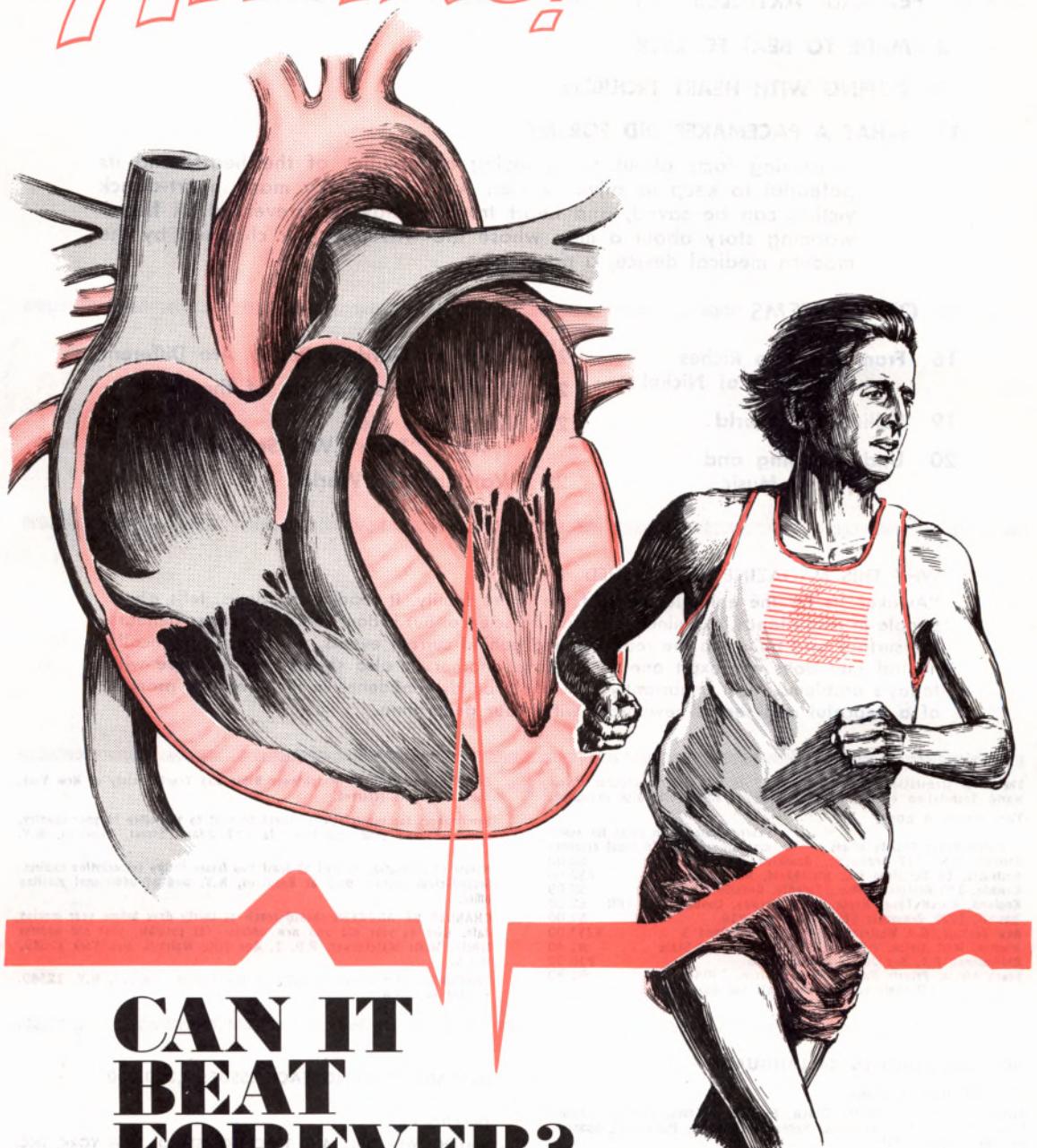


FEBRUARY 8, 1979

Awake!



CAN IT
BEAT
FOREVER?

FEATURE ARTICLES

- 3 MADE TO BEAT FOREVER
- 6 COPING WITH HEART TROUBLES
- 11 WHAT A PACEMAKER DID FOR ME

Reassuring facts about the amazing capabilities of the heart, and its potential to keep us alive forever. Also, learn how many heart-attack victims can be saved, and heart troubles may be prevented. A heart-warming story about a man whose life was radically changed by the modern medical device, a pacemaker

OTHER ITEMS

- 16 From Rocks to Riches
—The Story of Nickel
- 19 Selling the World
- 20 Understanding and Enjoying Music
- 24 Japanese Gardens Really Are Different
- 26 Shakespeare's Quoting of the Bible
- 27 The Bible's View
What "Truth" Will Set People Free?
- 29 Watching the World

WHY THIS MAGAZINE IS PUBLISHED

"Awake!" is for the enlightenment of the entire family. 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 stays politically neutral and does not exalt one race above another. It also shows how to cope with today's problems. Most importantly, "Awake!" builds confidence in the Creator's promise of a peaceful and secure new order within our generation.

The Bible translation used in "Awake!" is the modern-language "New World Translation of the Holy Scriptures," unless otherwise indicated.

Ten cents a copy

| Watch Tower Society offices | Yearly subscription rates for semi-monthly editions in local currency |
|--|---|
| America, U.S., 117 Adams St., Brooklyn, N.Y. 11201 | \$2.00 |
| Australia, 11 Beresford Rd., Strathfield, N.S.W. 2135 | A\$2.50 |
| Canada, 150 Bridgeland Ave., Toronto, Ontario M6A 1Z5 | \$2.00 |
| England, Watch Tower House, The Ridgeway, London NW7 1RN | £2.00 |
| Hawaii, 1228 Pensacola St., Honolulu 96814 | \$2.00 |
| New Zealand, 6-A Western Springs Rd., Auckland 3 | NZS3.00 |
| Nigeria, West Africa, P.O. Box 194, Yaba, Lagos State | #1.40 |
| Philippines, P.O. Box 2044, Manila 2800 | P10.00 |
| South Africa, Private Bag 2, Elandsfontein, 1406 | R1.80 |
| (Monthly editions cost half the above rates.) | |

Copyright © 1979 by Watchtower Bible and Tract Society of New York, Inc. All rights reserved.

Remittances for subscriptions should be sent to the office in your country. Otherwise send your remittance to 117 Adams Street, Brooklyn, N.Y. 11201.

Notice of expiration is sent at least two issues before subscription expires. Second-class postage paid at Brooklyn, N.Y. and at additional mailing offices.

CHANGES OF ADDRESS should reach us thirty days before your moving date. Give us your old and new address (if possible, your old address label). Write Watchtower, R.D. 1, Box 300, Wallkill, New York 12589, U.S.A.

POSTMASTER: Send Form 3579 to Watchtower, Wallkill, N.Y. 12589. Printed in U.S.A.

NOW PUBLISHED IN 34 LANGUAGES

SEMIMONTHLY EDITIONS

Afrikaans, Cebuano, Danish, Dutch, English, Finnish, French, German, Greek, Iloko, Italian, Japanese, Korean, Norwegian, Portuguese, Spanish, Swedish, Tagalog, Zulu

MONTHLY EDITIONS

Chichewa, Chinese, Hiligaynon, Malayalam, Melanesian-Pidgin, Polish, Sesotho, Swahili, Tahitian, Tamil, Thai, Twi, Ukrainian, Xhosa, Yoruba

AVERAGE PRINTING EACH ISSUE: 8,300,000

Published by

WATCHTOWER BIBLE AND TRACT SOCIETY OF NEW YORK, INC.
117 Adams Street, Brooklyn, N.Y. 11201, U.S.A.

Frederick W. Franz, Pres.

Grant Suiter, Secy.

MADE TO BEAT FOREVER



WITHIN your chest beats a truly astonishing organ about the size of your fist—your heart. Without pause, it pumps the blood that carries life-sustaining nourishment to your billions of body cells. Of this pump, doctors in the book *Your Heart* observe: "It is more efficient than any machine of any kind yet devised by man."

The forces involved in the design and construction of the heart are beyond human understanding. At conception, for example, the blueprints for the heart, as well as all other body parts, are drawn up. Amazingly, in a matter of minutes all the instructions are determined within the fertilized cell to make a new person! No scientist knows how this is done.

Without observable direction, the original fertilized egg cell soon begins to divide, forming cells that are different from their predecessors. Shortly, there are many different kinds of cells that start to form into various organs. At three weeks the partly developed heart begins to beat, probably even before the mother-to-be knows that she is pregnant.

What causes these heart cells, which at first form only a straight tube, to begin to contract rhythmically? "We are still a long way from finding the final answer," admits Dr. Robert L. DeHaan who has been studying the subject for years.

What is known, however, is fascinating. It inspires awe. Consider, for example, this beat, or contraction, of the heart that forces blood out to the rest of the body. Do you know what causes the heartbeat?

The Remarkable Control System

Responsible is the amazing ability of the heart to generate electrical impulses. Thus, if provided with oxygen and kept from drying out, the heart will continue to beat for a while even after it is removed from the body. Within the heart there is a complex system for generating and regulating electrical impulses. This remarkable control system is made up of special cells concentrated in groups in different parts of the heart.

A principal part of this system is a tiny comma-shaped structure called the *sinoatrial node*, or *S-A node*, a special tissue that is a cross between heart muscle and nerve cells. This is the heart's primary pacemaker, and so has been called the "spark plug" for the heart. Here a regular series of electrical pulses are generated that travel through the heart and trigger its beat. The basic rate of contraction generated by these sinoatrial node cells is about 70 beats per minute, the normal heart rate of most adults.

Another part of the heart's control system is the *atrioventricular node*, or *A-V node*. The electrical pulses from the sinoatrial node reach this part, where they are properly timed and regulated to assure good coordination of the heart's pumping action. Then from here these pulses move swiftly through other specialized conduction tissues, including one called the *bundle of His*, to the rest of the heart.

The atrioventricular node also has an inherent rhythm—about 50 beats per minute—somewhat slower than the sinoatrial

node. The impulse-generating function of this structure, however, is not utilized under normal conditions. But in an emergency, if the sinoatrial node fails, the atrioventricular node can serve as a reserve pacemaker. In addition, the bundle of His, along with yet other specialized conduction tissues, can serve as a last line of defense. They, too, can initiate slow contractions of the heart, about 30 to 40 beats per minute, a rate that may sustain life.

How the System Meets Body Needs

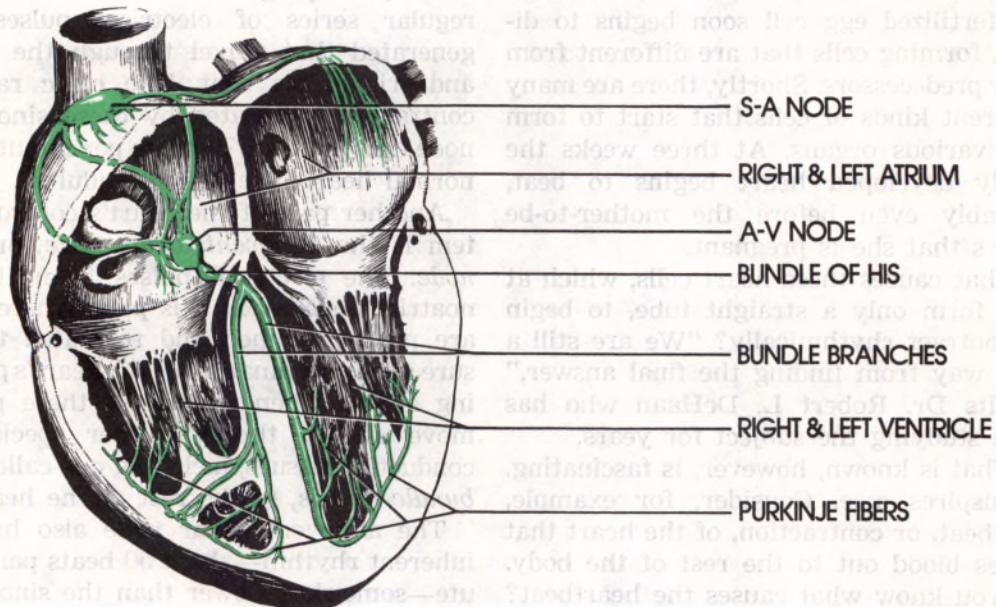
If you run to catch a bus, climb stairs, or exercise in a similarly strenuous way, the heart rate must increase to meet the body's need for more nourishment. What tells the heart to speed up? How does it know the rate at which to beat to meet various body needs?

Signals coming through nerve connections from other parts of the body are particularly responsible. During exercise, for example, your muscles need more oxygen; so they take an increased supply from the

blood. The decreased oxygen level of the blood triggers receptors in the arteries to send nerve signals to the brain. Through nerve impulses, the brain, in turn, signals the heart to beat faster, thus providing more oxygen-carrying blood for your muscles.

However, the heart is not dependent solely on such nerve connections, as illustrated in the case of heart transplants. In such operations the vagal and sympathetic nerve systems are severed, yet the transplanted heart continues to some extent to regulate its beat in response to the changing needs of the body. The heart is able to respond directly to chemicals, such as adrenaline, received through the blood stream, and thereby "knows" when to speed up or slow down.

Truly, it is wondrous how the heart is designed to keep just the right amount of blood flowing through the body to meet its changing needs! Amazing, too, are the many "backup" systems that can take over and compensate in emergencies. No wonder doctors say the heart "is more efficient



than any machine of any kind yet devised by man." A look at the heart's tremendous capacity for work will no doubt astonish you further.

The Heart's Capability

An adult body contains some six quarts of blood, and about 60,000 miles (96,500 kilometers) of blood vessels, including tiny capillaries. At its normal rate of about 70 beats per minute, the heart will pump some six quarts (6 liters) of blood every minute. Think of it! Your heart pushes your entire blood supply through your body in less than 60 seconds! Under ordinary conditions, it pumps up to 10 tons of blood through your vessels daily. Yet, at this rate, it is not even working very hard.

If yours is a physically fit heart, one trained by regular exercise, it may be capable of pumping as many as 30 quarts of blood or more a minute. At that rate it is pushing your entire blood supply through your body about every 10 seconds! Yes, your heart pumps so steadily and powerfully that *every day* it can push your blood through *several thousand* complete circuits of your body!

Such a marvelously designed organ may make you wonder: Were humans originally meant to live for only 70 to 80 years or so and then die? Could the heart beat indefinitely?

Meant to Beat Forever

The heart, as well as the rest of the body, is designed quite differently from any machine made by men. Machines of human design are made with permanent parts, which, of course, eventually wear out. The human body, however, differs considerably in its makeup. Years ago Dr. Paul C. Aebersold, then director of the Isotopes Division of the Atomic energy Commission, explained:

"Medical men used to think of the human body as an engine that takes in food,

air, and water mainly as fuel to keep running on. Only a small part was thought to go for replacement of engine wear. Investigations with isotopes have demonstrated that the body instead is much more like a very fluid military regiment which may retain its size, form, and composition even though the individuals in it are continually changing, joining up, being transferred from post to post, promoted or demoted, acting as reserves, and finally departing after varying lengths of service.

"Tracer studies show that the atomic turnover in our bodies is quite rapid and quite complete. In a week or two half the sodium atoms will be replaced by other sodium atoms. The case is similar for hydrogen and phosphorus. Even half of the carbon atoms will be replaced in a month or two. And so the story goes for nearly all the elements. . . . In a year approximately 98 per cent of the atoms in us now will be replaced by other atoms that we take in in our air, food, and drink."

Thus, regardless of whether a person lives to 20 years of age, 80 years, 800 years, or forever, most of the materials in his body would be less than a year old. Cell duplication theoretically should keep the body alive forever. Medical researchers have, at times, drawn attention to this potential, noting that it is easier to explain why humans should live forever than why they should die.

Nevertheless, as time passes, the heart, along with the rest of the body, fails to maintain its ability systematically to replace its cells before they become defective and die. Why? Cell biologists have many theories. But they do not really know for sure. Obviously, something eventually goes wrong in the inner workings of cells, and those wearing out and dying are not always replaced by new ones through cell division. So humans grow old and die.

If a correction could be made, and the right balance in cell replacement and renewal was maintained, humans could live

forever. However, man cannot repair the malfunction. He did not design the body, including its marvelous heart. Only the Creator, Jehovah God, can make the adjustments so that humans will live forever. And in time God will do this, as his Word the Bible promises. For example, Romans 6:23 says: "The gift God gives is everlasting life." Psalm 37:29 foretells:

"The righteous themselves will possess the earth, and they will reside forever upon it."

In the meantime, our marvelously designed hearts are commonly subject to troubles. Often, however, there is something that we can do to delay the onset of these troubles, and to control them when they occur.

COPING WITH HEART TROUBLES



ALL too often we hear about relatives, friends and acquaintances suffering a heart attack. In the United States alone heart attacks kill some 650,000 persons annually, more than a person every minute. About 350,000 die before they reach a hospital. But people in other countries, too, are affected. Nearly half the men in Western countries, as well as many women, are dying of this single ailment—heart attack!

What is particularly frightening is that so many of the victims are young—in their 30's, 40's and 50's. Often their hearts are essentially healthy. Why do they die? What is the trouble?

Source of the Problem

The source of the problem is a lack of blood supply to the heart muscle. 'But how can that be?' you may ask. 'Is the heart not literally bathed in blood? Do not tons of it pass through the heart daily?'

This is true. So to understand the nature of the problem, we must know a little

about how the heart works. It is a hollow muscle, with four chambers, the right atrium and the right ventricle, and the left atrium and the left ventricle. Oxygenated blood from the lungs flows to the left atrium while the right atrium is filling with blood laden with carbon dioxide from the body. On contraction of the atria, the blood is forced through valves into the ventricles. Then the major pumping action of the heart occurs. The ventricles forcefully contract, simultaneously sending the oxygenated blood to the various body parts by way of the aorta and the oxygen deficient blood to the lungs by way of the pulmonary artery.

While the blood is traveling through these chambers, the heart muscle itself is not benefited by this life-sustaining fluid. A comparison can be made with a gasoline truck. The truck does not derive its power from the gasoline that it is delivering to a customer. Rather, it is powered by the fuel that it obtains when it stops at service stations. This fuel is channeled

through the fuel line to the truck's engine.

Similarly, it is not the blood passing through the heart chambers that delivers nourishment to the heart. No; but, rather, it is the blood that is pumped out from the heart and delivered back again by another route that feeds the heart. The key to the problem of heart attacks lies in these 'fuel lines,' or blood-delivery routes to the heart.

Blood leaving the heart is pumped into the body's huge artery, the aorta. However, almost immediately much of this blood is channeled off into the two coronary arteries. In this way oxygen and chemical nutrients are carried to all parts of this most important muscle of the body. What happens, though, if there is an interference of blood flow through the coronary arteries?

Clogging of Coronary Arteries

This might be illustrated by what happens when a great deal of rust builds up on the inside of a water pipe. When you pump water through that pipe, the flow is restricted. So what happens if a large amount of water is required in a short period of time? The pump pushing the water may malfunction under the extra stress and break down.

This gives you an idea of what is occurring within the hearts of millions of persons today. The coronary arteries are being narrowed by a buildup of fatty deposits. This condition is called *atherosclerosis*. What happens, then, when the heart needs more blood to meet some physical or emotional emergency?

Even when a small part of the heart is temporarily starved of blood, electrical patterns can somehow become disturbed, upsetting the beating rhythm. The heart then goes into what is called *ventricular fibrillation*—an unusual and serious complication in which it twitches chaotically and ineffectively, and stalls from the lack

of a driving force. Death follows within a few minutes unless proper pumping action is restored.

Similarly, heart attacks are often precipitated by a clot, or thrombus, in a coronary artery. Atherosclerosis does not cause a uniform narrowing of the vessels. Rather, a buildup of deposits occurs intermittently along the blood vessel, while the diameter of the rest of the vessel may be normal. So the clot occurs at a narrowed part of a vessel, blocking the blood flow to a portion of the heart muscle. This blocking of a blood vessel in the heart is called a *coronary thrombosis*, or a *coronary occlusion*. The result of the blockage is referred to as a *myocardial infarction**—a heart attack.

How can you tell when a person is suffering a heart attack?

Symptoms

Many heart attacks are difficult to recognize. In fact, heart specialists estimate that perhaps 20 percent of initial attacks occur without any awareness by the victims. This may be because a blood vessel in the heart is closed off gradually over a period of weeks or months, instead of abruptly.

Then, again, the symptoms may simply not be recognized as a heart attack. They may be mistaken, for example, as a severe attack of indigestion. Also, vomiting may occur, along with fatigue and an ashen appearance. Other signals may be sweating and shortness of breath. The most common symptom of a heart attack, however, is uncomfortable pressure, squeezing or fullness in the center of the chest. Or it may be a crushing chest pain, which is an almost sure signal of a heart attack.

In many cases, persons live long and full lives after a heart attack, perhaps without ever realizing that they had one.

* "Myo" refers to muscle, "cardial" to heart, and "infarction" means the area of tissue that has died because of the interrupted blood flow.

On the other hand, even a mild attack that does minimal damage to the heart can precipitate ventricular fibrillation, and the victim may become unconscious and die within minutes. But you could save the victim, if you knew how to do it.

Saving Victims of Heart Attacks

Many persons whose hearts have stopped for up to five minutes or so are now physically fit and able to do all the things that they did before their heart attack. Swift action by persons who were near at hand saved them. They knew what to do. Would you know? Could you save a life?

It is not as difficult as you may think. In some places many of the general public are being taught the very effective life-saving procedure called *cardiopulmonary resuscitation*, or *CPR* for short. It is a combination of external heart massage and artificial respiration. If you have the opportunity, it would be fine to receive a course of instruction in this procedure. However, by carefully considering the directions provided here, you may be able to save the life of a heart-attack victim—perhaps someone you dearly love.

If you find a collapsed person, there are certain preliminary steps that you should follow before beginning CPR. But you should act quickly, because an unconscious person can live for only about four to six minutes without breathing.

First, you should determine if the person is really unconscious. It could be embarrassing to start lifesaving procedures on someone who is only sleeping! So gently shake the person's shoulder and ask: "Are you OK?" If he does not answer, check to see if he is breathing, since he may have only fainted. Do this by placing your ear close to his mouth, with your face turned toward his chest. If he is breathing, you should be able to feel his breath in your ear, and perhaps observe chest movements.

If there is no indication of breathing, it is important to open his air passage. Sometimes the tongue of an unconscious person sags backward in the throat, cutting off this vital air passageway to the lungs. Opening the airway to the lungs may be all that is necessary to restore breathing, and this is usually not difficult.

With the unconscious person lying on his back, use one hand to lift up the back of his neck gently. This will cause the head to drop backward, extending the neck. Put your other hand on his forehead and roll his head back fully, until it will go no farther. You may be surprised how far back the head will go with full extension. Having done this, the chin will be pointing almost straight upward, with the crown of the head resting on the floor. In this position the jaw and the tongue are drawn forward and the airway in the throat is cleared.

If this quick clearing of the airway does not restore breathing, begin immediately to give artificial respiration. Using your hand that is on the victim's forehead, pinch the victim's nose shut while, at the same time, keeping the heel of the hand in place to help to maintain head tilt. Keep your other hand under the victim's neck (or under his chin), lifting up. Then open your mouth wide and place it directly on the mouth of the victim, and give four quick, full breaths in rapid succession. You will see his chest rise as his lungs expand.

Next, quickly check for the victim's pulse, which tells you whether his heart is beating. The best place to locate the pulse is in the carotid artery, the major artery in the neck. To find it, take your hand from the back of the neck and slide its index and middle fingers into the groove beside the voice box. If there is no pulse, the heart has stopped and, in addition to artificial respiration, you must also provide artificial circulation to save the victim.

Artificial circulation is accomplished by closed-heart massage. This is a relatively simple procedure of compressing the chest. These compressions actually force the

heart to pump blood. This often prompts the heart to begin beating again on its own. But, of course, oxygen, too, must continue to be provided, since the circulat-



**Exactly how should
CPR be performed?**

A brochure from the American Heart Association gives the following concise directions:

"Kneel at the victim's side near his chest. Locate the lowest portion of the sternum [the victim's breastbone]. . . . Place the heel of one hand about 1 to 1 ½ inches [2.5 to 4 centimeters] away from [that is, above] that tip. Place your other hand on top of the one that is in position. Be sure to keep your fingers off the chest wall. You may find it easier to do this if you interlock your fingers.

"Bring your shoulders directly over the victim's sternum as you compress downward, keeping your arms straight. Depress the sternum about 1 ½ to 2 inches [4 to 5 centimeters] for an adult victim. Relaxation must follow compression immediately and be of equal time. A rhythmical, rocking motion helps insure the proper length for

the relaxation cycle. Remember, do not remove your hands from the victim's sternum while allowing the chest to return to its normal position between compressions.

"If you are the only rescuer, you must provide both rescue breathing and cardiac compression. The proper ratio is 15 chest compressions to 2 quick breaths. You must compress at the rate of 80 times per minute when you are working alone since you will lose compressions when you take time to interpose these breaths.

"When there is another rescuer to help you, position yourselves on opposite sides of the victim. One of you should be responsible for interposing a breath after every fifth chest compression. The other rescuer, who compresses the chest, should use a rate of 60 compressions per minute."

ing blood is useless if it is not picking up oxygen from the lungs.

Thus, what the rescuer must do is to carry on the vital functions of breathing for the victim and at the same time forcing his heart to pump his blood. Even if the heart does not start beating on its own, if you can keep up CPR until medical help arrives, the victim may be saved. There have been cases where the breathing and the

of foods deep fried in animal fat. At the same time eat a generous amount of nutritional vegetables, fruits, melons and cereals.

Today's high-speed, tension-producing way of life, too, seems to be another factor in accentuating the buildup of fatty deposits in the arteries. So, since those who struggle too incessantly to accomplish too many things in too little a space of time are prone to heart attacks, you will want to avoid this continual sense of time urgency.

Getting sufficient exercise is also an important means of offsetting the possible disastrous effects of a buildup of fatty deposits in our arteries. In fact, Dr. Wilhelm Raab, as director of Cardiovascular Research at the University of Vermont, said: "Lack of exercise is the major cause of coronary heart disease." Why is this?

The heart is, as we know, a muscle, and muscles become weak when they are not exercised sufficiently. In fact, our whole circulatory system is adversely affected. The arteries supplying blood to our muscles become narrower in size, and many small vessels even disappear. On the other hand, regular exercise causes our arteries to become larger, so they can carry more blood. Also, more blood vessels open up in muscle tissue, providing new routes for delivering more oxygen, thus minimizing the possibility of a heart attack.

Regular physical activity, too, strengthens the pumping action of our heart. As a result, fewer strokes are necessary to accomplish the same amount of work. Thus, a physically fit heart does not have to strain to meet an emergency as does an unconditioned heart. So to protect your heart, make exercise a *regular* habit. Said one doctor: "*Vigorous walking*, if practiced from youth on, would in itself drastically reduce the disability and early deaths due to coronary heart disease."

In Future Issues

- "Is That Your Voice on Tape?"
- Is World Unity Finally Within Reach?
- A Chemist Finds Powerful Evidence of Creation

pumping of blood has been carried on artificially for hours before the victim's own system was prompted to take over these functions.

Preventive Care

Besides being prepared to help heart-attack victims, what else can we do? Can the buildup of deposits in arteries—the principal cause of heart attacks—be prevented, or at least slowed?

It is generally agreed that cholesterol and fats (glycerides) are somehow involved in the buildup of these deposits. So it only makes sense to watch our diet and avoid putting on excess weight, since visible fat likely means that inside our body fatty deposits are accumulating in arteries, dangerously narrowing them. It may also be advisable to limit or exclude the eating

But not all heart troubles are precipitated by a buildup of fatty deposits that narrow the insides of coronary arteries. A malfunction in the heart's electrical system is the source of some heart troubles.

Heart Block

As noted earlier, the heart has a complex system of specialized cells that initiate and conduct electrical impulses throughout the heart to trigger its rhythmic beating. A heart block is an abnormality in the transmission of these electrical impulses. The impulses do not get through properly, and the pumping action of the heart is adversely affected.

There are different degrees of heart block. A partial block may involve only a delay in transmission of impulses, and it may not result in any significant abnormality in heart function. But the trouble

can be serious. The impulses from the atriums to the ventricles may be blocked completely, and so the heart chambers beat independently of each other. The result is ineffective heartbeats that fail to provide proper blood flow. If the heart block persists, and the inadequacy of blood flow is too great, the person may die.

Today, however, thousands of persons who would probably have died a few years ago are still living, and living practically normal lives. This is due to the development of artificial heart pacemakers. The first of these were implanted in patients around 1960. They have proved so successful that literally *hundreds of thousands* of persons today are walking around with these pacemakers in their bodies. You will find the following story about the tremendous changes a pacemaker made in one man's life both informative and heart-warming.



WHAT A PACEMAKER DID FOR ME

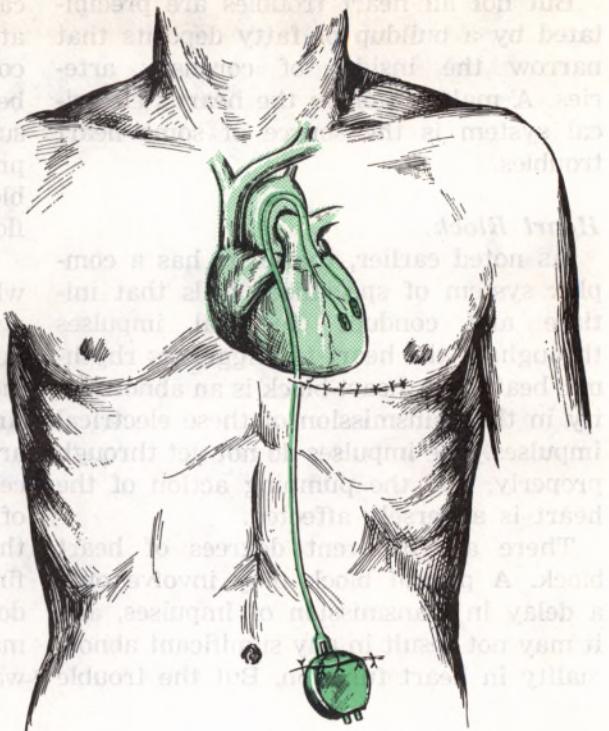
AS THE doctor bent over and listened to the unborn child's heartbeat, he knew immediately that something was very wrong. At times it was as low as 48 beats per minute, instead of the usual fetal rate of 120 beats per minute. The doctor promptly called in other physicians to determine the cause of the problem. Before a diagnosis could be made, I

was born a month prematurely on September 11, 1944. I indeed had a heartbeat of only 48 to 60 beats per minute. The cause? A ventricular heart block.

A ventricular heart block sounds worse than it is. In my case this means that the atriums beat normally, but the ventricles do not always get the message. This causes my ventricular beat to be much slower, about 30 to 40 beats per minute, while the atriums are 60 to 80 beats per minute. Since the ventricles perform the real pumping action of the heart, I received only half the blood flow of the average person. The doctor believed that I was the first recorded case of this heart problem ever found before birth. My mother was informed that my life expectancy would be short because medical science had no remedy for this problem.

After a very difficult first year I began to stabilize and became stronger. It was necessary during my childhood to limit my physical activities severely. I had to take frequent naps and could not participate in physical education or sports in school. My circle of friends was almost completely made up of Jehovah's Witnesses, who were always understanding and considerate of my special limits, and yet they included me in their activities. The next time we consulted a doctor was when I was in my late teens, but he said that nothing else could be done.

I became resigned to my physical limitations, recognizing that I needed to observe a restricted life-style if I was to stay alive. After I was graduated from high school I found that I could do part-time work, and this helped to pay my expenses in the family. For about a year and a half I was able to "pioneer" every other month, spending at least 75 hours during these months sharing my Christian



Pacemaker embedded in the abdominal wall with electrodes attached to the heart wall

faith with others. This was a highlight of my early life.

Getting a Pacemaker

In late 1965 my aunt, who is a practical nurse, came in contact with a cardiovascular physician who had a strong interest in an advancing medical treatment called pacemakers. My aunt inquired of this doctor, explaining my particular circumstances. She asked whether a pacemaker would help me. An initial visit was arranged. After some preliminary tests, this unusually considerate doctor said that he was fairly certain the pacemaker would greatly improve my situation.

The doctor explained that the pacemaker is a small battery-powered electronic instrument that usually is completely encased in hard plastic, with a plug-in

connection for wires that go to the heart muscle. This reverses the polarity of the heart muscle's electric charge, causing the muscle to contract, thus pumping the blood. These regular electric impulses to the heart muscle cause a beat each time, resulting in reasonably normal heartbeats.

There are several kinds of pacemakers in use. Earlier kinds were fixed-rate units. These run undeviatingly at a preset rate, usually 72 beats per minute. However, the most common kind is a demand unit. When the heart does not pace itself, the unit senses this and takes over. But when the heart does pace itself again, the unit senses this and doesn't interfere.

The doctor said that he would like me to come to the hospital for some special tests, which included a heart catheterization. This final test involved making small incisions in my arms and inserting tubes through my veins all the way through to my heart. All the while I was awake and aware of what was happening!

At one time I had four catheters, two in each arm, inserted at the same time. Thus the doctors were able to examine the walls and chambers of my heart for holes or deformities. They were even able to insert the wires from a pacemaker right into the heart muscle and test to see if the pacemaker would correct my problem. The results showed that the pacemaker would override my heart block and bring my heartbeat up to the normal rate preset in the pacemaker. The doctors found no other deformities in my heart.

A month later, January 23, 1966, was the date set for the implanting of the pacemaker into my body. An incision was made in my abdomen, and the replaceable pacemaker unit was implanted. The reason for the placement in the abdomen area was that at the time I weighed only 95 pounds (43 kilograms) and that was the fattest part of my body! Another incision was made between my middle ribs. This was

needed in order to attach the wires from the pacemaker to the heart. The wires were actually sewn to the ventricular heart tissue to make a good contact for the pacemaker's electrical impulses.

Beginning of a New Life

I quickly recovered and was able to leave the hospital in 10 days. My friends and family noticed how beet red I was because of the extra amount of blood now rushing through my blood vessels. After convalescing for six weeks, I went back to work only to find that my job had been eliminated during my absence. After a short while I was able to find other employment, and none too soon, for now I began to develop new goals and attitudes.

The first thing that I did was to start changing my attitude from "No, I can't do that," to "Yes, I think I can." Oh, yes, I still had limitations, but I began to learn new boundaries, especially in the area of physical activities. I could now work full time. Eventually I moved into my own apartment, and for the first time in my life I thought about marriage.

I had met my wife-to-be the night before the first implant surgery. She still talks about how she thought this young man had some tall tale to tell, but later found out that it was all quite true. I started working very hard to pay off some \$2,000 (U.S.) of miscellaneous medical debts, and also to furnish a home for us after marriage. I was able to prove to my family and friends that I was physically capable of supporting a wife and family.

We were married in 1967. The expected arrival of our first child had quite a touch of anxiety to it. This was because we were concerned as to whether our child would inherit my heart defect. My doctor felt that the chances were so remote that we needn't worry about it, but we did anyway. When she finally arrived she had a healthy heart and we were greatly relieved.

Pacemaker Replacements

My pacemaker was a 24-month model, the batteries lasting only that long. Those two years seemed very short. Then I had to go back to the hospital for a replacement unit. This time the surgery was much easier. All that the doctor had to do was to make an incision, carve the flesh away from the pacemaker, uncouple its wiring, remove it and hook up the new one. Then he sewed me up. This was done under a general anesthetic, and took about an hour. I spent three days in the hospital, and was able to go back to work within a week.

At first the pacemaker felt like a large belt buckle on my waistline, and protruded slightly out of my stomach area. In time, as I went from 95 pounds to 130 pounds, the doctor was able to put the replacement in a little deeper, and it was less noticeable.

The next replacement was basically the same as the previous one. But then, in 1972, the doctor started using a new procedure. I entered the hospital as an outpatient, and the surgery was performed while I was awake; I could watch it! First, I was given a local anesthetic. An incision was then made and the old unit was replaced with the new one. This took nearly an hour, and except for the first incision and anesthetic shots there was no real discomfort. Obviously, though, being awake while you are being operated on can build some tension.

I found something to hang onto and gripped it so hard that my hands hurt afterward. I tried to keep my mind off what was happening by talking incessantly for that hour. Every slight movement that the doctor made was amplified in my body. It felt as if he was moving my insides around, although there was really little movement at all. When the hour was up we were joking and laughing. I then got dressed, and walked to the car for the drive home.

This new procedure is much less expensive, since the hospital stay is eliminated. Also, the recovery time is quicker, for the body does not have to overcome the effects of a general anesthetic. I was able to go back to work within three days.

Another advantage of the new pacemakers is that the doctor can make certain adjustments from outside the body. For instance, the required beats per minute, such as 60, 70, 80 or 90, can be set with the use of a small electronic box. Also, the intensity of the electronic impulse can be set to low, medium or high. Thus, if some change is required due to a medical problem or a period of extra activity, the heartbeat can be adjusted during an office visit. In 1973 I was able to go to Israel on a tour arranged by the Watchtower Bible and Tract Society. The doctor increased my heartbeat to 80 beats per minute, and this proved so satisfactory that we have kept it there ever since.

Blessings, Followed by Tragedy

This was a very happy time of my life. I had a wonderful wife, two beautiful daughters, a nice place to live and a job that allowed plenty of time for Christian activities. I also served as an elder in the Christian congregation. Many of my Christian brothers and sisters never suspected that I had been so severely limited earlier in life, or that I have a pacemaker controlling my heart.

Of course, I still didn't have all the energy I would have liked. So I had to apportion my energy for various activities—some for secular employment, some for time with the family, as well as for Christian meetings, preparing talks, and sharing with my fellow Witnesses in the house-to-house preaching work. This usually meant taking a short nap after coming home from work and before going to our meetings. I wasn't like most people; I had no backup or reserve whenever I would

overdo. But I made the mental adjustments necessary to be balanced in my viewpoint and activities.

Then one Sunday afternoon in the summer of 1975 my wife and I were driving over to my mother-in-law's home to pick up the children. They had stayed overnight with her. A young boy driving in the opposite direction fell asleep on a curve and hit us head on! Astonishingly, we were not killed, but we were both seriously injured. My ankle exploded, as I was still pressing on the brake pedal when we collided.

The paramedics took us to a local hospital. I first had the emergency room physicians check my pacemaker. It was still beating regularly, not having been affected by the accident. They sewed my lip and X-rayed my foot and leg. When the orthopedic doctor came to see me about my foot, I asked him: "Can you fix it?"

"Yes, I think so," he replied.

"Will I be able to walk again?" I wanted to know.

"We can't tell this early."

"Can you do the operation without blood transfusions, as I am one of Jehovah's Witnesses?"

"No," he said.

"Can you find me another doctor who will?"

Our family doctor had someone in mind. When I asked this doctor the questions just mentioned, I got the same answers except for the third one. He said: "It's a bit more risky without blood, but if you're willing, I am." So I said: "Let's go."

The doctor was able to take extra time in surgery because there was less chance of complications developing with the pacemaker's regular, controlled beating. The operation took about four hours and required two screws and two metal pins to hold the ankle together. With our family and the friends in our local congregation lovingly doing the housework and cooking

our meals, my wife and I steadily recovered. I am happy to say that I can walk again.

Happy Prospects

During this time we lived in the southern California area. But after talking with local traveling representatives of Jehovah's Witnesses and after prayerful consideration, we decided to move to a rural area in northern Arizona where we could be of greater help in advancing the preaching work of Jehovah's Witnesses. For the past couple of years now I have, off and on, been able to share in the "pioneer" work, and so has my wife. We have had many blessings in sharing the Bible's message with our neighbors and in working with our Christian brothers and sisters.

An artificial pacemaker has undoubtedly extended my life, and unquestionably has improved it. Due to my heart problems, I have become better acquainted than perhaps most persons with the operations of the heart. True, there are now many things that can and do go wrong with it, and, at best, an artificial pacemaker can only temporarily correct certain problems. But when the marvels of the heart are studied, it can be seen that the heart has the potential to keep on beating forever.

This potential exists because our Creator, Jehovah God, originally purposed for humans to live forever in happiness on earth. And that purpose is certain to be fulfilled, even as the Bible promises: "God himself will be with them. And he will wipe out every tear from their eyes, and death will be no more, neither will mourning nor outcry nor pain be anymore. The former things have passed away." (Rev. 21:3, 4) What a grand prospect, therefore, we have to look forward to! Yes, a new system is at hand where all will enjoy vigorous health, without even the slightest hint of trouble with their hearts or any other part of their bodies!—Contributed.

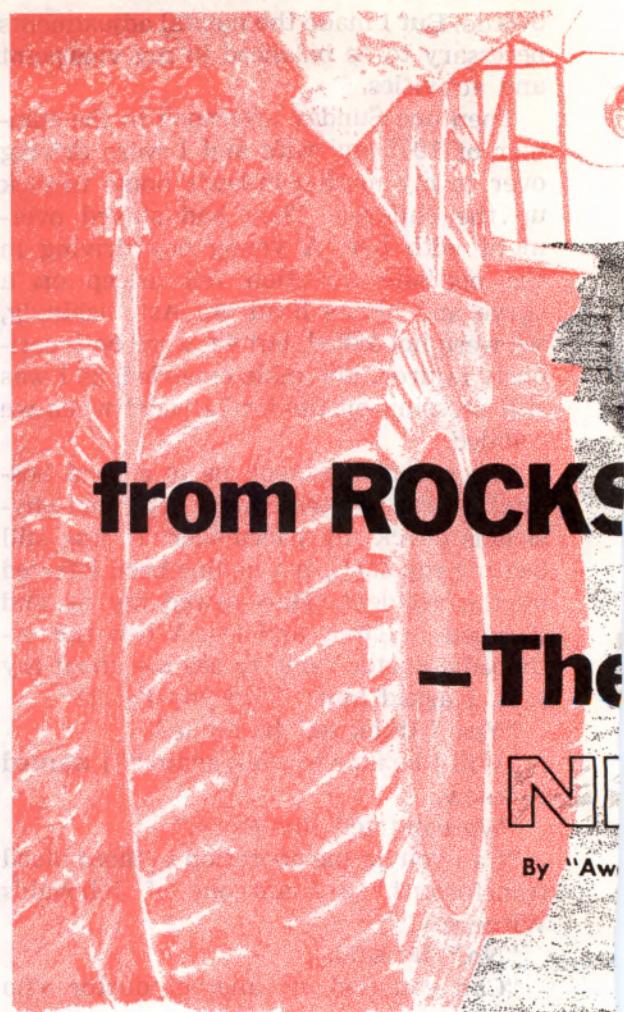
DURING the Middle Ages the alchemist's dream was that one day he would be able to turn iron into silver, and lead into gold. His tools were magic and secret formulas. For these, modern technology has substituted science and daring, banishing the alchemist into oblivion. At the same time technology has released useful materials and vast wealth from what previously was considered to be virtually worthless rock.

There are few places on earth, if any, where this is more evident than in the nickel-mining district of Sudbury, in the province of Ontario, Canada, the location of one of the richest mineral deposits known to man.

Origin of the Ore Bodies

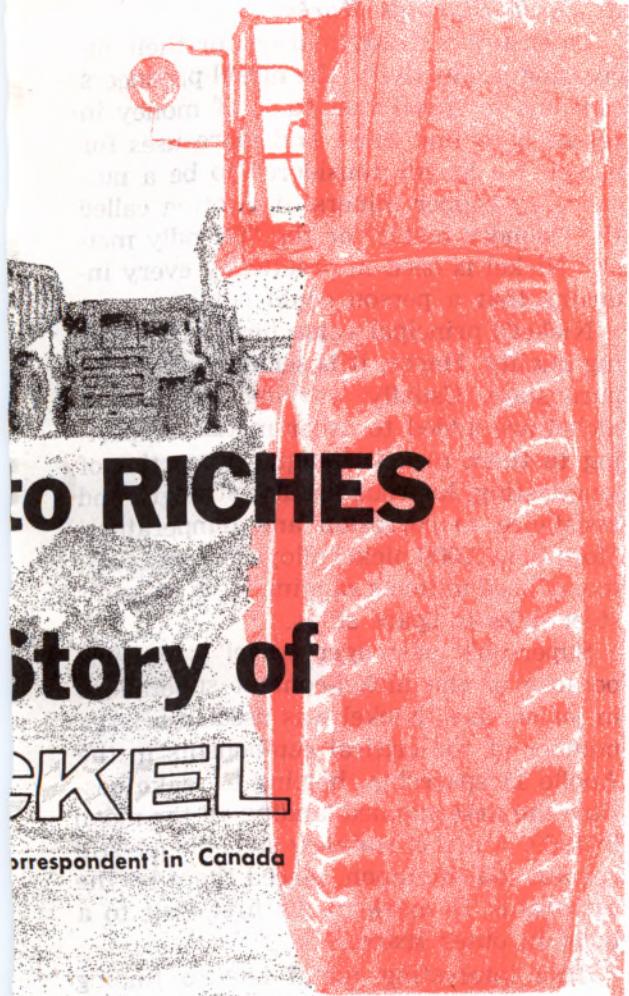
After years of trying to solve the riddle of the origin of this great storehouse of wealth, with its unique geological formations and unusual topographical features, many geologists now accept a theory that finds support from field examination and laboratory analysis. They believe that the rich Sudbury Basin, as geologists have named it, is actually the remains of an enormous crater blasted out of the earth's crust by a giant meteorite. They estimate that the meteorite was two or three miles (between 3 and 5 kilometers) in diameter and hit the earth with an impact 200,000 times as powerful as that caused by the blast of the atomic bomb dropped on Hiroshima, Japan.

The fact that shatter cones completely surround the Sudbury Basin tends to support the impact theory. These features are a peculiar conical form of fracture caused by tremendous shock waves that go through the rock, a characteristic of meteorite impact sites. Geologists have observed that there is more shatter-cone rock in the Sudbury Basin than in any other place on earth. This geological feature is so similar



to that found on the surface of the moon that in 1971 and 1972 the Apollo mission astronauts from the United States, in preparation for their landing on the moon to examine its geological features, trained for a while in the Sudbury area.

Geologists now believe that, after the meteorite impact, melted rock oozed up from the earth's mantle, carrying concentrations of nickel and copper minerals into the shattered crust. There they cooled and hardened into the huge ore masses that remained unknown and undiscovered until recent times.



Accidental Discovery

The ore in the Sudbury Basin was actually found by accident. In August 1883, railway construction crews in the area blasted a right-of-way through solid rock. An observant blacksmith discovered what proved to be copper- and nickel-bearing minerals. Immediately, news stories of important copper discoveries began to be circulated and prospectors rushed into the area to stake mineral claims.

Several mines were started, but, to many, it seemed they would be short-lived. The smelting process then commonly used did

not produce pure copper from this ore, but copper mixed with large quantities of nickel. At that time there were few uses for nickel and little demand for it. Indeed, it was then considered to be a troublesome rather than a valuable metal, because to separate copper from it with the then-known methods was difficult and costly. Interestingly, it was this fact that originally earned nickel its name.

More than 200 years ago some miners of Saxony in Europe tried smelting what they thought was copper ore, but which produced some unknown white metal instead of the copper they expected. Being superstitious and believing in spells and witchcraft, they concluded that Satan had cast a spell over their mine. Hence, they named the new metal "Old Nick's Copper," or, as they pronounced it in their language, *Kupfernickel*. Through the passage of years it became known simply as "nickel."

The success of the new Sudbury mining developments seemed to be completely dependent on solving the metallurgy problems of economically separating the copper from the nickel. No one at that time knew much about such a process, and there had been little incentive to develop one. Total world use of nickel was relatively insignificant, being mostly for nickel coinage and nickel plating. Therefore, the future did not seem to be bright for the new mines. They contained vast quantities of ore that was rich in a metal for which there was, as yet, no satisfactory smelting and separation process. Also, there was no substantial market for the finished product.

New Process Discovered

Considerable experimenting led to the discovery that, by adding niter cake during the smelting of the ore, an economical separation of the two metals could be effected. The vexing problem was solved.

This continued for many years to be a standard Canadian method for treating the unique Sudbury ores. It was, indeed, a technological triumph that would open the door to a whole new industry that would produce eventual wealth and benefits not even imagined at that time.

The North American nickel "industry" entered the 20th century revolving chiefly around two companies, one with a vast supply of the ore as a raw material and the other with a satisfactory method of separating the metals. The need to get together was obvious.

Through a succession of mergers and share exchanges beginning in 1902, there came into existence the giant industrial complex of corporations now known as the International Nickel Company of Canada, Limited, or Inco Limited. It is now Canada's biggest mining firm and the world's largest producer of nickel, delivering hundreds of millions of pounds (tens of millions of kilograms) of nickel yearly. Inco has proven ore reserves of over 400,000,000 tons. No less than 15 elements are recovered from its complex ores, including appreciable amounts of precious metals such as gold and platinum. It owns 19 mines in Canada and is represented in nearly a score of countries.

In more recent years, other companies have started nickel mining operations and this has increased the production of this metal for world use. One of the largest is Falconbridge Mines, Limited, incorporated in 1928 to develop a property examined years earlier by the famous American inventor-scientist Thomas Alva Edison. He had not been able to overcome certain technical problems, and abandoned the project. But Falconbridge succeeded, and today it is the heart of a mining and industrial empire that, like Inco, is truly international in scope. It is the second-largest employer in the Sudbury district.

Research Expands Market

To ensure a steady market for their increasing productivity, the nickel producers continue to spend vast sums of money in research to find more and more uses for nickel. No longer considered to be a nuisance by copper miners, it is often called the "wonder metal" or the "friendly metal." Nickel is used in practically every industry that a person could name.

Nickel's principal value lies in its alloying quality. Hence, it is seldom used in its pure state. Usually, varying amounts of nickel are added to other metals, imparting to them nickel's unique properties of long-lasting, lustrous beauty, strength and resistance to corrosion and temperature. More than 3,000 nickel alloys are now commonly used in items ranging from stainless steel sinks to space ships.

Supersonic passenger travel is possible because of the nickel-content superalloys in jet engines. Nickel was used in a large number of the critical components in the Apollo 11 spaceship, helping to make possible the first manned landing on the moon in 1969. A nickel-stainless-steel plaque still remains on the moon, placed there by the astronauts to mark man's first visit to a body in outer space.

This interesting metal is also finding increasing demand in construction as buildings grow taller. One nickel-steel alloy developed for constructional beams has the strength of conventional beams but weighs only one quarter as much.

Coinage provides an increasingly important example of nickel being used in its pure state. In Canada, for example, all coins, except the one-cent piece, are made of pure nickel. Nearly all the other nations use this metal in coinage either in its pure form or alloyed with another metal. One reason that countries are changing to nickel coinage is that the nickel coins last longer—proof of the toughness and wear-resistant qualities of the metal.

Effect on Environment

Many visitors to Sudbury and the immediate vicinity are heard to comment on how rocky and barren the area seems to be. Often they say that it resembles the surface of the moon. It is indeed "different," with much of the land surface being scarred and desolate-looking. So there has been a price to pay for seeking riches in the rocks of the earth. It should be noted, however, that the denuding of the countryside was not caused entirely by the mining companies. Many years before mining began, lumbering activities triggered the process of turning the forest-clad hills to virtual barren lands. After the lumbermen had removed the great stands of pine, prospectors moved in and burned off the fallen slash and thin topsoil—sometimes indiscriminately—to expose the rock underneath and facilitate their search for mineral deposits.

Later, there followed outdoor heap roasting of the rich ores nearby at Copper Cliff, Ontario. The resulting sulphur-dioxide air pollution poured over the countryside, destroying the remaining trees and vegetation. Subsequent erosion brought about complete devastation by 1920. Since those often-reckless days, improved technology and a greater awareness of the need for environmental protection and preservation have resulted in the reduction of emission of noxious wastes. Limits on such emissions have now been set by government authorities.

Tangible evidence of this interest in environmental protection and reclamation is

Inco's "superstack," which now dominates the Sudbury area skyline. Containing over 21,000 cubic yards (16,000 cubic meters) of concrete and rising to a height of 1,250 feet (381 meters), "superstack" represents an investment of \$25 million. It minimizes ground-level concentrations of sulphur dioxide by keeping the gases aloft as long as possible and diluting them by horizontal and vertical dispersion. Gases are conducted to the stack through a steel flue system nearly two thirds of a mile (nearly one kilometer) long. This takes place at speeds up to 55 miles (88 kilometers) per hour and at a maximum temperature of 735 degrees Fahrenheit (390 degrees Celsius).

Proof of the effectiveness of the varied efforts to reduce pollution and reclaim damaged areas can be seen in the many hundreds of acres of grass and rye now flourishing on what were formerly vast dumps for waste products. Insects and animals are returning, while geese and ducks can be seen using the small ponds within sight of the smelter areas. It is good to see men making efforts to preserve the God-given natural beauty in return for material benefits from earth's riches.

The development of more and more mines to produce nickel and the associated metals had a big impact on the people here, as well as on the environment. Millions of persons world wide have had their lives enriched by the development of some of the many uses of nickel. Are there yet other physical and chemical secrets in the rocks of earth's crust? Time will tell.

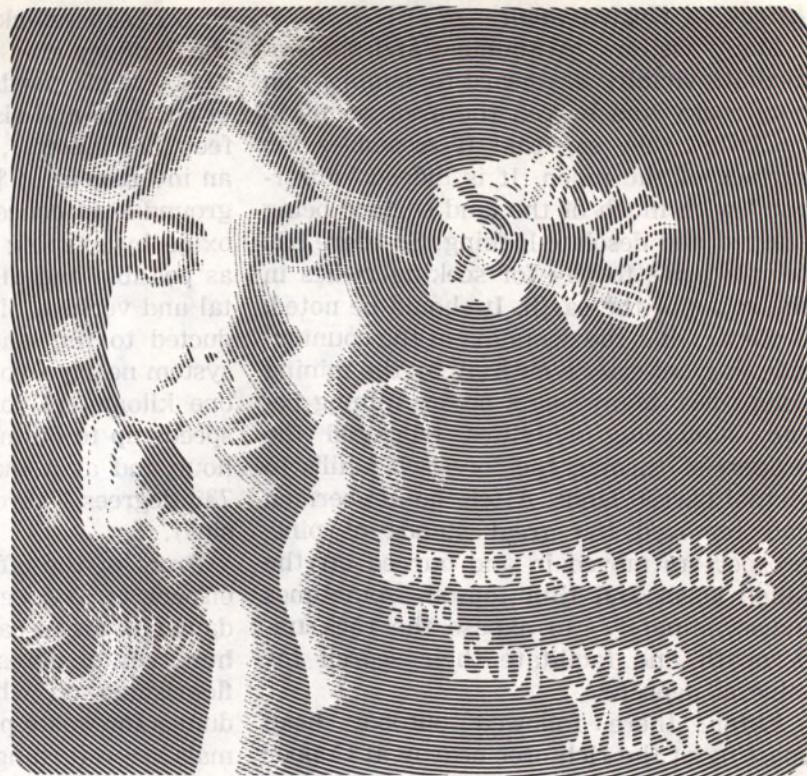
Selling the World

◆ The non-Communist world spends a yearly average of about \$25 (U.S.) per person to sell products by advertising. And the United States spends more than all the rest put together, according to the 1978 edition of *World Advertising Expenditures*. Americans are bombarded with over \$150 each in advertising, while Ethiopians each get about 3 cents' worth.

SOMEONE once said: "Music and noise are like two different boys—one so delightful, the other frightful!" Though different as Abel and Cain, and opposite as day and night, yet they originate in the same physical phenomenon, "sound." Whereas we may associate noise with sound that is harsh and upsetting (sometimes frightful), music can be soothing and relaxing (sometimes delightful). Haven't you noticed how music can stir within us uplifting emotions of joy and exhilaration, much like an updraft that carries a soaring bird aloft? At other times though, music can bring down on us a melancholy feeling, even sadness and tears.

What Is Music?

Music has been called an "international language." Why? Because people who do not speak the same tongue can communicate through enjoyment of the same music. Moreover, music has worldwide appeal because it touches just about every aspect of human life. We have love songs, wedding



Understanding and Enjoying Music

songs, cradle songs, "girl and boy" songs. We have popular and classical music, Oriental and Western music, folk songs and "rock." There is sophisticated music, sometimes with a "Latin beat." There is also the very lovely and captivating waltz. And, have you not tapped your toes or clapped your hands in time with a lively polka or a stirring march? Quite likely you have. Yes, a beautiful song that employs a few musical chords appeals to our ears much the same as a fine combination of colors pleases our eyes. Why, even commercial advertising tries to "hitch a ride on the bandwagon" by setting its ads to music!

In some way, due to our makeup as humans, melodious and harmonious sounds can have a deep and emotional impact on us. Especially is this so when they are coordinated with the right tempo, and perhaps accompanied with appropriate words, or lyrics. Music is "organized sound." Some of the ingredients used in organizing the sound of music include such things as the musical staff of five parallel lines and their respective "ID cards" or "clef" signs. Then there are "sharps" and "flats" that alter the character and pitch of the notes without changing their names. The different appearances of the notes indicate varying time or duration of the sounds

that they represent. Placed higher or lower on the lines of the staff, they signify higher or lower pitches of sound. This is written music. And the sound of music is the result of someone's playing a composer's arrangement of these ingredients in suitable patterns. Music is therefore an art form that exists in the realms of sound and time.

When sound comes to our ears, something is vibrating—a violin string, a drumhead, the reed of a pipe. What happens is that air is set in motion. Like the disturbed surface of a placid pool when a pebble is dropped in, the ripples and waves of air circle out from a source until they make our eardrums pulsate—and we hear sound! Without air there would be no sound. We can thank God for our wonderful hearing and all the related creation about us that makes such communication possible.

Tones at different pitches are sounded by a wide variety of musical instruments, the earliest of which doubtless was the human voice. When tones are arranged in a recognizable pattern for one voice, the result is "melody." Since voice flows like a stream, melody might be said to be "horizontal music." If different pitch-sounds are heard simultaneously, as in a chord, "harmony" has been produced and we may think of harmony as being "vertical music."

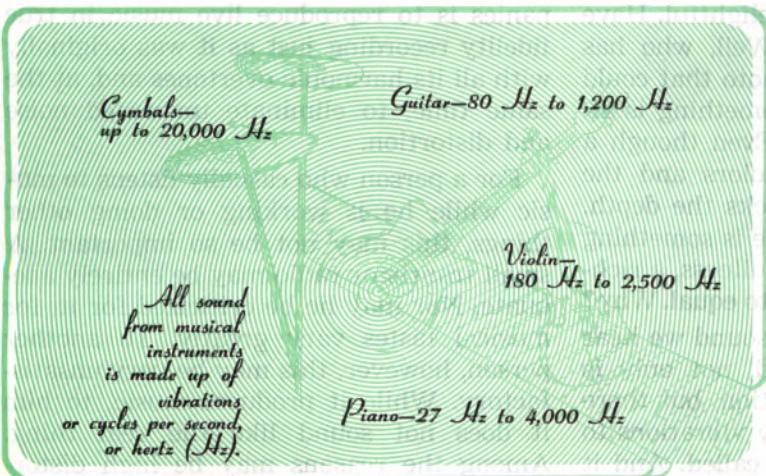
Harmony in music is primarily of two types: "concord" and "discord." Yes, that's right! Discord, or "dissonance," as it is sometimes called, is essential to music. Why? Because without dissonance there would be little or no sense of motion or movement to the music. For instance, when a piece of music comes to its end, it gives us the sense of "close," or rest. The end has been accomplished, and we

are given the feeling of satisfaction.

Counter-Melody

When "vertical music" or harmony flows in agreement with fixed rules of musical progression, very suitable accompaniment can be supplied to a well-known melody, or piece of "horizontal music." With special attention being given to the patterns of harmony, a "counter-melody" can be devised. Our understanding and enjoyment of music are enhanced when we listen for these patterns of supporting melody as they move along with, or move in contrary motion to, the main melody. For example, as the violins of an orchestra are playing a well-recognized melody, listen to see if you can pick out a supporting melody as played by a French horn or an oboe. Thrill as you hear a passage in which flutes repeat a previously played pattern!

In this way, we are aided to appreciate the "flow," or the forward movement, of the music. Repeating patterns serve as "mileposts," so to speak; we become conscious of them, await their return, and enjoy the satisfaction of their fulfillment. Like proph-



ecy of the Bible, they excite us as we learn of them; we anticipate keenly their fulfillment, and Oh, what satisfaction we realize with their blessings!

The Gift of Hearing

Without God's gift to us of our marvelous hearing there would be no music, or, at least, we would not be able to enjoy it. To understand and enjoy music, it must all sound within the range of our capability. Though it varies from individual to individual, it is generally accepted that human limits of ability to hear range from 16 vibrations, or "cycles," per second up to 20,000 cycles per second (abbreviated to "CPS"). A more recent term used today in electronics for "cycles per second" is "hertz" (Hz). The notes produced by all musical instruments fall well within these limits. For instance, the violin's limit is from a mere 180 Hz up to 2,500 Hz. The guitar goes a little lower with 80 CPS up to 1,200 CPS. What goes the highest? Well, the cymbals can produce vibrations up to 20,000 Hz. In an orchestra, the piano usually has the distinction of the widest frequency range, running from 27 CPS to 4,000 CPS.

Overtones Give Qualities to Sound

Most people will agree that "live," "in-person" music is the most delightful. Have you ever wondered why? Well, who has ever seen a painting or a photo that could equal the original scene? Something is always lacking in the copy. Even though a photo reproduces all the colors and the details of the original, it lacks the depth. In much the same way, there is something about live music that has a fullness, a richness, a depth that is difficult to equal. Why?

The light we see and the sound we hear are all vibrations. In sound, not only is there a main or basic vibration, but there are also partial or secondary vibrations to the "fundamental," as it is called. And it

is these partials, or "overtones," that give the richness, the fullness, the depth to the original, so difficult to reproduce in the copy. As a matter of interest, it is the enhancing, or the inhibiting, of these overtones in the original that causes us to understand that the music we are hearing is string music, or is flute music, or, again, can be the identical note played on a bagpipe! This quality of sound can be identified by the combination of overtones, called "timbre," normally produced by a brass instrument, for example, as compared with a stringed instrument, or one that is a pipe of air vibrated by a reed.

How We Can Enjoy Music

Very few people have the talent or the means to enjoy live music, yet millions continue to be entertained by good high fidelity reproduction. In radio there are AM and FM stations. FM is usually preferred due to its almost noise-free reception and its wider frequency range in music transmission. In many countries now FM stereo stations are quite popular, not only because many exercise restraint in programming, but because of their ability to reproduce in large measure the overtones that we have been discussing. In addition, high fidelity records and tapes are available. The ideal of recording companies is to reproduce live music in true fidelity recording just as it was originally with all its harmonic overtones and, at the same time, to eliminate unwanted noise and distortion.

For a person who casually listens to music while he is working or doing other things, this may not be so important. A small transistor radio may be entirely adequate. Nor may he be criticized for it, for musical tastes vary greatly. To another person, however, this may be very unsatisfactory. While it produces music, to him it does not sound like the real thing. Among the reasons may be high distor-

tion and limited range frequency. The lack of pure musical sound, along with noise and distortion, may cause this person to turn it off rather than to continue listening.

Low distortion is important in fine music reproduction. In the case of records, distortion may come from a poor quality cartridge or needle. Certain tapes are higher than others in distortion and hiss. The amplifier and speakers also have much to do with high-quality sound. If figures are available, it would be good to check the distortion level and frequency range. Some models may show a distortion level as high as 1.5 percent or more, while a superior product may read .04 percent or lower. Frequency range figures are important, too, but they can be misleading.

One authority, after much research on preference tests, put it this way: "Ninety percent of all listeners will be completely satisfied with a bandwidth of 60 to 8,000 CPS." So it would appear that the majority of persons are not as particular as some advertisers would have us believe. Of course, this by no means applies to everyone. Some have a keen sense of hearing, and their enjoyment of music is affected by distortion and lack of full range. In which class do you belong? In the end, it is your ear that is the best judge for you. Pick from what you can afford the sound that pleases you best.

Keeping a Balanced View

Music, like other pleasures, has its limitations. After a hard day's work it can be very relaxing before retiring. Some find it to be a stimulus from mild depression. However, it should not be looked on as the answer to everything. If one has a problem that requires action, listening to music will not get the job done. Also good to remember is that, for most persons, serious thinking and meditation require silence. However, some seem to be

so addicted to music that they feel they must have it playing constantly. And a common complaint from neighbors is that music is played with too much volume by some. It would seem that some fans are oblivious to the fact that not everyone shares their enthusiasm and taste. If a person lives in close quarters with others who can be disturbed, perhaps his enjoyment of music might be solved by means of a set of headphones. If not carefully controlled, music can also consume much time and, in this way, create more problems than it solves.

To illustrate this, let's take a brief look at some very famous people who made music their main interest in life, sometimes to the neglect of other things that should have received more of their attention. Ludwig van Beethoven is looked on as one of the greatest composers of all time, yet we are told that he had a very disorderly personal life. Another, Franz Schubert, who is said to have composed one of the most beautiful symphonies of all times, once described himself as a very unhappy man.

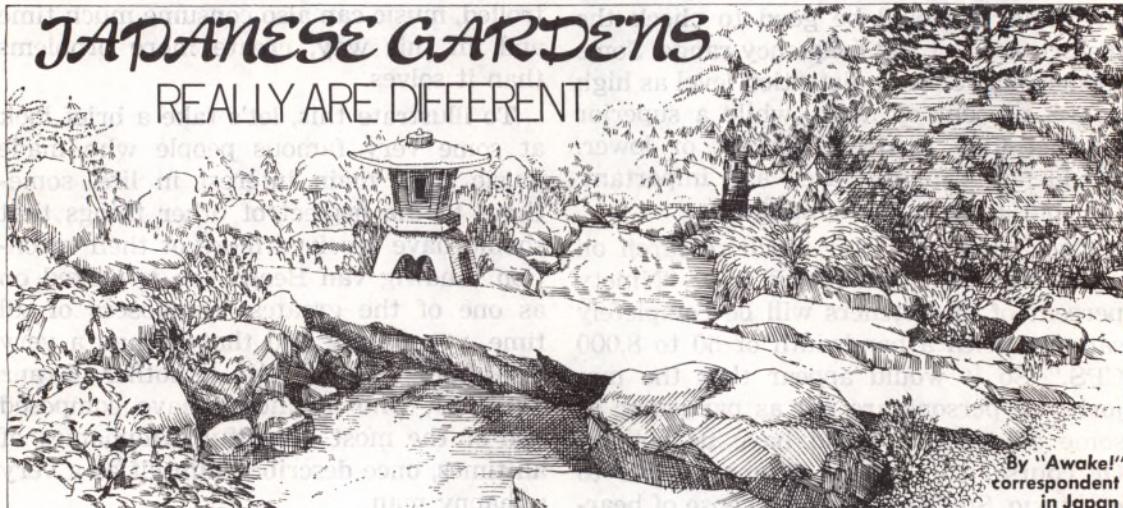
Nor do these emotional depressions belong only to artists of the past. The late Hank Williams, one of the most popular of Country and Western singers of his time, used to sing a religious song entitled "I Saw the Light." But, did he? On one occasion, after singing this song, he is reported to have burst out in tears and sobbed that he saw no light. His life ended tragically from an overdose of drugs, taken while en route to a singing engagement.

Yes, these were persons who lived for music; it was their entire life. We might well say that music to them was like a few snatches of sunlight on a tempestuous and storm-tossed sea! Whatever fleeting joy they got from it was all too soon clouded over by the gloom of personal problems. For those who seek a balanced and happy

life, such musicians are warning examples.

While most of us live as listeners, and not as performers, the above lesson is the same for both. Too much time spent playing, or listening to, music is not good. Music is a very beautiful thing, yes! But it is just ONE of God's wonderful gifts to mankind. There are other gifts too—our

families, our friends, our work, our Christian service. These also require our attention. If we can wisely keep music in its place—ready to be used when needed and wished for, not crowding out other responsibilities—we may well continue to understand and have a wholesome enjoyment of music throughout our years.



By "Awake!"
correspondent
in Japan

IS YOUR garden a border of spring flowers or summer roses around a well-clipped lawn? If so, you probably live in a Western country, where a garden often consists of flower beds that change in makeup with the seasons. In Japan, however, many gardens are quite different.

What would you think of a garden composed entirely of rocks and sand? A famous dry-landscape garden exists in Kyoto, Japan. It is the rock garden of the Ryoan-ji, a type of garden known as *kare-sansui*. This expression means "dry mountain water." The mountains are represented by 15 rocks of various shapes and sizes. These are carefully arranged in the "water," represented by raked white gravel. No flowers or plants of any kind can be

seen in this garden. It is a creation influenced by Zen Buddhism, with its emphasis on abstract thought and "nothingness."

This kind of rock garden is just one form of Japanese landscape gardening. Another is the moss garden at Saiho-ji in Kyoto, where 50 different varieties of moss form a velvet carpet under the ancient trees. Many other beautiful gardens are large enough to have ponds and streams, stone bridges and lanterns, pine trees and flowering shrubs.

History of Landscape Gardening

The earliest account of Japanese gardens is found in the *Nihon-shoki* (Chronicles of Japan) written in the eighth cen-

tury C.E. There we are told about a bridge and the representation of a mountain made in the southern court of the palace of Empress Suiko in the year 612. This seems to have been one of the first steps toward the development of landscape gardening as we know it today.

Later, from 1185 until the restoration of Emperor Meiji in 1868, the country was under the rule of successive shoguns, or war lords. These men, though fighting bitter battles with one another, took great interest in landscape gardening. In some gardens the ponds and streams were enlarged to such an extent that the guests could enjoy a boat ride and admire the scenery from various vantage points. Some of these splendid gardens remain to the present day.

One striking example is the garden of the famous Kinkaku-ji, or Golden Pavilion, in Kyoto. This was built in 1397 by Yoshimitsu, third shogun of the Ashikaga family. Though the pavilion was destroyed by fire in 1950, it has since been restored. The pond and surrounding garden are reminders of the splendor enjoyed by the then-existing ruling class.

One reason for the permanence of these old Japanese gardens is the use of rocks, sand and stone ornaments. Trees grow old, bamboo fences and thatched roofs decay, but the rocks remain in the form of stone bridges, lanterns, water basins and stepping stones along the paths leading to the tea house.

Home Gardens in Small Spaces

Though little is known of the gardens of the common people of early times, we know that the love of "nature" remained strong in the hearts of the Japanese people. Their ancestors, following the Shinto religion, worshiped mountains, trees, rivers and lakes, as well as the sun goddess. Even today one may see a very old tree

with a twisted straw rope tied around its trunk, indicating that it was recognized as a sacred tree.

In modern times, the Japanese have utilized the smallest of spaces to make a garden. It may be just a few carefully arranged rocks, a leaning pine tree and a small shrub. But what about people living in huge apartment complexes? How can they enjoy the pleasure of having their own garden? Here is where miniaturization comes into the picture.

Can you imagine some mountain and sea scenery on a small tray measuring about 50 by 30 centimeters (20 by 12 inches)? This is called *bonkei*, which means "miniature landscape on a tray." Here we have a small rock, some 10 centimeters (4 inches) high, shaped like a mountain and sloping down to rugged cliffs and an island-dotted sea complete with white-crested waves. There are even boats and fishermen with hair-thin fishing lines. Or, the scene may be Mount Fuji capped with snow, and below it a miniature house with thatched roof and tiny sliding doors. Another model is a garden complete with lantern, shrubs and trees no more than three centimeters (about an inch) high. In these tray gardens the seas, rivers and ponds are made of sand. Yet they are so realistic that the apartment dweller can enjoy an ocean view or a pastoral scene even in his small front entrance.

Bonsai is yet another art in which the Japanese excel. These are living trees and plants kept to miniature proportions by careful pruning of stems and roots. A grove of maples may be growing in a shallow pot small enough to hold in the palm of one's hand. Or, a gnarled pine tree 50 centimeters (20 inches) high may turn out to be 150 years old. These miniature trees and plants are often handed down from generation to generation and are regarded as family treasures.

A Visit to Gyoen Garden

But, now, why not come with us in November to see the far larger Gyoen garden in Shinjuku? This is a large park covering more than 57 hectares (140 acres) in one of the busiest parts of Tokyo, just a 15-minute walk from Shinjuku station. Nearby are some of Tokyo's highest skyscrapers, with large department stores and underground shopping centers. What a surprise when we go into the Gyoen park and see wide stretches of green lawns, hundreds of large trees, shrubs and rose gardens! This part of the garden is in Western-style, having been designed by French horticulturist Henri Martinet. We see tulip trees, plane trees, magnolias and beautiful Himalayan cedars. Some of these cedars now reach a height of 50 or 60 meters (165 or 197 feet) and their branches spread out to give shade to the many visitors who come sight-seeing or just to enjoy some recreation with families and friends on the wide expanse of green grass.

Continuing our stroll, we come to a small pond with a bridge leading to an island. The stone lantern in the center of the island makes us realize that we are leaving the Western-style garden and are seeing things that are typically Japanese.

Nearby there is an open booth with walls and a roof of fine bamboo stems plaited together. With its royal purple trimmings, this booth is truly a suitable place to show off chrysanthemums. Just look at that plant! The branches have been trained to make it dome-shaped, and more than 350 lovely yellow flowers come from the one main stem. Farther along the route, we see similar displays—some pure

white and others pink or dark red. It is a marvel that one plant can produce so many flowers. Turning a bend in the path, we come to other booths, each one housing a different type of chrysanthemum. Some plants have hundreds of small flowers, falling in cascades about two meters (6 feet) from the top, while others are just about 30 or 40 centimeters (12 to 16 inches) high, looking very dainty in pale pinks, yellows and whites. And here is something quite different—just one beautiful flower crowning a single stem. Each bloom is about the size of a saucer, some with broad curled petals, others with fine spidery petals. Outside flower beds contain medium-size plants with blooms of varying colors. At one time the number of varieties growing here exceeded 800—truly a tribute to the skill of the Japanese gardener.

Now as we cross an arched bridge, the water in the pond below begins to ripple. Look at those fish—red-, gold-, black- and silver-speckled carp. Some of them are 50 centimeters (20 inches) long. When the carp hear people talking, they come to the surface, joined by an inquisitive turtle, and the visitors enjoy feeding them with scraps from their lunch box. No wonder the fish live to a ripe old age! Some of these are said to be over 16 years old.

We have enjoyed our visit to the Gyoen, especially since we were able to compare the beauty of Western and Japanese types of gardens. Both are made possible because of what our Maker has done for us. He has endowed us with a sense of beauty and has provided an abundant variety of plant life to satisfy one aspect of this sense.

Shakespeare's Quoting of the Bible

Columnist Sydney J. Harris recently pointed out that William Shakespeare incorporated into his plays more than 1,000 Biblical references. "Thus," he explains, "many people imagine they are quoting Shakespeare when they are really quoting the Bible."

The Bible's View



WHEN in Jerusalem for the Festival of Booths of the year 32 C.E., Jesus made a statement that has become famous world wide. The Gospel account by John reports it in this way: "Jesus went on to say to the Jews that had believed him: 'If you remain in my word, you are really my disciples, and you will know the truth, and the truth will set you free.'"—John 8:31, 32.

What did Jesus mean by "the truth" that would set people free? Was he talking about true teaching as opposed to lies? Or did the Son of God have something else in mind?

We will be better able to identify the truth mentioned here by considering the manner in which those Jewish hearers of Jesus needed to be 'set free.' To that end, let us pay close attention to the context in which these well-known words are found.

Concerning the response of Jesus' hearers, John relates: "They replied to him: 'We are Abraham's offspring and never have we been slaves to anybody. How is it you say, "You will become free"?' " (John 8:33) Though they had been subject to Gentile kingdoms for centuries, the Jews viewed their fleshly descent from Abraham as a guarantee that they were actu-

What "Truth" Will Set People Free?

ally free. The Bible commentary by John Peter Lange explains:

"Because they were Abraham's seed [offspring] . . . , they claimed, according to Jewish theology, not only freedom, but even dominion over the nations. . . . these words [that they never had been slaves to anybody] can only mean: Often as we have been under oppression (under Egyptians, Babylonians, Syrians), we have never acknowledged any oppressor as master, but have always submitted only from necessity, reserving our right to freedom, and striving after it. . . . And to this day it stands among the fifteen benedictions which should be said [by Jews] every morning: 'Blessed art Thou, that Thou hast not made me a slave.' "

But Jesus pointed out that his hearers were indeed slaves. In fact, their slavery was worse than subjugation to Gentile powers. "Most truly I say to you," continued Jesus, "Every doer of sin is a slave of sin." (John 8:34) He knew that his listeners were habitual 'doers' of things contrary to the will and law of God. The basic reason for this is that by inheritance all humans are sinful; that is, they fall short of fully reflecting godly qualities of personality. (Rom. 3:23) This sinful condition results also in aging and death. (Rom. 5:12; 6:23) Fleshly descent from Abraham could not give them freedom from slavery to sin.

Refusal to admit their slavery put the Jews in a dangerous position. Jesus explained: "The slave does not remain in the household forever; the son remains forever." (John 8:35) A slave had no inheritance rights and could be dismissed at any time. (Compare Genesis 21:8-14; Galatians 4:30.) Only "the son" actually born or adopted into the household would remain "forever," that is, for as long as he lived. Since the Jews to whom Jesus spoke were indeed slaves, they were in danger of being expelled from the household of

God's worshipers.—See Matthew 8:11, 12; 21:43; Romans 11:15, 17, 19.

What now is "the truth" that can bring freedom from enslavement to sin? Jesus identified it in his next words: "If the Son sets you free, you will be actually free." (John 8:36) That freedom-giving truth was regarding "the Son," Jesus himself, the only-begotten Son of the God who is the source of all freedom. (2 Cor. 3:17) The same point is made at John 1:17, which states: "The undeserved kindness and the truth came to be through Jesus Christ."

In what sense did "the undeserved kindness and the truth" come through Jesus Christ in contrast to God's law through Moses? The Law served as a tutor leading to Christ. (Gal. 3:23-25) It contained shadows or prophetic pictures that attained fulfillment in Christ. In this regard, the apostle Paul writes: "Let no man judge you in eating and drinking or in respect of a festival or of an observance of the new moon or of a sabbath; for those things are a shadow of the things to come, but the reality belongs to the Christ." (Col. 2:16, 17) Accordingly, "the undeserved kindness and the truth came to be through Jesus Christ," because Jesus put the things foreshadowed by the Law into the realm of actuality, "reality."

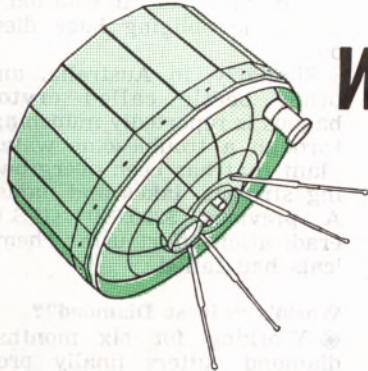
How can Jesus Christ as "the Son" set people free from sin? The 'shadows' of the Mosaic law included sin-atoning sacrifices. (Lev. 4:20, 26) Concerning the reality that those sacrifices foreshadowed, the apostle John writes: "He [God] loved us and sent forth his Son as a propitiatory sacrifice for our sins." (1 John 4:10) Jesus could offer his human life as a sin-atoning sacrifice because he was perfect, sinless, and a Son of God. Since sin entered the world by the disobedience of one perfect man, it could be removed by another perfect man who pursued a course of full

obedience to God, his Father. The apostle Paul writes:

"If by one man's trespass many died, the undeserved kindness of God and his free gift with the undeserved kindness by the one man Jesus Christ abounded much more to many." (Rom. 5:15) "So, then, as through one trespass [that of Adam] the result to men of all sorts was condemnation, likewise also through one act of justification [by Jesus Christ] the result to men of all sorts is a declaring of them righteous for life. For just as through the disobedience of the one man many were constituted sinners, likewise also through the obedience of the one person many will be constituted righteous."—Rom. 5:18, 19.

As regards Jesus Christ, the one to whom "the reality belongs," the sacrifices under the Mosaic law pointed to him. The Scriptures further state: "[Men under the Mosaic law] are rendering sacred service in a typical representation and a shadow of the heavenly things." (Heb. 8:5; compare 10:1-4.) "For if the blood of goats and of bulls [presented on the Day of Atonement] and the ashes of a heifer sprinkled on those who have been defiled sanctifies to the extent of cleanness of the flesh, how much more will the blood of the Christ, who through an everlasting spirit offered himself without blemish to God, cleanse our consciences from dead works that we may render sacred service to the living God?" (Heb. 9:13, 14) "This man [Jesus] offered one sacrifice for sins perpetually."—Heb. 10:12.

What, therefore, is "the truth" that can set people free? That truth revolves around Jesus Christ who is the fulfillment of the typical system of sacrifices under the Mosaic law. Since Christ's sacrifice brings freedom from sin and its consequence, death, Jesus himself could say: "God loved the world so much that he gave his only-begotten Son, in order that everyone exercising faith in him might not be destroyed but have everlasting life."—John 3:16.



Watching the World



"Collision Course"?

◆ "It now seems apparent that there is developing a collision course between government and organized religion," according to a statement made at the opening of the recent U.S. National Conference of Catholic Bishops. "During the next 25 years, the process of government in the United States will inevitably wrestle with, and resolve in some fashion, the question of whether or not churches are to be favored institutions under our system of law." Cardinal Krol of Philadelphia complained of the government's growing "mass of regulations, rules, licensings, directives and demands for information." And Archbishop Bernardin of Cincinnati stated: "This growing intrusion of government into church affairs is something we must monitor and that we must resist."

Pluto "Changing"

◆ New observations of the planet Pluto have produced surprising, previously unknown facts about its nature. The recent discovery of Pluto's satellite, Charon, resulted in revising estimates of the size and the mass of the planet drastically downward, "making Pluto the smallest and lightest planet in the solar system—even smaller than our own moon!" according to As-

tronomy magazine. The mass of Pluto also has been calculated to be 40 times lower than current estimates, a density little more than that of water. "It can be nothing more than a low density snowball of frozen gases," remarks *Astronomy*. And, at an estimated 40 percent of Pluto's size, Charon is larger in relation to its planet than any other moon in the solar system.

Rights and Responsibilities

◆ The recent U.S. Department of Health, Education and Welfare (HEW) booklet, *Your Legal Rights & Responsibilities—A Guide for Public School Students*, considers the matter of flag ceremonies. It states: "YOUR RIGHT: You may not be forced to take part in the salute to the Flag or Pledge of Allegiance if doing so violates your beliefs or values." The booklet calls attention to a 1943 Supreme Court decision on the matter, saying that "the Court noted that the [Jehovah's] Witnesses were in no way interfering with the rights of others when they refused to participate" on religious grounds. Under the heading "YOUR RESPONSIBILITY," it goes on to say: "If you refuse to participate in the salute to the Flag or Pledge of Allegiance, you may not disrupt the activity of

others who choose to do so."

Talmud for Hotels?

◆ Jerusalem's modern Hilton Hotel recently had its kosher status removed by the city's chief rabbi, a cause for great concern in a hotel that entertains tens of thousands of Jews each year. Rabbi Bezalel Zolty complained that Jewish hotel employees were working on Saturdays. According to *Time* magazine, Zolty demanded that the hotel "use only automated equipment and non-Jewish employees to heat food and wash dishes on Saturdays; abolish Saturday check-out except for emergencies; and program hotel elevators on the Sabbath so that Jewish users will not have to push floor buttons."

"Love Never Fails"

◆ The *Washington Post* reports that the B'nai B'rith Women Children's Home has an "astonishing 70 percent recovery rate with severely disturbed children." When asked the reason behind this success, Yecheskiel Cohen of the home's staff merely answers: "Love." And when questioned further about the details of therapy, he again answers: "Love." Such experience is just another illustration of the practical value in the Bible's observation: "Love never fails."—1 Cor. 13:8.

Assured Milk Delivery

◆ Great amounts of milk used to go to waste when the weather was too bad for a delivery boat to take it from Ameland Island's 70 farmers to the nearby Dutch coast. The Dutch solved the problem by building, in six weeks, the world's first undersea milk pipeline, 14.85 kilometers (9.23 miles) long. Rather than pumping the milk, which damages it, the daily 30,000-liter (8,000-gallon) delivery is separated with rubber plugs and pushed through the line by compressed air.

"Lead Balloon" Flies!

◆ The proverbial lead balloon has had a bad reputation as the ultimate put-down of ideas that, so to speak, "won't fly." According to a recent report in *Smithsonian* magazine, researchers at Arthur D. Little, Inc., in Massachusetts, "decided to test the phrase with—what else?—trial balloons." They built frames of three different shapes and covered them with lead foil, then filled them with helium. A cube-shaped one didn't get far before it ripped and fell. A round one stayed up for about a mile, and a third one, shaped like an oblong watermelon, "was last seen heading out to sea," says *Smithsonian*.

Work and Conscience

◆ When a man was suddenly assigned to make weapons parts by his employer, he quit the job for conscientious reasons based on his religious beliefs. An Indiana appeals court recently ruled that he could receive unemployment compensation, since his joblessness could not be considered his own fault.

Where Fat Is Beautiful

◆ King Taufa'ahau Tupou IV of Tonga, at 380 pounds (172 kilograms), is said to be the world's heaviest monarch. Both he and his subjects are pleased with this distinction, and they, too, aspire to heavyweight stature. Fat is beautiful for the 100,000 inhabitants of these Pacific islands, where food is "put on a pedestal." "We don't like thin people, but we aren't really in love with fat," according to Tongan anthropologist 'Epeli Hau'ofa. "It's food that is admired. We just can't stop eating." Until recently the hefty islanders remained relatively healthy for their weight. But now, according to a report in *The Wall Street Journal*, "wholesome innocence [has] ended with the arrival of junk food." And diseases associated with over-

weight in the Western world have begun to take hold.

Keeping Greenland Sober

◆ Beginning in the spring, the people of Greenland reportedly will have to use coupons based on "points" to buy alcoholic beverages. It seems that the Provincial Council became alarmed, not only at the way Greenlanders were following the example of the Danes among them in "social" drinking, but also at how they were using the alcohol to "drown" their problems. Fights, petty crime, suicides and murder rates jumped. A monthly ration of 72 points will determine how much adults can buy. Beer is one point, wine six points (a bottle) and spirits 24 points. The rationing also applies to drinks at restaurants. No points may be carried from one month to the next.

"Sacred" Cow Causes Deaths

◆ After swerving to avoid hitting a "sacred" cow, a loaded bus crashed into a flooded ravine in West Bengal state, India. United News service of India reports that 88 persons were killed and 20 others injured—quite a price to pay for the Hindu belief that a person's ancestors may be reincarnated into cows and other creatures.

Beetle Weed Killers

◆ A Cornell University scientist thinks that he may have found the ideal weed killer. The Argus tortoise beetle, often called the goldbug because of its shiny armor, eats only plants in the bindweed family, even dying rather than eating other plants. Bindweed infests crops of cereals, fruits, and especially potatoes. Professor G. Wilbur Selleck says that he noticed an explosion of the beetles in a cornfield that he was using for herbicide experiments. "By mid-July," he says, "not a single bindweed plant could be found in the

entire area of infestation." Then the obliging bugs died out.

Similarly, in Australia, another beetle called cryptocephalus is reportedly munching through a troublesome water plant that has been overgrowing streams, lakes and dams. A previous \$200,000 (U.S.) eradication effort using chemicals had failed.

World's "Finest Diamond"?

◆ Working for six months, diamond cutters finally produced what its owners call the "finest diamond in the world." Temporarily called the Big Rose, it has 189 facets and weighs 137.02 carats. Though only the world's 14th largest cut diamond, it is claimed to be the most valuable because of the cutting and polishing techniques used and its top rating for blue-white purity. "More than half of Big Rose went up in dust during cutting and polishing," reports London's *Daily Telegraph*. The stone from which it was cut, the Premier Rose, was found at the Premier Diamond Mine near Pretoria, South Africa.

Blind Leading Blind?

◆ A questionnaire including the query: "Do you believe the Bible to be God's inspired Word?" was sent to 10,000 clergymen. According to the publication *Pulpit Helps*, the percentages, by religion, of clerics answering No are as follows: 89 percent of Episcopalians; 82 percent of Methodists; 81 percent of Presbyterians; 57 percent each of Baptists and American Lutherans.

Something Wrong

with System?

◆ To keep the prices that farmers receive for their products above specified levels, agencies of the European Economic Community (EEC) buy up surplus produce. Last year such food amounted to about 201,000 long tons (225,000 short

tons), at a cost to taxpayers of over \$30 million (U.S.). The amounts of some of these fruits and vegetables expressed in long (and short) tons are: cauliflower, 30,000 (34,000); tomatoes, 23,000 (26,000); peaches, 60,000 (67,000); pears, 41,000 (46,000); oranges, 16,000 (18,000); and mandarins, 28,000 (31,000). What happens to all this surplus food? "Some of it was distributed free of charge to charities or used in animal feed," reports the London *Times*. "But a considerable amount was simply destroyed."

"Travel-Happy" Germans

◆ Are Americans the world's most traveled people? No, the Germans and Japanese are. Dr. Malte Bischoff of Lufthansa airlines charter service says that "about 28% of all Germans take at least one trip

abroad annually. This compares with 17% of all Britons, for example." He says that Germans spend more money on foreign travel than anyone else, about \$10.8 billion (U.S.) last year—\$3.4 million more than American travelers spent—"even though the American public is three and a half times larger than the German." Bischoff says German travel agents serve a "travel-happy, well-heeled nation."

French Catholicism Foundering

◆ A new survey of French Catholics reveals that regular Mass attendance has dropped by more than one fourth since 1971. In that year 22 percent said that they attended regularly, while only 16 percent do now. And what about faith? Only about a third of the French Catholics would agree that Jesus is "really living"

today, while the other two thirds disagreed or gave no opinion. Who bears chief responsibility for this state of affairs? "It must be recognized that we are doubtlessly responsible—we the bishops, the priests and also the (religious) activists," admitted a "disturbed" Archbishop Robert Coffy, head of the French bishops' committee on the sacramental pastorate.

Father of 212,000

◆ Bendalls Adema, called by the London *Times* "the most prolific bull in the history of Irish agriculture," recently died of old age at 14. The bull's semen has been used to inseminate artificially as many as 212,000 cows, who bore quality offspring. One of his daughters reportedly produced a record 11 gallons (13.2 U.S.) of milk in one day.

