Awake!

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Unlocking the Secrets of the Universe

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Unlocking the Secrets of the Universe 3-11

Throughout history humans have gazed in awe at the starry vault overhead. But for millenniums the enormity and significance of what they saw were veiled to them, veiled by the limitations of their eyesight, their superstitions, and their presumptuousness. Now, by means of optical telescopes and radio telescopes and other devices, many secrets of the universe are being unlocked. On the cover of this magazine is a photo of the Trifid Nebula. Inside it, new stars have been born.

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What is its source? Is it the sole province of women, or do men also possess it?

Cover photo: D. F. Malin, courtesy of Anglo-Australian Telescope Board

Galileo's Telescope
Only the Beginning!

WHEN Galileo turned his newly invented telescope to the sky, a whole new vision swam into view. He could see ten times as many stars as any man had ever before seen. The Milky Way now appeared, not as a nebulous mass, but as a kaleidoscope of countless stars, great and small. The moon's surface was transformed before his eyes from a lustrous porcelain into a mosaic of mountains, craters, and waterless seas.

A few months later, he spotted four of the moons of Jupiter. Then he saw the beautiful rings of Saturn. Directing his telescope to Venus, he noticed certain phases of the planet, subtle changes in illumination and apparent shape. These phases could be explained only if the planet moved around the sun. But if one planet moves around the sun, the others—including the earth—must do so also, he concluded. He was right. Thus, in the year 1609, the earth was toppled from its hallowed pedestal as the alleged center of the universe.

But venerated beliefs were not easily abandoned. The Catholic Church ruled that "the view that the earth is not the center of the universe and even has a daily rotation is . . . at least an erroneous belief." Galileo was hauled before the Inquisition and spent the last years of his life under house arrest. Religious dogmatism, however, could not check the curiosity that the invention of the telescope had raised. The challenge of unlocking the secrets of the universe attracted a growing number of scientists.

Now, after nearly four hundred years of intensive scrutiny, our knowledge of the universe has increased dramatically. Different types of stars, such as red giants, white dwarfs, and pulsars, have been identified. Recently, quasars—enigmatic objects that emit prodigious amounts of energy—have been detected in the outer reaches of space. And mysterious black holes—like unimaginably powerful cosmic whirlpools—are now believed to lurk unseen in many galaxies.

Powerful optical telescopes enable astronomers to peer far into space and thereby in effect journey billions of years back in time, to the very edge of the visible universe. A vast array of stars and galaxies have been discovered, some so distant that their light is calculated to have taken more than 15 billion years to reach us.*

Although stars in general are weak radio sources, other celestial objects, such as pulsars and quasars, have been discovered thanks principally to radio telescopes. As the name implies, these telescopes detect radio wavelengths rather than optical wavelengths. Since 1961, hundreds of quasars have been detected, many of them in the outer reaches of the known universe.

The task of charting the universe was greater than Galileo could possibly have imagined. Only in this century has man begun to comprehend the enormity of the

* To make these enormous distances manageable, new units of distance, such as the light-year, had to be created. A light-year is the distance that light travels in one year, some six trillion miles. A car traveling at a fixed speed of 60 miles an hour would take more than 11 million years to cover that distance!

cosmos, the billions of galaxies of which it is composed, and the staggering distances that separate them.

To help us imagine cosmic distances, physicist Robert Jastrow suggests the following analogy. Imagine the sun scaled down to the size of an orange. Then the earth would be a mere grain of sand circling in orbit around the sun at a distance of 30 feet. Jupiter would be like a cherry pit revolving around the orange a city block away, and Pluto would be still another sand grain at a distance of ten city blocks from our imaginary orange, the sun. On that same scale, the sun's nearest neighbor, the star Alpha Centauri, would be 1,300 miles away, and the entire Milky Way a loose cluster of oranges separated from one another by about 2,000 miles, with an overall diameter of 20 million miles. Even when everything is scaled down, the figures soon get out of hand.

It is not just the distances that are astounding. As scientists have unveiled the secrets of the universe, peculiar phenomena have come to light. There are neutron stars consisting of matter so dense that a mere teaspoonful weighs as much as 200 million elephants. There are tiny stars called pulsars, one of which winks on and off some 600 times a second. And, of course, there are those tantalizing black holes scientists speculate about. The holes themselves cannot be seen, but their insatiable appetite for light and matter may betray their cryptic presence.

Much, of course, still remains a mystery, shrouded by those immense distances and aeons of time. But what have scientists so far discovered about the universe? Does what they know throw new light on how and why the universe exists?

Courtesy of Jodrell Bank Radio Telescope

The Jodrell Bank radio telescope, constructed in 1957 in England, was the first fully steerable unit

Awake!®

Why *Awake!* Is Published *Awake!* is for the enlightenment of the entire family. It shows how to cope with today's problems. It reports the news, tells about people in many lands, examines religion and science. But it does more. It probes beneath the surface and points to the real meaning behind current events, yet it always stays politically neutral and does not exalt one race above another. Most important, this magazine builds confidence in the Creator's promise of a peaceful and secure new world before the generation that saw the events of 1914 passes away.

Would you welcome more information? Write Watch Tower at the appropriate address on page 5. This is part of a worldwide Bible educational work that is supported by voluntary donations.

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The Universe
Some Secrets Unlocked

ON THE 4th of July, in the year 1054, Yang Wei Te gazed up at the early morning sky. As official astronomer of China's Imperial Court, he was meticulously observing the movement of the stars when suddenly a bright light near the constellation of Orion attracted his attention.

A "guest star"—the name the ancient Chinese gave to such a rare occurrence—had made its appearance. After dutifully reporting to his emperor, Yang noted that the "guest star" had become so bright that it even outshone Venus and could be seen in broad daylight for several weeks.

Nine hundred years were to pass before this spectacle could be adequately explained. It is now believed that the Chinese astronomer was witnessing a supernova, the cataclysmic death throes of a massive star. The whys and wherefores of such an extraordinary phenomenon are just some of the secrets that astronomy is trying to unlock. The following is one explanation that astronomers have painstakingly pieced together.

Although stars like our sun may have immensely long and stable lives, their formation and demise give rise to the most spectacular sights in the skies. Scientists believe that the life story of a star begins inside a nebula.

Nebula. This is the name given to an interstellar cloud of gas and dust. Nebulas are among the most beautiful objects in the night sky. The one seen on the cover of this magazine is called the Trifid Nebula (or nebula with three clefts). Inside this nebula new stars have been born, which cause the nebula to give off a reddish glow.

Apparently, stars form inside a nebula when the diffuse matter condenses under the force of gravity into contracting regions of gas. These huge balls of gas stabilize when they reach the temperature at which nuclear reactions begin in the core of the cloud, preventing further contraction. Thus a star is born, often in conjunction with others, with which it makes up a star cluster.

Star clusters. In the photograph on page 8, we see a small cluster called the Jewel Box, thought to have been formed just a few million years ago. Its name was coined from the graphic description by 19th-century astronomer John Herschel: "a casket of variously

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coloured precious stones." Our galaxy alone is known to have over a thousand similar clusters.

The star's energy. A nascent, or developing, star stabilizes as a nuclear furnace is fired in its interior. It starts converting hydrogen to helium by a fusion process somewhat like that which occurs in a hydrogen bomb. Such is the mass of a typical star, like the sun, that it can burn its nuclear fuel for billions of years without exhausting the supply.

But what happens when such a star eventually uses up its hydrogen fuel? The core contracts, and the temperature rises as the star exhausts the hydrogen in the central regions. Meanwhile, the outer layers expand enormously, increasing the star's radius 50 or more times, and it becomes a red giant.

Red giants. A red giant is a star with a surface temperature that is relatively cool; its color therefore appears red, rather than white or yellow. This phase in a star's life is relatively short, and it ends—when most of the helium supply runs out—with a celestial fireworks display. The star, still burning helium, ejects its outer layers, which form a planetary nebula, glowing because of energy received from its mother star. Eventually, the star contracts dramatically to become a faintly shining white dwarf.

If the original star is massive enough, however, the final outcome is that the star itself explodes. That is a supernova.

Supernovas. A supernova is the explosion that ends the life of a star that was originally much more massive than the sun. Huge amounts of dust and gas are spewed into space by violent shock waves at speeds of over 6,000 miles a second. The intense light of the explosion is so bright that it outshines a billion suns, appearing as a sparkling diamond in the sky. The energy liberated in a single supernova explosion corresponds to the total energy the sun would radiate in nine billion years.

Nine hundred years after Yang observed his supernova, astronomers can still see the scattered debris of that explosion, a structure called the Crab Nebula. But something more than the nebula was left behind. At its center they discovered something else—a tiny object, rotating 33 times a second, called a pulsar.

Pulsars and neutron stars. A pulsar is understood to be a superdense, spinning core of matter left over after a supernova explosion of a star no more than three times as massive as the sun. Having diameters of less than 20 miles, they are rarely detected by optical telescopes. But they can be identified by radio telescopes, which detect the radio signals that are produced by their rapid rotation. A beam of radio waves rotates with the star, like the beam of a lighthouse, appearing as a pulse to an observer, giving rise to the name pulsar. Pulsars are also called neutron stars because they are principally composed of tightly packed neutrons. This accounts for their incredible density—over a billion tons per cubic inch.

But what would happen if a really massive star went supernova? According to astronomers' calculations, the core could continue its collapse beyond the neutron-star stage. Theoretically, the force of gravity compressing the core would be so great that a so-called black hole would result.

Black holes. These are said to be like gigantic cosmic whirlpools from which nothing can escape. The inward pull of gravity is so strong that both light and matter that get too close are inexorably sucked into them.

No black hole has ever been observed directly—by definition that is impossible—although physicists hope to demonstrate the existence of them by the effect they have on

Photo: D. F. Malin, courtesy of Anglo-Australian Telescope Board

Spiral galaxy M83

neighboring objects. New observing techniques may be needed to unlock this particular secret.

Secrets of the Galaxies

A galaxy is a cosmic structure made up of billions of stars. In 1920 it was discovered that the sun was not the center of our galaxy, as had previously been assumed. Soon afterward, powerful telescopes revealed a host of other galaxies, and man began to comprehend the immensity of the universe.

The misty tapestry we call the Milky Way is really an edge view of our own galaxy. If we could see it from afar, it would look much like a giant pinwheel. Its shape has been likened to two fried eggs placed back to back but, of course, on a far grander scale. Traveling at the speed of light, it would take 100,000 years to cross our galaxy. The sun, situated toward the outer edge of the galaxy, takes 200 million years to complete its orbit around the galactic center.

Galaxies, like stars, still hold many secrets that intrigue the scientific community.

Quasars. In the 1960's, strong radio signals were picked up from objects far, far beyond our local group of galaxies. They

The Jewel Box

Photo: D. F. Malin, courtesy of Anglo-Australian Telescope Board

Open star cluster, the Pleiades in Taurus, M45

Photo: D. F. Malin, courtesy of Anglo-Australian Telescope Board

Orion nebula, with inset showing Horsehead nebula

were called quasars—short for "quasi-stellar radio sources"—because of their similarity to stars. But astronomers were perplexed by the prodigious energy quasars emitted. The more luminous one is some ten thousand times as bright as the Milky Way, and the most distant ones detected are over ten billion light-years away.

After two decades of intensive study, astronomers have come to the conclusion that these distant quasars are very active nuclei of outlying galaxies. But what goes on in the nucleus of these galaxies to generate such enormous energy? Some scientists suggest that the energy is released by gravitational processes rather than by nuclear fusion as in stars. Current theory associates quasars with gigantic black holes. Whether this is correct or not remains uncertain at present.

Quasars and black holes are just two of the puzzles that are yet to be solved. In fact, some of the secrets of the universe may be forever beyond our grasp. Nevertheless, those that have been unlocked can teach us some profound lessons, lessons that have implications far beyond the realm of astronomy.

Lessons Learned From the Universe

"I don't pretend to understand the Universe—it's a great deal bigger than I am."—Thomas Carlyle, 1795-1881.

A HUNDRED years later, we have a better idea of how much bigger than we are the universe really is. Although scientists understand a lot more than they did, their situation is still, as one astronomer described it, like that of "the 18th-century botanists in the jungle finding all those new flowers."

Despite our limited knowledge, certain conclusions can be drawn. And these conclusions have to do with the most important questions of all—how the universe works, and how it got here in the first place.

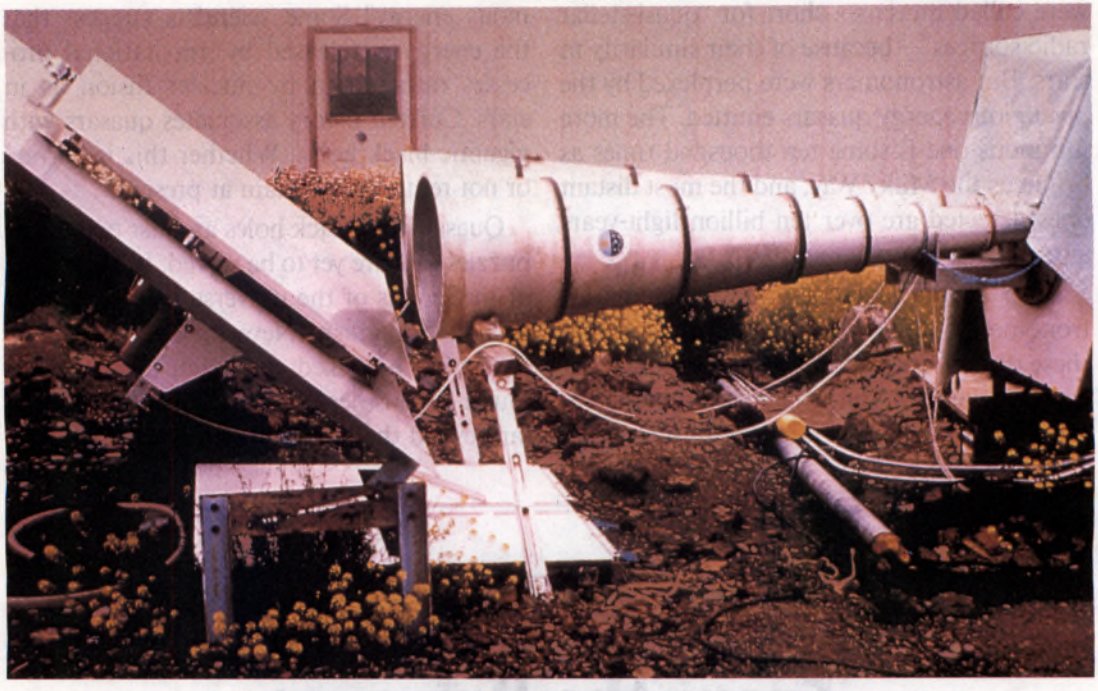
Order Rather Than Chaos

The study of the nature of the universe is called cosmology. That term is derived from two Greek words, *kosmos* and *logos,* indicating 'the study of order or harmony.' This is an apt name because order is precisely what astronomers encounter, whether they investigate the motion of celestial bodies or the matter of which the cosmos is composed.

Everything in our universe is in motion, and the movement is neither erratic nor unpredictable. Planets, stars, and galaxies move through space according to precise physical laws, laws that enable scientists to predict certain cosmic phenomena with unerring accuracy. And incredibly, the four fundamental forces that control the tiniest atom also govern the mightiest galaxies.

Order is also manifest in the very stuff of

Courtesy of the Royal Greenwich Observatory and the Canary Islands Institute of Astrophysics



Apparatus for detecting background radiation from the theoretical big bang

which the universe is built. "Matter is . . . organised on all scales from very small to very large," explains *The Cambridge Atlas of Astronomy*. Far from being randomly distributed, matter is structured in an orderly way, whether it is the way electrons are linked to the protons and neutrons of the atomic nucleus or it is the mutual attraction that binds together an enormous cluster of galaxies.

Why does the universe reveal such order and harmony? Why are there transcendent laws ruling it? Since these laws must have existed before the origin of the universe—otherwise they could not control it—the logical question is: Where did they come from?

Famous scientist Isaac Newton concluded: "This most beautiful system of the sun, planets, and comets could only proceed from the counsel and dominion of an intelligent and powerful Being."

Physicist Fred Hoyle said: "The origin of the Universe, like the solution of the Rubik cube, requires an intelligence." The conclusion that there must be a supernatural Lawgiver is confirmed by our understanding of the origin of the universe.

The Ultimate Question: How Did the Universe Get Here?

Theoretical physicist Hawking explains: "The early universe holds the answer to the ultimate question about the origin of everything we see today, including life." What exactly is the present scientific view of the early universe?

In the 1960's, scientists detected faint background radiation coming from all parts of the sky. This radiation was said to be a reverberation coming from the primeval explosion that astronomers have christened the big bang. So enormous was the explosion, they say, that its

echo could still be detected billions of years later.*

But if the universe suddenly exploded into existence between 15 billion and 20 billion years ago, as most physicists now believe (though that is hotly contested by others), a crucial question arises. Where did the original energy come from? In other words, what came before the big bang?

This is a question that many astronomers prefer to dodge. One of them confessed: "Science has proved that the world came into being as a result of forces that seem forever beyond the power of scientific description. This bothers science because it clashes with scientific religion—the religion of cause and effect, the belief that every effect has a cause. Now we find that the biggest effect of all, the birth of the universe, violates this article of faith."

An Oxford University professor wrote more pointedly: "The first cause of the universe is left for the reader to insert. But our picture is incomplete without him." The Bible, however, sets matters straight, identifying "the first cause" by saying: "In the beginning *God* created the heavens and the earth."—Genesis 1:1.

Man's Insignificance

The simplest lesson the universe teaches us is the most obvious one, one that proud medieval man strove to ignore but one that Biblical poets humbly acknowledged millenniums ago—that of man's insignificance.

Recent discoveries reinforce King David's realistic appraisal: "When I see your heavens, the works of your fingers, the moon and the stars that you have prepared, what is mortal man that you keep him in mind, and the son of earthling man that you take care of him?" —Psalm 8:3, 4.

Astronomy has unveiled the immensity and the majesty of the cosmos—the stars of Gargantuan proportions, the distances beyond imagination, the aeons of time that defy comprehension, the cosmic furnaces that generate temperatures of millions of degrees, the eruptions of energy that dwarf a billion nuclear bombs. Yet, all of this is well described in the book of Job: "Look! These are the fringes of his ways, and what a whisper of a matter has been heard of him! But of his mighty thunder who can show an understanding?" (Job 26:14) The more we learn about the universe, the scantier our knowledge appears, and the smaller our own place in it becomes. For the objective observer, it is a sobering lesson.

Isaac Newton admitted: "I seem to have been only like a boy playing on the seashore, and diverting myself in now and then finding a smoother pebble or a prettier shell than ordinary, while the great ocean of truth lay all undiscovered before me."

The humility that such comprehension should stir in us will help us to acknowledge that there is One who created the universe, One who established the laws that govern it, One who is far greater and wiser than we are. As the book of Job reminds us: "With him there are wisdom and mightiness; he has counsel and understanding." (Job 12:13) And that is the most important lesson of all.

As more secrets of the universe are unlocked, even greater mysteries are uncovered. A future article will discuss some of the latest discoveries that are now puzzling astronomers and raising new questions that are fueling debates among cosmologists.

* Just as a stone thrown into a pond forms ripples on the water, so this theoretical first explosion formed "ripples" of microwave radiation, which is what scientists believe they are picking up with their sensitive radio antennae, ripples described by one writer as "the hissing echoes of creation."

Can There Really Be a Just War?

OVER the centuries, Christendom has done a lot of talking about the concept of the "just war." Last year *Time* magazine published a list of six basic requirements that theologians feel a war should meet in order to be considered "just." History bears out that none of the wars backed by Christendom have actually met these requirements.

But Har-Magedon, the war that God has promised to bring against this corrupt system of things, does meet all six of the theologians' criteria.

"It pursues a 'just cause,' such as self-defense or the conquest of evil." Har-Magedon will crush out of existence all parts of the evil world of which Satan the Devil is the god. Thus, it can be said of God's "Faithful and True" Warrior at Har-Magedon, Christ Jesus, that "he judges and carries on war in righteousness."—Revelation 19:11; 2 Corinthians 4:4.

"It is declared and directed by a 'competent authority.'" Har-Magedon is unmistakably identified as being "the war of the great day of God the Almighty"—*his* war. Who could be a more competent authority than the Creator of the universe himself?—Revelation 16:14; see also 11:17, 18; compare Isaiah 36:10.

"It is a 'last resort' after peaceful means have failed." For thousands of years now, the Creator has encouraged—even pleaded with—mankind to "become reconciled to God" and to "serve Jehovah with fear." But by turning a deaf ear to peace initiatives and warnings from God for 6,000 years, man has left the Creator no alternative to war.—2 Corinthians 5:20; Psalm 2:2, 10-12.

"It carries at least a 'probability' of success." Consider the opposing sides. On one side is the collective power of the nations of this world, with all their arsenals of awesome weaponry. On the other side is the Creator of the universe. One of his smaller creations, the sun, is a vast furnace of thermonuclear explosions so powerful that even if the nations were to detonate all their nuclear weapons in a single gigantic blast, that explosion would seem like the fizzle of a single match by comparison. Jehovah has at his disposal all the mighty forces of creation to ensure that his war will achieve sure success. —Isaiah 40:15; 54:17.

"It conforms to 'proportionality'—the good to be achieved will outweigh the damage done." Consider a future *without* God's war of Har-Magedon. Mankind is bent inexorably on self-destruction. Left to his own devices, how long would man take to ruin this planet and shuffle off ignominiously down the road to extinction, the last in a grim parade of species he has sent that way? Will it be a single afternoon of nuclear holocaust? or a few decades of global pollution? Either way, mankind is doomed if God does not intervene in human affairs. On the other hand, consider the good Har-Magedon promises to achieve —godly humanity's peaceful future on this planet, no more pollution, no more war, no more poverty, no more disease or even death. God promises: "Look! I am making all things new."—Revelation 21:3-5.

"It is 'discriminate,' avoiding harm to noncombatants where possible." Har-Magedon will be selective. "Evildoers themselves will be cut off, but those hoping in Jehovah are the ones that will possess the earth."—Psalm 37:9.

All those interested in surviving this truly just war need to learn the basis for "hoping in Jehovah" by personal study of his Word.

Economic Anxieties When Will They End?

AS LONG as greedy commerce maintains its tight grip on the masses, economic anxieties will continue. That is the bad news. The good news is that its grip will soon be broken, putting an end to economic anxieties once and for all. Presently over four million Jehovah's Witnesses are making this good news known to others throughout the world.—See box on page 14.

A Most Effective Instrument

The purpose of advertising—when applied to economics—is to sell products or services. To promote sales, the public must be influenced to buy. Billboards, newspapers, magazines, radio, and television, not to mention that irritant known as junk mail, aim to accomplish this.

The sophisticated advertisements of modern television are far removed from the messages of public criers in ancient Greece. But the purpose of advertising—to influence people—has not changed. The invention of printing from movable type by Johannes Gutenberg opened up such new vistas of public advertising that by 1758 English literary giant Samuel Johnson could write: "Advertisements are now so numerous that they are very negligently perused, and it is therefore become necessary to gain attention by magnificence of promise and by eloquence sometimes sublime and sometimes pathetick." Were it not for his out-of-date spelling, we could suppose that Johnson had penned these words today, in 1992.

Advertising was given fresh impetus by the industrial revolution. The multitude of new products it made available needed buyers, who could now be reached by a growing network of newspapers and magazines. In time, radio and television embraced an even larger audience. Advertising became a business in its own right. Advertising agencies were formed as early as 1812, when Reynell and Son opened in London.

If advertising is truthful, informing us of available products or services to satisfy legitimate needs, it serves a good purpose. Not so, however, when it oversteps proper boundaries, seducing us into buying what we do not need and into taking on burdensome debts for the sake of instant gratification. "It cajoles, it implores, it reasons, it shouts," is the way one writer described it, adding: "Whether consciously or subconsciously, all of us are affected, for better or for worse, by advertising."

Prospective buyers are often swayed by factors that are not even relevant. Advertisers appeal to the ego; they work on the emotions. They may present half-truths. Worse, they may conceal negative or dangerous aspects of

their product, thereby showing a serious lack of concern for the welfare of others—all in the name of economic competition.

Is Economic Competition Necessary?

You may feel, as many do, that competition is essential for progress. And, indeed, at present, honest economic competition may in some ways protect the consumer. But the education manual *Psychology and Life* questions whether competition is "a necessary characteristic of human nature," asking: "Must we stand with one foot on the neck of the vanquished in order to be happy?"

While noting that people reared in a competitive society apparently "do respond to the challenge of beating the other fellow," this textbook maintains that competitiveness is not an inborn psychological trait. In fact, in the long run, competition is counterproductive. Tests reveal that it "produces a win-at-any-cost attitude which is frequently not conducive to the best quality of work."

Competition, for example, can breed fear of failure. But fear, whether at school, in the workplace, or elsewhere, is not really conducive to good performance. Besides, competition may lead to dishonesty or to cheating. Students who are overly competitive about getting good grades may lose sight of the real purpose of education: to equip them to become better and more productive members of society.

At the time of its writing in the 1930's, *Psychology and Life* cited Samoa as an example of a largely noncompetitive society. "People work and store the products of their labor in a common warehouse from which all can draw according to their needs," it explains, adding: "Anthropologists report that such people are fully as happy as their more individualistic fellow men in other parts of the world."

Thus, a rewarding and successful economic system need not necessarily be based on competition. A leading businessman contends that while competition may be necessary to motivate immature people, mature individuals should have no difficulty in finding moti-

No Economic Anxieties Under God's Kingdom

No soaring prices due to food shortages: "The earth itself will certainly give its produce; God, our God, will bless us." "There will come to be plenty of grain on the earth; on the top of the mountains there will be an overflow."—Psalm 67:6; 72:16.

No unpaid doctor bills: "No resident will say: 'I am sick.'" "The eyes of the blind ones will be opened, and the very ears of the deaf ones will be unstopped. At that time the lame one will climb up just as a stag does, and the tongue of the speechless one will cry out in gladness."—Isaiah 33:24; 35:5, 6.

No exorbitant rents or mortgage payments: "They will certainly build houses and have occupancy; and they will certainly plant vineyards and eat their fruitage. They will not build and someone else have occupancy; they will not plant and someone else do the eating."—Isaiah 65:21, 22.

No division into rich and poor classes: "He will certainly render judgment among many peoples, and set matters straight respecting mighty nations far away. . . . And they will actually sit, each one under his vine and under his fig tree, and there will be no one making them tremble."—Micah 4:3, 4.

No more unfulfilled needs of any kind: "As for those seeking Jehovah, they will not lack anything good." "You are opening your hand and satisfying the desire of every living thing."—Psalm 34:10; 145:16.

vation in the activity itself. Joy is to be found in learning, in being creative, in making others happy, in making improvements and new discoveries.

Understandably, then, the wise counsel of the Bible is: "Let us not become egotistical, stirring up competition with one another, envying one another."—Galatians 5:26; Ecclesiastes 4:4.

Break Free for Something Better!

It is evident that Satan is using greedy commerce as an instrument in pursuit of his own ends. By creating economic anxieties, he is getting an ever tighter grip on mankind. Worry about satisfying material cravings crowds out the meeting of essential spiritual needs. The throw-away mentality fostered by commerce negatively affects the environment. Its have-it-all-and-have-it-now attitude destroys contentment and happiness. In fact, legitimate economic interests, when not tempered by divine principles, ultimately degenerate into self-interest and, in turn, into greed.

Greed and excessive self-interest, however, are forms of idolatry, which is displeasing to God. (Colossians 3:5) People who allow their personalities to be negatively shaped by commerce are, like promoters of false religion and advocates of human rule, treading on dangerous ground. They run the risk of becoming objects of divine disapproval. Jesus warned: "Pay attention to yourselves that your hearts never become weighed down with overeating and heavy drinking and anxieties of life [including economic anxieties], and suddenly that day [of Jehovah's judgment] be instantly upon you."—Luke 21:34.

Those who would be Christians must break free from the grip of imperfect economic systems by rejecting the spirit they foster and by shelving selfish economic goals. Personalities must be molded by the almighty Creator, not by the almighty dollar. Honesty must be striven for at all times. Contentment must be found in what one has, not in constantly grasping for more.—Ephesians 5:5; 1 Timothy 6:6-11; Hebrews 13:18.

Under God's Kingdom economic anxieties will be over at last

To set proper priorities, Christians must periodically examine their goals in life. (Philippians 1:9, 10) This is reflected in their choice of work and of education for their children. They keep in mind that "everything in the world—the desire of the flesh and the desire of the eyes and the showy display of one's means of life—does not originate with the Father, but originates with the world. Furthermore, the world is passing away and so is its desire, but he that does the will of God remains forever." They constantly remind themselves that when the world passes away, world commerce will experience a 'Wall Street Crash' from which it and its supporters will never recover.—1 John 2:16, 17.

What Is This Thing Called Intuition?

ONE evening in 1893, a clerk for a coal company in Detroit, Michigan, U.S.A., saw a weird contraption made of spare parts and bicycle wheels clattering noisily down the street. Suddenly, he had a hunch—a flash of intuition. He somehow just *knew* that here was an invention with a future. Promptly he withdrew his life's savings of a thousand dollars and bought into the inventor's company, ignoring the sneers of experts who insisted that this odd device would never be very popular. About 30 years later, he sold his shares in Henry Ford's automobile company for $35 million. To say the least, his intuition paid off!

The renowned scientist Albert Einstein is another who acted upon a flash of intuition. He had a notion—one he later called the happiest thought of his life—which led to the

Einstein attached much importance to intuition

birth of the famous theory of general relativity. Einstein concluded that intuition was crucial to the discovery of natural laws. Not all of Einstein's hunches paid off so handsomely, though. He confessed that he once lost two years' worth of hard work by pursuing a beguiling intuition that never panned out.

Of course, intuition does not always lead to fame and fortune, nor is it strictly the province of geniuses and multimillionaires. For most of us, intuition is an ordinary part of everyday life. It may play some part in many of the decisions we make: the decision to distrust a stranger, the resolve to enter a business deal, the surmise that something is wrong with a friend whose voice didn't sound quite right over the telephone.

Many, though, rely on intuition to make much more important decisions: what career to pursue, where to live, whom to marry, even what religion to live by. When intuition in these areas doesn't pan out, the cost may be much higher than losing two years of work, as did Einstein. What, then, is "intuition"? How does it work? How reliable is it?

One teenage girl, quoted in *The Intuitive Edge,* by Philip Goldberg, answered that question by saying: "Intuition is when you know something, but, like, where did it come from?" Intuition has been more formally defined as "knowledge that comes to a person without any conscious remembering or reasoning." Intuition, it seems, involves a kind of leap—straight from seeing a problem to knowing its solution. Suddenly, we just *know* an answer or comprehend a situation. That does not mean, though, that intuition is the same thing as an impulse or a desire.

"When I saw it, I just *knew* I had to have it," for instance, does not express intuition so much as desire. Intuition may seem similar to desire in that it appears to come upon us without methodical, step-by-step reasoning. But its roots are really far less emotional and mysterious than the desires that well up from our often "treacherous" hearts.—Jeremiah 17:9.

Apparently intuition is not some mysterious sixth sense either. As *The World Book Encyclopedia* says: "Some people incorrectly call intuition 'the sixth sense.' But investigation usually shows that intuitions are based on experience, particularly the experience of individuals with great sensitivity." The individual builds up "a storehouse of memories and impressions," the *Encyclopedia* argues, from which the mind may draw a "sudden impression [called] an intuition, or 'hunch.'"

Intuition is not some mysterious sixth sense

So rather than being some mysterious or magical trait, intuition appears to result naturally when a person acquires expertise. As the magazine *Psychology Today* noted recently: "Researchers have found that intuitive people share one essential trait: They are experts in particular . . . fields of knowledge. And they easily tap their erudition to solve problems in their special domains. In fact, people appear to be intuitive precisely because—and to the extent that—they possess expertise." But why would expertise give birth to intuition?

Michael Prietula, an assistant professor of industrial administration, theorizes that as they gain more knowledge of a subject, "there is a gradual change in how people think and reason." The mind organizes the information into blocks, or chunks. These broad patterns of information sometimes enable the mind to bypass the slower, plodding, analytical steps and leap directly to intuitive conclusions, or hunches. According to Prietula, the hunches improve as the brain links more of these broad patterns.

Consider an everyday example from the book *Brain Function:* "Watch a locksmith at work as he feels his way with a simple bent wire in a complicated lock and snaps it open, as if guided by some mysterious intuition." The locksmith's intuition may well seem mysterious to an observer; in reality, it springs from years of experience. All of us use this kind of intuition. When you ride a bicycle, for example, you don't consciously say to yourself things like, 'I think I had better turn the front wheel a fraction to the right, or else I might lose my balance.' No, the brain makes such decisions intuitively, based on knowledge you gained from experience.

Similarly, Einstein's intuition in physics did not spring from thin air. He had a vast reservoir of expertise to draw from. However, expertise in one field may not lead to intuition in another. Einstein's intuition would not help him fix a plumbing problem.

In the minds of many, the words "women" and "intuition" go together. Are women really more intuitive than men? And if so, how could the acquiring of expertise explain this phenomenon?

Consider a common example. A baby cries. The experienced mother, busy in another room, reaches for the diapers instead of preparing to feed the child. Why? She has developed an intuitive sense about her child's cries. She knows which cries express which needs and which are more likely to come at certain times. In a split second, and without any conscious reasoning, she is able to assess the child's need and react accordingly. Is some

Are women really more intuitive than men?

By intuition a mother recognizes her baby's needs when it cries

mysterious sixth sense at work? No, her intuition is based on her expertise as a mother, a hard-won benefit of experience. A new mother or a baby-sitter may at first be at a loss in the same situation.

The notion of women's intuition is not limited to motherhood, though. Many have observed that women often seem able to size up the subtleties of situations involving people and personalities more quickly and intuitively than men. Scientists are not sure why the sexes seem to differ in this respect.

Based on his studies of the subject, psychologist Weston Agor of the University of Texas, El Paso, concluded that while women are, on the average, more intuitive than men, this difference is based more on culture than on physiology. Other experts have also concluded that the traditional roles of women train them to be good judges of character. As anthropologist Margaret Mead put it: "Because of their age-long training in human relations—for that is what feminine intuition really is—women have a special contribution to make to any group enterprise."

While women's intuition is an admittedly speculative subject, there is a growing consensus among experts that intuition is an extremely useful tool for both male and female. In his book *The Process of Education,* psychologist Jerome Bruner says: "The warm praise that scientists lavish on those of their colleagues who earn the label 'intuitive' is major evidence that intuition is a valuable commodity in science and one we should endeavor to foster in our students."

It is not just science students, though, who value the faculty of intuition and wish to cultivate it. The question is, Can it be done? Granted, some people are simply more gifted with intuition than others. But since intuition does seem to be so closely tied to the gaining of expertise, some experts feel that we can enhance innate intuitive ability by paying more attention to the *way* we learn.

For example, when reading, do not simply try to absorb a lot of facts. Raise questions. Clarify anything you do not understand. Try to summarize the main points and anticipate conclusions. Instead of trying to grasp a myriad of details, look for the broad categories

and pattern, the underlying principles. As psychology professor Robert Glaser sees it, "the ability to perceive large meaningful patterns" is at the very root of intuition.

Intuitions are not reliable when they are based on faulty knowledge

Of course, not every intuition is valid. What, for instance, if the knowledge upon which the intuition is based was faulty to begin with? That sobering thought may inspire us to test carefully the accuracy of what we learn. Nearly 2,000 years ago, the Bible wisely said just that. Philippians 1:10 puts it this way: "Make *sure* of the more important things."—See also Acts 17:11.

Another drawback of intuition is that it can be colored by our emotions. That is why leaning solely on intuition when making major decisions or when evaluating people can be dangerous. "When you have an emotional investment in something, your intuition may be less reliable unless you can put your feelings in perspective," warns psychologist Evelyn Vaughan. Anger, fear, envy, and hate —these strong feelings, while they are not intuitions themselves, can influence and even contaminate our intuitions. Take, for instance, two people who have long had a strong dislike for each other. When a new misunderstanding arises, each of them intuitively just *knows* that the other has bad motives. Wisely, though, the Bible cautions us against this kind of judging 'according to face value.'—2 Corinthians 10:7.

Another emotion, pride, might lead us to attach too much weight to our intuitions, as if they had some special value compared to the judgment and opinions of others. We might make snap decisions without consulting those affected. Or pride might lead us to cling stubbornly to an intuitive decision in the face of the hurt feelings or the well-considered counsel of others. Again, the Bible has some wise advice: "If anyone thinks he is something when he is nothing, he is deceiving his own mind."—Galatians 6:3.

Finally, relying too heavily on intuition may breed mental laziness. There is no shortcut to the acquiring of knowledge, understanding, and wisdom; organized study is the only way. So instead of seizing upon the first intuitive notion that comes along, a wise person builds up a reservoir of knowledge, which then becomes a source of understanding, insight—and often of intuition as well.

Intuition, after all, is of real value only when it is in harmony with the greatest mind in the universe—the mind of the Creator. He is the source of accurate knowledge and true wisdom, and he wants us to take in this vital knowledge. Through the Bible, he kindly allows us access to his thoughts, feelings, and actions. As we put such knowledge to use in our lives, our "perceptive powers," including intuition, become "trained."—Hebrews 5:14.

So acquire expertise in this field of knowledge about the Creator and his Son. (John 17:3) You will never find anything more worthy of your endeavor. There is no better source from which to draw intuition.

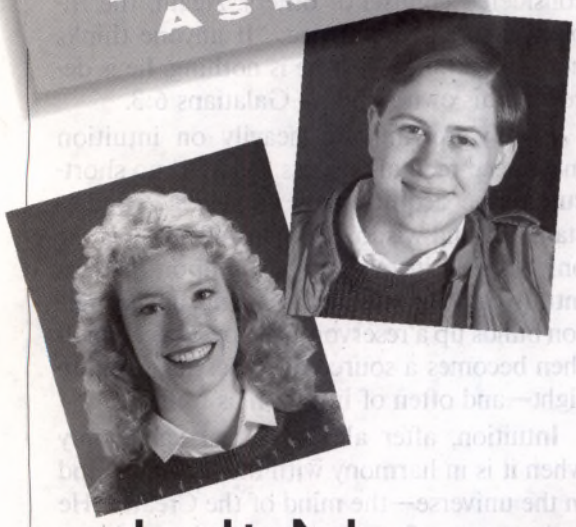
In Our Next Issue

Easter—What Does It Mean to You?

Why Should I Study Hard in School?

"I Wept for Joy"

Young People Ask . . .



Is It Normal to Be a Virgin?

'Is anything bothering you today, Jane?' asked the kindly physician. 'Doctor,' she said hesitantly, 'so many of the girls at school are talking about taking the birth-control pill and going all the way. Is there anything wrong with me because I'm not having sex?'
—*What Shall We Tell the Kids?*, by Dr. Bennett Olshaker.

VIRGINITY. In times past it was a badge of honor. Nowadays, many youths view it as a cause of shame and embarrassment, an abnormal condition, a malady to be "cured" as soon as possible.

Not surprisingly, youths are giving up their virginity in record numbers. For example, a 1983 survey of German youths revealed that only 9 percent of 15-year-old girls and 4 percent of 15-year-old boys had experienced sexual relations. By 1989 the numbers had risen to 25 percent and 20 percent respectively! Similar trends are noted all over the world.

What, though, has given virginity a bad name among youths? Youths of all generations have had to deal with the strong feelings aroused during puberty. Today's youths, however, grow up in a world that gives them little or no moral guidance. In one European land, a group of Christian elders report: "In spite of a religious veneer, this is essentially an amoral country. Immoral sex is tolerated as a 'human weakness.' Children are raised in families where the parents are not married. Sex-oriented advertising is worse here than in any other country in the Western world."

Youths in developing lands are likewise exposed to powerful cultural and economic forces that encourage promiscuity. 'If a young man doesn't have sex,' youths in one African land are warned, 'then his body will be weakened.' Equally common is the belief that 'a girl does not know life until she has had sex with a boy.'

Furthermore, because of widespread unemployment and poverty, a girl may be afraid to turn down a prospective employer's demand that she have relations with him. Teachers may likewise demand sex as payment for a passing grade in school. Why, it is not unusual for poor girls to offer sex in exchange for basic necessities—even for a bar of soap! "Having sex is considered much like having a drink or a meal," report observers in one developing land.

Peer Pressure

Particularly influential, though, is the pressure from peers. A youth who is still a virgin is likely to be the victim of unrelenting teasing and harassment. And if you are one of Jehovah's Witnesses, you may particularly be singled out in this regard. Your peers may tell you that you are not a real man or woman unless you have had relations. They may argue that it is a good idea to get "experience" before marriage. Or they may try to fill your ear with stories of illicit sexual escapades.

"Sally would go on and on about how great sex was with her boyfriend," said one young woman. "She also made me think that I was missing out on one of life's great pleasures." Failing to realize that "there is a lot of bragging, exaggerating and lying about sexual experience among teens," many youths are swayed by such stories. (*Coping With Teenage Depression,* by Kathleen McCoy) One young woman named Maria who gave up her virginity in immoral sex recalls: "I felt pressured, and I wanted so much to be accepted. Even though I knew it was wrong, I wanted to be like everyone else—to have a boyfriend."

Millions of youths have similarly swallowed the world's propaganda and come to believe that virginity is abnormal and that premarital sex is little more than harmless fun. Virgins have thus almost become an endangered species among youths.

Virginity—God's View

Nevertheless, there is a side to premarital sex that your peers may not talk about. Maria recalls: "Afterwards I felt embarrassed and ashamed. I hated myself and I hated my boyfriend." Such experiences are far more typical than most youths admit. Forget the tall tales and exaggerations you may hear from your peers. In reality premarital sex is often an emotionally painful and humiliating experience—with devastating consequences!

This should not surprise you. For while the world may very well view premarital sex as healthy and normal, this does not make it right in the eyes of God. Jesus Christ reminds us that "what is lofty among men is a disgusting thing in God's sight." (Luke 16:15) God has his own standards of acceptable behavior. "This is what God wills," the Bible says, "the sanctifying of you, that you abstain from fornication; that each one of you should know how to get possession of his own vessel in sanctification and honor . . . For God called us, not with allowance for uncleanness, but in connection with sanctification."—1 Thessalonians 4:3-7.

There is a lot of bragging and lying about sexual exploits

As far as God is concerned, then, virginity in a young man or woman is not only normal but *clean* and *holy!* In ancient Israel, virgin girls enjoyed an honorable status. They were protected by the Law from sexual exploitation. (Deuteronomy 22:19, 28, 29) And virginity continues to be honored among true Christians. The Christian congregation itself is likened to "a chaste virgin" because of its moral purity.—2 Corinthians 11:2; Revelation 21:9.

Nowhere does the Bible urge youths to view their virginity as a curse. On the contrary, the apostle Paul said that "if anyone stands settled in his heart . . . to keep his own virginity [by remaining single], he will do well. Consequently he also that gives his virginity in marriage does well, but he that does not give it in marriage will do better."* Paul was not condemning honorable sexual relations in marriage. Rather, he was showing that a Christian who chose to retain his or her virginity by remaining single would be able to enjoy "constant attendance upon the Lord without distraction."—1 Corinthians 7:25, 33-38.

For a Christian youth, then, virginity is not a badge of shame but a testimony to one's integrity to God. Granted, it is not easy to stay chaste; considerable self-control is required. But the Bible assures us that God's "commandments are not burdensome." (1 John 5:3) The psalmist assures us: "The orders from Jehovah are upright, causing the heart to rejoice; the commandment of Jehovah is clean, making the eyes shine." (Psalm 19:8) Following God's ways is always healthy, beneficial.

'Sinning Against One's Body'

By way of contrast, the Bible says at 1 Corinthians 6:18: "He that practices fornication is sinning against his own body." Popular folklore notwithstanding, there is no evidence that abstaining from sex is physically harmful. It is *indulging* that carries physical risks! A prominent physician says: "Sexually transmitted diseases will continue to increase in incidence unless effective control strategies can be applied, and the recent increase in incidence has been due, in part, to increased levels of sexual activity among young people."—*Current Controversies in Marriage and Family.*

Promiscuous behavior among youths has also given rise to an epidemic of teen pregnancies. In the United States, half of these pregnancies are terminated by spontaneous and induced abortions. Then there is the emotional devastation immoral sex can wreak. "After he'd gotten what he'd wanted all along," recalls young Diana, "he dropped me." Paul's words ring true. Premarital sex is a 'sin against one's body.'

Fornication also 'harms and encroaches upon the rights' of others. (1 Thessalonians 4:6) At the very least, it deprives another of the right to enter marriage in a clean moral state. A future marriage mate is also deprived of his or her right to have a virgin marriage partner.

The book *Why Wait Till Marriage?* thus makes this sobering observation: "With your first sex experience, you are no longer a virgin. . . . You can choose only once." Make the right choice! Do not be conned by the world's propaganda into thinking that something is wrong with you if you hold to Bible standards. Virginity is *not* strange or abnormal. It is immoral sex that is degrading, humiliating, and harmful. By retaining your virginity, you protect your health, your emotional well-being, and most important of all, your relationship with God.

Just how a youth can do this will be the subject of future articles.

* The Greek word rendered "virgin" in the Bible applies to both males and females.

How Stingy Plants Hoard Their Water

NOT all plants in Arizona's Saguaro National Monument are stingy with their water. In the coniferous forests of the majestic Rincon Mountains, the great bulk of the water is merely passing through, in at the roots and out through the leaves. But that is the remote area of the park. It is the hot, dry desert lowlands that attract the visitors. It is there that the water hoarders flourish, where less than 12 inches of rain falls in a typical year.

There are some 50 types of cacti in the park, but the one that hoards the most water is the namesake of this national monument, the giant saguaro, *Carnegiea gigantea.* The saguaro (pronounced "sawaro") starts out tiny but ends up a giant. However, it takes its time getting there. The seed itself is no bigger than the period at the end of this sentence. By the end of its first year, the seedling may measure only one fourth inch. One foot tall after 15 years, seven feet after 50, its first branch comes at age 75. At this time, it begins to flower and produce seeds. When mature, one saguaro produces tens of thousands of seeds a year, some 40 million in a lifetime, only one of which may survive into old age. It may live up to 200 years, with a trunk two and a half feet in diameter, be 50 feet tall, and weigh ten tons—four fifths of which is water. And it's very stingy with its water!

Also very grasping to get it! Its roots form a shallow network that spreads out up to 100 feet in every direction. After a rainfall, they may soak up 200 gallons of water, enough to last the

The flowers and the fruit of the saguaro

saguaro a year. Cylinders consisting of 12 or more woody ribs run up the center of the trunk and branches to give strength. Accordionlike pleats allow it to expand or contract as water is stored or depleted. Its green, waxy skin performs photosynthesis and retains moisture. Its sharp spines discourage animals from stealing its water.

But the most amazing water-conserving mechanism of cacti is their ability to manufacture their food without excessive water loss. Photosynthesis—the process by which plants manufacture their food—requires water from the roots, carbon dioxide from the air, and sunlight. During the daylight hours, most plants transpire through the pores, or stomata, of their leaves an overwhelming percentage of their water supply, at the same time taking in the carbon dioxide and sunlight required for photosynthesis.

The cacti, however, cannot afford such water losses during the daylight hours of their hot, arid environment. Hence, they close the stomata of their stems to halt any water losses through transpiration. This, however, halts the intake of the carbon dioxide required for photosynthesis, which can only take place when there is sunlight to provide the needed energy. How is this dilemma solved? By a very unusual biological design.

The Dilemma's Solution

Desert nights are cool, even cold. Cacti open their stomata at that time. They take in carbon dioxide but lose very little moisture through transpiration into the night air. But no photosynthesis takes place at this time. The carbon dioxide is stored by a totally different and most efficient set of chemical reactions, called the PEP system. Later, the carbon dioxide is released and sent to the location where the usual daytime processes of photosynthesis take place.

Photosynthesis itself is a very complex process involving some 70 separate chemical reactions and has been declared "truly a miraculous event." The special manner in which cacti initiate it at nighttime to preserve water only adds to the miraculousness of it. Evolutionists, of course, say that it all evolved by blind chance, but since it is used by several unrelated plants, blind chance had to perform the miracle not once but many times. The evidence plus common sense indicates that it came about according to the design of an intelligent Creator.

A Servant of Many

The saguaro does community service. Beginning in late April and continuing into June, big bouquets of white blossoms form a covering cap over the tips of trunk and branches. Each individual flower opens at night and withers the next day. But each saguaro repeats the spectacle night after night for some four weeks, producing as many as a

hundred blooms. The splashy display has earned it the honor of being Arizona's state flower. Birds, bats, bees, and moths feed on the nectar and pollinate the flowers.

The fruit ripens during June and July, when javelinas, coyotes, foxes, squirrels, harvester ants, and many birds feast on the fruit and seeds. Flickers and woodpeckers excavate more nest holes in trunk and branches than they need, but the plant heals the wounds with protective scar tissue to prevent loss of water, and these cavities are later used by many other birds, including elf owls, screech owls, and small hawks. Competition is keen.

In years past, these gourdlike cavities were used by the Indians as water jars. The woody ribs that supported the huge weight of the water-laden saguaros were used to build shelters and fences. These green giants also provided a bounty of juicy figlike fruit, which the native Papago Indians knocked off the tops of trunks and branches with long poles. They made jam, syrup, and alcoholic drinks from them. The seeds were eaten by the Indians and their chickens. So important was the saguaro fruit to the Papago that the harvesting season marked the new year.

Desert plants are versatile in coping with the water problem. The mesquite plant gets all the water it needs. It sends a taproot from 30 to 100 feet down to find an underground source. But how does the small seedling survive this long dry run until its taproot hits water? That's just one of the unsolved mysteries of the desert. The night-blooming cereus grows a bulb that serves as its private underground reservoir. The creosote bush sends out far-reaching roots to collect water, which at the same time excrete toxins to kill any seedlings that start to grow near it.

Those beautiful annuals that bloom in the spring and carpet the desert with their colorful extravaganzas have none of these ingenious devices for surviving shortages of water. So how do they manage to do it? They avoid the shortages altogether! Their seeds have within them chemical inhibitors that prevent them from sprouting. A heavy rainfall will wash out these inhibitors, and the seeds will germinate and grow, the plants will bloom and produce seed for future plants. It takes at least a half inch of rainfall to remove the inhibitors; a light shower will not suffice. These seeds can measure rainfall, as it were, and unless enough has fallen to soak the ground sufficiently to see them through their complete life cycle, they lie dormant. They don't start what they can't finish.

The saguaros have interesting neighbors, do they not?

They serve as high perches for hawks

Frank Zullo

Composting Is Back and Bigger Than Ever!

COMPOSTING is almost as old as home gardening. Roman farms had their compost pits, where human and animal excrement were piled up along with weeds, leaves, and whatever household wastes had accumulated. From time to time, water was added to assist in the process of decay. A thousand years later, in Moorish Spain, an agricultural treatise described three methods for making heaps of "artificial dung," as the compost was called—pigeon dung being added to hasten decay.

With the advent of community landfills for waste disposal and no-fuss-no-muss chemical fertilizers for easy use on lawns and gardens, home composting in general became almost a rarity. But composting has recently made a comeback. Landfills were beginning to overflow, states were putting restrictions on what and how much could be dumped, and dumping fees might range from $30 to $100 a ton. Moreover, environmental concerns have increased, and this also has made composting fashionable once more.

Not only is composting back, it is back bigger than ever. Its eye is on landfills as the next target. "Composting is a promising technology that may end up helping to solve the ever-growing waste-disposal problem," said an article in *The New York Times Magazine*. "Its proponents believe it is capable of making use of up to half the garbage—kitchen waste, yard trimmings, even some waste paper—that most Americans now throw out. They believe composting can create farms that build the soil instead of destroying it, that compost can replace eroded or damaged soils, protect young plants from disease and reduce dependence on pesticides and synthetic fertilizers."—September 8, 1991.

"They Are Making Meals for Bugs"

"The new composters are seeking to understand and direct an already existing process: microbial digestion. Essentially, they are making meals for bugs," the *Times* article explains and gives details:

"Composting is simple in essence, but com-

plex in detail. Basically, it is the means by which the earth turns raw organic leavings into material that is useful to plants. The microbes that live in the land—a billion of them in a gram of good soil—have a tremendous appetite for organic compounds, which are themselves made largely out of carbon, nitrogen and hydrogen atoms. The bacteria and fungi burn the carbon for energy and use the nitrogen and some of the carbon to build their cellular bodies. Most work in the presence of oxygen, but some do better without. When they run low on raw compounds, they begin to eat each other. Out of all this mutual gobbling and engulfing comes heat, water, carbon dioxide and the substance called humus, a complex of organic molecules that attracts and holds the nutrients, water and air that plants need for growth."

With the right mixture in the compost, the microbes can even devour diesel oil, TNT hydrocarbons, and uranium. Certainly, they are potent little microorganisms, but in your backyard composting, they will not face such challenges.

Preparing Your Own Compost

First of all, forget about those untidy heaps of garden refuse, where you used to dump, year after year, all the leaves, grass clippings, straw, old hay, and weeds and which were likely to sprawl out of control. When kitchen debris was added to such a heap, an obnoxious odor used to be unavoidable, as any gardening sage well knows. To solve this problem, you need a proper compost bin. The idea is to produce in your garden the amazing natural process described above. It is the same process that recycles dead organic matter that accumulates on every forest floor, and it has been going on for thousands of years. As usual, God did it first, when he created green land plants that eventually died and initiated the composting process to recycle the needed chemicals for reuse.—Genesis 1:11-13.

A bin is preferable for composting, since it holds the material together and allows for better ventilation, which increases the efficiency of the decomposition process. Gaps or holes should be made in the sides of the bin to allow entry of the oxygen needed for the bacteria. Also, the dampness should be controlled. The bin should be elevated from the ground, and the right location chosen. The composting process does not work well if exposed all day to the full force of the sun, yet neither does it thrive in total shade.

The composting mixture itself may be thought of as a many-tiered sandwich: one layer of garden debris, one layer of soil, one layer of household waste, with this composition repeated until you have a pile some four or five feet high. Finally, the completed stack might be covered with sod or similar material.

After two years you will have very good humus and the gardener's best friends—lots of earthworms. They will work tirelessly to break up and oxygenate the topsoil of your garden. The composting process can be accelerated by turning the pile over every once in a while or by adding products to hasten decay, such as small quantities of manure. With a properly constructed bin and the right mixture of materials, the decomposition process can be speeded up until the compost is ready for use after only three or four months instead of two years.

And remember, the compost needs to breathe, so adequate ventilation, with the right humidity, will reduce the mixture to the mulch so delectable to your plants. When you spread it on the topsoil, the table is set, and the feast for your flowers and vegetables can begin. Give your garden such a treat, and it will reward you with a bountiful harvest of beauty for your eyes and taste delights for your palate.

Watching the World

"Doomsday Clock" Reset

With the December 1991 issue, the minute hand of the "Doomsday Clock" on the cover of *The Bulletin of the Atomic Scientists* has been moved farther back than ever before—to 17 minutes before midnight. "A cold war icon" that first appeared in 1947, notes *U.S.News & World Report,* "the clock reflects nuclear tension by marking the time until the midnight of Armageddon." When conceived, the clock had only a 15-minute range, as its founders thought that this was all that would be needed in their lifetimes. As East-West relations developed over the years, the clock was reset back and forth 13 times, in the range of 12 minutes to midnight to 2 minutes to midnight. Now, with the Strategic Arms Limitation Treaty and the withdrawal of thousands of tactical weapons, the *Bulletin* editors feel that a new era has been entered, with hopes for achieving "a new world order." "But the world is still a dangerous place," says the *Bulletin.* "There are still nearly 50,000 nuclear bombs and warheads out there."

Cambodian Mine Casualties

"Cambodia has the highest proportion of physically disabled people in the world," states *The Economist.* Why? Because land mines "have been laid indiscriminately by both the government and the opposition groups in the civil war." As no records of their locations have been kept, mines have been causing more injuries than any other weapon. Two human rights groups, Asia Watch and Physicians for Human Rights, feel that the countries that supplied the mines or gave instruction on how to lay them—Britain, China, Singapore, the former Soviet Union, Thailand, the United States, and Vietnam—have a moral obligation to see that they are cleared out. They are calling for a ban by the UN on devices that "do not distinguish between the footfall of a soldier and that of a child collecting firewood," says the magazine.

Matrimony and Life Expectancy

According to a report by the French National Institute of Demographic Studies, married people generally live longer than those who are single. For both men and women, the report reveals a definite relationship between a person's marital status

and his or her life expectancy. Statistics show that married persons have the highest average life span, while divorced persons, single persons, widows, and widowers respectively have shorter life spans. Noting that the difference in life expectancy is less pronounced between married and unmarried women, researchers say that women seem better able to adapt to their unmarried state.

Protecting Antarctica

"Antarctica has finally won protection for its environment," notes *New Scientist* magazine. The Antarctic Treaty nations have "signed a protocol that bans mining on the continent for at least 50 years." The protocol's provisions also cover rules on pollution and waste disposal, requiring that any new activity be subject to an environmental impact assessment. At present, tourism is considered to be the most immediate threat to Antarctic ecosystems. Each nation is to provide a newly formed environmental committee with detailed information on its procedures for managing the environment, as well as for monitoring the environment for pollution. The protocol does not go into force until formally ratified by the member nations, which will take about two years.

Legacy of Columbus

Columbus and other explorers did more than discover the Americas—they altered them radically. Today, writes historian Alfred Crosby, a "botanist can easily find whole meadows [in America] in which he is hard put to find a species that grew in American pre-Columbian times." As listed in *Wilson Quarterly,* among the plants brought over from the Old World are bananas, cabbage, daisies, Kentucky bluegrass, lemons, lettuce, mangoes, oranges, peaches, radishes, rice, sugarcane, tumbleweed, and wheat. Animals brought over include cattle, chickens, domestic cats, donkeys, honeybees, horses, pigs, rats, sheep, sparrows, and starlings. Most destructive, though, were the diseases brought over. These included bubonic plague, chicken pox, influenza, jaundice, malaria, measles, meningitis, mumps, smallpox, tonsillitis, and whooping

cough. While a number of animals and plants also made their way from the Americas to the Old World, only one disease, syphilis, is believed to have been taken back.

Dung Beetles

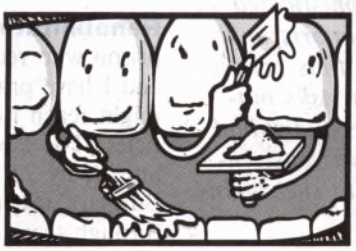
Each day, the average cow produces from 10 to 15 large pats of waste matter; the elephant, about four pounds every hour or so. Add to this the droppings of all other animals, including man, and one may wonder why our globe is not by now smothered in dung. Enter the dung beetle. Each day they clear away massive amounts of droppings. As soon as a pat is laid, thousands of beetles from as many as 120 species converge on it and quickly whisk it away. Researchers counted 16,000 beetles on a single pat of elephant dung, which was completely gone when the scientists returned two hours later. Some species even cling to the rump fur of certain animals and leap onto the droppings in midair. Whatever they do not eat, they roll into balls and bury as food for their offspring. In so doing, they perform another great service for mankind—the adding of fertilizing nitrogen to the soil. They also churn up the soil and aerate it, and beetle larvae consume the maggots and parasitic worms that live in dung and that can spread disease. So valuable are they that the ancient Egyptians even venerated the scarab.

Double Parking

Car makers in Japan, who keep churning out cars and would like to persuade families to buy a second car, have run into a snag —where to park it. New parking rules require that a sticker be displayed proving that the owner has a parking space for his car, either at home or near the office, a requisite for getting the car registered. But parking spaces are expensive, costing as much as ¥230,000 ($1,800, U.S.) a month in some Tokyo residential areas. So car manufacturers have entered the business of selling machines for double-tier and triple-tier parking in a single parking space. The first car is driven onto a platform, which is then raised electrically, and the second (or third) car is parked underneath. A variation is a home-parking machine that lowers the first car into a pit below ground. Information on the availability of parking spaces is also provided for car buyers.

Self-Repairing Teeth?

Teeth make their own light repairs if we grant them enough time to do the job. That is what Professor Tadashi Yamada explains in *Shikai Tenbo* (Dental Circles View), a Japanese medical



journal. After sugar enters the mouth, regardless of the amount, plaque on the teeth becomes acidy for about 8 to 20 minutes. The acidy plaque dissolves tooth calcium causing what Yamada calls "minicavities." According to Yamada, however, calcium from the saliva gradually replaces the lost calcium, so that after a few hours, the teeth return to normal condition. Since traces of sugar are found in most foods, Yamada recommends regular brushing, especially before sleeping, and avoiding snacks between meals to allow teeth enough time to make their own repair work.

Black Sea Tragedy

"For centuries, the Black Sea produced dolphin skins and caviar and fish so plentiful that no one thought such bounty could ever end," notes *The New York Times.* That has now changed. Not only does every industry and town along its shores use the Black Sea as their sewer but from a region encompassing 160 million people, over 60 rivers dump waste into the sea. The four largest—the Danube, Don, Dnieper, and Dniester—sweep through an area recognized as one of the most polluted in the world, carrying tons of toxic materials. Overfishing has also taken its toll, together with a proliferation of jellyfish that eat the eggs and larvae of other fish. As a result, only 5 of the 26 commercial fish species abundant in 1970 are found in commercial quantities today, and the seals have disappeared altogether. "Even if we stopped all the pollution as if by magic," says biologist Yuvenaly Zaitsev, "it would be impossible to go back to the 1950's. Nature has its own laws."

Immunized Children

Worldwide, 4 out of every 5 children are now immunized against six killer diseases: diphtheria, measles, polio, tetanus, tuberculosis, and whooping cough, says the World Health Organization. Ten years ago, the ratio was about 1 in 5. Now, at a cost of only a dollar each for the vaccines, about three million children's lives are being saved each year. Yet, according to the World Health Organization, preventable diseases still claim the lives of some two million children each year.

From Our Readers

Help for the Dying Since I am a nurse working in a hospital cardiology unit, your *Awake!* issue on "Help for the Dying" (October 22, 1991) interested me. However, I feel a slight error should be corrected, for you say: 'Many physicians have concluded that it is ethical to withdraw nutrition and hydration [fluids] from certain dying, hopelessly ill, or permanently unconscious patients.' I assure you that it would be cruel and extremely painful to stop a sick person's nutrition and hydration. Through personal observation, I can say that this would cause even more suffering.

M. S., France

The statement in question was quoted from "The New England Journal of Medicine" and reflects the thinking of many physicians. Doctors believe that many severely brain-damaged patients are incapable of experiencing pain and suffering. Furthermore, the administering of medical nutrition and hydration requires sophisticated medical skill and entails discomforts and risks of its own. Some doctors thus believe that in certain situations, such risks outweigh the benefits. In any case, individual Christians must make their own conscientious decisions when it comes to such painful and emotional issues.—ED.

Twenty years ago I made the decision to withdraw life support from my one-day-old son. He had been born prematurely and was brain-dead. I had delivered him myself at home, as we had not been able to get to the hospital in time. I cannot explain the misery and guilt I carried for years. But by reading the articles, I was able to come to terms with my 20-year-old burden.

S. M., United States

Eastern European Conventions I was deeply moved by the series "Lovers of Godly Freedom Rejoice in Eastern Europe." (December 22, 1991) Having been brought up as one of Jehovah's Witnesses, I have been inclined to take for granted the spiritual food we receive. But learning about how Witnesses in Eastern Europe received for the first time in their mother tongues publications that we have had for several years made me better appreciate the privilege I have of being a part of such a wonderful organization.

T. O., Japan

Reading I am 13 years old. The article "Read to Expand Your Horizons" (July 22, 1991) was just what I needed. I used to read one word at a time. My mind would often stray, making it necessary to reread the material in order to understand it. Your wonderful tips were of great help.

A. K., Poland

Rehabilitating Criminals I have a son in prison who receives a subscription to *Awake!*, and I have prayed diligently for articles that might reach his heart. I *so* appreciated the articles "The Power of the Truth to Rehabilitate" (July 22, 1991) and "I Was a Professional Burglar." (September 8, 1991) I read them through tears of deep gratitude to God, who "desires all to attain to repentance." (2 Peter 3:9) Hopefully, some day my son will do so.

A. F., United States

Cricket Cricket is one of our favorite pastimes here in the Caribbean. But I was really surprised to see the article "Cricket or Baseball—What's the Difference?" (November 8, 1991) I never dreamed of seeing such an article in the magazine! It was very informative, and using just this article, I was able to place many copies of *Awake!* with others.

J. D., Jamaica

What's in a Name?

DO YOU know why your parents gave you your name? In Bible times people's names often reflected faith in God and his promises. For example, the name Abraham, which God gave him, means "Father of a Crowd (Multitude)." Ishmael means "God Hears (Listens)." And Jesus means "Jehovah Is Salvation."

In African lands today, the giving of names often reflects religious beliefs and values. This is certainly so among many African Witnesses of Jehovah.

In Nigeria one young woman relates: "My father learned the truth of the Bible from Jehovah's Witnesses a year before I was born. In that same year, the book *The Truth That Leads to Eternal Life* was released in English. Later, about the time of my birth, the *Truth* book came out in our Yoruba language. Because of that, my father thought it fitting to give me the name Truth."

Another witness of Jehovah, a man, states: "My dad became a Witness the year before I was born. He worked at a place managed by staunch Catholics, and because of his beliefs, he lost his job. When I was born, he had no job and very little money. But he was not discouraged. 'I'm suffering unemployment because of my allegiance to God's Kingdom,' he said. So he named me Kingdom."

"My parents named me Ifeanyichukwu, an Igbo name," said another young man. "That's a mouthful for those who don't speak Igbo, so I wanted a name that was easier. I also wanted to serve at Bethel [the local branch office of the Watch Tower Society], and I had a friend whose name was Bethel. So I asked my parents if I could take 'Bethel' as my name. They agreed."

"My parents were pioneers [full-time ministers]," relates another Nigerian man. "My father wanted to name one of their children after their vocation. That's how I got the name Pioneer. They hoped that I too would experience the rich blessings of full-time service."

When one member of the Governing Body of Jehovah's Witnesses was in Côte d'Ivoire in December 1978, he met a sister with a baby called Victorious Faith because she was born while the mother was attending the "Victorious Faith" Convention.

Truth, Kingdom, Bethel, and Pioneer all work at the Watch Tower Society's branch office in Nigeria. Also serving there are Witnesses with such names as Bible, Wisdom, Christian, Love, Innocent, Genesis, and Blessing. All these Christian ministers are working hard to maintain a good reputation, or name, with Jehovah God, to whom every family in heaven and on earth owes its name.—Compare Ephesians 3: 14, 15.

A Special Occasion
Will You Come?

AS OPPRESSED slaves in Egypt over 3,500 years ago, the Israelites were in dire need of deliverance. But Pharaoh refused to let his slaves go. So Jehovah God had the Israelites kill a lamb and sprinkle its blood on the doorposts and lintels of their houses. That very night His angel *passed over* the houses that had blood on the doorposts but killed the firstborn sons in the houses of all the Egyptians. At that Pharaoh let the Israelites go free. Ever since then, on the anniversary date of when the angel *passed over* the Israelite homes, Jews have celebrated this event.

Later, Jesus Christ appeared on the earthly scene. One day John the Baptizer, who had baptized Jesus, pointed to him and said: "See, the Lamb of God that takes away the sin of the world!" (John 1:29) As the blood of the Passover lamb meant deliverance for the Israelite firstborn, so Christ's poured-out blood can deliver from sin and death.

Jesus instituted a meal to memorialize his sacrificial death. He handed his faithful apostles bread and said: "Take, eat. This means my body." Then he gave them a cup of wine and said: "Drink out of it, all of you; for this means my 'blood of the covenant,' which is to be poured out in behalf of many for forgiveness of sins." Also, Jesus said: "Keep doing this in remembrance of me." (Matthew 26:26-28; Luke 22:19, 20) So Jesus meant for it to be an annual observance of his death.