

Awake!

January 22, 1996

**THE AWESOME
U N I V E R S E**
Where Did It Come From?

The Awesome Universe Where Did It Come From?

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What is the purpose of it all?
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The Hubble telescope raises questions,
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Cover and page 2 background: Courtesy of Anglo-Australian Observatory, photograph by David Malin

The Awesome Universe

WHAT THE BIG BANG EXPLAINS —WHAT IT DOESN'T

EVERY morning is a miracle. Deep inside the morning sun, hydrogen is being fused into helium at temperatures of millions of degrees. X rays and gamma rays of incredible violence are pouring out of the core into the surrounding layers of the sun. If the sun were transparent, these rays would blast their way to the surface in a few searing seconds. Instead, they begin to bounce from tightly packed atom to atom of solar "insulation," gradually losing energy. Days, weeks, centuries, pass. Thousands of years later, that once deadly radiation finally emerges from the sun's surface as a gentle shower of yellow light—no longer a menace but just right for bathing earth with its warmth.

Every night is a miracle too. Other suns twinkle at us across the vast expanse of our galaxy. They are a riot of colors, sizes, temperatures, and densities. Some are supergiants so large that if one were centered in the position of our sun, what remained of our planet would be inside the surface of that superstar. Other suns are tiny, white dwarfs—smaller than our earth, yet as heavy as our sun. Some will peacefully drone along for billions of years. Others are poised on the brink of supernova explosions that will obliterate them, briefly outshining entire galaxies.

Primitive peoples spoke of sea monsters and battling gods, of dragons and turtles and elephants, of lotus flowers and dreaming gods. Later, during the so-called Age of Reason, the gods were swept aside by the new-found "magic" of calculus and Newton's laws. Now we live in an age bereft of the old poetry and legend. The children of today's atomic

age have chosen as their paradigm for creation, not the ancient sea monster, not Newton's "machine," but that overarching symbol of the 20th century—the bomb. Their "creator" is an explosion. They call their cosmic fireball the big bang.

What the Big Bang "Explains"

The most popular version of this generation's view of creation states that some 15 to 20 billion years ago, the universe did not exist, nor did empty space. There was no time, no matter—nothing except an infinitely dense, infinitely small point called a singularity, which exploded into the present universe. That explosion included a brief period during the first tiny fraction of a second when the infant universe inflated, or expanded, much faster than the speed of light.

During the first few minutes of the big bang, nuclear fusion took place on a universal scale, giving rise to the currently measured concentrations of hydrogen and helium and at least part of the lithium in interstellar space. After perhaps 300,000 years, the universewide fireball dropped to a little below the temperature of the surface of the sun, allowing electrons to settle into orbits around atoms and releasing a flash of photons, or light. That primordial flash can be measured today, although greatly cooled off, as universal background radiation at microwave frequencies corresponding to a temperature of 2.7 Kelvin.* In fact, it was the discovery of this

* A kelvin is the unit of a temperature scale whose degree is the same as the degree on the Celsius temperature scale, except that the Kelvin scale begins at absolute zero, that is 0 K.—the equivalent of -273.16 degrees Celsius. Water freezes at 273.16 K. and boils at 373.16 K.

background radiation in 1964-65 that convinced most scientists that there was something to the big bang theory. The theory also claims to explain why the universe appears to be expanding in all directions, with distant galaxies apparently racing away from us and from each other at high speed.

Since the big bang theory appears to explain so much, why doubt it? Because there is also much that it does not explain. To illustrate: The ancient astronomer Ptolemy had a theory that the sun and planets went around the earth in large circles, making small circles, called epicycles, at the same time. The theory appeared to explain the motion of the planets. For centuries as astronomers gathered more data, the Ptolemaic cosmologists could always add extra epicycles onto their other epicycles and "explain" the new data. But that did not mean the theory was correct. Ultimately there was just too much data to account for, and other theories, such as Copernicus' idea that the earth went around the sun, explained things better and more simply. Today it is hard to find a Ptolemaic astronomer!

Professor Fred Hoyle likened the efforts of the Ptolemaic cosmologists at patching up their failing theory in the face of new discoveries to the endeavors of big bang believers today to keep their theory afloat. He wrote in his book *The Intelligent Universe*: "The main efforts of investigators have been in papering over contradictions in the big bang theory, to

build up an idea which has become ever more complex and cumbersome." After referring to Ptolemy's futile use of epicycles to rescue his theory, Hoyle continued: "I have little hesitation in saying that as a result a sickly pall now hangs over the big bang theory. As I have mentioned earlier, when a pattern of facts becomes set against a theory, experience shows that it rarely recovers."—Page 186.

The *New Scientist* magazine of December 22/29, 1990, echoed similar thoughts: "The Ptolemaic method has been lavishly applied to . . . the big bang cosmological model." It then asks: "How can we achieve real progress in particle physics and cosmology? . . . We must be more honest and forthright about the purely speculative nature of some of our most cherished assumptions." New observations are now pouring in.

Questions the Big Bang Does Not Answer

A major challenge to the big bang has come from observers using the corrected optics of the Hubble Space Telescope to measure distances to other galaxies. The new data is giving the theorists fits!

Astronomer Wendy Freedman and others recently used the Hubble Space Telescope to measure the distance to a galaxy in the constellation of Virgo, and her measurement suggests that the universe is expanding faster, and therefore is younger, than previously thought. In fact, it "implies a cosmic age as little as eight billion years," reported *Scientific American* magazine just last June. While eight

Awake!

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billion years sounds like a very long time, it is only about half the currently estimated age of the universe. This creates a special problem, since, as the report goes on to note, "other data indicate that certain stars are at least 14 billion years old." If Freedman's numbers hold up, those elderly stars would turn out to be older than the big bang itself!

Still another problem for the big bang has come from steadily mounting evidence of "bubbles" in the universe that are 100 million light-years in size, with galaxies on the outside and voids inside. Margaret Geller, John Huchra, and others at the Harvard-Smithsonian Center for Astrophysics have found what they call a great wall of galaxies some 500 million light-years in length across the northern sky. Another group of astronomers, who became known as the Seven Samurai, have found evidence of a different cosmic conglomeration, which they call the Great Attractor, located near the southern constellations of Hydra and Centaurus. Astronomers Marc Postman and Tod Lauer believe something even bigger must lie beyond the constel-

lation Orion, causing hundreds of galaxies, including ours, to stream in that direction like rafts on a sort of "river in space."

All this structure is baffling. Cosmologists say the blast from the big bang was extremely smooth and uniform, according to the background radiation it allegedly left behind. How could such a smooth start have led to such massive and complex structures? "The latest crop of walls and attractors intensifies the mystery of how so much structure could have formed within the 15-billion-year age of the universe," admits *Scientific American*—a problem that only gets worse as Freedman and others roll back the estimated age of the cosmos still more.

"We Are Missing Some Fundamental Element"

Geller's three-dimensional maps of thousands of clumped, tangled, and bubbled galactic agglomerations have transformed the way scientists picture the universe. She does not pretend to understand what she sees. Gravity alone appears unable to account for her great wall. "I often feel we are missing some

THE LIGHT-YEAR—A COSMIC YARDSTICK

The universe is so big that measuring it in miles or kilometers is like measuring the distance from London to Tokyo with a micrometer. A more convenient unit of measurement is the light-year, the distance that light travels

in a year, or about 5,880,000,000,000 miles. Since light is the fastest thing in the universe and requires only 1.3 seconds to travel to the moon and about 8 minutes to the sun, a light-year would seem to be truly enormous!

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fundamental element in our attempts to understand this structure," she admits.

Geller enlarged on her misgivings: "We clearly do not know how to make large structure in the context of the Big Bang." Interpretations of cosmic structure on the basis of current mapping of the heavens are far from definitive—more like trying to picture the whole world from a survey of Rhode Island, U.S.A. Geller continued: "Someday we may find that we haven't been putting the pieces together in the right way, and when we do, it will seem so obvious that we'll wonder why we hadn't thought of it much sooner."

That leads to the biggest question of all: What is supposed to have caused the big bang itself? No less an authority than Andrei Linde, one of the originators of the very popu-

lar inflationary version of the big bang theory, frankly admits that the standard theory does not address this fundamental question. "The first, and main, problem is the very existence of the big bang," he says. "One may wonder, What came before? If space-time did not exist then, how could everything appear from nothing?... Explaining this initial singularity—where and when it all began—still remains the most intractable problem of modern cosmology."

An article in *Discover* magazine recently concluded that "no reasonable cosmologist would claim that the Big Bang is the ultimate theory."

Let us now go outdoors and contemplate the beauty and the mystery of the starry vault.

The Awesome Universe SO MYSTERIOUS, YET SO BEAUTIFUL

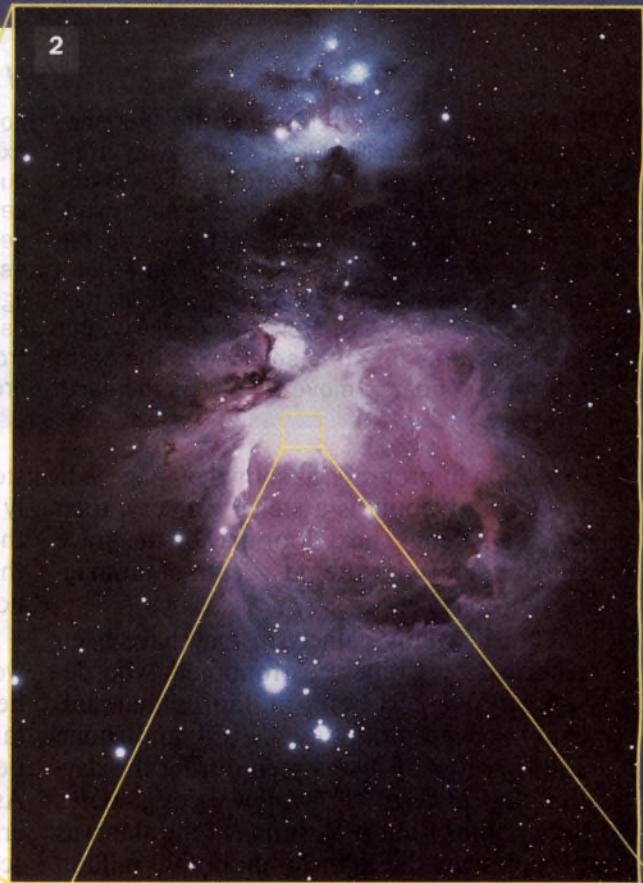
THIS time of the year, the night sky beckons with bejeweled splendor. High overhead strides mighty Orion, easily visible on January evenings from Anchorage, Alaska, to Cape Town, South Africa. Have you had a good look recently at the celestial treasures to be found in well-known constellations, such as Orion? Astronomers took a peek not long ago using the recently repaired Hubble Space Telescope.

From the three stars of Orion's belt dangles his sword. The fuzzy star in the middle of the sword is not really a star at all but the famous Orion Nebula, an object of striking

beauty even when seen through a backyard telescope. Its ethereal glow, however, is not the secret of its fascination for professional astronomers.

- "Astronomers investigate the Orion Nebula and its many young stars because it is the largest and most active region of starbirth in our part of the Galaxy," reports Jean-Pierre Caillault in *Astronomy* magazine. The nebula appears to be a cosmic maternity ward! When the Hubble telescope photographed the Orion Nebula, capturing details that had never been seen before, astronomers saw not just stars and glowing gas but what

- 1 The constellation of Orion, a familiar sight in January skies the world over**
- 2 The Orion Nebula, a stunning close-up of the fuzzy “star”**
- 3 Deep inside the Orion Nebula —a cosmic maternity ward?**



Caillault describes as “fuzzy little ovals. Blots of orange light. They resemble specks of one’s lunch dropped accidentally onto the photo.” Scientists believe, however, that rather than darkroom defects, these fuzzy ovals are “protoplanetary disks, the first solar-systems-in-the-making viewed from a distance of 1,500 light-years.” Are stars—indeed, entire solar systems—being born at this moment in the Orion Nebula? Many astronomers believe they are.

From Maternity Ward to Stellar Graveyard

As Orion strides forward, bow in hand, he seems to confront the constellation Taurus, the bull. A small telescope will reveal, near the tip of the bull’s southern horn, a faint patch of light. It is called the Crab Nebula, and in a large telescope, it appears to be an



#2: Astro Photo - Oakview, CA
#3: C. R. O'Dell/Rice University/NASA photo

HOW DO THEY KNOW HOW FAR IT IS?

When astronomers tell us that the Andromeda galaxy is two million light-years away, they are really giving us an educated guess. No one has come up with a way to measure such mind-boggling distances directly. Distances to the very closest stars, those within 200 light-years or so, can be measured directly by stellar parallax, which involves simple trigonometry. But this only works for stars so close to the earth that they appear to move slightly as the earth

goes around the sun. Most stars, and all galaxies, are much farther away. At that point the guesswork begins. Even stars in our own backyard, such as the famous red supergiant Betelgeuse in Orion, are subject to guesswork, with estimated distances for it ranging from 300 light-years to over 1,000. It should not surprise us, therefore, to find disagreement among astronomers regarding galactic distances, which are a million times greater.

explosion in progress, as shown on page 9. If the Orion Nebula is a stellar nursery, then the Crab Nebula next door may be the grave site of a star that suffered a death of unimaginable violence.

That heavenly cataclysm may have been recorded by Chinese astronomers who described a "Guest Star" in Taurus that suddenly appeared on July 4, 1054, and shone so brightly that it was seen during the daytime for 23 days. "For a few weeks," notes astronomer Robert Burnham, "the star was blazing with the light of about 400 million suns." Astronomers call such a spectacular

stellar suicide a supernova. Even now, nearly a thousand years after the observation, the bombshards from that blast are racing through space at a speed estimated at 50 million miles per day.

The Hubble Space Telescope has been at work in this area too, peering deep into the heart of the nebula and discovering "details in the Crab that astronomers never expected," according to *Astronomy* magazine. Astronomer Paul Scowen says the discoveries "should have theoretical astronomers scratching their heads for some time to come."

SUPERNOVAS, PULSARS, AND BLACK HOLES

At the heart of the Crab Nebula lies one of the strangest objects in the known universe. According to scientists, the tiny corpse of a deceased star, compressed into unbelievable densities, spins in its grave 30 times per second, sending out a beam of radio waves that were first detected on earth in 1968. It is called a pulsar, described as a spinning supernova remnant so compressed that the electrons and protons in the atoms of the original star have been squeezed together to produce neutrons. Scientists say it was once the massive core of a supergiant star like Betelgeuse or Rigel in Orion. When the star exploded and the outer layers were blasted into space, only the shrunken core was left, a glowing white-hot cinder, its nuclear fires long extinguished.

Imagine taking a star as massive as two of our suns and squeezing it into a ball 10 to 12 miles in diameter! Imagine taking the planet Earth and squeezing it down to 400 feet. A cubic inch of this material would weigh more than 16 billion tons.

Even this does not appear to be the final word on compressed matter. If we were to shrink the earth all the way down to the size of a shooter's marble, the earth's gravitational field would finally become so strong that not even light could escape. At this point our tiny earth would seem to disappear inside what is called a black hole. Although most astronomers believe in them, black holes still have not been proved to exist, and they do not appear to be as common as was thought a few years ago.



Astro Photo - Oakview, CA

**The Andromeda galaxy, the most distant object visible to the naked eye.
Its rotation rate seems to violate Newton's law of gravity and raises the question
of dark matter invisible to telescopes**

Astronomers, such as Harvard's Robert Kirshner, believe that understanding supernova remnants like the Crab Nebula is important because they can be used to measure the distance to other galaxies, which is currently an area of intense research. As we have seen, disagreements over the distances to other galaxies have recently touched off a lively debate over the big bang model of the creation of the universe.

Beyond Taurus, but still visible in the Northern Hemisphere in the western January sky, is a soft glow in the Andromeda constellation. That glow is the Andromeda galaxy, the most distant object visible to the naked eye. The wonders of Orion and Taurus are in our own cosmic backyard—with a few thou-

sand light-years of Earth. Now, however, we gaze across an estimated two million light-years at a great spiral of stars much like our own galaxy, the Milky Way, but even larger—some 180,000 light-years from end to end. As you look at the gentle glow of Andromeda, your eyes are bathed in light that may be over two million years old!

In recent years Margaret Geller and others have embarked on ambitious programs to map all the galaxies around us in three dimensions, and the results have raised serious questions for the big bang theory. Instead of seeing a smooth distribution of galaxies in every direction, the cosmic cartographers discovered a “tapestry of galaxies” in a structure extending for millions of

Bill and Sally Fletcher



**The Crab Nebula in Taurus
—a stellar grave site?**

light-years. "How that tapestry was woven from the nearly uniform matter of the newborn universe is one of the most pressing questions in cosmology," according to a recent report in the respected journal *Science*.

We began this evening with a look at our January night sky and quickly discovered not only heart-stopping beauty but also questions and mysteries that pertain to the very nature and origin of the universe. How did it begin? How did it arrive at its present stage of complexity? What will happen to the celestial wonders that surround us? Can anybody say? Let us see.

ARE THOSE COLORS REAL?

People who scan the sky with a backyard telescope often feel a sense of disappointment upon first locating a famous galaxy or nebula. Where are the beautiful colors they have seen in photographs? "The colors of galaxies cannot be seen directly by the human eye, even through the largest existing telescopes," notes astronomer and science writer Timothy Ferris, "for their light is too faint to stimulate the color receptors of the retina." This has caused some persons to conclude that the beautiful colors seen in astronomical photos are fakes, simply added in the processing somehow. This is not the case, however. "The colors themselves are real," writes Ferris, "and the photographs represent the best efforts of astronomers to reproduce them accurately."

In his book *Galaxies*, Ferris explains that the photos of faint distant objects, such as galaxies or most nebula, "are time exposures obtained by aiming a telescope at a galaxy and exposing a photographic plate for as long as several hours while starlight seeps into the photographic emulsion. During this time a driving mechanism compensates for the earth's rotation and keeps the telescope trained on the galaxy, while the astronomer, or in some cases an automatic guiding system, makes minute corrections."



Above: The Cartwheel galaxy. A smaller galaxy collided with it, careened through it, and the smaller galaxy left in its wake the blue ring of billions of newly formed stars surrounding the Cartwheel galaxy

Kirk Borne (ST Scl), and NASA

Below: The Cat's Eye Nebula. The effect of two stars orbiting each other most easily explains the intricate structures

J. P. Harrington and K. J. Borkowski (University of Maryland), and NASA



The Awesome Universe

'SOMETHING IS MISSING' —WHAT?

AFTER gazing at the stars on a clear, dark night, we come inside, chilly and blinking, our minds spinning with vast beauty and a multitude of queries. Why is the universe here? Where did it come from? Where is it going? These are the questions that many try to answer.

After five years of research into cosmology, which carried him to scientific conferences and research centers all over the globe, science writer Dennis Overbye described a conversation with world-famous physicist Stephen Hawking: "In the end what I wanted to know from Hawking is what I have always wanted to know from Hawking: Where we go when we die."

Although tinged with irony, these words reveal much about our age. The queries are not so much on the stars themselves and the theories and conflicting views of the cosmologists that study them. People today still hunger for answers to the basic questions that have haunted mankind for millenniums: Why are we here? Is there a God? Where do we go when we die? Where are the answers to these questions? Are they to be found in the stars?

Another science writer, John Boslough, observed that as people have left religion, scientists such as cosmologists have become "the perfect priesthood for a secular age. They, not religious leaders, were the ones who would now reveal all the secrets of the universe bit by precious bit, not in the guise of spiritual epiphany but in the form of equations obscure to all but the anointed." But will they reveal all the secrets of the universe

and answer all the questions that have haunted mankind for ages?

What are the cosmologists revealing now? Most espouse some version of the big bang "theology," which has become the secular religion of our time, even as they quibble incessantly over the details. "Yet," Boslough noted, "in the context of new and contradictory observations, the big bang theory begins to appear more and more like an overly simplistic model in search of a creation event. By the early 1990s the big bang model was... increasingly unable to answer the most fundamental questions." He added that "more than a few theorists have expressed the opinion that it would not even last out the 1990s."

Perhaps some of the current cosmological guesswork will turn out to be correct, perhaps not—just as perhaps there really are planets coalescing in the ghostly glow of Orion's nebula, perhaps not. The undeniable fact is that no one on this earth really knows for sure. Theories abound, but honest observers echo Margaret Geller's astute observation that despite the glib talk, something fundamental seems to be missing in science's current understanding of the cosmos.

Missing—The Willingness to Face Unpalatable Facts

Most scientists—and this includes most cosmologists—subscribe to the theory of evolution. They find talk unpalatable that gives intelligence and purpose a role in creation, and they shudder at the mere mention of God as Creator. They refuse even to consider such heresy. Psalm 10:4 speaks disparagingly of the supercilious person who

"makes no search; all his ideas are: 'There is no God.'" His creative deity is Chance. But as knowledge increases and chance and also coincidence collapse under the growing load, the scientist begins to turn more and more to such no-no's as intelligence and design. Consider the following examples:

"A component has evidently been missing from cosmological studies. The origin of the Universe, like the solution of the Rubik cube, requires an intelligence," wrote astrophysicist Fred Hoyle in his book *The Intelligent Universe*, page 189.

"The more I examine the universe and study the details of its architecture, the more evidence I find that the universe in some sense must have known that we were coming."—*Disturbing the Universe*, by Freeman Dyson, page 250.

"What features of the Universe were essential for the emergence of creatures such as ourselves, and is it through coincidence, or for some deeper reason, that our Universe has these features? . . . Is there some deeper plan that ensures that the Universe is tailor-made for humankind?"—*Cosmic Coincidences*, by John Gribbin and Martin Rees, pages xiv, 4.

Fred Hoyle also comments on these properties, on page 220 of his book quoted above: "Such properties seem to run through the fabric of the natural world like a thread of happy accidents. But there are so many of these odd coincidences essential to life that some explanation seems required to account for them."

"It is not only that man is adapted to the universe. The universe is adapted to man. Imagine a universe in which one or another of the fundamental dimensionless constants of physics is altered by a few percent one way or the other? Man could never come into being in such a universe. That is the central point of the anthropic principle. According to this principle, a life-giving factor lies at

the centre of the whole machinery and design of the world."—*The Anthropic Cosmological Principle*, by John Barrow and Frank Tipler, page vii.

God, Design, and the Constants of Physics

What are some of these fundamental constants of physics that are essential for life to exist in the universe? A report in *The Orange County Register* of January 8, 1995, listed a few of these constants. It stressed how fine-tuned these features must be, stating: "The quantitative values of many basic physical constants defining the universe—for example, the charge of an electron, or the fixed velocity of light, or the ratio of the strengths of fundamental forces in nature—are ravishingly precise, some to 120 decimal places. The development of a life-breeding universe is exceedingly sensitive to these specifications. Any tiny variation—a nanosecond here, an angstrom there—and the universe might well have been dead and barren."

The author of this report then mentioned the usually unmentionable: "It seems more reasonable to assume that some mysterious bias lurks within the process, perhaps in the action of an intelligent and intentional power who fine-tuned the universe in preparation for our arrival."

George Greenstein, professor of astronomy and cosmology, gave a longer list of these physical constants in his book *The Symbiotic Universe*. Among those listed were constants so fine-tuned that if they were off to the very slightest degree, no atoms, no stars, no universe, would have ever been possible. The details of these relationships are listed in the accompanying box. They must exist for physical life to be possible. They are complex and may not be understood by all readers, but they are recognized, along with many others, by astrophysicists trained in these areas.

As this list lengthened, Greenstein became overwhelmed. He said: "So many coinci-

A Listing of Some of the Physical Constants Necessary for Life to Exist

The charges of electron and proton must be equal and opposite; the neutron must outweigh the proton by a tiny percent; a matching must exist between temperature of the sun and the absorptive properties of chlorophyll before photosynthesis can occur; if the strong force were a little weaker, the sun could not generate energy by nuclear reactions, but if it were a little stronger, the fuel needed to generate energy would be

violently unstable; without two separate remarkable resonances between nuclei in the cores of red giant stars, no element beyond helium could have been formed; had space been less than three dimensions, the interconnections for blood flow and the nervous system would be impossible; and if space had been more than three dimensions, planets could not orbit the sun stably.

—*The Symbiotic Universe*, pages 256-7.

dences! The more I read, the more I became convinced that such ‘coincidences’ could hardly have happened by chance. But as this conviction grew, something else grew as well. Even now it is difficult to express this ‘something’ in words. It was an intense revulsion, and at times it was almost physical in nature. I would positively squirm with discomfort. . . . Is it possible that suddenly, without intending to, we have stumbled upon scientific proof of the existence of a Supreme Being? Was it God who stepped in and so providentially crafted the cosmos for our benefit?”

Sickened and horrified by the thought, Greenstein quickly recanted, recovered his scientifically religious orthodoxy, and proclaimed: “God is not an explanation.” No reason—it was just so unpalatable that he could not stomach the thought!

A Natural Human Need

None of this is to disparage the hard work of sincere scientists, including cosmologists. Especially do Jehovah’s Witnesses appreciate their many discoveries concerning creation that reveal the power and the wisdom and the love of the true God, Jehovah. Romans 1:20 declares: “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, so that they are inexcusable.”

The inquiries and labors of scientists are

the natural human response to a need that is as basic to mankind as the need for food, shelter, and clothing. It is the need to know answers to certain questions concerning the future and the purpose of life. God has “set eternity in the hearts of men; yet they cannot fathom what God has done from beginning to end.”—Ecclesiastes 3:11, *The Holy Bible—New International Version*.

This is not such bad news. It means that mankind will never know it all, but neither will they ever run out of new things to learn: “I saw all the work of the true God, how mankind are not able to find out the work that has been done under the sun; however much mankind keep working hard to seek, yet they do not find out. And even if they should say they are wise enough to know, they would be unable to find out.”—Ecclesiastes 8:17.

Some scientists object that making God the “solution” to a problem kills the incentive for further research. However, a person who recognizes God as the Creator of the heavens and the earth has an abundance of further fascinating details to discover and intriguing mysteries to probe. It’s as though he has a green light to move on into a delightful adventure of discovery and learning!

Who can resist the invitation of Isaiah 40:26? “Raise your eyes high up and see.” We have raised our eyes high up in these few pages, and what we have seen is the

Has Anybody Seen My Missing Mass? A

The Andromeda galaxy, like all spiral galaxies, rotates majestically in space as if it were a giant hurricane. Astronomers can calculate the rate of rotation for many galaxies from the light spectra, and when they do, they discover something puzzling. The rotation rates seem to be impossible! All spiral galaxies seem to rotate too fast. They behave as if the visible stars of the galaxy were embedded in a much larger halo of dark

matter, invisible to the telescope. "We do not know the forms of the dark matter," admits astronomer James Kaler. Cosmologists estimate that 90 percent of the missing mass is unaccounted for. They are frantic to find it, either in the form of massive neutrinos or some unknown but superabundant type of matter.

If you locate the missing mass, be sure to let your local cosmologist know right away!

'something missing' that has eluded the cosmologists. We have also located the fundamental answers to those recurring questions that have nagged the mind of man throughout the ages.

The Answers Are Found in a Book

The answers have always been there, but like the religionists of Jesus' day, many people have blinded their eyes, shut their ears, and hardened their hearts to answers that did not match their human theories or their chosen life-style. (Matthew 13:14, 15) Jehovah has told us where the universe came from, how the earth got here, and who will live on it. He has told us that earth's human inhabitants must cultivate it and lovingly care for the plants and animals that share it with them. He has also told us what happens when people die, that they can come back to life, and what they must do to live upon the earth forever.

If you are interested in having the answers given to you in the language of God's inspired Word, the Bible, please read the following scriptures: Genesis 1:1, 26-28; 2:15; Proverbs 12:10; Matthew 10:29; Isaiah 11:6-9; 45:18; Genesis 3:19; Psalm 146:4; Ecclesiastes 9:5; Acts 24:15; John 5:28, 29; 17:3; Psalm 37:10, 11; Revelation 21:3-5.

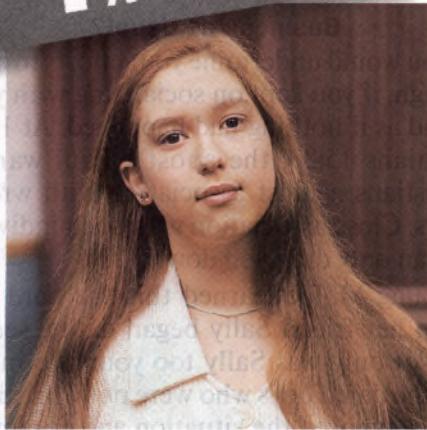
*"The heavens are declaring the glory of God;
and of the work of his hands the expanse is telling."
—Psalm 19:1.*

Why not read these scriptures with your family or with a neighbor or with a group of friends in your home some evening? Be assured it will make for an informative and lively discussion!

Are you intrigued by the mysteries of the universe and moved by its beauty? Why not get to know better the One who created it? Our curiosity and wonder mean nothing to the inanimate heavens, but Jehovah God, their Creator, is also our Creator, and he cares for those meek ones who are interested in learning about him and his creations. The invitation is now being given throughout the earth: "Come!" And let anyone hearing say: 'Come!' And let anyone thirsting come; let anyone that wishes take life's water free." —Revelation 22:17.

What a heartwarming invitation this is from Jehovah! Rather than by a mindless, purposeless explosion, the universe was created by a God of infinite intelligence and definite purpose who had *you* in mind from the beginning. His reserves of unlimited energy are carefully controlled and always available to sustain his servants. (Isaiah 40:28-31) Your reward for getting to know him will be as endless as the majestic universe itself!

Young People Ask...



What Should I Do if a Friend Gets Into Trouble?

Fourteen-year-old Sherrie says:
"My best friend drifted away from being a Christian. It makes me sad. I've tried so hard to encourage her!"*

HAS someone close to you got into trouble or begun to follow a questionable lifestyle? "I was close to Chris," Johnny says. "We were best friends. One day he ran away from home. This shocked me, and I felt obligated to go after him. I drove all night looking for him."

* Some of the names have been changed.

The Bible warned that during the last days, great pressures would come upon people, young and old. (2 Timothy 3:1-5) So it should not shock us when from time to time a young Christian stumbles. But when it happens to someone you care about, you may feel a spectrum of emotions, ranging from sorrow and compassion to anger. You want to help your friend. But *how* can you do so?

'I Can Save Him'

The Bible says: "He who turns a sinner back from the error of his way will save [the sinner's] soul from death and will cover a multitude of sins." (James 5:20) But does this mean that doing so is *your* burden? Not necessarily. Your friend's parents have the primary responsibility for him.* (Ephesians 6:4) The Bible further says at Galatians 6:1: "Brothers, even though a man takes some false step before he is aware of it, you who have spiritual qualifications try to readjust such a man in a spirit of mildness." Congregation overseers are particularly qualified in this regard. They are thus in a better position to help than you are.

Face it, as a young person, you have limited experience in life. (Compare Hebrews 5:14.) So modestly acknowledge your limitations in this regard and avoid biting off more than you can chew. (Proverbs 11:2) Consider a youth named Rebekah. She tried to help a male friend, a relative, who had become involved in drugs. She relates: "What put pressure on me was that he confided in me and not in his parents. I tried to help him, but it was very frustrating. It helped me when I finally realized I could do nothing . . . I could not be his savior." Rebekah then urged him to get help from qualified adults.

Young Matthew was in a similar situation, but he acknowledged his limitations at the

* For the sake of simplicity, we will refer to the wayward friend in the male gender.

outset. He says regarding a troubled friend: "He would come to me with his problems, but I would tell him to go to his parents. I knew better than to carry his problems."

How You Can Help

This does not mean that you cannot do *anything* to help. Much depends upon the circumstances. Maybe your friend wants to confide in you. Naturally, you would want to be there for him and offer a hearing ear. (Proverbs 18:24; 21:13) Or it may be that he has begun to follow a questionable life-style. It would be appropriate to take the initiative and tell him that while you care about him, you cannot approve of what he is doing.

Another situation may involve a friend who admits to serious wrongdoing. He may even try to swear you to silence. But the Bible says: "Never . . . be a sharer in the sins of others; preserve yourself chaste." (1 Timothy 5:22) If your friend was gravely ill and needed medical help, would you not *insist* on taking him to a doctor? Similarly, if he has got into serious wrongdoing, he needs spiritual help. To keep matters secret could kill him spiritually—and adversely affect the congregation. You therefore have an obligation to see to it that the congregation elders are informed.—Compare Leviticus 5:1.

Young Caroline took a courageous stand regarding a wayward friend who was lying to her parents. She says: "I gave her two weeks to go to the elders. If she didn't, I told her I would go to them. This was not easy for me to do." Johnny, mentioned at the outset, showed similar strength of character. Regarding his friend, Johnny recalls: "I was surprised to find he was living with a girl. There were other guys there drinking and smoking." Johnny asked his friend to step outside and strongly recommended that he seek help from the elders in the congregation.

Your friend may or may not appreciate

your efforts. The Bible tells us that when his brothers engaged in wrongdoing, the young man Joseph "brought a bad report about them to their father." This certainly did not enhance his popularity with his brothers. Indeed, "they began to hate him."—Genesis 37:2-4.

Business as Usual?

You would undermine your efforts to help, though, if you kept on socializing with your friend as if nothing had happened. At 1 Corinthians 15:33, the apostle Paul warned Christians against associating with wrongdoers. Close association with such individuals can only drag you down!

Young Mollie learned this the hard way when her friend Sally began dating secretly. Not only was Sally too young to marry but she dated boys who were not Christians. Mollie ignored the situation and continued associating with her friend. The result? Says Mollie: "Eventually, Sally set me up with a worldly boy, and we went out on a date." Fortunately, Mollie got some help from congregation elders before the situation became more serious.

Lynn likewise made some dangerous compromises in order to retain her friendship with a girl named Beth. "I felt I could rescue her," recalls Lynn, "but it didn't work. I went to clubs with her. I knew it was wrong, but I didn't want her to get hurt. Her problems began weighing me down. I kept silent about the matter, thinking the problem would go away, but it got bigger." Tragedy gave Lynn a rude awakening. Her friend Beth was killed by the young man she was dating.

Sticking by a friend may sound noble. But if your friend were literally drowning in a powerful whirlpool, would you jump in yourself? All that would do is get both of you killed. The sensible thing to do would be to throw him a life preserver. Similarly,

you need to render help from a distance.—Jude 22, 23.

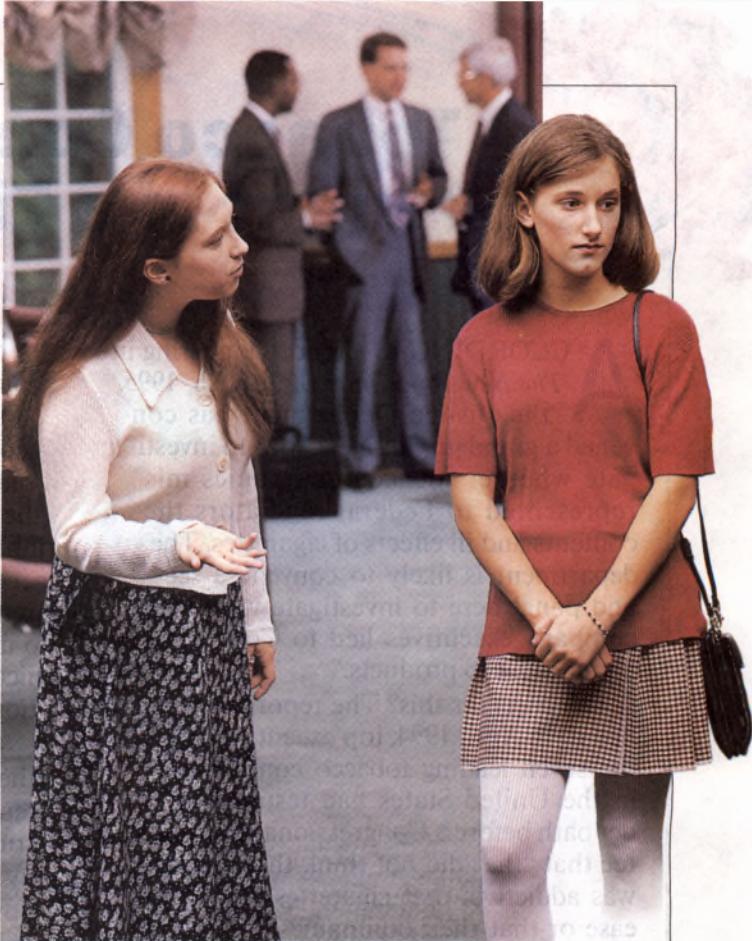
Keeping your distance is imperative if your friend is expelled from the congregation. The Bible's command is to "quit mixing in company" with that one. (1 Corinthians 5:11) While you still care about that one, you can best help him, not by following him into wrongdoing, but by displaying loyalty to Jehovah. (Psalm 18:25) Your uncompromising stand may be the very thing that moves him to reconsider his actions. More important, your loyalty will bring pleasure to Jehovah.—Proverbs 27:11.

Overload

Oftentimes, though, one's best attempts to help fail. Rebekah recalls regarding her friend: "I tried to reach out and help her. I even wrote her a letter, but she never answered it." Caroline found that after months of trying to help a friend who was flirting with trouble, she "started to feel some strain."

It is important to recognize that "each of us will render an account for himself to God." (Romans 14:12) And while it is appropriate to help someone carry his burdens, or personal problems, by rendering practical assistance, you simply cannot carry another person's "load"—that is, his responsibility toward God. "Each one will carry his own load," says the Bible. (Galatians 6:5) You are not responsible for the choices your friend makes.

Even so, watching a friend wreck his life is painful. A young man named Mike says regarding the loss of a friend: "It hit me hard. I was so close to Mark and his parents. I suffered some depression."



Encourage your friend to get help

It is only natural to grieve such a loss. However, talking about your feelings with someone you trust can help. (Proverbs 12:25) "With the help of my parents," says Rebekah, "I was able to get over it." You can also pour out your feelings to Jehovah God in prayer. (Psalm 62:8) Caroline sums matters up well by saying: "Praying to Jehovah and preaching to others helped me very much. I also got close to others in the congregation, especially older women. I finally realized that people are accountable for their own actions and that I needed to move on with my life." By doing all of that, you will surely help yourself. And you just might help your wayward friend too.

Tobacco Companies Caught in a Firestorm

ACCORDING to a report appearing in *The New York Times* of July 26, 1995, "the Justice Department has convened a grand jury in New York to investigate whether tobacco companies misrepresented to Federal regulators the contents and ill effects of cigarettes. The department is likely to convene a second panel here to investigate whether company executives lied to Congress about tobacco products."

The basis for this? The report clarified it. In April 1994, top executives of the seven leading tobacco companies in the United States had testified under oath before a Congressional committee that "they did not think that nicotine was addictive, that cigarettes caused disease or that their companies manipulated the level of nicotine in tobacco products."

Thereafter the roof fell in—their claims of innocence collapsed—when in June 1995, two thousand incriminating documents came to light. These documents show that tobacco researchers had spent 15 years studying nicotine's "pharmacologic" effects on the body, brain, and behavior of smokers. Dr. Victor DeNoble, a former research scientist with one of the companies, describes the key find of the research: "The company began to realize that they could reduce the tar, but increase the nicotine, and still have the cigarette be acceptable to the smoker. After all their work, they realized that nicotine was not just calming or stimulating, but it was having its effect centrally, in the

brain, and that people were smoking for brain effects."

According to *The New York Times*, company studies showed that "whatever brand people smoked, they tended to get the amount of nicotine they needed by inhaling deeper, holding the smoke longer in the mouth, or smoking more cigarettes." Company researchers attempted to make a low-tar cigarette with sufficient nicotine levels to deliver smoker satisfaction.

The documents further revealed that the tobacco company displayed an intense interest in its customers. College students were the subject of its scrutiny for more than 15 years. People in one Iowa town, including some 14-year-old smokers, were questioned about their smoking habits.

The disclosure of these research documents is seen as a boon to a coalition of lawyers launching a class-action suit against seven tobacco firms. They charge that tobacco companies concealed knowledge of nicotine's addictive properties and manipulated nicotine levels to promote addiction. One lawyer said that no jury in the world will believe that these companies were doing this research as a hobby.

As the firestorm heats up in the developed world, the tobacco smoke blows more to the developing world. Forty years ago, virtually no women and only about 20 percent of the men in the South, or developing world, smoked. But today, 8 per-

cent of all women and 50 percent of all men in developing countries are tobacco smokers—and that number is rising. "Smoke," say researchers, "blows South."

Awake! Correspondent Reports on the Trend

Our writer stationed in Brazil makes some general comments on the situation in the South. Research in the industrialized world paints an ever-more-deadly picture for the tobacco smoker. It has its effect. "Countries that have recognized the vital importance of public information are now seeing the beginnings of a decline in tobacco consumption," reports the World Health Organization (WHO). "In the North," adds Panos, a London-based information organization, "smoking is no longer socially acceptable in many homes, public places and work places," and most people now realize that "smoking can kill them." "The tobacco industry is moving South."

By contrast, in the South, opening a new market proves to be as easy as opening a pack of cigarettes. For the tobacco industry, conditions in developing countries are tantalizing. In 3 out of 4 of the developing countries, there are no bans on advertising, and at the same time, public awareness of the dangers of smoking is low. "People are not aware of the risks because they are not told about them," notes Panos.

To persuade young women—one of the industry's main targets—to light up their first cigarette, advertisements "portray smoking as a glamorous fun-loving activity enjoyed by independent women." The tobacco ads sound suspiciously similar to those used in the industrialized world half a century ago. Back then, the ads worked. Before long, says one source, 1 out of 3 women "was lighting up with male-like enthusiasm."

Today, intensified aggressive marketing aimed at unaware women in developing



WHO photo by L. Taylor

A chief target —women in developing countries

countries assures that this advertising "success" of the 1920's and 1930's is about to be repeated. The gloomy outlook is, therefore, that millions of young females in the world's poorer countries are presently at risk of becoming, as one observer put it, "pretty young girls in their early nicotines."

The Prime Target

While women form one of the tobacco industry's chief targets, young people are its

China—Number One

Zhang Hanmin, a 35-year-old worker in China, cups his hands and lights up a cigarette. "To tell the truth," he says, "I can do without a lot of things, but cigarettes isn't one of them." The same can be said, it would seem, of 300 million others of Zhang's compatriots. Since the 1980's, China has "out-produced, out-sold and out-smoked every country." In a recent year, "billions of cigarettes were sold to an inveterate smoking population," making China the "world's number one tobacco nation."—Panoscope magazine.



WHO

Not aware of the risks?

prime target. Cartoon-style advertisements and cigarette logos on toys are paying off, and so is sponsorship of sporting events.

In China, reports the magazine *Panoscope*, young people "are taking to cigarettes in a big way." Some 35 percent of 12- to 15-year-olds and 10 percent of 9- to 12-year-olds are smokers. In Brazil, reports the daily *Folha de S. Paulo*, an estimated ten million youths are smokers. Are they unaware of the dangers? "I know that smoking cigarettes is harmful," says Ra-

Cigarettes With a "Warranty"?

Though three million people die each year because of tobacco-related diseases, advertisements keep telling smokers that their habit is safe. One recent ad in a Brazilian magazine, for instance, trumpeted the arrival of a cigarette brand that "comes with a factory warranty." Assures the ad: "Your car has a warranty; your TV has a warranty; your watch has a warranty. Your cigarette does too." However, as the ads point out and chronically ill smokers can testify, the only warranty is that "smoking is harmful to health."

fael, a 15-year-old Brazilian boy who smokes one and a half packs of cigarettes a day, "but it's very good." The result of this carefree reasoning? "Every day," reports Panos, "at least another 4,000 young people start smoking."

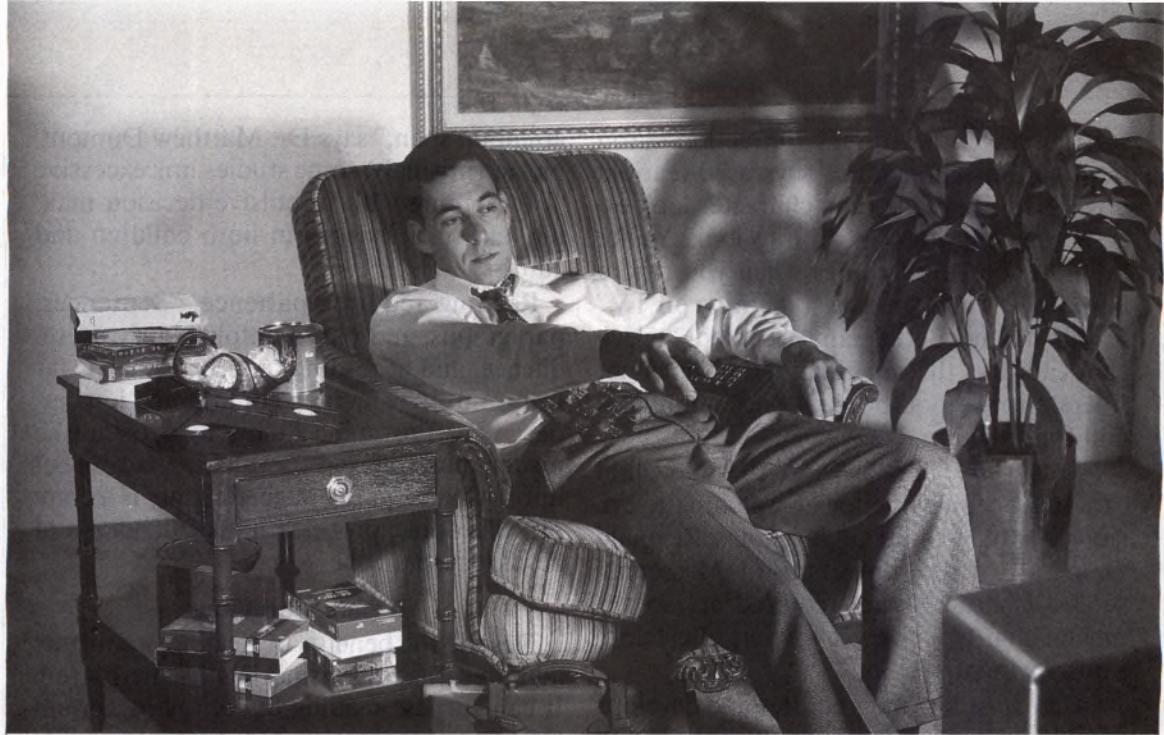
The tobacco industry exports some products to the South that have a higher content of tar and nicotine than brands sold in the North. The reason is obvious. "I don't apologize for nicotine," said one tobacco-industry official some years ago. "It's what brings repeat business. It's what makes people come back." It works. "Because of the high levels of nicotine," confirms the Dutch publication *Roken Welbeschouwd* (Smoking—All Things Considered), "dependence is accomplished more quickly, and this opens opportunities to increase the consumption and sales by gradually lowering those levels."

"The tobacco industry," concludes Panos, "views the South as the market that will keep the industry in business."

Lighting Up or Living On?

If you are living in a developing country, what will you do? The facts are clear. Until 1950, deaths from smoking-related diseases were negligible, but today one million people in the South are dying each year from smoking-related diseases. However, WHO warns that within three decades the yearly number of smoking-related deaths in developing countries will rise to seven million. Contrary to what the tobacco ads are telling you, cigarettes are ultimately coffin nails.

You say that you are aware of the dangers? Fine, but what will you do with that knowledge? Will you be like the smoker who had read so many terrible things about smoking that he decided to give up reading? Or will you be smart enough to see through the smoke screen put up by tobacco ads and say *no* to smoking? True, tobacco smoke is blowing South—but it does not have to blow *your way!*



GUARD AGAINST ALITERACY

A NEW type of reading problem is sweeping our world. It is called aliteracy. It is defined as "the quality or state of being able to read but [being] uninterested in doing so."* (*Merriam-Webster's Collegiate Dictionary, Tenth Edition*) Yes, reading—which was once indulged in as a pleasure—is now often spurned as a chore. "You have to work to read," complained one 12-year-old girl, "and that's no fun."

Many adults are aliterate too. The United States, for example, boasts a 97-percent literacy rate; yet, about half of American adults seldom read books or magazines! Clearly, reading *ability* is not always matched by reading *desire*. This is true even among well-educated persons. "When I come home tired from a long day," says a Harvard University graduate, "I turn on the TV instead of picking up a book. It's easier."

* Aliteracy is not to be confused with "illiteracy," which is the "inability to read or write."

What has happened to reading? In recent decades its popularity has succumbed to the attention-grabbing media. "Now that we have our MTV—and our VCR and Nintendo and Walkman—the prospect of plowing through a book doesn't seem as easy as it did in simpler times," writes Stratford P. Sherman in *Fortune* magazine. Perhaps the most time-consuming competitor of reading is television. Indeed, by age 65 the average American will have spent *nine years* of his life watching TV!

Since the rewards of reading are so often sacrificed to the flickering screen, it would be well to consider the following.

The Benefits of Reading

Reading stimulates the imagination. Television does your thinking for you. Everything is spelled out: facial expressions, voice inflections, and scenery.

With reading, however, you select the cast,

set the stage, and direct the action. "You have so much freedom," says a 10-year-old boy. "You can make each character look exactly the way you want him to look. You're more in control of things when you read a book than when you see something on TV." As Dr. Bruno Bettelheim observed, "television captures the imagination but does not liberate it. A good book at once stimulates and frees the mind."

Reading develops verbal skills. "No child or adult becomes better at watching television by doing more of it," notes Reginald Damerall of the University of Massachusetts. "What skills are required are so elemental that we have yet to hear of a television viewing disability."

In contrast, reading requires and develops verbal skills; it is inextricably linked with speech and writing. Says one high school English teacher: "There is no question that your success as a student depends enormously on your vocabulary, both in what you can understand as you read and in how you reason as you write, and there is *no way* to build up a good vocabulary except by reading—there just is none."

Reading promotes patience. More than a thousand images may flash across the TV screen in just one hour, leaving little time for the viewer to reflect on what he is seeing. "This technique literally programs a short

attention span," says Dr. Matthew Dumont. Not surprisingly, some studies link excessive TV watching with impulsive decision making and restlessness—in both children and adults.

Reading requires patience. "Sentences, paragraphs, and pages unfold slowly, in sequence, and according to a logic that is far from intuitive," writes communications expert Neil Postman. At his own pace, the reader must interpret, evaluate, and reflect upon what is on the page. Reading is a complex decoding process that demands—and develops—patience.

A Balanced View

Despite the benefits of reading, it must be admitted that television has its merits too. It can surpass reading in conveying certain types of information.* A fascinating TV presentation can even stimulate interest in reading. "It is reported that TV shows dramatizing children's literature and science influence children to seek out books on those and related topics," says *The Encyclopedia Americana*.

A balanced view is essential. The printed page and television are two different media. Each has inherent strengths and limitations. Each can be used—or abused. Yes, excessive reading to the point of isolating oneself can be just as detrimental as excessive TV watching.—Proverbs 18:1; Ecclesiastes 12:12.

Yet, reading is often slighted in favor of visual diversion. One Japanese newsman laments: "We are shifting from a culture of readers to one of watchers." This is especially noticed among youths. As a result, many of them grow up illiterate and later suffer the consequences. Therefore, how can parents help their children to develop a desire to read?

IN OUR NEXT ISSUE

**Compulsive Behavior
—Does It Control Your Life?**

Whom Can You Trust?

What to Do When You Offend Others

* In recognition of this, the Watch Tower Society has in recent years supplemented its production of printed material with videocassettes on various Bible-related subjects.

How Parents Can Help

Set the example. A *Newsweek* article entitled "How to Raise Good Readers" gives this pointed admonition: "If you are a couch potato in front of the TV, your child probably will be one, too. On the other hand, if your kids see you happily curled up with a good book, they'll get the idea that you not only preach reading, you practice it as well." Even better, some parents read aloud to their children. In doing so, they create a warm bond—something that is sadly lacking in many families today.

Start a library. "Have books around—lots of books," recommends Dr. Theodore Isaac Rubin. "I remember reading them because they were there and because everyone else was reading them, too." Children will read if books are readily available. The incentive to read will be even greater if the books are part of their own personal library.

Make reading enjoyable. It has been said that if a child likes to read, half the battle of learning is won. So make reading a pleasurable experience for your child. How? First, set limits on television time; it will almost always win out over reading. Second, create an atmosphere that is conducive to reading; quiet times and areas, such as a personal library with good lighting, invite reading. Third, do not force reading. Make the materials and opportunities to read available, but let the child develop the desire.

Some parents begin reading to their children at an early age. This can be beneficial. Some experts say that by the age of three, a child understands most of the language he will use in ordinary adult conversation—even though he cannot yet fluently express these words. "Children begin to learn to understand language earlier and at a more rapid rate than they learn to use it orally," says the book *The First Three Years of Life*. The Bible says of Timothy: "From infancy

you have known the holy writings." (2 Timothy 3:15) The word infant traces back to the Latin *infans*, which literally means "non-speaker." Yes, Timothy heard scriptural words long before he could speak them.

The Bible—An Excellent Aid

"The Bible is an awesome collection of literary work," says the book *The Bible in Its Literary Milieu*. Indeed, its 66 books contain poetic forms, songs, and historical accounts from which young and old alike can learn. (Romans 15:4) Furthermore, the Bible is "inspired of God and beneficial for teaching, for reproving, for setting things straight, for disciplining in righteousness."—2 Timothy 3:16.

Yes, the most vital reading material available is God's Word, the Bible. With good reason each Israelite king was required to have a personal copy of the Scriptures and "read in it all the days of his life." (Deuteronomy 17:18, 19) And Joshua was commanded to read the scriptures "in an undertone"—that is, to himself, with a soft voice—"day and night."—Joshua 1:8.

Admittedly, parts of the Bible are not easy reading. They may demand concentration. Remember, Peter wrote: "As newborn infants, form a longing for the unadulterated milk belonging to the word." (1 Peter 2:2) With practice, an inclination toward the "milk" of God's Word can become as natural as an infant's instinctive yearning for its mother's milk. Appreciation for reading the Bible can be cultivated.* It is well worth the effort. "Your word is a lamp to my foot, and a light to my roadway," wrote the psalmist. (Psalm 119:105) Do we not all need such guidance in our troubled times?

* To help children form a longing for Bible knowledge, the Watch Tower Society has produced simplified Bible study aids, such as *My Book of Bible Stories* and *Listening to the Great Teacher*. Both books are also available on audiocassettes.



By courtesy of Australian International Public Relations

Beware of the 'Eyes of the River'!

BY AWAKE! CORRESPONDENT IN AUSTRALIA

AN ADVENTUROUS vacationer was quietly paddling her canoe along a tributary of the East Alligator River in the wetland wonder of Australia's Northern Territory, Kakadu National Park. Suddenly, what she thought was a harmless piece of driftwood began to thrash her canoe. It was a dreaded saltwater crocodile, and the tourist happened to be in its defined territory at the most dangerous time of the year.

Frantically, she paddled away to a group of trees. As she got her foot onto the first branches, the crocodile came out of the water, pulled her back down, and rolled her a total of three times. Each time the crocodile changed its grip, the woman tenaciously tried to climb up the muddy riverbank. On the third attempt, she managed to get up the bank, dragging herself a mile until a ranger heard her desperate calls for help. Despite terrible wounds, the woman survived.

This near tragedy occurred in 1985. Two years later an American tourist was less fortunate. She ignored warnings from companions and decided to swim in crocodile-infested Prince Regent River, Western Australia. She was attacked and killed by a saltwater crocodile. Reports that there were young crocodiles in the water suggest that it was probably a female crocodile protecting her young.

Deadly 'Eyes of the River'

All the estuary fisherman sees in the moonlight is the ripple effect of an insect

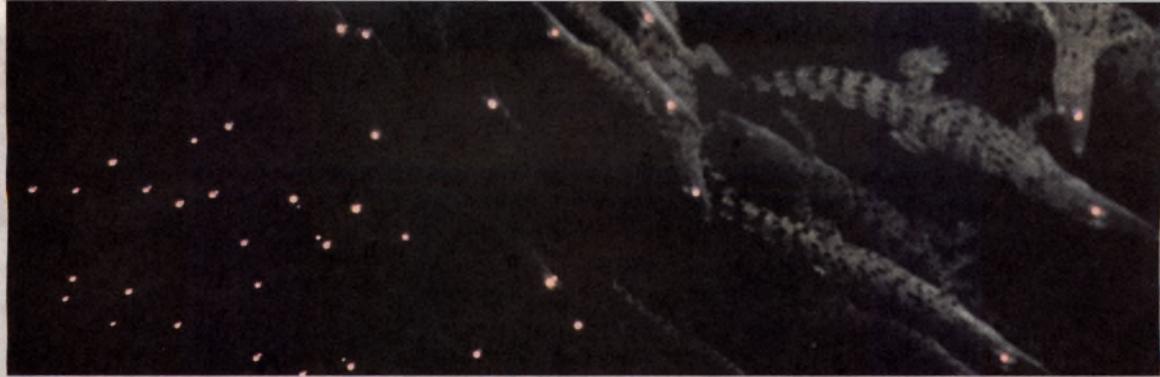
landing on glassy water. Even so, the fisherman in the far north of Australia is ever conscious of the unseen—the 'eyes of the river.' If he was to shine his flashlight, crocodile eyes silently breaking the water's surface would glow luminous red. He is an intruder in an ancient predator's territory.

Australia's saltwater crocodile, also found elsewhere, is one of the biggest and most dangerous of the world's 12 crocodile species. It can grow up to 23 feet in length. Unsuspecting prey see the gleaming eyes too late to escape its lunging attack and infamous death-roll drowning technique. Prey as large as buffalo, cattle, and horses have been attacked as they quenched their thirst at the water's edge.

Luxury Threatens Their Survival

The ancient myth that a crocodile sheds hypocritical tears of grief over its victim has found its way into modern culture in the expression "crocodile tears." But few human tears have been shed over the crocodile. Rather, this water-loving reptile has been hunted mercilessly for its valuable hide, or skin.

Many a crocodile has been strutted down a haute couture catwalk in the form of coveted leather goods, for the skin of the saltwater crocodile is considered by some to be the best leather in the world—the softest and most durable available. Recently a ladies' handbag on sale in London was priced at \$15,000. Crocodile skin is still a status symbol in many parts of the world.



By courtesy of Koorana Crocodile Farm, Rockhampton, Queensland, Australia

When light is shone on the water at night, crocodile 'eyes of the river' glow red

The lure of big profits threatened the survival of the saltwater crocodile in Australia. Between 1945 and 1971, about 113,000 of these reptiles were killed in the Northern Territory alone. Crocodile hunting was limited in the early 1970's to prevent their being wiped out, and the result was that by 1986, their numbers in the wild had recovered. The crocodile is therefore no longer endangered in Australia, although some argue that its habitat is.

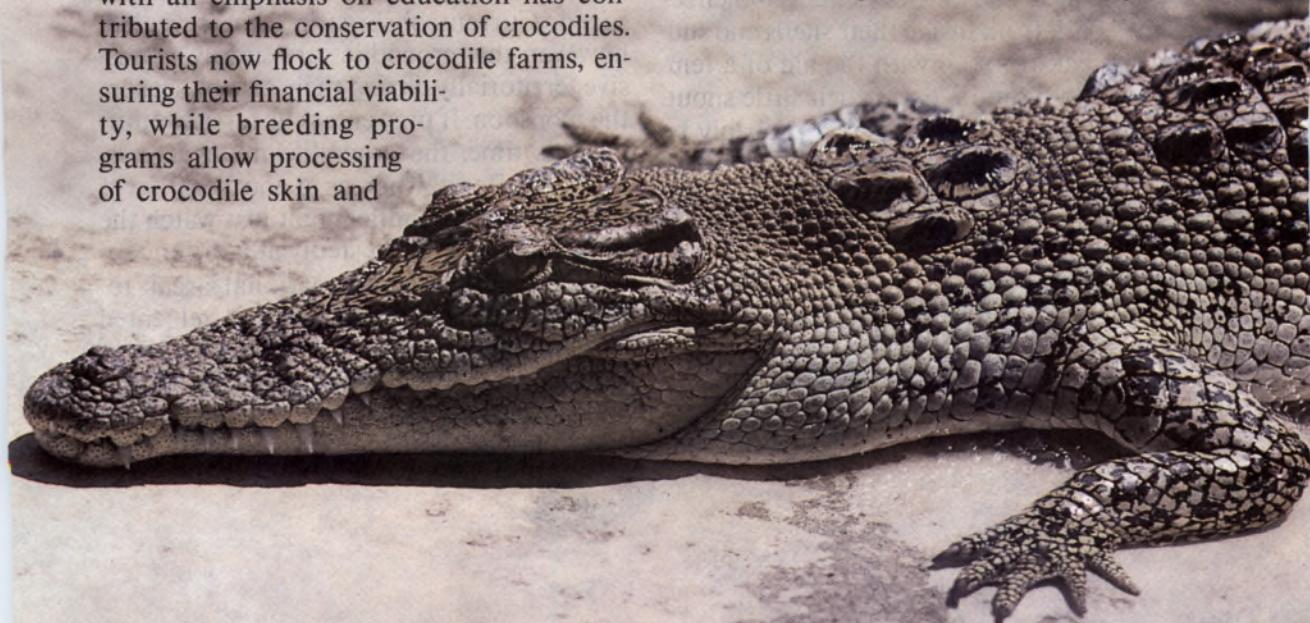
For centuries the Australian Aboriginal population knowingly or unknowingly conserved the crocodile population. While some tribes were proficient crocodile hunters, other tribes for religious reasons prohibited their being hunted.

In recent years crocodile farming coupled with an emphasis on education has contributed to the conservation of crocodiles. Tourists now flock to crocodile farms, ensuring their financial viability, while breeding programs allow processing of crocodile skin and

meat without impinging on wild populations.

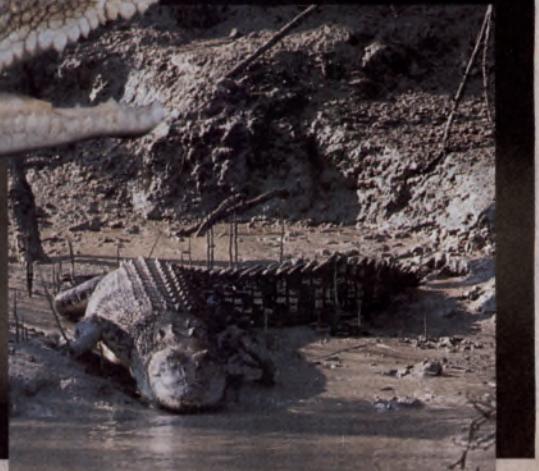
One well-known Australian crocodile farmer believes that people only conserve things they love, understand, and grant some of their space and time. He commented: "So crocodiles don't get much of a look-in. But their ecological value is equal to any of the pretty things."

Visiting a crocodile farm is exhilarating as one views the swamp-colored leathery reptiles at close range—but from behind the security of a wire fence. Farmhands defy fear and get into enclosures with the crocodiles, inviting them to perform and rewarding them with fresh chicken and other meats. One farmhand, however, recently learned the hard way that a crocodile should never be taken for granted. Unexpectedly, the





By courtesy of Koorana Crocodile Farm, Rockhampton, Queensland, Australia



By courtesy of Australian International Public Relations

reptile suddenly lunged at him and completely ripped off his left arm!

On the other hand, holding a 12-month-old crocodile is quite an experience and very enlightening. The skin of its underbelly is remarkably soft, whereas bony plates on its back called osteoderms form hydrodynamic armor. Now it is understandable why their leather is so prized. But be careful with this "toddler." Even a 12-month-old crocodile with its jaws securely tied is strong for its size.

Unhatched baby crocs delight audiences as they bark from inside their shells and suddenly break through with the aid of a temporary tooth on the tip of their little snout.

Most agree that this would probably be the only time when a crocodile really looks cute!

Left: A baby croc suddenly breaks out of the egg

Inset: An adult croc sunning itself on the muddy bank of the Mary River

Some Long-Held Myths Dispelled

Closely observing the behavior of these frightening reptiles as they grow up under cultivation on crocodile farms has helped dispel some long-standing myths. For years it was thought that a crocodile patiently stalks its prey for days, or even weeks, before striking unexpectedly with lightning speed. Current observation has revealed, however, that crocodiles are simply aggressive territorially during their mating season, the monsoon. If prey enters its territory during this time, the crocodile might aggressively go after it, whereas at another time of the year, the crocodile might just watch the same animal disinterestedly at a distance.

When sighted in recreational areas today, crocodiles are removed and relocated by professional crocodile hunters. Part of their technique is to noose the hinged lower jaw, raise it, and quickly tie the upper and lower jaws together. This

renders the crocodile jaw virtually powerless, for while the lower jaw's closing muscles are extremely powerful, the opening muscles are weak. If a hunter is not careful, however, he can easily be knocked to the ground by the crocodile's powerful tail.

Not All Cruelty and Violence

The same jaws that can inflict serious injury are also capable of a deft touch. If unborn crocodiles are sluggish breaking out of their shells, the mother crocodile will roll her eggs ever so gently, stirring the hatchlings to action.

Crocodile teeth are designed to grip rather than to slice. If small enough, the prey is swallowed whole. Otherwise, it is ripped apart and consumed piece by piece. Autopsies on dead reptiles have revealed stones in their stomachs. Whether eaten deliberately or not, these stones are believed to act as ballast.

Visitors often observe crocodiles on riverbanks with their huge jaws agape. Most would probably assume this posturing signals aggression. On the contrary, the open-jaw position allows it to adjust to outside temperature. Like all reptiles, crocodiles are constantly adjusting their body temperature.

Quite surprisingly, although it is a reptile, a crocodile has a heart with four chambers, just like a mammal. However, when a crocodile dives, a change takes place, and the heart acts like one with three chambers.

The saltwater crocodile is distinguished from an alligator by a narrower snout and by teeth in the lower jaw that are visible when its jaws are closed. True crocodiles can be found from Africa, where the dwarf crocodiles live, across to India, and down through Asia to Papua New Guinea. They reside as far south as Australia and prefer mangrove coastal strips and tropical wetlands,

for they build their nests close to the water's edge. The natural disadvantage of this is that floodwaters often drown a large number of crocodile embryos. Because of predators, such as the adult crocodile, barramundi fish, and the nankeen bird, only 50 percent of crocodile hatchlings survive their first year.

Amazingly, crocodiles are born with their own food supply. They feed on a yolk sac within their bodies for the first few weeks of life. Nevertheless, almost as soon as their mother gently takes them in her mouth and moves them to the water's edge, they begin exercising their snouts, snapping at anything within reach.

Why is the term 'eyes of the river' so appropriate? Because even as hatchlings, their little eyes shine red under artificial light at night. A layer of crystals behind the retina enhances night vision and causes the red glow.

Yes, the crocodile is truly an intriguing reptile—but always keep a respectful distance. And as any fisherman well knows, attempts to tame the leviathan are futile.

The poetry of Job fittingly describes the crocodile as "Leviathan": "Can you draw out Leviathan with a fishhook, or with a rope can you hold down its tongue? Can you put a rush in its nostrils, or with a thorn can you bore its jaws? Will it make many entreaties to you, or will it say soft words to you? Will it conclude a covenant with you, that you may take it as a slave to time indefinite? Will you play with it as with a bird, or will you tie it for your young girls? Will partners barter for it? Will they divide it up among tradesmen? Will you fill its skin with harpoons, or its head with fish spears? Put your hand upon it. Remember the battle. Do not do it again."—Job 41:1-8.

Wise words of caution, urging the unwary and the curious: Beware of the 'eyes of the river'—the mighty, fearsome crocodile!

WATCHING THE WORLD

"Silent Holocaust"

In the eyes of Oxfam, a leading development charity organization, the suffering of the world's poor is severe enough to be termed a "silent holocaust," according to the British newspaper *Guardian Weekly*. In a report launching a five-year campaign to help the world's poor, Oxfam found that one fifth of the world's population reside in the 50 poorest nations. Those same countries have seen their share of the world's income plummet to a mere 2 percent. The gulf between the rich and the poor within countries is growing too. Mexico, for instance, has suffered from a severe financial crisis and widespread poverty but at the same time has seen the fastest growth in the number of billionaires. Says an Oxfam spokeswoman: "There is a sense that world leaders and the UN have . . . lost their way. We need a new vision for a new millennium."

More Harmful Than Cigarettes

This is the conclusion drawn by a parliamentary committee in India regarding the bidi, also known as the poor man's cigarette. It is estimated that more than four million men, women, and children produce over 300 million bidis a day, wrapping tobacco dust in tendu leaves and tying the small roll with thread. According to *The Times of India*, a recent report shows that the bidi has two and a half times the cancer-causing potential of cigarettes, can cause silicosis and tubercu-

losis, and contains 47 percent tar and 3.7 percent nicotine compared with the standard Indian cigarette that has 36 percent tar and 1.9 percent nicotine. Not only are smokers at risk. The millions of people who prepare the bidis are usually found working long hours in unhygienic conditions, breathing in the tobacco dust in poorly ventilated huts. Especially do child laborers suffer.

The Effect of Literacy on Mothers

Public-health experts have long believed that children in developing lands have a better chance of survival if their mothers are literate—but they have never been able to isolate



reading itself as a decisive factor. According to *New Scientist* magazine, a study carried out in Nicaragua "is the first to demonstrate that educating women has a direct effect on their children's health." The study examined illiterate women who as adults took part in Nicaragua's massive literacy program between 1979 and 1985. In the late 1970's, the mortality rate for children of illiterate mothers was about 110 deaths per 1,000 live births. By 1985, the mortality rate for children of moth-

ers who had learned to read in the program dropped to 84 per thousand. Their children were also better nourished. Experts are still uncertain as to why the children of literate mothers are so much better off.

Shattered Trust

The tiny town of Chesterfield Inlet on the Hudson Bay in Canada's Northwest Territories has been rocked by charges of widespread abuse of schoolchildren. According to *Maclean's* magazine, an independent report recently released by the government found incidents of sexual and physical abuse of native Inuit children over a 17-year period in the 1950's and 1960's at the Sir Joseph Bernier Federal Day School and at an adjacent residence run by the Catholic Church. The police completed a 21-month investigation into 236 allegations of abuse and decided not to lay charges—in some cases because the statute of limitations had expired; in others because the alleged perpetrators were elderly or even dead; in others because some former students could not identify the offenders with certainty. Noted *Maclean's*: "Although the passage of time has clearly made punishing alleged offenders more difficult, it has not erased the pain of the victims."

Family Life Deteriorating

How fares family life these days? According to the United Nations Department of Public Information, fathers worldwide spend on the average less

than one hour a day alone with their children—in Hong Kong the average is only six minutes. Single parenthood is increasing. In the United Kingdom, for example, half of all births in 1990 were to unmarried women. Family violence is also increasing. It is estimated that of the children who live in the United States and Western Europe, 4 percent experience serious violence within the home each year. The elderly are having problems too. The UN report states: "Even in the so-called 'developed' countries of the European Union (EU), one fifth of the elderly population live in relative poverty, often isolated in urban ghettos without the support of an expanded family structure."

Hazards of International Matchmaking

With the increased freedom to travel from Eastern Europe to Western Europe has come an unsavory by-product: international matchmaking. Since 1991 an estimated 15,000 women have gone from Eastern Europe to Western Europe as mail-order brides. Many women live in poverty and dream of a better life, so they answer an advertisement of a matchmaking agency. All too often, the dream turns into a nightmare when a woman ends up isolated in a foreign land and at the mercy of a brutal husband. One Polish bride was so badly beaten by her husband in Germany that she fled to the woods and hid there for two days in freezing temperatures. As a result of frostbite, her left foot and her right leg had to be amputated. Noted the English newspaper

Guardian Weekly: "Many of the match-making agencies double as prostitution rings. They entice women abroad and then force them into brothels. Those who resist are routinely killed."

Travel Sickness

Do you experience travel sickness? If so, you are not alone. Fully 9 in every 10 people are prone to motion sickness to varying degrees, reports the *International Herald Tribune*. Dogs, especially puppies, are also susceptible. Even fish when transported by boat on rough seas can get seasick! What is



the remedy? Many people turn to medications, which can be purchased at most pharmacies. Here are other suggestions that may help: Do not read in a moving vehicle. Seat yourself where there is the least motion—in the front seat of a car, for example, or over the wing of an airplane. Focus on distant objects, such as the horizon. If you do not want to do that, close your eyes.

Air Pollution Worsening in France

Despite concerted efforts to combat it, air pollution is becoming worse and is posing a serious health threat to millions who live in Paris and other French cities. While in the past the primary culprit was heavy industry, today the auto-

mobile is responsible for 80 percent of urban air pollution. The number of vehicles in France has doubled since 1970, soaring from 12 million to 24 million, with 3.2 million in the Paris region alone. The Paris newspaper *Le Monde* says that a recent government study showed that for every increase in the concentration of toxic gases in the Paris region, there was a corresponding rise in the number of deaths and hospitalizations due to respiratory ailments. Little concrete action has yet been taken. Evidently, politicians fear that any measures severe enough to be effective will displease their voters who drive.

Speech Disorders Among Children

Researchers at the University Clinic for Communication Disorders in Mainz, Germany, have discovered that every fourth child of preschool age has a speech disorder. "I couldn't believe the figures," confessed Professor Manfred Heinemann, clinic director. Medical personnel carried out tests on children three and four years of age and found that between 18 and 34 percent had speech disorders. The corresponding figure in 1982 was only four percent. Why the increase? "Families are watching TV too much and talking too little," reports the German newspaper *Der Steigerwald-Bote*. It seems that videos, TV, and computer games are taking over the role of the parents in many families. Researchers observed that some children who could hardly talk were nonetheless "as quick as a flash" when it came to computer games.

FROM OUR READERS

Tobacco Industry The series "Killing Millions to Make Millions" (May 22, 1995) was informative and intelligent. The painting on the cover ("Skull With Cigarette") by Vincent van Gogh was chilling! Perhaps this picture alone will be enough to make some people stop smoking or at least deter some from starting.

M. B., United States

Since I work for the American Cancer Society, I was particularly excited to read these articles. I sent a copy to the woman who chairs the local chapter of a tobacco-free coalition. She was impressed with the quality of writing and research and requested 35 copies for her colleagues.

J. O., United States

My husband and I had given up smoking for nearly three months, but I still had cravings for cigarettes. Then I read this article, and it made me realize that some of the ingredients in a cigarette are so toxic that it is illegal to dump them in a landfill! This strengthened me to hate what is bad.

L. T., South Africa

Lupus Sufferer Thank you so much for the information on lupus in the article "Now It Is Only Mia and Jehovah." (February 22, 1995) I am 18 years old, and I have been suffering from this illness for about two years. It is encouraging to know how suffering is endured by other brothers and sisters in different parts of the world and to see how our Creator always lovingly supports us.

J. A. Y., Italy

Problem Parents I had prayed for an article like "Young People Ask . . . What If My Parent Falls Short?" (May 22, 1995) How sad and hurt I was when my mother was disfellowshipped from the Christian congregation! I almost quit pioneering, full-time evangelizing. The article strengthened me to 'work out

my own salvation with fear and trembling' instead of worrying excessively about Mom's standing with Jehovah. (Philippians 2:12) Thank you so much.

J. P., Philippines

I'm a baptized Christian, but I've found it very hard to honor my father who comes home drunk every day. While reading this article, I could not stop crying. Now that I've read it, my negative feelings and thinking toward my father have eased up considerably, and I feel more settled inside.

N. M., Japan

Christian Science The article "Seminars to Improve Relations Between Doctors and Jehovah's Witnesses" (March 22, 1995) carries a comment on the Christian Science approach to sickness. In the interest of building understanding between our faiths, I'd like to assure your readers that in relying on spiritual healing, Christian Scientists value and protect human life as we believe Christ Jesus showed us to do. A record of verified healings published in our periodicals for over a century illustrates that it is worship of God, not martyrdom, which is our motive. Spiritual, moral, and physical well-being are consistently the result.

M. V. W., Manager, Committees on Publication, The First Church of Christ, Scientist, United States

Thank you for these comments. Our intent in quoting the words of a medical doctor was to highlight the fact that Jehovah's Witnesses do accept medical treatment. While we respect the rights of others to believe as they wish, Jesus Christ actually said that "persons in health do not need a physician, but the ailing do." (Matthew 9:12) And when Paul discussed Timothy's "frequent cases of sickness," he did not recommend spiritual healing but offered a common medical treatment. (1 Timothy 5:23) The Bible's view of medical treatment is thus in conflict with the teachings of Christian Science.—ED.

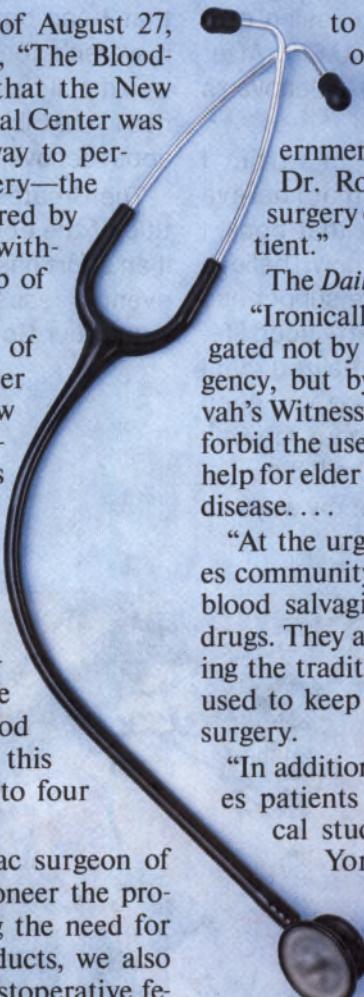
JEHOVAH'S WITNESSES INSTRUMENTAL IN HEART SURGERY ADVANCE

THE New York *Daily News* of August 27, 1995, headlined their report, "The Bloodless Operation." It stated that the New York Hospital-Cornell Medical Center was "to reveal a revolutionary way to perform coronary bypass surgery—the same surgery recently required by ex-Mayor David Dinkins—with- out losing so much as a drop of blood."

"Inspired by the concerns of Jehovah's Witnesses," the paper said, "the wonder of the new procedure . . . will be reflected in hundreds of thousands of dollars in savings for hospitals and substantially less risk of blood contamination for patients." Dr. Todd Rosengart, director of the hospital's bloodless surgery program, said: "We are now able to reduce the amount of blood transfusion necessary during this surgery from the usual two to four units per patient to zero."

Dr. Karl Krieger, a cardiac surgeon of the hospital, who helped pioneer the procedure, said: "By eliminating the need for donor blood and blood products, we also reduce the risk of certain postoperative fevers and infections normally associated with transfusions."

Other experts say that "the bloodless bypass decreases time spent in intensive care after surgery—from 24 hours or more to just six hours. Patients in clinical trials were able



to get back on their feet and out of the hospital up to 48 hours sooner." That means big savings for hospitals, government, and insurance companies. Dr. Rosengart estimated that "this surgery can save at least \$1,600 per patient."

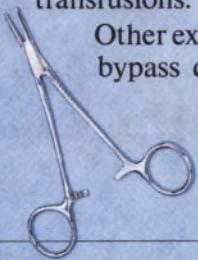
The *Daily News* account continued:

"Ironically, the new surgery was insti- gated not by economic or even medical ur- gency, but by religious fervor. The Jeho- vah's Witnesses community—whose beliefs forbid the use of transfusions—was seeking help for elder members succumbing to heart disease. . . .

"At the urging of the Jehovah's Wit- nesses community, the doctors combined their blood salvaging techniques with the new drugs. They also found a new way of utilizing the traditional heart and lung machine used to keep patients alive during cardiac surgery.

"In addition to the 40 Jehovah's Wit- nesses patients comprising the initial clin- ical study, six months ago the New York-Cornell team introduced the operation into the gener- al patient community. Since then, they have completed 100 consecutive bloodless bypass surgeries with no deaths," said Krieger. The mortality rate for normal bypass surgery is about 2.3%."

Worldwide 102 hospitals have added bloodless surgery programs to their facil- ities, making these safer surgical procedures available to the general patient community earth wide.



“Thanks for helping me learn about Jehovah!”

That was the heartfelt expression of a 16-year-old girl from Florida, U.S.A. After reading publications published by Jehovah's Witnesses, she wrote:

“I cannot recall the name of it, but I read a book about Jesus' life that I believe you published. Before reading that book, I thought I knew all I needed to know. I believe in God and Jesus, I pray before supper and again at night, and I lead a pretty good life. But after reading that book, I realized that I don't know very much at all and that I need to keep reading and learning about Jehovah God and Jesus and others in the Bible.

“I'm slowly changing some of my ways so

that I can be a better servant of God. If it weren't for the Watch Tower Society, I would still be ignorant of God and the stories in the Bible. Thanks for helping me learn about Jehovah!”

The Greatest Man Who Ever Lived is the title of the book the girl was referring to. In it an effort has been made to present every event in Jesus' earthly life that is set forth in the four Gospels.

