

Awake!

SEPTEMBER 22, 1986

*From the
Cradle
to the
Grave,*

*Our
Greatest
Need
Is Love*



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AWAKE! is for the enlightenment of the entire family. It shows how to cope with today's problems. It reports the news, tells about people in many lands, examines religion and science. But it does more. It probes beneath the surface and points to the real meaning behind current events, yet it stays politically neutral and does not exalt one race above another.

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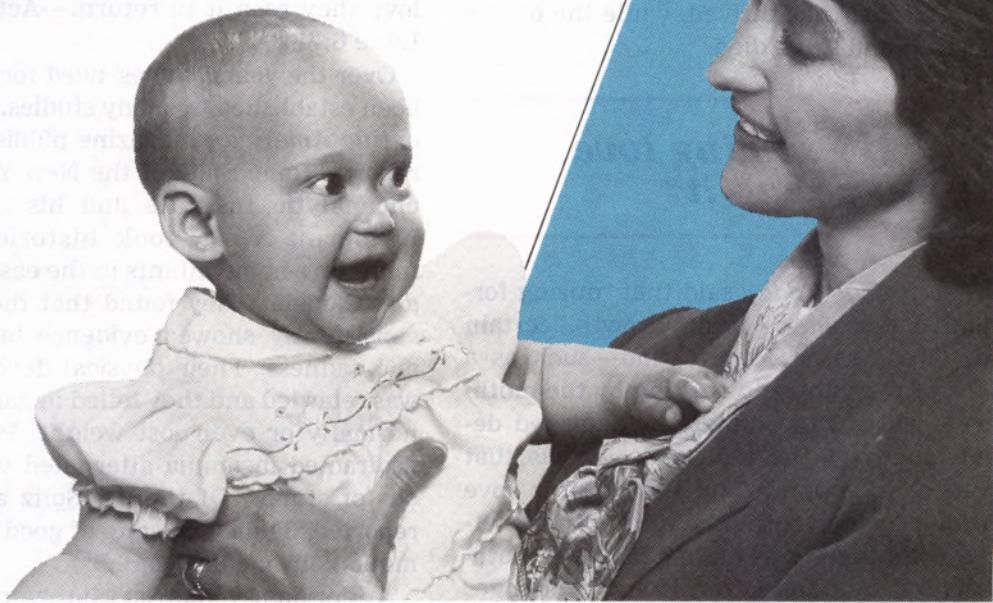
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Frederick W. Franz, President

From the Cradle to the Grave, Our Greatest Need Is Love



Love is our greatest need. Babies die without it. The elderly waste away for lack of it. Illness flourishes in its absence. Books are written about it. Groups assemble to touch and hug in search of it. Movies and plays distort and degrade it. Those having sex call it "making love" and show their ignorance of it. A corrupt and violent world rejects as impractical the only kind of love that could save it. Yet that saving love is our greatest need.

AT A business seminar on human relationships, the speaker told of a hospital ward filled with orphaned babies. In a long row of beds, the babies became ill and some of them died—except the baby in the last bed. It did well. The doctor was puzzled. All were fed, bathed, kept warm—no difference in their care. Yet only the baby in the last bed thrived. As months passed and new babies were brought in, the story was always the same: Only the baby in the last bed did well.

Finally the doctor concealed himself to watch. At midnight the cleaning woman came in and on hands and knees scrubbed the floor, from one end to the other. The floor finished, she stood up, stretched, rubbed her back.

Then she went to the last bed, picked up the baby, walked around the room with it, cuddling it, talking to it, rocking it in her arms. She put it back in its bed and left. The doctor watched the next night, and the next. Each night the same thing happened. It was always the baby in the last bed that got picked up, cuddled, talked to, and loved. And in all the new groups of babies brought in, it was always the baby in the last bed that thrived, while the others got sick and some died.

“By sowing love they reap it”

Psychology Today said that “during formative periods of brain growth, certain kinds of sensory deprivation—such as a lack of touching and rocking by the mother—result in incomplete or damaged development of the neuronal systems that control affection.” The baby learns love from a loving mother. Within minutes after birth, there is a bonding between mother and baby. Thereafter, loving exchanges nourish the attachment between them, as the book *Making Your Family Life Happy* shows on page 101:^{*}

“A mother bends over a baby in its bed, puts her hand on its chest and jiggles it gently as she puts her face close to the baby’s and says, ‘I see you! I see you!’ The baby, of course, doesn’t know the words (which really aren’t particularly logical anyway). But it wriggles and coos with delight, for it recognizes that the playful hand and the tone of voice are clearly saying to it, ‘I love you! I love you!’ It is re-

assured and feels secure. Babies and small children who are shown love appreciate it, and, in imitation of that love, they practice it, putting small arms around the mother’s neck and giving enthusiastic kisses. They are pleased with the heartwarming emotional response they reap from their mother as a result. They begin to learn the vital lesson that there is happiness in giving love as well as in receiving it, that by sowing love they reap it in return.—Acts 20:35; Luke 6:38.”

Over the years, babies’ need for love has been established by many studies. The *Scientific American* magazine published this report: “René Spitz of the New York Psychoanalytic Institute and his colleague Katherine Wolf, took histories of 91 foundling-home infants in the eastern U.S. and Canada. They found that the infants consistently showed evidence of anxiety and sadness. Their physical development was retarded and they failed to gain weight normally or even lost weight. Periods of protracted insomnia alternated with periods of stupor. Of the 91, Spitz and Wolf reported, 34 died ‘in spite of good food and meticulous medical care.’”

A Florida psychiatrist said: “A child who does not get enough hugging or cuddling may grow up to be withdrawn, detached or aloof. . . . Physical body contact between parent and child is so essential in child rearing that in some cases children who were not hugged or cuddled during the first year of their lives did not survive.”

A report concerning the findings of Dr. James Prescott of the National Institute of Health stated: “From the moment of birth, many Americans are deprived of something that could prevent them from becoming criminals, mentally ill or violent adults. That something is touching and physical affection—a kind of ‘sensory plea-

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sure' that humans need as much as they need food." *Psychology Today* concurs. On the baby's need for touching and rocking, it said: "Since the same systems influence brain centers associated with violence, . . . the deprived infant may have difficulty controlling violent impulses as an adult."

The *Journal of Lifetime Living* once said: "The psychiatrists, in their lurid battle against mental illness, have finally concluded that the great taproot of mental ills is *lovelessness*. The child psychologists, wrangling over scheduled versus demand feeding, spanking versus non-spanking, have found that none of it makes much difference *so long as the child is loved*. The sociologists have found *love* the answer to delinquency, the criminologists have found it the answer to crime, the political scientists have found it the answer to war."

They may have found the answer, but they obviously have not applied it. Dr. Claude A. Frazier warned that if our technological society is not humanized by love, "the alternative, as we can now surely comprehend, is a nation of cities turned into jungles of hate, of families rent by bitter conflict, of young people seeking escape in drugs and death, and of a world ready to commit global suicide at any moment."

Frazier also said: "As a physician, I find that a significant number of patients I see daily are suffering from illnesses influenced at least in part by this emotional famine. . . . The illnesses usually mentioned in this context are such things as headaches, back problems, ulcers, heart disease. However, some medical researchers are widening the list to include such grim maladies as cancer."

Just as caring human relationships and love are beneficial to our health, the lack of companionship can be detrimental. The

pressures of modern living, broken homes, single-parent families, emotionally neglected children, the mania for material things, the collapse of morals, the demise of true values—all add to the instability and loneliness that damage our health. James J. Lynch pursues this at length in his book *The Broken Heart—The Medical Consequences of Loneliness*. "The price we are paying for our failure to understand our biological needs for love and human companionship," he says, "may be ultimately exacted in our own hearts and blood vessels. . . . There is reflected in our hearts a biological basis for our need for loving human relationships, which we fail to fulfill at our peril."

Serum cholesterol is linked not only to diet but also to emotional stress. It can also increase blood pressure. Cardiovascular disease is the cause of 55 percent of all deaths in the United States, and it takes a heavier toll of those who are alone. Lynch states: "The mortality statistics for heart

**"*The great taproot
of mental ills is
lovelessness*"**

disease among those adult Americans who are not married are striking—a death rate from heart disease that is as much as two to five times higher for nonmarried individuals, including those who are divorced, widowed, or single, than for married Americans." Recent scientific studies indicate that loneliness can impair the body's immune system, making it more vulnerable to disease. Loneliness is hazardous to your health. Even Adam felt a lack in a paradise garden. God saw that it was not good for

man to be alone and gave him Eve.—Genesis 2:18, 20-23.

If we were isolated in darkness and in a soundless environment, we would become mentally disoriented. We need input from our senses to keep our senses. Being gregarious by nature, we need input from other people. We need companionship even if there is no talking. We need an inter-

We need input from our senses to keep our senses

change of feelings. Comforting words are good, but talk empty of feeling does not dispel loneliness. There can be communication on a deeper level than is possible with words.

Such is the case of the woman who anxiously scans the face of her husband when he is disturbed and transmits to him a healing force from within herself. Or the case of the 75-year-old man in an intensive-care unit who knew he was going to die and who had only one simple request—that his wife of 48 years stay by his side. Which she did, all the while gently stroking his hand, communicating a quiet peacefulness to him beyond the power of words. Or on an even deeper level, the nurse who by gently holding the hand of a man who is in a deep



coma and breathing on a machine slows the racing heart and lowers the blood pressure, making one appreciate the power of the human touch.

"You must love your neighbor as yourself," Jesus said, quoting from the Mosaic Law. (Mark 12:31; Leviticus 19:18) This does not mean self-adulation or self-centeredness. Rather, acknowledging mistakes, repenting, asking for forgiveness, trying to do better—this approach allows us to respect ourselves and gain God's forgiveness. "Remembering that we are dust," he mercifully forgives, and his forgiveness eases guilt feelings that we otherwise would project upon others, spoiling our relationships with them. (Psalm 103:14; 1 John 1:9) So in this way we can accept ourselves, love ourselves, and then love others as we do ourselves. Love yourself without demanding perfection of yourself; love others without demanding perfection of them.

This kind of love is best defined by what it does and does not do: "Love is long-suffering and kind. Love is not jealous, it does not brag, does not get puffed up, does not behave indecently, does not look for its own interests, does not become provoked. It does not keep account of the injury. It does not rejoice over unrighteousness, but rejoices with the truth. It bears all things, believes all things, hopes all things, endures all things. Love never fails."—1 Corinthians 13:4-8.

Do you want to be loved in this marvelous way? Then sow it to reap it. Exercise it as you would a muscle. Make it grow, increase, until it fills you, becomes you. Then prove it's alive by loving works. "Practice giving," Jesus said, "and people will give to you. They will pour into your laps a fine measure, pressed down, shaken together and overflowing. For with the measure that you

are measuring out, they will measure out to you in return." (Luke 6:38) By giving you inspire others to become givers, and all share the joy. As Jesus also said: "There is more happiness in giving than there is in receiving." (Acts 20:35) The greatest form of giving is giving of yourself—your time, your attention, your sympathy, your understanding. You "treat others as you would

Share their feelings, their joys, even their tears

like them to treat you." (Matthew 7:12, *The New English Bible*) Communicate. Share their feelings, their joys, even their tears. And above all else, give yourself to God.

—Psalm 40:7, 8; Hebrews 10:8, 9.

The Bible says that "God is love." (1 John 4:8) Many object, 'If God is love, why does he permit wickedness?' It is his purpose to end all wickedness, but he delays because of his love for us: "Jehovah is not slow respecting his promise, as some people consider slowness, but he is patient with you because

he does not desire any to be destroyed but desires all to attain to repentance." (2 Peter 3:9) In his mercy he now permits wickedness, that repentant ones may cease doing it and live. (Ezekiel 33:14-16) But in his due time he will end wickedness by destroying those who persist in it. He will end war by ending warmongers, end crime by ending criminals, end pollution by ending polluters, end gross immorality, rape, incest, and perversion by ending those who insist on practicing them. All wickedness will end when God ends all workers of wickedness. In so doing he shows love to those who want to live in peace and righteousness. (Psalm 37:10, 11; Proverbs 2:21, 22) As any gardener knows, weeds must go before flowers can flourish.

Because God is love, he created the earth and put man upon it and made its bounties available for all, both good and bad: "He makes his sun rise upon wicked people and good and makes it rain upon righteous people and unrighteous." (Matthew 5:45) Because God is love, he will end sickness and death. Already he has provided a means of salvation for all mankind: "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) Because God is love, he "recommends his own love to us in that, while we were yet sinners, Christ died for us." (Romans 5:8) Multitudes berate God for permitting wickedness even as they enjoy committing it, but those grateful for his love respond differently: "We love, because he first loved us."

—1 John 4:19.

In this world, there is a shortage of love for God and there is a shortage of love for neighbor, but there is no shortage of God's love for man. And it is his love for us that is our greatest need.



What Has Happened to Our Soil?

DENIZENS of tenement and apartment houses towering above asphalt and concrete corridors of large cities seldom see it. Single-home urbanites with small lawns, front and back, pay little attention to it. To those who live in suburbia, it is a dirty nuisance when it is tracked into their homes.

It is different things to different people. Boys dig in it. Little girls make mud pies with it. Mothers abhor it. Washing-machine manufacturers make windfall profits because of it. Bulldozer operators make their living moving it. Farmers plow it, cultivate it, and plant it. It is used as a dumping ground for poisonous chemicals, rendering it useless for generations to come. Humankind was made from it. When we expire, we are buried in it.

Of all earth's most precious resources, none are so much abused, misused, and taken for granted as is our soil. Defying all wisdom, it has been overplowed, overplanted, overfertilized, overpolluted.

It has been viewed as an unlimited resource, as plentiful as the sands of the sea shore. Pioneers and settlers moving into new territories bought land cheap. They stripped it of its trees and much of its vegetation as they plowed straight furrows up and down the hills and planted their seed. Then the rains came, and the plowed furrows turned into watercourses that became



U.S. National Archives

great gullies scarring the land, taking the topsoil to the riverbeds and, in time, out to sea. When there was no more good land, they moved on, and with their stubborn genius for not learning from their mistakes, an endless cycle of ruined land was left in their wake. Meanwhile, the settlers kept coming, plowing topsoil too thin to plant. Within a generation the land was ruined.

Cattlemen let their teeming herds graze the uncultivated land to a barren waste. Next came the droughts. The eroding soil, the barren land, and the blowing winds brought on the great dust bowl of the 1930's that destroyed vast areas of farmland across five states of Midwestern America. The dust blew in clouds thousands of feet in the air, from horizon to horizon. It came through the cracks around the doors and windows. It piled in high drifts in the streets and fields, covering sheds, tractors, and farm equipment.

Millions of acres of farmland were destroyed by soil erosion. Precious topsoil, just one inch (2.5 cm) of which experts say can take several hundred years to build,

was now, in a matter of a few months, gone with the water and the wind.

Finally, man learned from his mistakes. National conservation systems were established to help the farmers save their land from erosion. Contour plowing was introduced. Deep furrows were cut that ran around the slope of the land instead of up and down the hills. This method enabled the water to collect in the troughs and soak into the ground rather than letting it run off and carry the topsoil with it. Conservation workers went up and down the land showing farmers the need for contour plowing and thereby saved millions of acres of topsoil from being lost.

Was this, however, the panacea needed to arrest this cancerous erosion of the earth's soil? As the year 1986 draws to a close, some 50 years removed from the infamous dust-bowl era, does it find the stewards of God's good earth caring for the land properly? What do the reports from around the world show?

Increasing Losses of Topsoil

In America alone, the loss of soil is today an even greater crisis. "Of our current 421 million acres [170 million ha] of productive farmlands," writes the *National Wildlife* magazine of February/March 1985, "97 million acres [39 million ha] are eroding at more than twice the 'tolerance' level—the level at which soil can be replaced naturally. Another 89 million acres [36 million ha] are eroding at one to two times that tolerance level. In all, nearly 40 percent of our farmlands are losing soil. In Iowa, some topsoils that were once a foot [30 cm] deep today are only six inches [15 cm]. One tenth of the rich wheat-growing Palouse region of eastern Washington has lost all of its topsoil. In parts of northern Missouri, half the topsoil

is gone, and the land is still eroding at some five times the rate of replacement."

Not all soil erosion is caused by blowing winds as was the case in the dust-bowl era and as is the case in much of Africa today. In the United States particularly, most of the erosion comes from rain runoff. According to the U.S. Department of Agriculture, reports for the year 1977 show that an estimated 6.4 billion tons of topsoil were washed away from farmlands, ranges, forests, and construction sites. The greatest portion of this topsoil loss was speeded up by human activities. "Off-road vehicles have in a few years scoured more soil off parts of California than nature will replace in 1,000 years," said one authority.

What about the lesson learned a half century ago—time-tested contour plowing and windbreaks that prevent water runoff? In order to keep up with the demand from foreign markets for grain in the early 1970's, particularly from the Soviet Union, American farmers were encouraged to plow from "fencerow to fencerow." Straightaway they responded by maximizing their grain production, and throwing all caution to the winds, they bulldozed erosion terraces and rows of trees that served as windbreaks and held the soil in check. They plowed unusable land and up



U.S. National Archives



U.S. National Archives

Strip-cropping for soil and water conservation

and down hills and abandoned crop rotation—a proved method of soil retention. Four million acres (1.6 million ha) of dry rangeland that many experts considered too dry to farm were turned by the plow.¹⁰

Indeed, the farmers realized a bumper crop of grain production and with it came a greater farm income. But, alas, offsetting the handsome profits were the lamentations that went up from the same farmers when they realized that their farms were eroding away, by many tons to the acre. Published reports say that the United States is now losing topsoil at the rate of six billion tons a year.

"The consequences of such actions could be enormous in the years ahead," writes the *National Wildlife* magazine. "Ours is already a hungry world. If, as the experts believe, one-third of the earth's cropland is eroding faster than nature can replace the soil, we are losing productivity. We may cultivate the same number of acres, but as the soil gets thinner, we will harvest less food from it."

A World Crisis

According to a 1985 report from the Worldwatch Institute, the world is losing

in excess of 25 billion tons of topsoil a year. Reports indicate that in the famine-ravaged country of Ethiopia, over one billion tons of topsoil are washed away from the country's land each year. "An environmental nightmare unfolding before our eyes . . . , a result of the acts of millions of Ethiopians struggling for survival," says a report by the U.S. Agency for International Development. It adds: "Scratching the surface of eroded land and eroding it further, cutting down the trees for warmth and fuel and leaving the country denuded."

"Land hunger in the Andean countries—Bolivia, Chile, Ecuador, and Peru—is evident in the push of unterraced farming up the mountainsides," reports the Worldwatch Institute. "Even to the casual observer it is evident that much of the soil on the steeply sloping, freshly plowed mountainsides will soon be washed to the stream beds below, leaving only bare rock and hungry people." Brazil shows a similar trend of widespread erosion.

A world away, China is plagued with severe topsoil loss—five billion tons of it are washed into her rivers and streams each year. India is losing six billion tons of topsoil annually, affecting 370 million acres (150 million ha). "It is generally agreed that in Italy 2 million hectares [4.9 million a.] have been abandoned in the last ten years," states a European report. "Similar-

ly," says Worldwatch, "some of the decline in the harvested area of cereals in Yugoslavia and Bulgaria over the past two decades reflects the movement from eroded, worn-out soils in farm areas with rugged terrain." And as the rest of the world goes, so goes the Soviet Union—soil erosion in epidemic proportions and it is worsening, admits the Soil Erosion Laboratory of the University of Moscow.

What Soil Loss Means for You

Whether you live in a bustling metropolis or on a farm, you will indeed pay the price for the loss of soil. "If we are interested in food prices at the end of the century," says the Worldwatch Institute, "we should be looking at soil erosion rates today. The less soil we have, the more food will cost."

As the earth's inhabitants move steadily closer to five billion and the population pressure explodes on the land, the soil will inexorably disappear. In China, for example, where the loss of cropland is a mounting problem, "authorities are now trying to conserve land by encouraging cremation instead of interment in the traditional burial mounds seen throughout the countryside," writes Lester R. Brown in the book *State of the World—1985*. "In this crowded country the living compete with the dead for land."

In countries where population is exploding with staggering soil loss, the results can be catastrophic. Nowhere is this more evident than in Africa, where grain production is on a drastic decline and famine is an ever-present threat. According to reports published in the book *State of the World—1985*, Africa was essentially self-sufficient in food production as recently as 1970. In 1984, however, some 140 million people—out of a total of 531 million—were fed with grain from abroad.

Conditions are expected to worsen in the years to come. What has made the difference in just 14 years? "The decline is largely attributable to three well-established trends," writes *State of the World—1985*, "the fastest population growth of any continent in history, widespread soil erosion and desertification, and the failure by African governments to give agriculture the support that it needs."

It is estimated that 1.5 billion people, or a third of the world's population, live in countries where cropland and soil are rapidly dwindling. "It seems incredible that something as basic as the very soil on which we stand should be disappearing at such a rate that by the end of the century there will be 32 per cent less per person than there is at present," writes *New Scientist* magazine. As our soil and cropland go with the wind and the rain, the world will find it increasingly harder to feed its exploding population.

Experts do not see a solution. The problem is worsening. Only Jehovah God can restore the earth to a land that will yield its full increase. That time is soon to come, and it will be, as his Word promises, a grand paradise from horizon to horizon, even to the ends of the earth.—Psalm 72:1-8, 16.

In Our Next Issue

● **Can You Beat Cancer?**

● **Why Don't Grown-Ups Understand Me?**

● **"The Levee Has Broken!"**

Young People Ask...

Aren't Practical Jokes Harmless Fun?

IT WAS just a joke. The boys responsible were doubled over with laughter. They had tied some oil drums together, placed fins on one end, and painted the whole contraption white. On its side were the letters "C.C.C.P."—the Cyrillic-alphabet initials for the Soviet Union. They placed it near the house of a man named Ted. Next morning, in a state of shock, he called the police, reporting that a Soviet missile had landed near his home. But while he was talking excitedly to one of the officers who arrived to investigate, the joke turned sour. Ted collapsed and was hospitalized in critical condition.

True, not every practical joke will put a person in the hospital, but imagine how you would feel if you were responsible for such a mishap—just because you wanted a little fun. Practical jokes are popular with many young people, who for the most part see no harm in them and consider them a lot of fun. But is this really so?

"Like a Lunatic"

The Bible book of Proverbs was written "to give to the inexperienced ones shrewdness, to a young man knowledge and thinking ability." (Proverbs 1:1-4) Its wise sayings include this passage dealing with practical jokes: "Just like someone mad that is shooting fiery missiles, arrows and death, so is the man that has tricked his fellowman and has said: 'Was I not having

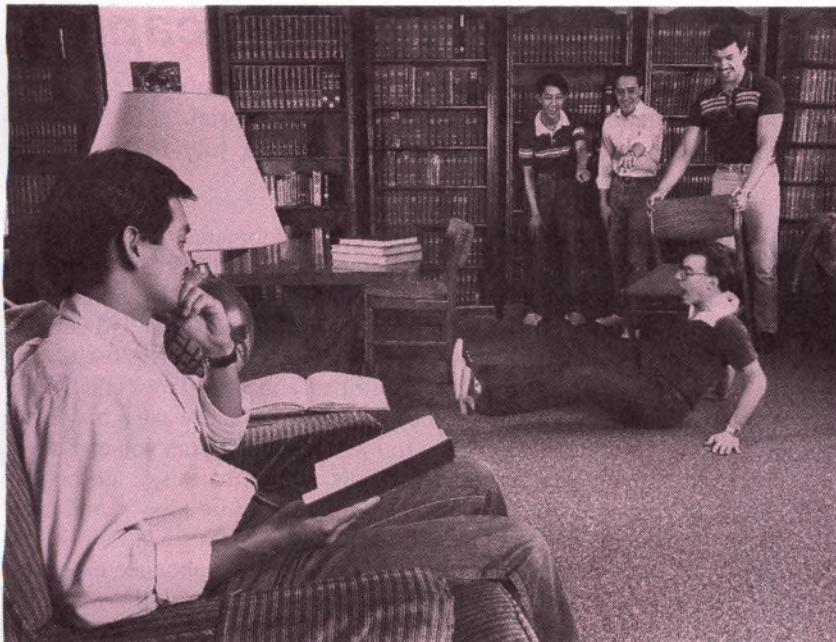
fun?'" (Proverbs 26:18, 19) The word "mad" has reference to someone who is insane. "Like a lunatic" is how *A New Translation of the Bible* by James Moffatt reads.

Imagine the damage to life and property inflicted by a mentally deranged person shooting arrows—even some with fiery tips! "A lunatic" may not fully comprehend the seriousness of his actions. He is devoid of reason. Similarly, those who 'trick' others may not really intend to cause harm. This, however, is small consolation to those injured either physically or emotionally by such pranks. Why, then, do some play such jokes on others?

The proverb gave the excuse as, "Was I not having fun?" So usually it is done for fun, to dispel boredom, or to get attention from others. Also, according to the book *Childstress!* by Mary Susan Miller, practical jokes are listed as one of the "Neurotic Defenses" employed by some children and adults in response to stress. Still others play jokes in retaliation for being a victim of someone else's pranks. Of course, by continuing the cycle of foolishness, a youth simply brings himself down to the level of the instigator. The smart move is to refuse to play practical jokes.

How to Stop

Ask yourself: "Would I want someone to do the same thing to me?" Jesus said: "All



The jokester may get the laughs, but who will gain the friends?

things, therefore, that you want men to do to you, you also must likewise do to them." (Matthew 7:12) The Bible encourages fellow feeling and tender compassion, and it discourages paying back injury for injury. (1 Peter 3:8, 9) Developing such kindly qualities will not only prevent you from pulling practical jokes on others but also endear you to others. The jokester may get the laughs, but you will gain the friends.

Also, you have to watch the kind of persons with whom you associate. "I have not sat down in the intimate group of those playing jokes," said the prophet Jeremiah. (Jeremiah 15:17) It is easy to be influenced by our companions. Avoid those who have a reputation for being jokesters.

"I wanted to be accepted very much by the kids I hung around with at school, so I could have someone to have fun with," admitted Debbie as she reflected on her trouble-filled life as a teenager. She ex-

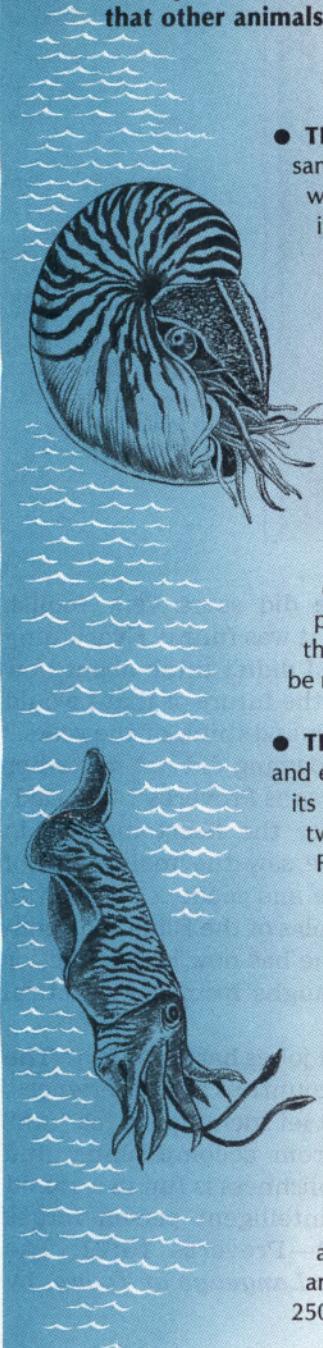
plained why she did some very foolish things: "Because it was funny. Everything had to be funny. I didn't think about how this would affect the future or that I would one day look back and think of the scars." Such constant clowning did not make her really happy. It was as Proverbs 14:13 said: "Even in laughter the heart may be in pain." Finally she saw the foolishness of her course of life and made a decision to live by the principles of the Bible. The genuine happiness she has now is far superior to the fleeting laughs from her practical jokes.

So are practical jokes harmless fun? The Bible, as well as countless sad experiences, answers no. Don't let such a quest for "fun" sidetrack you from accomplishing fine goals in life. "Foolishness is fun to a stupid person, but an intelligent person forges straight ahead."—Proverbs 15:21, *The Holy Bible in the Language of Today*, by W. F. Beck.

Nature's Submarines and Bathyscaphes

"Our pride in man's latest discoveries must be tempered by the knowledge that other animals may have been using them from time immemorial."

—*Scientific American*, July 1960.



● **THE CHAMBERED NAUTILUS.** The nautilus was submarining untold thousands of years before man was even on the earth to daydream of such a wonder. From babyhood it makes its own house, adding on larger rooms as it grows. It partitions off the vacated ones left behind, until its beautiful shell has spiraled outward to some ten inches in diameter. Most of it is decorated with shiny brown zebra-like stripes, and in the latest and largest room that opens out on the sea the nautilus lives. In its wake it may have left behind 30 or more chambers, former residences from younger days. But each time the nautilus moved to new, larger quarters, it left behind a part of itself—a tubelike siphuncle (Latin for "little pipe"). And each time the nautilus partitioned off a chamber, it left a small hole in the partition. Through these openings the siphuncle, a siphonlike extension of the nautilus, threads its way through the chambers, all the way back to the first tiny compartment. It is these compartments and the siphuncle passing through them that give the nautilus its submarining abilities. The chambers serve as flotation tanks. They are filled with gas. The siphuncle passing through them can add water, or it can remove water. It can vary the gas/water ratio and thus change the buoyancy. Thus the nautilus can be near the surface or two thousand feet deep, or float anywhere in between.

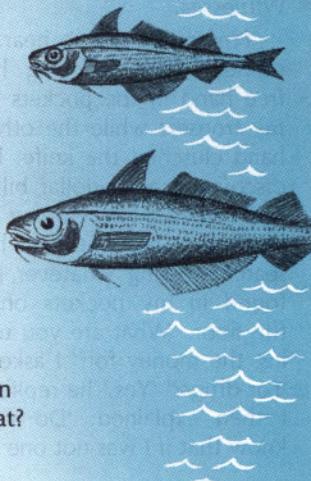
● **THE CUTTLEFISH.** The common cuttlefish is found in the Mediterranean and eastern Atlantic waters. A large specimen may have a body two feet long, its eight arms reaching out another ten or twelve inches, and additionally, two long tentacles may shoot out beyond these arms to grab food items. For locomotion it has elongated fins along the sides of its body, plus a funnel, or siphon, that provides jet propulsion. Like the chambered nautilus, it has a submarinelike mechanism for varying its buoyancy. But unlike the shell chambers of the nautilus, the cuttlefish's buoyancy mechanism is made of bone, the cuttlebone. It is located just under the skin along the back of the cuttlefish. It is a soft, chalky structure, having up to a hundred thin plates held apart by pillars, and honeycombed with many separate chambers. It is this bone that serves as the cuttlefish's buoyancy tank. As the cuttlefish grows and gets heavier, more chambers are added to the cuttlebone to increase its powers of buoyancy. (Incidentally, it is this cuttlebone that is put in the cages of birds.) By a process of osmosis the cuttlefish can pump water out of the cavities of its cuttlebone or allow water to enter. In this way it varies its buoyancy to ascend or descend in the ocean. In principle, the cavities in its cuttlebone are like the water tanks of a submarine. Cuttlefish usually stay from 100 to 250 feet deep but can descend to 600 feet.

"His invisible qualities are clearly seen from the world's creation onward, because they are perceived by the things made, even his eternal power and Godship." (Romans 1:20) Surely, Jehovah God's purposeful wisdom is revealed in these buoyant marine animals.

● **THE DEEP-SEA SQUID.** This giant squid may be the source of the legendary tales of sea monsters that grab ships in their tentacles. Bodies over 10 feet long have been found—with tentacles included, 65 feet! For animals, its eyes are the largest known—16 inches across! It moves swiftly by jet propulsion. It, like the nautilus and the cuttlefish, can adjust to different depths in the sea but does it differently. The upper two thirds of its body is a large cavity, the coelomic cavity. It is filled with a liquid. If this liquid is removed, the squid sinks. The fluid gives the animal its neutral density to seawater. Analysis has shown that it has a very high concentration of ammonia, 1.2 ounces per gallon. Why is this so? Unlike mammals, the squid excretes its nitrogenous wastes as ammonia instead of urea. This ammonia diffuses from the bloodstream into the fluid of the coelomic cavity, where it dissociates into ammonium ions. These ions are light-weight and make the fluid lighter than seawater, imparting buoyancy to the squid. *Scientific American* magazine compares it with Auguste Piccard's bathyscaphe that descends into the ocean depths. The bathyscaphe's large chamber filled with gasoline, which is lighter than seawater, supports the observation chamber suspended below it. Similarly, the coelomic cavity fluid of the deep-sea squid serves as a flotation device. But the squid did it first, because its Creator thought of it first.



● **THE SWIM-BLADDER FISH.** Many fish have swim bladders filled with gas. When the fish descends, the pressure of the water compresses the gas and reduces the size of the swim bladder. If the fish rises, the water pressure lessens, the gas expands, and the size of the bladder increases. When the size of the bladder changes, so does the size of the fish. So when it descends, increased pressure decreases its volume, which means its average density increases, and this lessens its buoyancy. When it rises, its volume increases, which lessens its average density, and this increases its buoyancy. Thus the swim bladder functions to keep the density of the fish equal to the density of the seawater around it, enabling the fish to float at any depth. But it is not always that simple. At a depth of 6,500 feet, pressure has squeezed the bladder's volume down to only 1/200th of its volume at the surface, the gas in it is 200 times denser, and buoyancy has about disappeared. Yet fish hover motionless at twice that depth, the gas in their swim bladders exerting a pressure of more than 7,000 pounds per square inch to withstand the pressure of the sea! Yet how do they retain buoyancy? Very slowly they can add gas to their swim bladders as they go deeper and resorb it as they rise. But how can fish in the depths add gas to the bladder when the pressure in it is already so great? No answer. The mechanism of this gas pump is still an enigma.



God's Word— The Best Defense!

IF someone tried to rob you, what would you do? Quickly hand over your possessions or fight back in an effort to protect what is yours? In today's violent world, many people believe that the use of force to protect one's property is justified. Owning a gun or training in some form of martial arts is viewed as a safeguard against attack. But do they really bring the best results? Often, people who have used weapons have regretted it afterward. In contrast, however, wise King Solomon said: "Do not say: 'I will pay back evil!' Hope in Jehovah, and he will save you."—Proverbs 20:22.

Recently, a staff member of the world headquarters of Jehovah's Witnesses in Brooklyn, New York, went to the home of some friends in Brooklyn. "As I arrived in front of the building, a man in an army jacket came charging at me with a knife, demanding: 'I want your money! Give me all your money!'

"Seeing that I was not rattled by his attack, he ordered: 'Get inside the building! I don't want anyone to hear! Get in!' Once inside, he demanded my wallet. He found only \$2.00. As he sorted through the rest of its contents, I explained to him that I was one of Jehovah's Witnesses.

"Pretending not to hear, he insisted on more money. Then, sticking his free hand in the pockets of my trousers while the other hand clutched the knife, he discovered a 20-dollar bill I had tucked away. Hoping to find more, he continued his search, tossing whatever he found in my pockets onto the floor. 'What are you using the money for?' I asked. 'For drugs?' 'Yes,' he replied. I then explained: 'Do you know that if I was not one of

Jehovah's Witnesses, you would be a dead man? I have been trained in karate. More than once you have been careless with that knife.'

"As I referred to the Bible to clarify my position as one of Jehovah's Witnesses, he reached into his front pocket and withdrew a small book and exclaimed, 'Look, I have a Bible!' It was a miniature pocket-size Bible.

"'Fine help that is to you,' I said. 'You're not even applying what it says there.' I took his Bible and read to him Matthew 6:33 and John 17:3 and emphasized the importance not only of taking in Bible knowledge but also of applying it in his life.

"He confessed that two months earlier he had been released from prison. Out of a job and in need of money, he took up stealing. Reading 1 Corinthians 6:9, 10, I showed him that thieves will not inherit God's Kingdom. I added: 'One day you might just come across someone who is foolish enough to fight over his money, and you may end up killing him, or he may end up killing you, or you will eventually get caught and end up going back to prison!' 'Don't say that!' he exclaimed fearfully. I reminded him that 'those who live by the sword will perish by the sword.'

—Matthew 26:52.

"Apparently moved by the Scriptures, he apologized. Hanging his head, he noticed what he had thrown to the floor while emptying my pockets. Sheepishly, he picked up everything and handed it to me, but he kept the money. Moving toward the door, he asked if I would pray for him. I explained, 'What you did to me was wrong, but most of all, you sinned against Jehovah. It is between you and him.'

"On leaving, he asked if I would do him a favor. Stretching out his palm, which held the knife, he asked, 'Could you throw this away for me? I am through robbing people.' I took the knife and replaced it with an *Awake!* magazine."—As reported by Ricky Hanagami.



Scientific Dates for Prehistoric Times

"Sinkhole is rich archeological find. 10,000-year-old remains place humans in Ice Age Florida, scientists believe."

"The oldest Stone Age hut in Japan has been unearthed near Osaka. Archaeologists date the hut to about 22,000 years ago."

"About a million years ago a river flowed through eastern Corona (California), and mastodons, camels, horses and rabbits were among the prehistoric animals that frequented its banks."

THE foregoing recent claims are typical of those announcing discoveries by archaeologists and paleontologists. The first thing people want to know about a new find is, How old is it? The scientist who talks to reporters is always ready to give an answer, whether it is based on evidence or it is merely a guess.

When you read such reports, does the question sometimes cross your mind, How do they know? How certain is it that humans lived in Florida 10,000 years ago and in Japan 22,000 years ago, or that mastodons and camels were roaming the California landscape a million years ago?

There are several different scientific methods of dating ancient remains. Some are more reliable than others, but none are as certain as ages based on historical records. But man's historical records go back only 6,000 years at the most. When we go back beyond this time, the scientific dates are all we have.

Radioactive Dating

Of various methods for scientific dating, the most reliable are the radioactive clocks. They depend on

Radioactive clocks tell time in the millions of years, but how accurately do they tell it?

the rates of radioactive decay processes. While other methods depend on aging processes that may go faster or slower under differing environmental conditions, such as changing temperature, radioactive decay rates have been shown to be unaffected by the extremes of external conditions.

The Uranium-Lead Clock

We can illustrate the method with the first radioactive clock devised, the one based on the decay of uranium to lead. Radioactive decay goes strictly according to a law of statistical probability. The amount of uranium decaying in a unit of time is always proportional to the amount left. This results in a curve like that in the drawing (page 19), which shows the amount left after any given time. The time it takes for half the uranium to decay is called its half-life. One half of the remaining half will decay in the next half-life, leaving one quarter of

This article and the two following ones describe and evaluate the different means of radioactive dating used by geologists to measure the ages of rocks and the remains of once-living organisms. They have been prepared by a nuclear physicist of many years' experience in both research and industry in the field of radioactivity.

Geologists using the uranium-lead clock have to look out for a number of pitfalls

the original amount. After three half-lives, one eighth will be left, and so on. The half-life of uranium is 4.5 billion years.

Since the uranium is transformed into lead, the amount of lead is increasing all the time. The amount accumulated up to any given time is shown by the broken curve. The lead curve is the complement of the uranium curve, so that the total number of lead atoms and uranium atoms is always the same, equal to the number we started with.

Now suppose we have a rock containing uranium but no lead, and we seal it up tight so that nothing can get into or out of the rock. Then, some time later we open it up and measure the amounts of both elements. We can tell from that how long the rock has been sealed. For example, if we find equal amounts of lead and uranium, we know that one half-life, that is, 4.5 billion years, has passed. If we find that just 1 percent of the uranium has decayed to lead, we can use the mathematical formula for the curve to figure that 65 million years have elapsed.

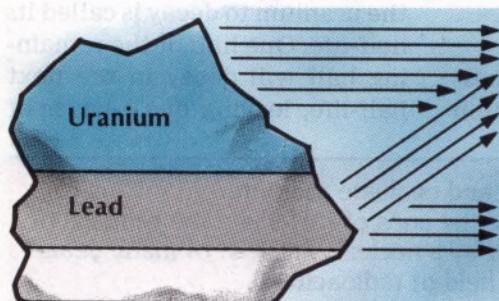
Note that we do not have to know how

much uranium was in the rock to start with because all we have to measure is the proportion of lead to uranium at the end of the period—which is just as well because none of us were around to measure anything at the beginning of the experiment.

Now you may be thinking that these are immense periods of time we are talking about, millions and billions of years. What is the possible use of a clock that runs so slowly? Well, we learn that the earth itself has been in existence for a few billion years, and there are rocks in a few places that appear to have been there for a good part of that time. So geologists find such a clock quite useful in studying the history of the earth.

How Certain Are They?

We must admit that the dating process isn't quite as simple as we have described it. We mentioned that the rock has to be free from lead at the beginning. This is usually not the case; there is some lead to start with. This gives the rock what is called a built-in age, something more than zero. Also, we assumed that the uranium was tightly sealed in the rock so that nothing could get in or out. Sometimes this may be true but not always. Over long periods of time, some of the lead or the uranium might seep out into groundwater. Or more uranium or lead might get in, especially if



How much uranium (or lead) did this rock originally have?

How much uranium (or lead) leached into the rock later?

How much lead derived from the decay of thorium?

it is a sedimentary rock. For this reason, the uranium-lead clock works best on igneous rocks.

Other complications arise from the fact that another element, thorium, which may be in the mineral, is also radioactive and slowly disintegrates into lead. Besides that, uranium has a second isotope—the same chemically but different in mass—that decays at a different rate, also forming lead. Each of these ends up in a different isotope of lead, so we need not only a chemist with his test tubes but also a physicist with a special instrument to sort out the various isotopes, leads of different mass.

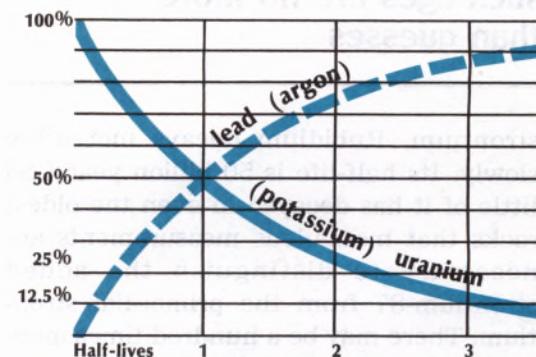
Without going into detail on these problems, we can understand that the geologists using the uranium-lead clock have to look out for a number of pitfalls if they are to get a reasonably trustworthy answer. They are glad to have other radiometric methods to verify their age measurements. Two others have been developed that can often be used on the same rock.

The Potassium-Argon Clock

The one that has been most widely used is the potassium-argon clock. Potassium is a more common element than uranium—potassium chloride is sold in grocery stores as a substitute for common salt. It consists mostly of two isotopes with masses 39 and 41, but a third isotope, of mass 40, is weakly radioactive. One of the products of its decay is argon, an inert gas that makes up about 1 percent of the atmosphere. The potassium of mass 40 has a half-life of 1.4 billion years, which makes it suitable in measuring a range of ages from tens of millions up to billions of years.

In contrast with uranium, potassium is widespread in the earth's crust. It is a constituent of many minerals in the most com-

The decrease in uranium is directly proportionate to the increase in lead



mon rocks, both igneous and sedimentary. Required conditions for the potassium-argon clock to work are the same as explained above: The potassium must be free of argon when the clock is started, that is, when the mineral is formed. And the system must remain sealed for the duration, allowing no potassium or argon to escape or enter.

How well does the clock work in practice? Sometimes very well but at other times poorly. It sometimes gives ages greatly different from those of the uranium-lead clock. Usually, these are smaller; such results are attributed to loss of argon. But in other rocks, the potassium and uranium ages agree very closely.

A most newsworthy use of the potassium-argon clock was in dating a rock that was brought back from the moon by the astronauts of Apollo 15. Using a chip from this rock, scientists measured the potassium and argon and determined the age of the rock to be 3.3 billion years.

The Rubidium-Strontium Clock

Another radioactive clock for minerals has been developed more recently. It is based on the decay of rubidium into

They give no warning that such ages are no more than guesses

strontium. Rubidium decays incredibly slowly. Its half-life is 50 billion years! So little of it has decayed in even the oldest rocks that meticulous measurements are necessary to distinguish the added strontium-87 from the primordial strontium. There may be a hundred times more strontium than rubidium in the mineral, and even in a billion years, only a little more than 1 percent of the rubidium decays. In spite of these difficulties, the minute amount of strontium produced by decay has been measured in a few cases. This clock is valuable for checking the ages found by other methods.

An exciting example of the use of this method was on a meteorite that astronomers believe might be like the rocks that theoretically fell together to form the planets, a remnant of the primordial material from which the solar system was made. The indicated age, 4.6 billion years, was consistent with this view.

An outstanding success of the rubidium-strontium clock was in dating the same moon rock described above. Five different minerals in the rock were tested, and they joined in indicating an age of 3.3 billion years, the same as the potassium-argon age.*

In some cases the comparative ages obtained by these three geological clocks are

* A word of caution about the rubidium clock: The decay of rubidium is so inordinately slow that its half-life cannot be measured with accuracy by counting the beta rays from its decay. The half-life has been determined by comparing it with other long-lived elements. So in this sense, it is not a completely independent method.

in close agreement and give confidence that the ages in such cases are very likely correct. It should be emphasized, however, that such cases show what kind of agreement is possible—but only under ideal conditions. And conditions are usually not ideal. Far longer lists could be given of comparisons that clash with one another.

Paleontologists Try to Date the Fossils

Paleontologists have attempted to copy the geologists' success in dating rocks only a few million years old. Some of their fossils, they believe, might fall in that age range. Alas, the potassium-argon clock does not work so well for them! Of course, fossils are not found in igneous rocks but only in sediments, and for these radiometric dating is usually not trustworthy.

An illustration of this is when fossils have been buried in a thick fall of volcanic ash that has later been consolidated to form a tuff. This is actually a sedimentary stratum, but it is made of igneous matter that solidified in the air. If it can be dated, it will serve to give the age of the fossil enclosed in it.

Such a case was found in the Olduvai Gorge in Tanzania, where fossils of apelike animals attracted special attention because their finders claimed they were linked to humans. First measurements of argon in the volcanic tuff in which the fossils were found showed an age of 1.75 million years. But later measurements at another qualified laboratory gave results a half million years younger. Most disappointing to evolutionists was the finding that the ages of other layers of tuff, above and below, were not consistent. Sometimes the upper layer had more argon than the one below it. But this is all wrong, geologically speaking—the upper layer had to be deposited after the lower and should have less argon.

The conclusion was that "inherited argon" was spoiling the measurements. Not all the argon previously formed had been boiled out of the molten rock. The clock had not been set to zero. If only one tenth of 1 percent of the argon previously produced by the potassium was left in the rock when it melted in the volcano, the clock would be started with a built-in age of nearly a million years. As one expert put it: "Some of the dates must be wrong, and if

some are wrong maybe all of them are wrong."

Notwithstanding expert opinions that these dates may be quite meaningless, the original age of 1.75 million years for the Olduvai fossils continues to be quoted in popular magazines committed to evolution. They give the lay reader no warning that such ages are really no more than guesses.

The Radiocarbon Clock

It Dates Once-Living Remains. Or Does It?

ALL the foregoing clocks run so slowly that they are of little or no use in studying archaeological problems. Something much faster is needed to match the time scale of human history. This need has been met by the radiocarbon clock.

Carbon 14, a radioactive isotope of ordinary carbon 12, was first found in atom-smashing experiments in a cyclotron. Then it was found also in the earth's atmosphere. It emits weak beta rays, which can be counted by a suitable instrument. Carbon 14 has a half-life of only 5,700 years, which is suitable for dating things associated with man's early history.

The other radioactive elements we have discussed have lives that are long compared to the earth's age, so they have existed since earth's creation down to the present day. But radiocarbon has such a short life, relative to the earth's age, that it can still be here only if it has been continually produced in some way. That way is the bombardment of the atmosphere by cosmic

rays, which convert nitrogen atoms into radioactive carbon.

This carbon, in the form of carbon dioxide, is used by plants in the process of photosynthesis and is converted into all kinds of organic compounds in living cells. Animals and, yes, we humans, eat the plant tissues, so everything that lives comes to contain radiocarbon in the same proportion as it is found in the air. As long as anything lives, the radiocarbon in it, which decays, is replenished by fresh intake. But when a tree or an animal dies, the supply of fresh radiocarbon is cut off, and the radiocarbon level in it begins to drop. If a piece of wood charcoal or an animal bone is preserved for 5,700 years, it will contain only half as much radiocarbon as it had when alive. So, in principle, if we measure the proportion of carbon 14 remaining in something that once was alive, we can tell how long it has been dead.

The radiocarbon method can be applied to a wide variety of things of organic origin.

Many thousands of samples have been dated by it. Their fascinating diversity is suggested by just a few examples:

Wood from the funerary ship found in the tomb of Pharaoh Seostris III was dated at 1670 B.C.E.

Heartwood from a giant redwood in California, which had 2,905 annual rings when it was cut down in 1874, was dated at 760 B.C.E.

Linen wrappings from the Dead Sea Scrolls, dated to the first or second century B.C.E. by the style of handwriting, were measured by the radiocarbon content to be 1,900 years old.

A piece of wood found on Mt. Ararat, and considered by some to be possibly from Noah's ark, proved to date only from 700 C.E.—old wood, indeed, but not nearly old enough to predate the Flood.

Woven rope sandals dug out of volcanic pumice in an Oregon cave showed an age of 9,000 years.

Flesh from a baby mammoth, frozen in Siberian muck for thousands of years, was found to be 40,000 years old.

How reliable are these dates?

Errors in the Radiocarbon Clock

The radiocarbon clock looked very simple and straightforward when it was first demonstrated, but it is now known to be prone to many kinds of error. After some 20 years' use of the method, a conference on radiocarbon chronology and other related methods of dating was held in Uppsala, Sweden, in 1969. The discussions there between chemists who practice the method and archaeologists and geologists who use the results brought to light a dozen flaws that might invalidate the dates. In the 17 years since then, little has been accomplished to remedy these shortcomings.

One nagging problem has always been to

ensure that the sample tested has not been contaminated, either with modern (live) carbon or with ancient (dead) carbon. A bit of wood, for example, from the heart of an old tree might contain live sap. Or if that has been extracted with an organic solvent (made from dead petroleum), a trace of the solvent might be left in the portion analyzed. Old buried charcoal might be penetrated by rootlets from living plants. Or it might be contaminated with much older bitumen, difficult to remove. Live shellfish have been found with carbonate from minerals long buried or from seawater upwelling from the deep ocean where it had been for thousands of years. Such things can make a specimen appear either older or younger than it really is.

The most serious fault in radiocarbon-dating theory is in the assumption that the level of carbon 14 in the atmosphere has always been the same as it is now. That level depends, in the first instance, on the rate at which it is produced by cosmic rays. Cosmic rays vary greatly in intensity at times, being largely affected by changes in the earth's magnetic field. Magnetic storms

Just this year *Science News*, under the title "New Dates for 'Early' Tools," reported:

"Four bone artifacts thought to provide evidence for human occupation of North America approximately 30,000 years ago are, at most, only about 3,000 years old," report archaeologist D. Earl Nelson of Simon Fraser University in British Columbia and his colleagues in the May 9 *SCIENCE*. . . .

"The difference in age estimates between the two types of carbon samples from the same bone is, to say the least, significant. For example, a 'flesher' used to remove flesh from animal skins was first given a radiocarbon age of 27,000 years old. That age has now been revised to about 1,350 years old."—May 10, 1986.

The radiocarbon clock is now known to be prone to many kinds of error

on the sun sometimes increase the cosmic rays a thousandfold for a few hours. The earth's magnetic field has been both stronger and weaker in past millenniums. And since the explosion of nuclear bombs, the worldwide level of carbon 14 has increased substantially.

On the other hand, the proportion is affected by the quantity of stable carbon in the air. Great volcanic eruptions add measurably to the stable carbon-dioxide reservoir, thus diluting the radiocarbon. In the past century, man's burning of fossil fuels, especially coal and oil, at an unprecedented rate has permanently increased the quantity of atmospheric carbon dioxide. (More details on these and other uncertainties in the carbon-14 clock were given in the April 8, 1972, issue of *Awake!*)

Dendrochronology—Dating by the Growth Rings of Trees

Faced with all these fundamental weaknesses, the radiocarbon people have turned to standardizing their dates with the help of wood samples dated by counting tree rings, notably those of bristlecone pines, which live hundreds and even thousands of years in the southwestern United States. This field of study is called dendrochronology.

So the radiocarbon clock is no longer regarded as yielding an absolute chronology but one which measures only relative dates. To get the true date, the radiocarbon date has to be corrected by the tree-ring chronology. Accordingly, the result of a measurement of radiocarbon is referred to as a

"radiocarbon date." By referring this to a calibration curve based on tree rings, the absolute date is inferred.

This is sound so far back as the bristlecone ring count is reliable. The problem now comes up that the oldest living tree whose age is known goes back only to 800 C.E. In order to extend the scale, scientists try to match overlapping patterns of thin and thick rings in pieces of dead wood found lying nearby. By patching together 17 remnants of fallen trees, they claim to go back over 7,000 years.

But the tree-ring standard does not stand alone either. Sometimes they are not sure just where to put one of the dead pieces, so what do they do? They ask for a radiocarbon measurement on it and use that as a guide in fitting it in. It reminds one of two lame men with only one crutch between them, who take turns using it, one leaning for a while on his partner, then helping to hold him up.

One must wonder at the miraculous preservation of loose bits of wood lying so long in the open. It would seem they might have been washed away by heavy rainfall or picked up by passersby for firewood or some other use. What has prevented rot or insect attack? It is credible that a living tree might withstand the ravages of time and weather, an occasional one surviving for a thousand years or more. But dead wood? For six thousand years? It strains credibility. Yet this is what the older radiocarbon dates are based on.

Nevertheless, the radiocarbon experts and the dendrochronologists have managed to put aside such doubts and smooth over the gaps and inconsistencies, and both feel satisfied with their compromise. But how about their customers, the archaeologists? They are not always happy with the dates they get back on the samples they

send in. One expressed himself this way at the Uppsala conference:

"If a carbon-14 date supports our theories, we put it in the main text. If it does not entirely contradict them, we put it in a footnote. And if it is completely 'out of date,' we just drop it."

Some of them still feel that way. One wrote recently concerning a radiocarbon date that was supposed to mark the earliest domestication of animals:

"Archeologists [are coming] to have second thoughts about the immediate usefulness of radiocarbon age determinations simply because they come out of 'scientific' laboratories. The more that confusion mounts in regard to which method, which laboratory, which half-life value, and which calibration is most reliable, the less we archeologists will feel slavishly bound to accept any 'date' offered to us without question."

The radiochemist who had supplied the date retorted: "We prefer to deal with facts based on sound measurements—not with fashionable nor emotional archeology."

If scientists disagree so sharply about the validity of these dates reaching back into man's antiquity, is it not understandable that laymen might be skeptical about news reports based on scientific "authority," such as those quoted at the head of this series of articles?

Direct Counting of Carbon 14

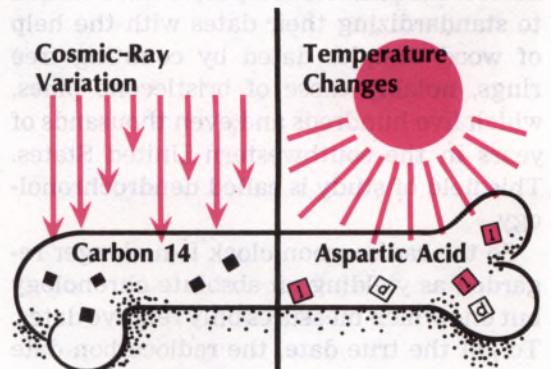
A recent development in radiocarbon dating is a method for counting not just the beta rays from the atoms that decay but all the carbon-14 atoms in a small sample. This is particularly useful in dating very old specimens in which only a tiny fraction of the carbon 14 is left. Out of a million carbon-14 atoms, only one, on the average, will decay every three days. This makes it

quite tedious, when measuring old samples, to accumulate enough counts to distinguish the radioactivity from the cosmic-ray background.

But if we can count all the carbon-14 atoms now, without waiting for them to decay, we can gain a millionfold in sensitivity. This is accomplished by bending a beam of positively charged carbon atoms in a magnetic field to separate the carbon 14 from the carbon 12. The lighter carbon 12 is forced into a tighter circle, and the heavier carbon 14 is admitted through a slit into a counter.

This method, although more complicated and more expensive than the beta-ray-counting method, has the advantage that the amount of material needed for a test is a thousand times less. It opens up the possibility of dating rare ancient manuscripts and other artifacts from which a sample of several grams that would be destroyed in testing just cannot be had. Now such articles can be dated with just milligrams of sample.

One suggested application of this would be to date the Shroud of Turin, which some believe Jesus' body was wrapped in for bur-



The amount of carbon 14 (or racemized aspartic acid) varies with external conditions

al. If radiocarbon dating was to show that the cloth is not that old, it would confirm the suspicions of doubters that the shroud is a hoax. Until now, the archbishop of Turin has refused to donate a sample for dating because it would take too large a piece. But with the new method, one square centimeter would be enough to determine whether the material dates from the time of Christ or only from the Middle Ages.

In any event, attempts to extend the time range have little significance as long as the greater problems remain unsolved. The older the sample is, the more difficult it is to ensure the complete absence of slight traces of younger carbon. And the farther we try to go beyond the few thousand years for which we have a reliable calibration, the less we know about the atmospheric level of carbon 14 in those ancient times.

Several other methods have been studied for dating events in the past. Some of these are related indirectly to radioactivity, such as the measurement of fission tracks and radioactive halos. Some involve other processes, such as the deposition of varves (layers of sediment) by streams flowing from a glacier and the hydration of obsidian artifacts.

Amino-Acid Racemization

The racemization of amino acids is another dating method used. But what does "racemization" mean?

Amino acids belong to the group of carbon compounds that have four different groups of atoms attached to a central carbon atom. The tetrahedral arrangement of the groups makes the molecule asymmetrical as a whole. Such molecules exist in two forms. Although chemically identical, one is physically the mirror image of the other. A simple illustration of this is a pair of gloves. They have the same size and shape,

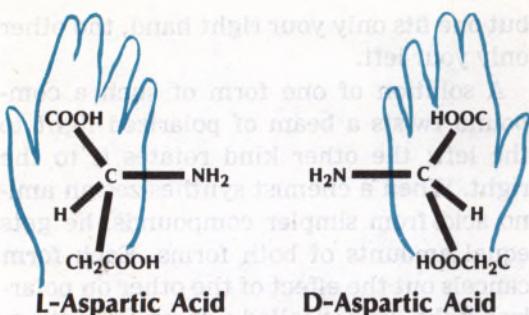
but one fits only your right hand, the other only your left.

A solution of one form of such a compound twists a beam of polarized light to the left; the other kind rotates it to the right. When a chemist synthesizes an amino acid from simpler compounds, he gets equal amounts of both forms. Each form cancels out the effect of the other on polarized light. This is called a racemic mixture, when both left-handed and right-handed amino acids are equally present in the mixture.

When amino-acid compounds are formed in living plants or animals, they come in only one form, usually the left-handed, or l- (for levo-) form. If such a compound is heated, the thermal agitation of the molecules turns some of them inside out, changing the left-handed form to the right-handed (the dextro form). This change is called racemization. Continued long enough, it produces equal amounts of the l- and d-forms. It is of special interest because it relates to living things, as does radiocarbon dating.

At lower temperatures, racemization goes at a slower pace. How much slower depends on the energy it takes to invert the molecule. It follows a well-known chemical law, known as the Arrhenius equation. If the amino acid is cooled more and more, the reaction goes slower and slower until, at ordinary temperatures, we cannot see it changing at all. But we can still use the equation to calculate how fast it is changing. It turns out that it would take tens of thousands of years for a typical amino acid to approach the racemized state, when both left-handed and right-handed forms of the amino acids are present in equal quantities.

The idea for dating by this method is this: If a bone, for example, is buried and left undisturbed, the aspartic acid



(a crystallized amino acid) in the bone is slowly racemized. We dig up the bone a long time later, extract and purify the remaining aspartic acid, and compare its degree of polarization with that of pure l-aspartic acid. Thus we can estimate how long ago the bone was part of a living creature.

The decay curve is similar to that of a radioactive element. Each amino acid has its own characteristic rate of decay, just as uranium decays slower than potassium. However, note this important difference: Radioactive rates are unaffected by temperature, whereas racemization, being a chemical reaction, is markedly dependent on temperature.

Some of the most highly publicized applications of the racemization method have been to human skeletal remains found along the coast of California. One, called the Del Mar man, was dated by this method at 48,000 years. Another, the skeleton of a female found in an excavation near Sunnyvale, appeared to be even older, a startling 70,000 years! These ages created quite a stir not only in the public press but especially among paleontologists, because no one had believed that man was in North America that long ago. Speculation arose that man could have wandered across the Bering Strait from Asia as much as a hundred thousand years ago. But how certain were

the dates turned out by this novel method?

To answer this, tests were made by a radioactive method involving intermediate decay products between uranium and lead that have half-lives suitable for this range. This gave ages of 11,000 years for the Del Mar skeleton and only 8,000 or 9,000 for the Sunnyvale. Something was wrong.

The big uncertainty in racemization ages is the unknown thermal history of the specimen. As mentioned above, the rate of racemization is extremely sensitive to temperature. If the temperature goes up by 25 degrees Fahrenheit (14° C), the reaction goes ten times as fast. How could anyone know what temperatures the bones could have been exposed to so many years in the past? How many summers might they have lain bare under a hot California sun? Or might they even have been in a campfire or a forest fire? Besides the temperature, other factors have been found to affect the rate greatly, such as the pH (degree of acidity). One report says: "Amino acids in sediments show an initial rate of racemization almost an order of magnitude (tenfold) faster than the rate observed for free amino acids at a comparable pH and temperature."

Even that is not the end of the story. One of the Sunnyvale bones was tested for radiocarbon, both by the counting of beta particles from decaying atoms and by the newer atom-counting method. These gave roughly concordant values. The average was only 4,400 years!

What can we believe? Obviously some of the answers are terribly wrong. Should we put more confidence in the radiocarbon date, since there is longer experience in using it? But even with it, different samples from the same bone varied from 3,600 to 4,800 years. Perhaps we should just admit, in the words of the scientist quoted previously, "Maybe all of them are wrong."

Credibility of Bible Dates Unimpeached



HOW do the results of scientific dating affect our understanding of the Bible? That depends on our viewpoint. If we have held to the fundamentalist interpretation that the earth, the sun, the moon, and the stars—not just mankind—were all created in just six 24-hour days, we have to admit that the scientific evidence is unsettling.

On the other hand, if we understand that the days of Genesis were long periods of thousands of years, with billions of years prior thereto for planet Earth's formation, there is no problem.

A conflict does arise, however, when a few radiocarbon dates indicate that there were men burning campfires, making tools, or building houses more than 6,000 years ago. Such dates contradict Bible chronology. Which should we believe?

From the time Adam was created, the Bible gives a year-by-year count of time that links up with reliable secular history about 25 centuries ago. The years were marked by the annual march of the sun from the summer to the winter solstice and back again, a sign God put in the sky for that purpose. Intelligent men noted and logged the successive years from one historic event to another. The records were incorporated in the early books of the Bible and preserved thereafter as part of the sacred treasury of the Jewish people as long as their national existence continued. This history of unmatched accuracy and authority tells us that mankind has been on the earth only about 6,000 years.

In contrast with this definite and positive

authority, look at the radiocarbon theory. It is based on assumptions that have all been questioned, revised, and qualified, and many of which are still clouded in serious doubts. How can it seriously challenge the historical chronology of the Bible?

What, then, may we conclude? We have seen that geologists find generally good support in radiometric dating for their theories on the history of the earth, although most of the dates are far from certain.

Paleontologists, most of whom are prejudiced by their training and by their associates in favor of the theory of evolution, keep looking for support from radiometric dating for their claims that supposed fossils of ape-men are millions of years old. But their pursuit is a frustrating one.

On the one hand, the geological clocks, uranium and potassium, run so slowly that they are not suitable. On the other hand, the radiocarbon clock, which works fairly well for just a few thousand years back, gets hopelessly entangled in difficulties beyond that. Even so, the overwhelming majority of radiocarbon measurements fall within the Biblical 6,000-year range. The few older dates, to which evolutionists cling desperately, are all suspect.

Other scientific dating methods, of which amino-acid racemization was foremost in the attack on the Bible's history of man's creation, have failed evolutionists miserably.

We can confidently stand on this fact: The chronology in the Bible stands unimpeached by any scientific dating.

From Our Readers

The Homosexual Life-Style

I was interested in your article "The Homosexual Life-Style—Just How Gay Is It?" (March 22, 1986) However, you imply that AIDS is Jehovah's judgment on homosexuals. Do you believe that sickle-cell anemia, which affects primarily blacks, is Jehovah's punishment of blacks? Also, AIDS has left lesbians unaffected. Does this mean that Jehovah dislikes gay males but smiles on lesbians? It is convenient for those who dislike homosexuals to draw a link between homosexuality and AIDS, but it is massively irresponsible.

M. D., United States

We neither stated nor implied that AIDS was God's judgment on homosexuals. Sickness is part of sin and imperfection that all of us have inherited from Adam. (Romans 5:12) But it cannot be denied that certain actions bring certain unavoidable consequences. The tobacco smoker exposes himself to greater risk of lung cancer. The misuser of alcohol exposes himself to a greater risk of liver disease. The glutton exposes himself to dangers related to obesity. The link between homosexuality and AIDS has not been drawn by us but is a fact established by medical science. Though not expressions of God's judgment, the specific consequences are linked to violations of God's laws. At Galatians 6:7 it is stated: "Do not be misled: God is not one to be mocked. For whatever a man is sowing, this he will also reap."—ED.

Resisting Rape

Thank you for your article "Now You Are Going to Die!" (May 22, 1986) I might note some concerns about the advice given, however. Some rapists are very angry and sadistic in their approach and come armed

with weapons and the intent to use them if there is the least provocation. Our Metropolitan Organization to Counter Sexual Assault suggests resistance, but if the woman is paralyzed by fear or her instincts tell her not to resist, we recognize that as appropriate. We would rather have someone live through the experience than be killed or seriously mutilated.

P. R., United States

The Bible does support the thought that a woman attacked by a rapist should scream and resist. True, the woman has to respond according to her assessment of the danger to her life, and we believe that is covered in the advice given in the box on page 23 (May 22, 1986). It should be kept in mind that submitting to rape gives no guarantee that the victim will not be beaten or killed afterward. See the article "They Resisted Rapists" in our issue of February 22, 1984.—ED.

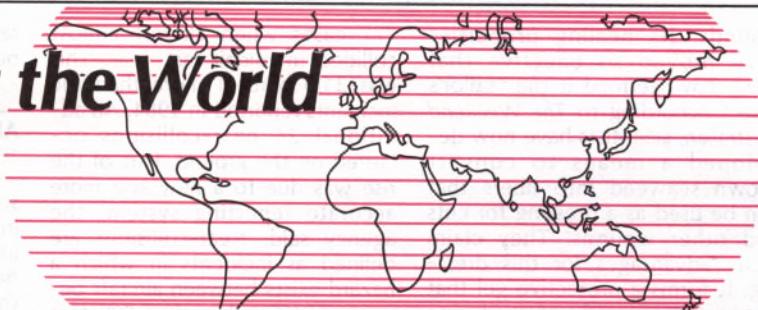
The Bomb and Man's Future

I enjoyed very much reading your articles on "The Bomb and Man's Future." (May 22, 1986) However, I don't believe that the article went far enough, such as urging readers (Christians) to oppose nuclear weapons by voting and letter writing to their lawmakers. Aloha.

J. G. B., Hawaii

Voting and writing to lawmakers suggests that there is a human solution to the problem. Our articles made very clear that only God's Kingdom will bring lasting peace and security to lovers of peace everywhere. Jehovah's Witnesses pray for that Kingdom, they live in harmony with its principles of peace, and they spend their time telling others about it.—ED.

Watching the World



Hunger Woes

United Nations officials have rated Mozambique the third most hungry country in Africa. Local production of grains in 1986 were estimated to be less than 10 percent of what is needed to feed the nation's 13 million inhabitants. A drought, which has persisted for the past four years, has been cited as a major factor contributing to the problem. However, the main cause for hunger in Mozambique is the civil war that has been ravaging the country for the past ten years, disrupting transport and even water supplies. Officials claim that five million inhabitants of the country are "in immediate danger of starvation."

Australia's "Superpig"

Australian scientists have produced "superpigs" by implanting into pig embryos DNA genetic material that actually controls how they grow. Though normal in size, the pigs will grow at least 20 percent faster and produce more meat with less fat. The scientists claim that this genetic breakthrough will give characteristics to livestock that farmers have been trying to breed into them for centuries, notes *The Weekend Australian*. The advantage over natural breeding, they point out, is that this enables them to introduce desirable characteristics into an animal without "unknown junk

genes" being transferred to offspring. Their success with pigs through genetic breeding has prompted future hopes of disease-resistant livestock, cows producing more milk, and sheep that have quick-growing wool. Scientists believe the possibilities are endless.

Camels for Morocco

Recent droughts in Morocco have almost decimated the stock of camels, forcing the government



to replenish their dwindling stock. Surprisingly, a plentiful supply awaits them in the Australian outback. Why Australia? In the 1860's, camels were brought to South Australia from India because they were suitably adapted to the climate and soil of the country. Though highly useful during the early development of the harsh Australian interior, these "ships of the desert" were abandoned with the development of motor transport. Eventually many were set free in the inland areas and have

multiplied into the thousands in the ideal arid conditions of central Australia. *The Sydney Morning Herald Magazine* says the Moroccan government has plans to purchase 2,000 camels per year for the next five years. The sale of the camels will provide a source of revenue to the Aboriginal community that, at present, is almost totally dependent on the Australian government.

Natural Fertilizer

Lightning-produced nitric acid helps yield more produce than regular fertilizers, conclude scientists at the Institute of Geology, Geophysics, and Mineral Raw Materials in Novosibirsk, U.S.S.R. In one test, researchers grew two plots of tomatoes, one fertilized in the normal way and the other watered with a weak nitric-acid solution equivalent to the amount found in thunderstorm rain. On comparing the yields, what did they find? Up to 50 percent more tomatoes from the plot of ground treated with nitric acid. Growing oats, wheat, and cucumbers in this way met with similar success. "The best yields," reports *The Times* of London, "were from soils that had never been fertilized."

Seaweed First Aid

For hundreds of years, seafarers have used seaweed for dressing

wounds. Its healing properties have proved so effective that many have termed it the "sailor's cure." According to *The Weekend Australian*, scientists have now developed a means to convert brown seaweed into fibers that can be used as a dressing for cuts and other wounds. They claim many advantages for this dressing. It forms a protective gel that keeps the wound moist during healing. The dressing can be left undisturbed for a long time. In fact, in most cases it needs to be removed only when the scab that forms over the wound is ready to come off. If frequent dressing changes are required, the protective gel prevents any damage to the healing tissue. Seaweed also acts quickly to control bleeding and could be a welcome addition for hospitals when emergency treatment is given.

Unknown Species

A previously unidentified species of parrot living in a mountain forest in Ecuador has recently been discovered by an ornithologist from the Philadelphia Academy of Natural Sciences, reports *The New York Times*. This small, newly discovered bird is predominately green in color, with red and blue patches on its wings. It is capped with a distinctive red crown and has a maroon tail. Until this find, most ornithologists had believed that all parrot species in the Americas had been discovered and classified. The last discovery of an unknown species of parrot was in 1914, claim museum officials. No name, as yet, has been given the nontalking parrot.

Close Calls

The U.S. Federal Aviation Administration has cited a record

777 cases when aircraft almost collided in midair last year. This was 31.9 percent more than the incidents reported in 1984. An additional 24 near-collisions occurred on the ground. Part of the rise was due to a new and more accurate reporting system, the agency said. Near-collisions are defined as incidents in which a hazard exists between aircraft because of being less than 500 feet (150 m) apart or when reported as such by a pilot. The largest portion, 518 cases, involved military aircraft or private planes. There were 35 cases involving two scheduled passenger airlines, 205 cases involving a passenger airline and private or military aircraft, and 19 undefined incidents.

Astounding Flight

The short-tailed shearwaters, or mutton birds, are profound travel-



ers. In 1949 some of these birds were selected and banded. One bird rebanded in November 1985 was first banded in 1950, indicating it was now over 35 years old! The little bird was still laying eggs and still flying its annual migratory passage. The yearly migration route is from Tasmania off Australia's southeastern tip to the Bering Sea, north of Japan. The bird's 35 migratory round-trips total over 650,000 miles (1,050,000 km). Comparing this to a maximum round-trip to the moon of 505,400 miles (813,400 km), our

feathered friend has apparently outflown the astronauts!

AIDS Raids

Two Australian men, each in a separate incident, were involved in similar holdups using a syringe as their weapon. Claiming to have AIDS, these men apparently threatened to inject their victims with the deadly virus-carrying blood if the money they demanded was not handed over. Alarmed over the possibility of a rash of future AIDS hold-ups, one police spokesman explained: "In many ways it is more effective than using a gun as people are scared by the slow form of death caused by the AIDS virus." He then added: "It is a sick way of cashing in on a deadly disease."

Public Recognition

"Patrick Joseph Burke eluded Federal marshals for five years after he disappeared in 1981, when he was on probation for distributing cocaine," says *The New York Times*. "Then he took a bit part in a nationally televised miniseries." Rosetta Anderle, a county sheriff, noted his face on her TV screen and matched it with a "Wanted" poster that had been sent to all Colorado sheriffs. Mr. Burke was located at work and arrested on the main street of the town where the film had been made.

Catholics Show Decline

The Catholic Church showed a 7.7-percent decline in the number of U.S. converts from 1983 to 1985, according to the *Official Catholic Directory*. Citing statistics, Alvin Illig, the director of the Paulist National Catholic Evangelization Association, noted that the number of converts nation wide

went from 95,346 in 1983 to 87,-996 in 1985. He explains: "Obviously those of us in leadership positions in primary evangelization in the United States have failed . . . to raise practical interest among our Catholic people in the evangelization of the 80 million unchurched Americans." For this, he adds, U.S. Catholics "should be ashamed."

Updated Figures

Our Galaxy is 25 percent smaller than we thought previously, scientists say. Using a new technique that involves advanced geometry, the international team of astronomers has determined that the diameter of the Milky Way's 200 billion stars is some 70,000 light-years. Our sun and its planets are now placed 23,000 light-

years from the center of the galaxy—much closer than previously thought.

Also, the speed of sound in air is almost a half mile per hour slower than previously measured. It was set at 741.5 miles per hour, or 331.45 meters per second, after the sound barrier was smashed in 1947. But in an effort to calibrate microphones accurately, senior research officer George S. K. Wong, of the National Research Council of Canada, uncovered a calculation error made in 1942 that crept through scientific literature unchallenged. The new figure given is 741.1 miles per hour, or 331.29 meters per second.

Tree-Moving

"Don't fell trees, transplant them!" is the slogan of a German

company that specializes in transplanting fully grown trees. It points out that trees provide many benefits: They purify the air, their leaves trap dust and soot, and a fully grown tree can provide the oxygen requirements of 64 people. Additionally, they absorb noise, provide shade, and regulate temperature. The company has developed machinery and techniques to move trees from one location to another—even while the trees are in full leaf in midsummer—with a claimed 95-percent success rate. "Trees up to a century old, with trunks one to two metres [3.3 to 6.6 ft] in [circumference] and weighing up to 30 tonnes, can be transplanted," says *The German Tribune*. However, some types of trees fare better than others, and suitable locations, aftercare, and trimming must be provided to ensure survival.

complaints from the customer. It is important that you have a good relationship with your customers so that you can quickly resolve any problems they may have. This will help to build trust and loyalty, which are key factors in maintaining a successful business.

It's also important to keep your customers informed about any changes or updates to your products or services. This can be done through email newsletters, social media, or even direct mail. By keeping your customers informed, you can ensure that they are always up-to-date with what's new and how it can benefit them. This can help to increase customer satisfaction and loyalty, which is crucial for long-term success.

Finally, it's important to listen to your customers' feedback and suggestions. This can help you to identify areas where you can improve your products or services. It can also help you to stay ahead of the competition by understanding what your customers want and need. By listening to your customers, you can build a loyal customer base and ensure that your business continues to grow and succeed.

Upcoming Events

There are several events coming up in the next few months that you might be interested in attending. One event is the "Customer Experience Conference" on May 15th, which will focus on improving customer service and satisfaction. Another event is the "Retail Technology Show" on June 10th, which will showcase the latest trends in retail technology. Additionally, there is the "Business Expo" on July 12th, which will feature various exhibitors and speakers sharing their expertise in business management.

Free-Moving

If you're planning to move, consider using a moving company that offers free moving services. Many companies offer free estimates and free moving services for customers who book their services in advance. This can save you money and reduce stress during the moving process.