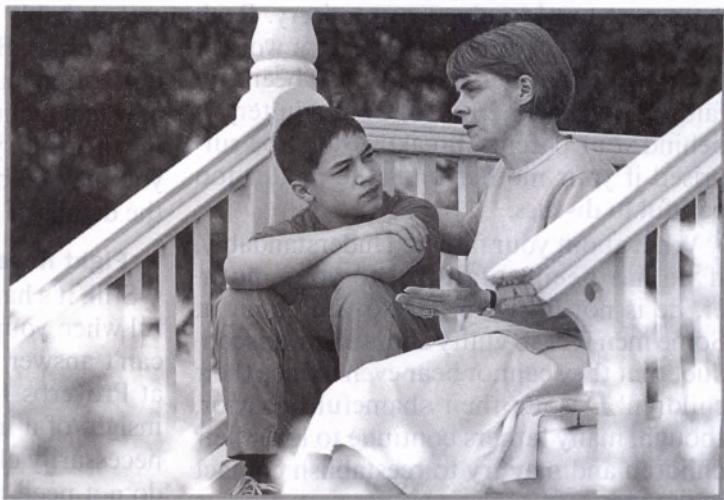
YOUNG PEOPLE ASK . . .

"I never really understood why my father left. All I knew was what my mother told me."—James.*

WHEN a father picks up and leaves home, he often leaves behind a storm of pain and bitterness. "I was really upset when my mom and dad broke up," says 14-year-old James, quoted above. And when a father leaves without a word of explanation and then fails to keep in touch, his children may wrestle with feelings of guilt, rejection, and resentment for years to come.[#]

If your own father has left, you may be painfully aware of the reason why. "My Dad left for another woman," says a youth named Michael. "I saw him with her once, and it made me mad. I felt that Dad had betrayed us." However, in some cases the departure may come as a relief. Melissa, whose dad is an alcoholic, says: "If he had stayed home, it would have been harder on us."

In many cases, though, children have no idea why their father departed, and this can make his absence seem all the more painful. True, you might have known that your folks had problems, but you may never have dreamed that they would split up. Recalls



Why Did Dad Leave Us?

Robert: "When Dad left, I really didn't understand everything that was going on. All I knew was that things were bad because my parents were fighting all the time."

Why do some fathers leave home? If your own dad has left, should you take it as a personal rejection? And why might your parents be reluctant to tell you much about it? Don't they owe you an explanation?

Why They Are Silent

The reasons behind a father's departure are never pleasant. Oftentimes, the reason is adultery—misconduct that has usually been well hidden from the family. When a wife discovers such wrongdoing, she may decide to divorce her husband. She may even ask him to leave quietly before the divorce papers are filed. The children may be totally unaware of why this is happening.

Try to understand, though, why your mom might be reluctant to reveal specifically

* Some of the names have been changed.

See the cover series "Fatherless Families—Breaking the Cycle," in the February 8, 2000, issue of *Awake!*

what has taken place. For one thing, she may feel that revealing any misconduct on your dad's part would only stir up misery. Realize, too, how hurtful it must be for a woman to discover that her husband has been unfaithful. (Malachi 2:13, 14) So if adultery is behind your parents' breakup, don't be surprised if your mother finds the matter too painful to discuss.

What about your father? Understandably, if he has been unfaithful to your mother, he is not likely to talk to you about it. Some men feel so guilty about their misconduct that they cannot bear even to face their children! Despite their shameful behavior, though, many fathers continue to love their children and may try to reestablish contact with them.

In some cases the father leaves because of misconduct on the wife's part, and he makes every effort to maintain closeness with his children. In other cases, though, a breakup is, not the result of adultery at all, but the climax of years of marital bickering.* (Proverbs 18:24) Because this often takes place behind closed doors, you may have no idea what the fighting was about.

The Bible says at Proverbs 25:9: "Plead your own cause with your fellowman, and do not reveal the confidential talk of another."

* The Bible makes it plain, however, that the only Scriptural ground for dissolving a marriage that allows both parties to remarry is fornication.—Matthew 19:9.

IN OUR NEXT ISSUE

The Problems of Children —The Solution at Last!

Yellowstone—Crucible of Water, Rock, and Fire

Can Science Bring Everlasting Life?

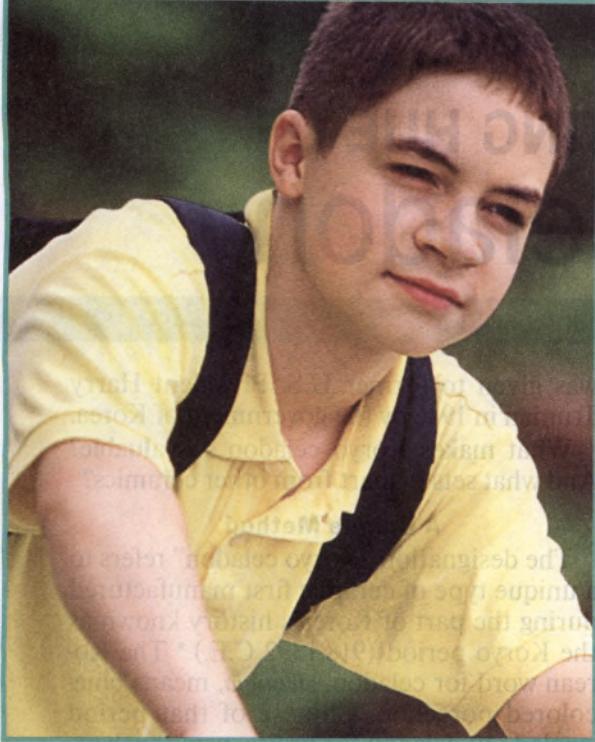
er." Sometimes marital disputes involve private, intimate matters. Believe it or not, you are probably better off not hearing about such things. Besides, revealing "confidential talk" often makes a bad situation worse. You may feel inclined to take sides—only widening the rift in your family. So in the long run, you may be better off if your parents keep the details of their disputes to themselves.

Fight Resentment by Gaining Insight

Still, it's hard not to feel angry and resentful when your father has left home and you can't answer the question, Why? However, at Proverbs 19:11, the Bible observes: "The insight of a man certainly slows down [not necessarily eliminates] his anger." And you do not need to know all the details to have insight.

For example, the Bible helps us to see that our parents are imperfect. It says: "All have sinned and fall short of the glory of God." (Romans 3:23) Accepting this painful truth can help you to put your parents' mistakes in perspective. If, for example, your father has dishonored his marriage vows, that is a serious shortcoming—one for which he is accountable before God. (Hebrews 13:4) But it does not necessarily mean that he has rejected you or that he does not love you.

All married couples suffer "tribulation in their flesh." (1 Corinthians 7:28) And while there is no excuse for their doing so, some men and women give in to wrongdoing under the pressures of life in this troubled world. Robert recalls: "Dad wanted the best for us. He moved the family to an area where he thought he could make a better living so that we could have a nice house and the family would be happy." But his father's well-meaning attempts to carve out a better life for his family soon went awry. Robert explains: "Dad slowed down in going to Christian meetings. Then he lost his job.



Do not blame yourself for your parents' marital problems

he is guilty of wrongdoing, he is still your father. You have an obligation to show him at least a measure of respect. (Ephesians 6:1-3) Avoid "anger and wrath and screaming and abusive speech" when dealing with him. (Ephesians 4:31) If possible, stay neutral regarding your parents' private marital disputes. By reassuring both of your parents that you love them, you may be able to enjoy good relations with both of them.

It's Not Your Fault

Having your father leave home is probably one of the most painful things you will ever experience. But even if you never find out all the reasons why he left, there is no need to feel that it was your fault. True, it may feel like a personal rejection. But marriages rarely break up because of the children. Your parents took a vow before God to stay together. It is their responsibility—not yours—to live up to it.—Ecclesiastes 5:4-6.

After a while he became abusive toward my mother and my sister." Soon things deteriorated to the point that his father and mother were divorced.

Robert could have become consumed with bitterness because of his father's failures. But having insight into his father's situation has tempered his anger. Although the breakup of his parents' marriage was tragic, it has taught Robert something important. Robert says: "When I start a family, spiritual things must come first."

Michael, mentioned earlier, has also had to fight bitter feelings. "I wanted to hurt my dad for what he did to us," he admits. But he maintained a relationship with his father. As time passed, Michael was even able to let go of his anger and move on with his life.

You too may want to try to maintain as normal a relationship with your father as the situation permits. True, he may have hurt you and your mom. But likely you do not have all the facts. And even if you know

Still, if you feel confused, guilty, or responsible, why not try telling your parents? They just might open up and give you some needed reassurance. James, quoted at the outset, admits: "I used to think that I was to blame, until my mother and my father sat me down and talked with me." Young Nancy likewise felt guilty when her father and mother broke up. After several conversations with her mom, Nancy was able to conclude: "Kids should not blame themselves for what their parents do." Yes, letting your parents 'carry their own load' of responsibility can prevent you from feeling overloaded emotionally. (Galatians 6:5) But how can you cope now that you live in a fatherless home? A future article in this series will provide some answers.

THE ENCHANTING HUE OF Koryo Celadon

BY AWAKE! WRITER IN KOREA

IN 1995 a treasure was discovered in the Truman Library in Missouri, U.S.A. What was it? A small ceramic water bottle bearing a floral pattern and a deep-colored glaze. Although only nine inches tall, the bottle has been valued at about \$3,000,000. It is an example of the Korean pottery known as Koryo celadon, and it

was given to former U.S. President Harry Truman in 1946 by the government of Korea.

What makes Koryo celadon so valuable? And what sets it apart from other ceramics?

A Unique Method

The designation "Koryo celadon" refers to a unique type of ceramic first manufactured during the part of Korea's history known as the Koryo period (918-1392 C.E.).* The Korean word for celadon, *ch'ongja*, means blue-colored porcelain. Chinese of that period singled out celadon for praise, using such expressions as the "best under heaven." It is Koryo celadon's deep, lustrous blue-green glaze that makes it so special.

The attractive jade-green hue is the result of combining the colors of the clay and a glaze. This was accomplished by firing each piece twice. Korean art historian Yang-Mo Chung explains that in this process the vessel was shaped from clay that contained iron. First, it was fired at 1,300 to 1,500 degrees Fahrenheit. Next, the surface was coated with a glaze that contained calcium carbonate and between 1 and 3 percent iron. Then, the vessel was fired again—this time at a temperature of 2,300 to 2,400 degrees Fahrenheit and in a reducing atmosphere.[#]

A close look at Koryo celadon reveals that its elegant lines and shape seem to be in natural harmony. Classic celadon bottles, teapots, dishes, and jars reflect the same artistic lines and form as traditional Korean dress and

* The modern name Korea is derived from the name Koryo.

[#] In a reducing atmosphere, the air supply to the kiln is limited, resulting in the presence of carbon monoxide.



even dances do. The artistic designs on the vessels also reflect themes from nature. Potters combined motifs inspired by mountains, trees, flowers, fish, birds, insects, and people into wonderful landscapes on the surface of the celadon. Some of the geometric patterns they used can still be found in contemporary pottery designs.

Now let's take a look at colors used in celadon patterns. Most of the patterns were inlaid using black and white pigments. Initially, Koryo potters borrowed their techniques from China. But they soon began to demonstrate inventiveness of their own. An outstanding example is the inlaying technique called *sanggam*. In this process the desired motif is incised on the surface of the unfinished vessel, and the resulting grooves are filled with white or red clay. The piece is then fired. During this step the white clay remains a snowy white, but the red clay turns black.

Close examination of a celadon will reveal fine cracks on its surface. Is this an imperfection? What makes this phenomenon appear? The more elaborate the inlaid design, the thinner the glaze must be in order for the design to show up distinctly. Because of being so thin and brittle, celadon glaze inevitably developed tiny cracks over its entire surface—a side effect of the pursuit of a truly transparent finish.



An original
12th-century vase

The Collection of National
Museum of Korea

Thus, the cracks came to be perceived as a natural feature of Koryo celadon and not as a flaw. In fact, some modern potters intentionally use glazes that crack.

Efforts to Revive Koryo Celadon

After the Mongols invaded Korea early in the 13th century, Koryo celadon suffered a rapid decline. Finally, potters stopped making the beautiful vessels, and their production methods became a lost art. Today, because of the high prices fetched by Koryo celadon and the limited number of pieces in existence, modern potters have been intent on reviving the technique. By examining fragments of ancient celadon, they have created pieces that are identical to the originals in size and form, and a few potters claim to have succeeded in matching older Koryo celadon's enchanting hue. However, it is difficult to recreate the precise composition of the ancient glaze—a glaze that was made using only natural materials.

Modern potters are also faced with duplicating other details, such as how the pottery was fired and for how long. Researchers at the Celadon Research Institutes in Korea have experimented with various materials and techniques in order to revive the enchanting hue of Koryo celadon.

In recent years, long-lost treasures of Koryo celadon have been discovered. For instance, in 1995 a fisherman decided to act on stories that he had heard about fragments of pottery becoming entangled in fishnets. Along with other fishermen, he began look-

ing for pottery. Eventually he pulled up 129 pieces of celadon. Following the success of these fishermen, the Korean Cultural Property Preservation Bureau formed an investigation team. They found a ship that had sunk while carrying celadon, and over several months the team recovered as many as 463 pieces! Needless to say, all of this greatly excited celadon researchers and art historians.

Enjoying Koryo Celadon Today

How can you enjoy the beauty of Koryo celadon today? Perhaps you can visit the exhibitions of Korean art in some of the famous museums of the world, such as the British Museum or New York's Metropolitan Museum of Art. Better yet, if you come to Korea, you may visit the town of Kangjin, where the largest number of early celadon kilns were located. Or you may attend one of several annual ceramics festivals held in Kyōnggi Province. There you can see celadon being made. You can even try your hand at the potter's wheel. Can you imagine shaping a vessel yourself, inscribing it with words or patterns, firing it in the kiln, and finally holding the finished product in your hands?

Of course, you can also obtain modern celadon at department stores or souvenir shops. There, vases, sets of teacups, and other types of containers are on display—either handmade by local potters or made in a factory. Perhaps you can then treat your guests to some Korean tea served in celadon teacups while a celadon vase filled with flowers graces your table.



Detail of a Koryo celadon showing the unique inlay

Do You Have RESTLESS LEGS?

IT'S nighttime.

You are comfortable and relaxed in your bed. Then it begins—that crawling feeling in your legs. You cannot ignore it. The only way to find relief is to get up and move around. Walking helps, but when you lie down again, the sensation returns. You want to sleep, but you cannot. If this sounds like something you experience, you are not alone. For example, perhaps as much as 15 percent of the U.S. population live with this condition.

Though many doctors today fail to diagnose or properly treat this disorder, it is not new. In 1685 a doctor wrote of those who after going to bed feel "so great a Restlessness" in their arms and legs that they "are no more able to sleep, than if they were in a Place of the greatest Torture."

Part of the problem in recognizing this disorder is that there is no laboratory test that can determine if a person has it. It is identified by the symptoms it produces. A knowledgeable doctor may ask: 'Do you feel the crawling sensation in one leg or both? Do you ever feel it in your arms? Does the discomfort go away if you get up and walk, take a bath, or massage your legs? Does the unpleasant sensation sometimes occur if you have to sit for a long period, such as in a car or an airplane? Does it bother you most at night? Do any of your fami-



ly members experience the same problem? Does your mate say that you sometimes jerk your legs when you are asleep?' If your answer to some of these questions is yes, the doctor may conclude that you have restless legs syndrome (RLS).

Those Who Have It

For some, RLS is a mild disorder with occasional symptoms. For others, it is much more serious, causing chronic insomnia resulting in daytime fatigue that interferes significantly with everyday life. Said one victim: "I feel as if worms are creeping and crawling in my legs. I need to wiggle my legs to make the feelings go away."

RLS affects both sexes and is most common and more severe in older people. Most often it is diagnosed in people in their 50's, though often the symptoms appear decades earlier. Sometimes symptoms can be traced back to childhood. Often, though, RLS goes unrecognized in children. Because they can't sit still or are constantly fidgeting, young people with RLS are frequently labeled as "hyperactive."

Though experts recognize RLS to be a neurological disorder, its cause is difficult to pinpoint. In most of those who have it, the cause is unknown. RLS has, however, been linked to certain factors. For example, RLS runs in families, passing genetically from parents to their children. Some pregnant women experience RLS symptoms, especially during the last months of pregnancy. After delivery, the disorder usually disappears. Sometimes medical disorders, such as low iron levels or a lack of certain vitamins, trigger RLS discomfort. Chronic disease may also cause RLS symptoms—particularly kidney failure, diabetes, rheumatoid arthritis, and peripheral neuropathy, damage to the nerves in the hands and the feet.

The Search for Relief

Sadly, there is no cure for RLS, and the symptoms often worsen over the years. However, the good news is that RLS can be treated effectively, often without drugs. There is no one solution; what works for one person may not work for another. Those who have it need to find what habits, activities, or medications either worsen the symptoms or improve them.

A first step in treatment is to decide if there is some correctable medical condition that is causing RLS symptoms. For those who have an iron or vitamin deficiency, supplementing the diet with iron or vitamin B₁₂ may be all that is needed to relieve RLS symptoms. However, taking too many vitamins and minerals can endanger one's health. Thus, a health-care provider should be involved in deciding whether a person should have iron or vitamin supplements.

In some people caffeine aggravates RLS symptoms. Coffee, tea, chocolate, and many

soft drinks contain caffeine. Cutting back on caffeine or cutting it out may help to improve or eliminate RLS symptoms. Alcohol consumption too usually increases the span or intensity of symptoms. By reducing alcohol in the diet or eliminating it, some find relief.

Living With RLS

If you have RLS, life-style changes may help you. Since fatigue and drowsiness often make symptoms worse, a consistent sleep routine can be a real help. If possible, it's best to have a sleeping environment that is quiet, cool, and comfortable. Going to bed at the same time every evening and waking up at the same time every morning also help.

A regular exercise program will help you get a good night's sleep. However, vigorous exercise within the six hours before you go to bed may have the opposite effect. Some with RLS find that moderate exercise immediately before bedtime helps them sleep. Experiment with various exercises to discover what is best for you.

Don't fight the urge to move. If you try to suppress movement, the symptoms usually worsen. Often the best solution is to get out of bed and move about. Some find a measure of relief in walking, stretching, bathing in hot or cold water, or massaging their legs. If you have to sit for a long time, such as when traveling, it may help if you keep your mind actively engaged in reading.

What about medication? The Restless Legs Syndrome Foundation, located in Raleigh, North Carolina, U.S.A., says that "the institution of pharmacologic [drug] therapy may become necessary." Since there is no one medication that is effective for all who suffer from RLS, your health-care provider may need to find the one that works best for you. Some find that a combination of medications is most effective. Sometimes a medication that works for a while loses its effectiveness. Since taking drugs and especially combinations of drugs carries health risks, it is important to work closely with your health-care provider to determine what works best for you.

FROM AGONY TO ANESTHESIA

PRIOR to the 1840's, patients did not go into an operating room feeling anxious. They were terrified! Why? Because there was no anesthesia. In his book "We Have Conquered Pain," Dennis Fradin says: "Surgeons were known to enter the operating room with a bottle of whiskey in each hand—one for the patient and the other for the doctor so that he could endure his patient's screams."



Getting the Patient Drunk or "High"!

Doctors, dentists, and patients would try almost anything to reduce the pain of surgery. Chinese and Indian doctors used marijuana and hashish. Opium was also widely used in various parts of the world, as was alcohol. Ancient Greek physician Dioscorides—the first person known to have used the word "anesthesia"—attributed anesthetic powers to potions made from mandrakes and wine. In later times some doctors even experimented with hypnotism.

Yet, pain relief was far from satisfactory. Hence, surgeons and dentists worked as fast as they could; in fact, they were rated according to their speed. But the fastest could still inflict enormous suffering. As a result, people commonly preferred to endure all manner of ills, from tumors to a mouth full of rotting teeth, rather than face the agony of surgery or tooth extraction.

Sweet Vitriol and Laughing Gas

In 1275, Spanish physician Raymond Lullus, while experimenting with chemicals, made a volatile, flammable liquid he called sweet vitriol. In the 16th century, a Swiss-born physician commonly known as Paracelsus made chickens breathe sweet vitriol and noted that they not only fell asleep but also felt no pain. Like Lullus before him, he did not experiment on humans. In 1730, German chemist Frobenius gave this liquid its present name, ether, which is Greek for "heavenly." But 112 more years would pass before ether's anesthetic powers were fully appreciated.

Meanwhile, in 1772, English scientist Joseph Priestley discovered the gas nitrous oxide. Initially, people thought this gas to be lethal, even in small doses. However, in 1799, British chemist and inventor Humphry Davy decided to find out by experimenting on himself. To his astonishment he found that nitrous oxide made him laugh, so

ACUPUNCTURE

Pain Relief From the East

Acupuncture is an ancient Chinese therapy that is said to relieve pain. Practitioners insert needles at specific points on the body, often distant from the area being treated. Once inserted, the needles may be twirled or connected to a low-voltage electric current. *Encyclopædia Britannica* says that acupuncture "is routinely used in China as an anesthetic during surgery. Western visitors have witnessed ambitious (and ordinarily painful) surgical operations carried out on fully conscious Chinese patients locally anesthetized only by acupuncture."

Acupuncture should only be practiced by a skilled, medically trained therapist. According to the *Encyclopedia Americana*, "serious accidents have occurred when acupuncture needles have pierced the heart or the lungs, and hepatitis, local infection, and similar complications may occur when unsterilized needles are used." Of course, the use of general anesthesia also carries risks, as do operations themselves—whichever form of anesthesia is used.

he nicknamed it laughing gas. Davy wrote about the potential anesthetic properties of nitrous oxide, but nobody at that time pursued the matter any further.

Ether and Laughing-Gas Parties

Davy's antics while under the influence of laughing gas—to which he became temporarily addicted—became well-known. Soon breathing it for fun caught on. Even traveling showmen, as part of their programs, had volunteers from the audience step onto the stage and take their turn at breathing nitrous oxide. The gas melted inhibitions, and soon the unrestrained antics of the volunteers had audiences in the grip of laughter.

About the same time, the recreational use of ether also became popular. One day, how-

ever, a young American physician named Crawford W. Long noticed that his friends felt no pain when they injured themselves while staggering around under the influence of ether. He immediately thought of its potential in surgery. Conveniently, a participant in one of those "ether frolics," a student named James Venable, had two small tumors he wanted excised. But fearing the pain of surgery, Venable kept putting the operation off. Hence, Long suggested that he have his operation while under the influence of ether. Venable agreed, and on March 30, 1842, he had a painless operation. However, Long did not announce his discovery until 1849.

Dentists Also Discover Anesthesia

In December 1844, a U.S. dentist named Horace Wells attended a traveling show where a certain Gardner Colton demonstrated nitrous oxide. Wells volunteered to try the gas but retained sufficient presence of mind to notice that another participant dashed his legs against a hard bench but felt no pain, even though he was bleeding. That night Wells made a decision to try nitrous oxide in his dental practice—but after he first tried it on himself. He arranged for Colton to supply the gas and for fellow dentist John Riggs to extract a troublesome wisdom tooth. The extraction was a success.

Wells decided to make his discovery public by demonstrating it before his peers. However, he was extremely nervous and administered insufficient gas, so that the patient cried out when the tooth was pulled. Immediately Wells' audience jeered him. But they should have questioned the patient, for later he confessed to Wells that although he cried out, he felt little pain.

On September 30, 1846, fellow American dentist William Morton performed a painless tooth extraction on a patient who submitted to ether—the same compound

used by Long in 1842. Morton prepared his ether with the assistance of eminent chemist Charles Thomas Jackson. Unlike Long, Morton arranged for a public demonstration of ether's anesthetic properties on a patient undergoing surgery. In Boston, Massachusetts, on October 16, 1846, Morton anesthetized the patient. Then the surgeon, a Dr. Warren, performed the operation—the removal of a growth from under the patient's jaw. The operation was a signal success. Word soon spread like wildfire across the United States and Europe.

Further Discoveries

In the wake of these thrilling discoveries, experiments with various vapors continued. Chloroform, discovered in 1831, was used with success in 1847. In some places it quickly became the preferred anesthetic. Soon chloroform was given to women in childbirth, including Queen Victoria of England, in April 1853.

Sadly, the history of general anesthesia has been somewhat tarnished. A heated dispute erupted over who—Long, Wells, Morton, or Jackson, the eminent chemist who assisted Morton—should get foremost credit for the discovery of anesthesia (not, of course, of the chemical compounds themselves). No consensus has ever been reached, but with the calmness of hindsight, many acknowledge the contribution of all four men.

Meantime, advancements were being made in the field of local anesthesia, often referred to as regional anesthesia. Anesthetics are used that allow patients to remain lucid while one region of

their body is made anesthetic, without feeling. Nowadays, dental surgeons commonly use local anesthetics when working on teeth and gums, and physicians use them for minor operations and trauma repair. Anesthesiologists commonly administer local anesthetics to women giving birth.

Over time, anesthesiology has developed into a medical specialty in its own right. Modern anesthesiologists participate in preparing patients for surgery. They induce anesthesia using sophisticated equipment and complex anesthetics that are mixtures of a number of chemical agents, along with oxygen. In fact, many patients may not even be aware that their doctor has used anesthetic gases because these are often administered only after initial anesthesia has been established by intravenous means. The anesthesiologist is also involved with pain management after surgery.

So if you should require surgery someday, try not to become too anxious. Imagine yourself lying on a crude operating table about two centuries ago. The door opens and in walks your surgeon carrying two bottles of whiskey. Suddenly the modern anesthesiologist's sophisticated equipment looks almost friendly, does it not?

Anesthesiology has become a medical specialty



Courtesy of Departments of Anesthesia and Bloodless Medicine and Surgery, Bridgeport Hospital - CT

Greening the Amazon Forest

BY AWAKE!
WRITER IN BRAZIL

DURING the 1990's, the world annually lost millions of acres of natural forests, reported the United Nations Food and Agricultural Organization. In Brazil's Amazon region alone, whirring chain saws and crackling fires have already turned a tract of rain forest larger than Germany into a mere pasture. Instead of a seamless landscape of treetops, the forest canopy is now broken by stretches of cracked clay thinly covered with weeds and exposed stumps baking under the sun.

Although this ongoing forest destruction is disturbing, there are glimmers of hope. One promising program has already yielded some results. It is called agroforestry, and one source describes it as "a system in which cultivation of trees is combined with field

crops or pasture in an ecologically ... sustainable manner." How does agroforestry work? What has it accomplished? What prospects might it hold for the future? To find out, *Awake!* visited the National Institute for Research in the Amazon (INPA) in Manaus, the capital of Brazil's Amazonas State.

The Disappointing Escape

Johannes van Leeuwen, a Dutch agronomist at INPA's Department of Agronomy, has been working with farmers in the Amazon for the past 11 years. But how did so many farmers end up in the Amazon forest in the first place? Large-scale mechanized farming in the center and south of Brazil began to rob small farmers of their land and

Orange and Acerola, Move Over

The orange, that familiar symbol of vitamin C, pales in comparison with a fruit that is hailed as "the new queen of vitamin C." Even the acerola, the sovereign among the fruits rich in vitamin C, must concede defeat. The new ruler? A small but mighty, purple-colored fruit that is about the size of a grape and grows naturally in the Amazon's floodplains. Its name? *Camu-camu*. Does it deserve the throne? A Brazilian magazine notes that 100 grams of orange contains 41 milligrams of vitamin C, while 100 grams of acerola contains 1,790 milligrams of vitamin C. Yet, the same amount of *camu-camu* has a whopping 2,880 milligrams of vitamin C —70 times the amount in oranges!

Acerola and camu-camu: Silvestre Silva/Reflexo

The Art of Layering Trees

After farmers have agreed to adopt some parts of the agroforestry program, agronomist Johannes van Leeuwen can hand them a more detailed proposal—a layout of their future tree farm. Instead of haphazardly choosing and combining just any trees, computer simulations of agroecosystems are used to help determine which species should be planted and how they should be arranged. There is an art to layering, or arranging, species of small, medium-size, and large trees into groups.

For example, the first group, made up of guava, guarana, and *cupuaçu* trees, are planted close together. These trees stay small and start bearing fruit early. The second group, of medium-size trees such as *biribá*, avocado, and murumuru palm, will need more space. In this group, fruit production generally starts later than in the first. The third group, of large trees like the Brazil nut, piquia, and mahogany, need even more space.

Some trees in this last group produce fruit, others valuable timber, and still others both.

When all three groups of trees grow up together, the farm resembles a natural forest.

**Johannes van Leeuwen
(far right)**

**A market in Manaus
with locally grown fruit**



J. van Leeuwen, INPA, Manaus, Brazil

livelihood, causing them to migrate. Other farmers, who cultivated jute, used in the manufacture of burlap sacks, saw their livelihood vanish as sacks were replaced by plastic bags. Still others, living in drought-stricken regions, were forced to move in search of more fertile soil. But where could they go? On hearing promises of land, housing, and fertile soil in the Amazon, they followed a new road leading into the rain forest.

The farmers, however, soon discovered that they had settled in an area where the rainfall is heavy, the humidity is high, the climate is hot, and the soil is poor. Within

two to four years, the soil was completely exhausted and the same problem arose: poor people on poor soil. The desperate farmers tackled the problem by clearing away yet more areas of forest to serve as farmland.

Granted, small farmers are not the main cause of the Amazon's forest destruction. Large cattle ranches, big agribusinesses, mining and logging industries, and hydroelectric dam construction projects have done most of the damage. Even so, the influx of small farmers and the slash-and-burn method of farming that they practice have contributed to forest destruction.

How the Forest Can Recover

1. February 1993—This forest plot in central Amazon was cut down and burned in September 1992. In January 1993, pineapple plants were planted. One month later, fruit trees were planted as well.



2. March 1994—The pineapple plants have grown, and the fruit trees are becoming more visible. Small signs on sticks standing next to the trees identify them as abiu, Brazil nut, and peach palm trees, to name a few. The weeding that the farmers did around the crop benefited the trees as well. As if to show gratitude, the trees have begun to rehabilitate the fertility of the soil.



3. April 1995—The fast-growing crops have been harvested and eaten or sold, and a variety of fruit trees continue to grow.



Pictures 1-3: J. van Leeuwen, INPA-CPCA, Manaus, Brazil

Consulting "Living Libraries"

"No matter how big their impact on the forest is," says Van Leeuwen, "these poor farmers are here and have nowhere else to go. So to slow deforestation, we have to help them live off their land without having the need to cut down more forest." And that is where the agroforestry program comes in, teaching a farming method that combats soil degradation and allows farmers to use the same deforested plot for many years. How did the researchers arrive at the specifics of the program?

Years of surveys, questionnaires, and field collections preceded the launching of INPA's agroforestry program. Valuable data came especially from interviews with the "living libraries"—Indians and caboclos, people of mixed white, black, and Indian ancestry whose forefathers settled in the Amazon basin.

These inhabitants of the Amazon have a storehouse of knowledge. They are familiar with the local climate and the types of soil—black dirt, red clay, white clay, red dirt, and a mixture of sand and clay—as well as the array of native fruits, spices, and medicinal plants that the forest produces. By tapping this knowledge, agronomists and farmers became research partners—a partnership that improved the quality of the program.

The Forest Is Not a Mine

The agroforestry program was carried out gradually. The first step was to convince farmers not to view the forest as a mine—to be worked and then abandoned—but to look at it as a renewable resource. Next, they were advised to plant not only cassava, bananas, corn (maize), rice, beans, and other fast-growing crops but trees as well. "Trees?" asked the farmers. "Why?"

Since farmers often come from areas where trees do not play a role in agriculture and since they were also unfamiliar with Amazonian tree species, researchers spelled out

the benefits of planting trees. They explained that forest soil does not hold the nutrients that food crops need. Before nutrients can enter crops like corn, for example, rains wash them away. In contrast, trees manage to absorb and build up a supply of nutrients and maintain soil fertility. In addition, trees furnish forage and shade for animals. Farmers can also use trees as live fence posts to mark their property borders. And, of course, fruit trees can serve as a source of income-producing fruits and wood.

The farmers were also encouraged to plant many different species and varieties of trees. Why? So that a wide variety of fruits and wood can be harvested. That way, the farmer avoids ending up with a large harvest of just one or two kinds of fruit that he must sell for a low price because everyone else is selling the same product at the same time.

Budding Program Bears Fruit

What kind of trees are planted? "Presently we use between 30 and 40 of the fruit trees mentioned here," says agronomist Van Leeuwen as he hands over a list of 65 trees with exotic names. To show that the program is working, Van Leeuwen lays out several photos of the same plot of cleared forest land taken at different intervals.—See the box "How the Forest Can Recover."

A visit to the food markets in Manaus shows that the budding agroforestry program is bearing fruit. In these markets more than 60 different kinds of locally grown fruits are already for sale. As for the future, agronomists hope that the deeper agroforestry takes root, the slower the deforestation will advance. After all, when a farmer has learned how to reuse an old farm, he may forgo cutting down the forest to create a new one.

These laudable efforts are not likely to eliminate the global threat to earth's ecology. But they demonstrate what can be done when our precious resources are treated with respect.

WATCHING THE WORLD

Driving-Test Rage

"Assaults, verbal and physical, against France's 500 driving-test 'inspectors' have escalated 150 percent since 1994," reports the Paris newspaper *International Herald Tribune*. Less than 60 percent of all applicants pass the 20-minute driving test, and nearly all candidates who have not taken an expensive driving course fail. Those who fail are increasingly venting their rage on examiners, who have been punched and dragged from the car by the hair. One examiner was even pursued by a man wielding a syringe containing, he claimed, AIDS-contaminated blood. Recently, a 23-year-old man who failed his test shot the examiner with a gun loaded with rubber bullets. To ward off all such violence, inspectors are recommending that drivers be notified of their test results by mail instead of being informed in person.

Stressed Students

Year-end school examination time brings increased stress to many children in India, reports the *Asian Age* newspaper of Mumbai. Cramming just before exams and the pressure to get good grades prove too much for some, and the number who visit psychiatrists doubles during the exam period. Some parents, anxious to see their children do well on exams, curtail all forms of entertainment. "Children are placed under a good deal of pressure by their parents. Also there is the competition with oth-

er students," observes psychiatrist V. K. Mundra. He adds that many parents "don't realise that helping the child relax will refresh his mind and help him study better." Dr. Harish Shetty notes that exam stress "has filtered down to even the first to seventh [grade] students."

Boars Go to Town



Wild boars, normally shy forest dwellers, have discovered that cities provide not only plenty of food but also refuge from hunters, says the German weekly *Die Woche*. Wild sows have even given birth in the city of Berlin. The hungry animals do not stick to forested areas or public parks. They also devastate private gardens, munching on flower bulbs. The boars, which can weigh up to 800 pounds, have frightened many citizens, who in some cases have sought refuge in trees or telephone booths. The animals have caused countless traffic accidents. Upon coming home from work, a number of residents have encountered the bristly invaders. One person asked: "How do I manage to get in when there are 20 wild boars standing between my car and the front door?"

Teen Marriage

In India as many as 36 percent of married adolescents are between 13 and 16 years of age, according to a recent National Family Health survey. The study also found that 64 percent of girls between 17 and 19 have already borne a child or are pregnant, reports the *Asian Age* newspaper of Mumbai. Young mothers aged 15 to 19 are twice as likely to die of pregnancy-related causes than are those aged 20 to 24, states the report. Moreover, sexually transmitted infections among youths aged 15 to 24 have doubled during the past few years. Experts blame the growing problems on a lack of knowledge and on misleading information from peers and the media about sexual matters.

Exchanging One Disease for Another

"Thirty years ago, three out of five Egyptians suffered from bilharzia, a debilitating disease caused by parasites carried by water-snails," states *The Economist*. Antibilharzia campaigns using modern drugs have radically reduced the threat. However, it now appears that one of the early campaigns may "have exposed millions of people to hepatitis-C, a potentially deadly virus that may replace bilharzia as Egypt's leading health problem." The reason is that the needles used for the injections against bilharzia "were routinely reused, and rarely sterilised properly. . . . Scientists did not even identify the blood-borne hepatitis-C virus (HCV) until 1988," the maga-

zine says. Surveys now show that Egypt has "the highest toll of hepatitis-C in the world." About 11 million Egyptians—approximately 1 out of 6—are said to carry the disease, which develops into chronic liver disease in 70 percent of cases and proves fatal in 5 percent. Calling this "the greatest single transmission of a viral disease by doctors known to date," the article adds: "The one consolation is that, without the mass campaigns, many more people would have been killed by bilharzia."

Pollution Invites a Gnat Plague

Water pollution has apparently contributed to the problem of biting insects near the Chili River, which flows through Arequipa, one of Peru's largest cities. Residents there have exhausted local supplies of insect repellent in the face of an invasion of small biting gnats. The plague, according to *El Comercio* newspaper of Lima, is believed to have resulted from chemical pollution of the Chili River. Toxins appear to have destroyed many of the river's toads, which "for years maintained a natural biological control of these insects," says the paper.

Stronger Wines

Police and alcohol-awareness groups in Britain are warning that a rise in the alcohol content of wine can cause casual drinkers to become drunk. Ten years ago, usually only special vintage or dessert wines had a 13- or 14-percent alcohol content. Now, however, wines for everyday drinking are commonly as much as 14 per-

cent alcohol. These wines come largely from countries such as Australia, South Africa, and Chile, where warmer climates produce riper, sweeter grapes, producing a stronger wine. Reporting on this, *The Sunday Times* of London quotes Mary-Ann McKibben, assistant director of Alcohol Concern: "Alcohol strengths of wine are increasing, and it is becoming confusing for consumers, who are not taking the higher alcohol content into account."

Too Clean?



According to the Institute of Environmental Medicine and Hospital Hygiene at Freiburg University, Germany, antibacterial additives in some household products may be useless or even dangerous, reports the German newspaper *Westfälische Nachrichten*. "None of them are necessary," says Professor Franz Daschner, head of the institute. "Quite the opposite, the users can be harmed." For one thing, some of such products contain substances that are highly allergenic. Bad-smelling clothes simply need to be washed, not treated with antibacterial chemicals, says the report. Daschner concludes: "Normal cleaning with environmentally sound cleaning agents is quite sufficient."

Pressure to Conform

A government survey of 500 teenagers in England suggests that young people are "struggling under increasing pressure to conform to idealised images in advertising and the media," reports *The Guardian* of London. While girls tend to cope with such stress by confiding in close friends, boys find it more difficult to communicate their feelings, with the result that many express their anger in aggressive or criminal behavior. With feelings of low self-worth and increased depression, boys are three times more likely to commit suicide than girls of the same age. On the other hand, girls are four times more likely to harm themselves intentionally or to suffer from such eating disorders as anorexia and bulimia.

Abandoned Soccer Players

"More than 90 percent of young soccer players recruited in Africa to play on French teams end up as illegal workers [without] any hope of integration into French society," says the Paris newsmagazine *Marianne*. An official French government report denounced the unscrupulous recruiting agents who travel the globe in search of "golden-legged youths." Thousands of young African boys, including about 300 under the age of 13, have been seduced by the dream of a dazzling sports career. But the vast majority do not sign any official contract with a club and wind up penniless. The magazine comments: "There are many more sad stories in the files of soccer lawyers than there is glitter."

FROM OUR READERS

Disabled Preacher I couldn't stop the tears from falling when I read the account of Konstantin Morozov in the article "A Bright Outlook Despite Infirmities." (February 22, 2000) I am a single mother with two children to raise. It is not easy, and sometimes it seems that my problems will never end. But still, they are nothing compared to what Konstantin has to cope with!

I., Russia

I am a full-time evangelizer. I suffer from retinal degeneration and find it very difficult to read. I always was a voracious reader, and occasionally I get frustrated and depressed. When I think of Konstantin, I feel that I should never complain. He overcame mountainlike obstacles and serves as a full-time evangelizer. What strength Jehovah provides!

W. W., India

At age 16, I became paralyzed from the waist down. Like Konstantin, I experience difficulties daily. The article showed, however, that a disabled person can have a place in society and a share in worshiping God. Even though my hearing is not very good and I do not see very well, I often preach alone on the street while sitting on a stool with my back to a wall. I congratulate Konstantin for his zeal and devotion.

D. F., Côte d'Ivoire

Modern Slavery In the touching series "Modern Slavery—Its End Is Near!" (March 8, 2000), the statement is made: "No one can be a true Christian and share in the inhumane exploitation and oppression of any of his fellow humans." How far must a Christian go in order to avoid contributing to this heinous practice? In the Western world, it is nearly impossible to

find products that are not made under questionable circumstances.

K. H., United States

The article was discussing the direct exploitation of people by manufacturers and others. We did not mean to imply that a Christian is obliged to devote a great deal of time to researching the background of every product he or she purchases. But when it is known that something is the product of slave labor, a Christian has to make a personal decision as to whether or not to purchase it. In this, as in all matters, a Christian wants to hold a good conscience before God. (1 Peter 3:16)—ED.

I am a 16-year-old girl, and I was moved by your article. I know some young girls who are suffering from modern slavery. They work very hard in families who have taken them in. But they don't receive any education—or affection. I was greatly relieved to read in the Bible that Jehovah will release oppressed ones soon.

A. O., Burkina Faso

Faith Today I read the article "The Bible's Viewpoint: True Faith—What Is It?" (March 8, 2000) It showed logically that true faith is not credulity. Many magazines are full of advertising and have few informative or upbuilding articles. We should never take for granted what you publish for us.

E. S., Italy

Noah Video I just had to express my appreciation for the article "Noah—He Walked With God—How the Video Was Made." (March 8, 2000) Our two-and-a-half-year-old son has been watching the video since before he could walk. He watches it over and over again and wants me to rewind certain parts so that he can view them again. How wonderful it is to have tools that instill love of Jehovah in our children!

M.V.G., United States

Protecting Delicate Teeth

AT WHAT age did your teeth begin to develop? You might be surprised to learn that the process started while you were still in the womb—likely before your mother even knew that she was pregnant! It is thus important for an expectant mother to get an adequate supply of nutrients, including calcium, phosphorus, proteins, and vitamins.

What about newborns? Experts say that bottle-fed babies are particularly vulnerable to tooth decay, usually beginning with the upper front teeth. But how does this occur? Some infants routinely fall asleep while sucking on a bottle that contains milk, juice, sugar water, or soda. These fermentable liquids contain carbohydrates on which bacteria thrive. The bacteria, in turn, produce acids that can damage the babies' teeth—especially if they are in contact with the teeth throughout the night. Some babies with severe decay suffer premature tooth loss, which can adversely affect the development of their permanent teeth.

How can parents protect their baby's delicate teeth? Breast-feeding is recommended, especially since mother's milk is sterile and rich in antibodies. If a bottle is used, however, experts say that its use should be discontinued after the baby reaches 18 months of age. They also



strongly recommend that a bottle be used only for feeding—and not as a pacifier. Furthermore, if the baby is put to bed with a bottle, it would be best if it contained plain water. After each feeding, a clean, soft cloth can be used to clean the baby's teeth.

Early tooth decay can be prevented. Proper dental care—yes, even for an infant—is essential!



"We Were Meant to Live Forever"

That was the conclusion of a man from Kasama, Zambia, regarding the book *Is There a Creator Who Cares About You?* He wrote regarding our Creator:

"Jehovah came to have new meaning altogether to me by the time I completed the book. I was especially drawn to him after I read about how intricately our bodies are made. There can be no doubt that we were meant to live forever."

Such evidence is considered in chapter 4, entitled "How Unique You Are!" which discusses not only the physical structure of the brain but also language, intelligence, and human consciousness.

We invite you to examine the scientific evidence and see if you do not agree with the conclusion reached in the book: "The more we learn about the workings of our brain and mind, the easier it is to see why millions of people have concluded that man's conscious existence is evidence of a Creator who cares about us."

