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OCTOBER 1994

SCIENCE AND RELIGION

UFOS AND GOD

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For our sixteenth birthday *Omni* explores the range of belief systems—be it science, religion, or otherworldly—that spring from the human mind as we seek to understand our world
Cover art by Steven Hunt (Additional art credits, page 113)

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FIRST WORD

ALONE IS NEVER ENOUGH
Seeing the world through both eyes

By John Polkinghorne

I am a theoretical physicist and a clergyman. People sometimes think that is a pretty odd combination, as if I had said I was a vegetarian and a butcher. Aren't science and religion at war with each other, and isn't science winning the battle? Which side am I really on?

I do not think I have to choose sides. In fact, if I am really going to understand the very rich and varied world in which we live, I need the insights of both science and religion. Each is concerned with the search for truth, but they survey different aspects of our experience. It is not the case—as many suppose it is—that science deals with real knowledge of a world of reliable facts, whilst religion trades in individual opinion, which might be "true for me" but which cannot be just plain "true." In fact, such ideas are literally mistaken.

They are wrong about science because scientific facts are never plain, unvarnished observations; to be interesting they must already be interpreted. That interpretation requires an interweaving of fact (experiment) and opinion (theory). That the Geiger counter clicks is pretty uninteresting; it only comes to life when we understand it to be the sign of a radioactive decay.

Religion, conversely, is concerned with the search for motivated belief. Faith does not involve shutting one's eyes and believing impossible things because some unquestionable authority tells one to do so. It is the quest for an understanding of human experience rooted in worship, hope, and the history of holiness represented by the great religious figures of world history.

I believe that science and religion both are concerned with interpreted fact, with motivated opinion. They are intellectual

cousins under the skin. Their difference lies in the kinds of questions they ask and the kinds of experiences they are prepared to consider. Science asks the question *How?*; religion asks the question *Why?* Both are important questions if we want to understand all that is going on. "The kettle is boiling because burning gas heats the water." "The kettle is boiling because I want to make a cup of tea." I do not have to choose between these answers. Like science and religion, both are true.

Science limits itself to treating the world as an object, an "it" which can be manipulated and put to the experimental test. Religion is concerned with personal encounter with that reality which can only be treated as a "thou." In the realm of the personal, testing has to give way to trusting.

Science by itself could never be enough. It is too limited. Ask a scientist to tell you all about music. Wearing his scientific hat, he will have to reply, "It is just vibrations in the air." But we all know that there is much more to music than that. Science trawls experience with a coarse-grained net and there is much of the highest significance and importance which slips through its wide meshes.

In fact, there are some questions which arise from science but which go beyond its narrow power to answer, which seem to many of us to point in a religious direction. Scientists are greatly struck by the wonderful rational beauty of the physical world as it becomes revealed to them through their investigations. The experience of wonder is a fundamental reward for all the toil and labor involved in scientific research. Scientists are also greatly impressed by our human power to understand the physical world. Why are our minds so formed that we can comprehend not only the world of everyday experience which we clearly have to understand if we are to survive, but also the strange unpicturable world of quantum mechanics so totally different from what common sense would lead us to expect? You could say that fundamental physics discovers a world shot through with signs of mind. It is natural to interpret this as indeed an encounter with "the mind of God." Science is possible because the universe is a creation, and we are made in the image of the Creator.

The history of the universe, which has turned an expanding ball of energy into the home of saints and scientists over the last 15 billion years, suggests a purpose at work. An evolutionary universe can be understood theologically as a universe allowed by its Creator to make itself, as it actualizes the astonishing potentiality with which it has been endowed.

The goal for every scientist should be a thirst for understanding—a thirst which will never be quenched by science alone. ☐☐

John Polkinghorne is the author of *The Faith of a Physicist*, published by Princeton University Press. He is also president of Queens College in Cambridge, England.

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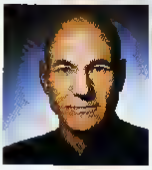

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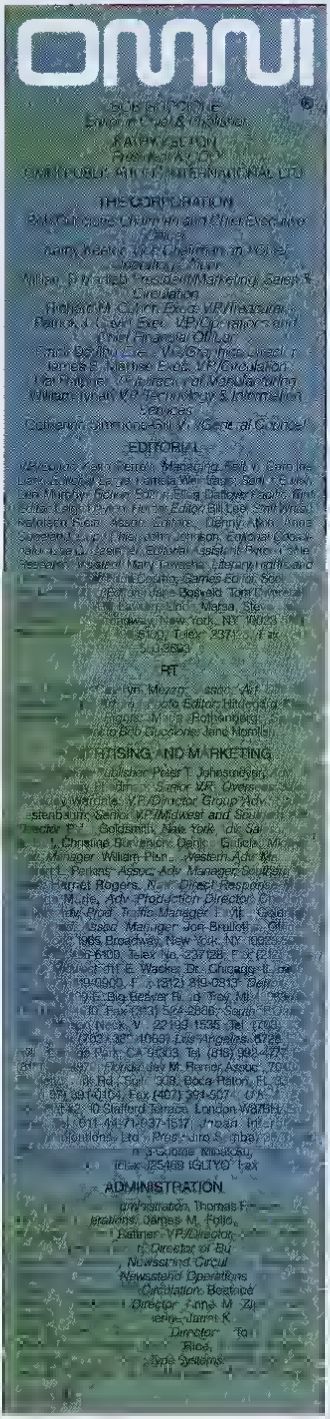

COMMUNICATIONS

READERS' WRITES

Alien-Nation, another one for the birds, and milking the cow

Looking for UFO Answers

I was pleased to hear you started investigating the alien presence and the government cover-ups [April 1994]. The idea of asking the government for secret files and information is really exciting. This will not only open new fields of study but will allow more universities and research institutions to have more access to such studies. I support your research and hope that in future issues you can prove some of the questions that people have been asking about UFOs and their existence. Good luck.

Jorge Torres Jr.
Miami, FL

Brinning over with New Ideas

David Brin's "Extraterrestrial Nightmares" [First Word, June 1994] unwittingly reveals the problem aliens must face in making official contact with a new world. If they arrive when we are on the verge of either blowing ourselves up or putting international warfare behind us, it could deprive the human race of the chance to mature. Add that to the fact that our science would instantly become antique, and you have a prescription for bad relations. If a race capable of interstellar travel wanted to enslave or destroy us, they could have done so long before now. Why wait to make contact, unless it is to minimize the disruption to Earth-dwellers?

William L. Schlosser
Indianapolis, IN

David Brin [First Word, June 1994] attempts to equate UFO phenomena, especially abductions, to elves and other mythological wee folks stealing away people; however, Brin concludes his piece by shooting himself in the foot. He begs forgiveness for doubting so harshly, but says his faith lies in the more practical approach to proving extraterrestrial intelligence. He writes, "... until then, I remain a big fan of the Air Force. Keep watching the skies, guys!" Doesn't Brin find it an ironic contradiction that some of the best sightings of UFOs have been reported by Air Force pilots?

Philip Paul
U.S. Air Force, Retired
Hampton, VA

Birds of a Feather

As an amateur paleontologist, I found George Olshevsky's article [June 1994] on which came first, the bird or the dinosaur, fascinating. While his theory is perfectly plausible and solves some of the questions created by the birds-are-dinosaur-descendants theories, clearly much more study needs to be done on finds like Mesenosaurus and Cosesaurus. I guess we simply have to wait and see if new finds will support the birds-first theory. Keep up the great work.

Bill Barbour
Greensboro, NC
AOL: CORWIN3210

Cash Cow or Prestige Pig?

Piers Bizony's article, "Politics of Apollo" [July 1994] was accurate, excellent and timely. As one of many devoted NASA middle-management officials during the Apollo years, I can make one minor correction. In discussing funding for the program, Bizony states that "NASA looked like a fat cash cow begging to be milked." In some cases, the cow was milked not for cash but for prestige. On the incentive evaluation board, we graded contractors based on their previous quarter's performance. After one contractor got its second low grade, its senior management was called in and given the option of quietly surrendering the contract. The Apollo program meant so much in terms of prestige that these managers almost begged to be allowed to continue losing money rather than disappoint their shareholders by not being a part of Apollo. The 'fat cash cow' was even bigger and fatter than we'd imagined.

Charles D. Friedlander
San Diego, CA

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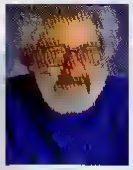
SOUNDS

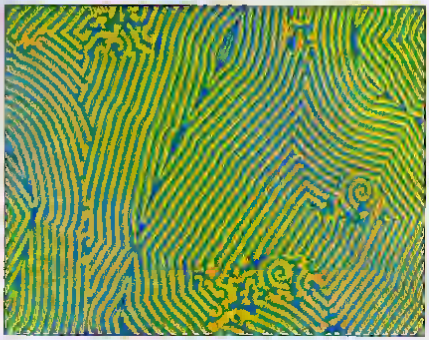
CATHEDRAL DREAMS
A synthesis of music, mathematics, and mysticism

By Jane Bosveld



It was an odd and spectacular event even for a crowd used to the visual and audio overload of rock concerts by such luminaries as David Bowie, Michael Jackson and the comeback tours of the Rolling Stones. The band, so to speak, was as strange as the *Cathedral Dreams* music and light show that played at the Cathedral Church of St. John the Divine in New York City on a cool October night.

The brainchild of mathematician and chaos guru Ralph Abraham, the concert blended computer images and music with improvised visual effects con-



Using a supercomputer, Ralph Abraham connects the resonance of sight and of sound.

trolled by human performers. Strange mazes appeared on a screen only to fade into pulsating geometric shapes. Fluid images reminiscent of stained-glass windows—one in the shape of the cathedral itself—changed colors and dissolved. Using a specially designed computer called MIMI (Mathematically Illuminated Musical Instrument), Abraham programmed intricate mathematical formulas which were then translated by a supercomputer into video images. In addition to Abraham, other performers for the event included Ami Radunskaya, a professor of mathematics at Rice University in Houston, whose electronic cello accompanied the visual display, and Peter Broadwell, senior software engineer at Silicon Graphics of Mountainview, California, who designed the concert software.

The *Cathedral Dreams* however, was more than academic exercise in the interaction of technology and art. In many ways, it represented the culmination of Abraham's lifelong desire to invest his work in mathematical theory and his love of music with a spiritual dimension. As a member of the Lindisfarne Association, whose twentieth anniversary the concert commemorated, Abraham and his colleagues are dedicated to the serious investigation of the religious dimensions of science. Founded in 1972 by William Irwin Thompson, other members include microbiologist Lynn Margulis, Gaia hypothesis originator James Lovelock, anthropologist Mary Catherine Bateson, poet Wendell Berry, architect Paolo Soleri, and the dean of St. John the Divine, James Parks Morton.

For Abraham the renewal of religion is essential for the growth of a vibrant "planetary culture." The old religions, he explains, no longer work. "But we can prune those religions of whatever has inhibited their evolution over the centuries. We need a planetary religion, a revolution of religion where there would be a renewal of meaning in rites and rituals."

Abraham's spiritual journey began in the 1960s during a walkabout that took him to India where he met a guru with whom he spent a week on a meditative retreat inside a cave that had been home to yogis for centuries. It was here that he first experienced 'visual illuminations,' telepathic communications and insights into what the Vedic religious tradition calls the vibration metaphor. Throw a pebble in a pond, and the vibrations ripple out in concentric circles; strike a bell, and it vibrates in waves of sound; meditate on a thought, and it echoes according to Vedic teachings, through the realm of the collective unconscious, the eternal wellspring of thought. Abraham's training as a mathematician made him wonder if there were a mathematical basis for the vibration metaphor, if human thought could somehow be understood in the same way as ringing a bell.

When Abraham returned to his professorship at the University of California at Santa Cruz in 1974, he began giving seminars on vibration theory, combining Vedic ideas with Western mathematics. To visually represent certain principles of vibration, Abraham had his students build a macroscope—a device that amplifies sound and sends it through a liquid solution, causing it to vibrate in patterns which are then projected via lenses onto a screen. Abraham asked an Indian singer he knew to sing through a microphone that was attached to the macroscope. "His singing produced beautiful patterns on the screen that were suggestive of the music itself," he explains. "It connected, all at once, my experience with Indian music, vibration theory, and mathematics. Math, music, mysticism—all are one."

By the 1980s, video innovations enabled the use of digital equipment in Abraham's experiments with visual music. This work led him to design the MIMI and later to *Cathedral Dreams* and the hope that visual vibrations designed in mathematical formulas can be tuned to the pulsating beat of human consciousness.

THE ROSWELL DECLARATION

TIME OUT.
A call for accountability by the U.S. government

By A. J. S Rayl

Would you like to know if a flying saucer actually crashed near Roswell, New Mexico, back in 1947, as many UFO buffs now contend? If the government has knowledge—or possession—of extraterrestrials and/or their craft? You are not alone.

A grassroots movement to find out is now underway, and you can become a part of it by signing a copy of the Roswell Declaration, a one-page petition calling for the administration to issue an executive order declassifying any government information regarding Roswell, UFOs, and extraterrestrial intelligence.

"This is about getting to the truth, setting the record straight once and for all about what the government knows," says declaration author and one of the organizers, Kent Jeffrey, an international airline pilot. Jeffrey and his fellow organizers plan to deliver a copy of the declaration and a list of signatories to all members of Congress and to the White House.

Is the U.S. government concealing vital information about UFOs? A grassroots movement needs your help to find out.

The Roswell Declaration is not an endorsement of a position or belief, but a request for a change in the law.

"Knowledge about extraterrestrial intelligence is not a matter of national security, but one to which all humankind should have an inalienable right," Jeffrey states. "The primary goal," he adds, "is to get the matter into the open so that the truth can be determined one way or the other." Jeffrey hopes that all individuals, no matter what their personal stand on ETs, will support that view.

Various UFO organizations throughout the world are doing just that by disseminating the declaration, which has also shown up on numerous computer bulletin board services. While the main thrust of the Roswell initiative has been in the United States, it is gaining support internationally, especially in Great Britain and Germany.

If you would like to take part in this groundswell for government accountability, just sign the Declaration on the facing page, tear it out, and mail it to the following address: The Roswell Declaration, Omni Magazine, 324 West Wendover Avenue, Suite 205, Greensboro, North Carolina 27408. We will forward all of the signatures to the organizers so your voice can be heard. All signed forms need to be returned to *Omni* by November 30.

Please Copy and Circulate

THE ROSWELL DECLARATION

Forty-seven years ago, an incident occurred in the southwestern desert of the United States that could have significant implications for all mankind. It involved the recovery by the U.S. military of material alleged to be of extraterrestrial origin. The event was announced by the U.S. military on July 8, 1947, through a press release that was carried by newspapers throughout the country. It was subsequently denied by what is now believed to be a cover story claiming the material was nothing more than a weather balloon. It has remained veiled in government secrecy ever since.

The press release announcing the unusual event was issued by the commander of the 509th Bomb Group at Roswell Army Air Field, Colonel William Blanchard, who later went on to become a four-star general and vice chief of staff of the United States Air Force. That the weather balloon story was a cover-up has been confirmed by individuals directly involved, including the late General Thomas DuBose who took the telephone call from Washington, DC, ordering the cover-up. Numerous other credible military and civilian witnesses have testified that the original press release was correct and the Roswell wreckage was of extraterrestrial origin. One such individual was Major Jesse Marcel, the intelligence officer of the 509th Bomb Group and one of the first military officers at the scene.

On January 12, 1994 United States Congressman Steven Schiff of Albuquerque, New Mexico announced to the press that he had been stonewalled by the Defense Department when requesting information regarding the 1947 Roswell event on behalf of constituents and witnesses. Indicating that he was seeking further investigation into the matter, Congressman Schiff called the Defense Department's lack of response "astounding" and concluded it was apparently "another government cover-up."

History has shown that unsubstantiated official assurances or denials by government are often meaningless. There is a logical and straightforward way to ensure that the truth about Roswell will emerge: an Executive Order declassifying any information regarding the existence of UFOs or extraterrestrial intelligence. Because this is a unique issue of universal concern, such an action would be appropriate and warranted. To provide positive assurance for all potential witnesses, it would need to be clearly stated and written into law. Such a measure is essentially what presidential candidate Jimmy Carter promised and then failed to deliver to the American people 18 years ago in 1976.

If, as is officially claimed, no information on Roswell, UFOs, or extraterrestrial intelligence is being withheld, an Executive Order declassifying it would be a mere formality, as there would be nothing to disclose. The order would, however have the positive effect of setting the record straight once and for all. Years of controversy and suspicion would be ended, both in the eyes of the United States' own citizens and in the eyes of the world.

If, on the other hand, the Roswell witnesses are telling the truth and information on extraterrestrial intelligence does exist, it is not something to which a privileged few in the United States government should have exclusive rights. It is knowledge of profound importance to which all people throughout the world should have an inalienable right. Its release would unquestionably be universally acknowledged as an historic act of honesty and goodwill.

I support the request, as outlined above, for an executive order declassifying any U.S. government information regarding the existence of UFOs or extraterrestrial intelligence. Whether such information exists or whether it does not. I feel that the people of the world have a right to know the truth about this issue and that it is time to put an end to the controversy surrounding it.

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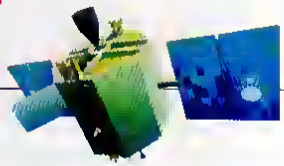
ELECTRONIC UNIVERSE



THE INFO SPACELANES
The Internet sucks you in like a black hole

By Gregg Keizer

It all started so innocently. The Internet, the mother of all computer networks and perhaps the embryonic information superhighway (an info alley?), was just too tempting. Twenty million people to talk to, links that leaped across the globe faster than I could say "gkeizer@rain.com," enough information to balloon my brain and my hard disk drives to the breaking point. What would it hurt just to dip into that well and pull up a bucketful? Or maybe two?

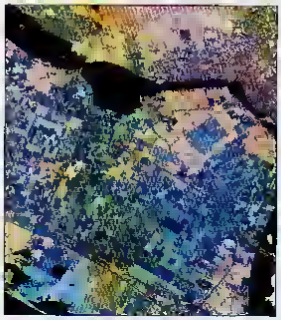
Log on to the Internet and download the latest Hubble Speco Telescope discoveries, or grab some more down-to-earth satellite images.

It hurt plenty at the beginning. Getting on the Internet is tough, unless you're lucky enough to have access already through your college, perhaps, or your job. The rest of us—I'm in that crowd somewhere—have to do the scut work ourselves. I played with America Online's Internet Center, but because it wouldn't yet let me download files, I felt like a second-rate citizen. So I went looking for an Internet service provider, a company that would get me a first-class connection in exchange for some cash. Veteran Internauts may look down on newbies like me for paying for something they get free, but I only wanted on.

It got worse before it got better. I got connected after finding a provider that had a local access number for my modem to dial, but I needed an arsenal of software to get between me and the Internet's alien UNIX commands. (Using UNIX without a software crutch is a lot like wrestling on the farm: most of the time you're in deep muck.) I got *Mosaic*, a World Wide Web (WWW, W3, or just Web) browser for my Windows PC. I got a Gopher client. I got a Usenet newsgroup reader. I even got an E-mail program. I was armed for digital bear.

And I nailed a big one first time out. It was as if I had pulled my thumb from the dike. The rushing spill of space-science information nearly drowned me.

Like the W3 site at *http://www.ksc.nasa.gov/ksc.html*, the Kennedy Space Center's W3 server home page. This spot was chock-full of space stuff, and with *Mosaic* as my W3 browser, I could look at on-screen graphics, click my way through menus, and download files without a hitch. I blew most of a day reading shuttle mission overviews, downloading shuttle patch logos, scoping out future shuttle mis-



sions, and reviewing the history of the space program.

Then *http://hypatia.gsfc.nasa.gov/NASA_homepage.html* hit me. Another W3 locale, it's a general jumping-off place for all of NASA. I could search through what seemed to be every arm of NASA's research and development octopus, and vault from Maryland's Goddard Space Flight Center to California's Jet Propulsion Laboratory in a flash. I killed more time digesting their informational meals and spent hours downloading dessert planetary and space images of all kinds. At the JPL W3 server, for instance, I found some incredible radar images of Earth taken by *Endeavor* only five weeks before.

I started to get impatient for *Mosaic* took time to fill its screens with all those graphics. So I used a more direct approach to image libraries and connected with Gopher. It only showed menus and lists of items to read or download—no pretty pictures—but I could still point and click to navigate my way from a computer in North Carolina to another in Norway. I pounced on the Space Telescope Electronic Information System's Gopher at *gopher.gsfc.nasa.gov* and dug up all kinds of details about the Hubble Space Telescope, including its weekly schedule and a slew of images. And with the Veronica search tool, I was able to find several pictures and even a few movie-like clips snapped by *Clementine*, the cheapo probe that accidentally blew its fuel in May.

Even that wasn't enough. I wanted news and views *now*. So I subscribed to a couple of the Internet's Usenet newsgroups, those bulletin board–style collections of messages that stick to a specific subject. I started reading *sci.space.news*, which posts space-related news items like NASA's daily updates. Then I moved on to *sci.space*, a broader group where professionals and laypeople discussed everything from *Clementine*'s failure to where to find images of the partial eclipse just past. I felt plugged in, part of the in-crowd.

But I couldn't leave. There was too much I hadn't seen, too many people I hadn't talked to or listened to. I was trapped, having skimmed only a paper-thin layer from the Internet's surface.

I was in trouble.

Next month: It gets even harder to walk away from the Internet when I find Star Trek *stuff and people who say they've been abducted by UFOs.*

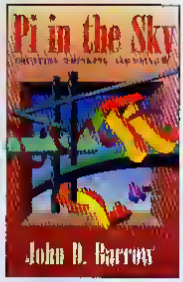
BOOKS

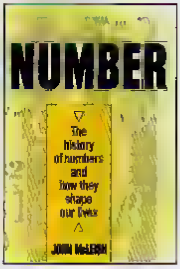
NUMBERS: Calculating the mind of God

By Anna Copeland

Discovery or invention: a look at some recent books suggests that there is a lot of fire in the old debate.

It's an old debate. On one side stands God, perfection, the ideal, the underlying pattern of the universe. On the other stands human ingenuity, the material world, and our own desire to understand by the invention of analytical tools. The arguments are familiar enough in literary or philosophical studies, where ideas, awash in language, spill and tumble with each other through the centuries. But this debate penetrates even the most sober abstract realm of representation—the language of numbers. A look at some recent publications in the history and theory of mathematics suggests that the old debate has plenty of fire left in it.





In *e: The Story of a Number*, Eli Maor's conclusion of his history of a number living in the shadows of the ever-popular π, frames the question nicely. "Think of it. Of the infinity of real numbers, those that are most important to mathematics . . . are located within less than four units of the number line. A remarkable coincidence? A mere detail in the Creator's grand design? I let the reader decide."

To help the reader, I recommend taking a look at a couple of recent titles. John Barrow's *Pi in the Sky: Counting, Thinking and Being* (Oxford University Press, 1992) and John McLeish's *Number: The History of Numbers and How They Shape Our Lives* (Fawcett Columbine, 1991).

Barrow, a British astronomer, engages the reader in an exploration into the nature of mathematics with an impressive array of factual and anecdotal evidence that spans centuries and cultures. A glance at the plethora of epigrams—including quotes from personal ads, Spiro Agnew, Emberto Eco, and Muslim sayings—is evidence for Barrow's premise that mathematics indeed reflects an underlying, cosmic, and connective design.

Under the banner of Platonic Ideality, he crusades for a vision of mathematical harmony "that is itself ultimately religious." Math, like God, is an abstract system that offers the possibility of completeness—in spite of Godel's theorem. Our inability to stand outside the system in order to comprehend the totality of it in no way negates the presence of a timeless paradigm—a paradise of pure form and function. In fact, our inability to stand outside the system is evidence that we did not create it. In the end, Barrows argues that mathematical discoveries affirm that "our ability to create and apprehend mathematical structures in the world is merely a consequence of our own oneness with the world."

John McLeish, an educational psychologist, has a more down-to-earth approach toward the history and meaning of mathematics. Just as Barrow structures his inquiry to reflect the cosmic dimensions of mathematics, McLeish structures his work around his central concern in connecting mathematics to human experience. His investigation is organized chronologically and concentrates on cultures less frequently associated with mathematical discoveries, such as the ancient Sumerian and Babylonian cultures or the Incas of Peru. Sifting through the records of archaeology and anthropology, rather than the more abstract works of philosophy that Barrows favors, McLeish begins with a straightforward premise. "In confronting and solving a few key problems," he tells us, "human beings employ 'tools' to discover and understand reality better."

Clearly for McLeish, mathematics is an invention, something created by the human mind. Though many different cultures may variously come to the same conclusion independent of each other, this does not indicate that there must be a transcendent ideal, but rather that "numbers and number problems are subject to the laws of step-by-step logic." Thus mathematics discoveries are essentially human invention based in the primary urge "to develop member skills as efficient practical tools." McLeish sharply criticizes those who study numbers "in the service of convoluted and inept notions . . . of how the universe had been formed and of the supernatural conditions necessary for its continuance."

Although Barrow and McLeish would be hard-pressed to find a compromise between their respective positions, they would, however, agree that the future of mathematics, like its past, promises to be full of adventure, debate, discovery, and invention. They would also agree that numbers add up to a whole lot more than abstract calculations if we look at them in the right way.

DIGS

DID JEWS DISCOVER THE NEW WORLD?

Intriguing artifacts raise questions about North America's history

By Jeffrey Heck

In Newark, Ohio, in 1860, county surveyor David Wyrick, an amateur archaeologist, unearthed two artifacts that rank among the strangest ever found in the United States: two finely made stone tablets carrying religious inscriptions in Hebrew. Who made the tablets? Are they hoaxes or genuine religious relics? More than 130 years after their discovery, the Newark Holy Stones, as they've come to be known, continue to puzzle scientists and historians.

Wyrick found the stones while excavating some of the huge earthen mounds that dot the American Midwest. Most historians today believe the earthworks to be the products of pre-Columbian native civilizations. Investigators in previous centuries, however, held different notions. A common opinion during Wyrick's time was that the mound-builders were the Ten Lost Tribes of Israel, who vanished after being captured by the Assyrians.

Mysterious artifacts or a clever hoax? Scholars remain divided on the origins of the Keystone (above) and the Decalogue Stone (right) found over 100 years ago in Native American earthworks.

A supporter of this theory, Wyrick came across the Key stone, the first of the Holy Stones, in June of 1860 while digging near Newark's 50 acre Octagon Mound. A wedge-shaped piece of sandstone, the Keystone is inscribed on all four sides with Hebrew that reads: "The Laws of Jehovah. The Word of the Lord, King of the Earth, The Holy of Holies." Wyrick, naturally considered this proof of the Ten Lost Tribes theory.

The discovery made headlines as far away as New York City, but shortly after, the Key stone was denounced as a fake. A Hebrew scholar in Cincinnati proclaimed that the Hebrew was too modern for the stone to be authentic. Determined to redeem himself and his theories, Wyrick and a small excavation party discovered in November 1860 a stone box in which lay the piece of black alabaster now known as the Decalogue Stone. On the front of the stone is a priestly figure, and above it, etched in a style of Hebrew found nowhere else before or since, is the name of Moses. A condensed version of the Ten Commandments is inscribed in this unique Hebrew on every surface of the stone.

"A lot of thought went into the production of this stone," says J. Huston McCulloch, a professor of economics at Ohio State University who became so intrigued by the stones that he learned the Hebrew alphabet to study them better. "The letters are evenly spaced, not crammed to make it all fit. You end the reading of the Commandments at the exact point that you began."

"When I look at the stones, two things strike me," says Robert Alrutz, now retired from Denison University, who, like McCulloch, believes the stones to be genuine. "One, the stones differ in the type of writing. One's more stylized than the other, a sort of longhand. But more importantly, the box in which the Decalogue Stone was found contains holes for no apparent reason, as if you were going to stand something up in them—slots as if the two lids were held together by something. Who, if he's going to fake something, would go to all of this trouble?"

The Holy Stones, however, fail every possible archaeological test, argues Stephen Williams in his 1991 book, *Fantastic Archaeology*. Their inscriptions are the only ones of their kind known, and the forms are not epigraphically correct for the time period. If they are genuine Hebrew texts, he asks, why are they not associated with other artifacts of Palestine at the time of Christ?

Brad Lepper, archaeologist and current curator of the Newark Earthworks, also has problems with theories claiming that the stones were produced by the ancient Hebrew culture. "If ancient Hebrews were present in the Americas, then we should find evidence of their settlements, towns, villages, trading camps, and so on." Lepper says. "No modern archaeological research project in the Americas has yet located an ancient Hebrew settlement."

Who, then, made the Holy Stones? Lepper believes that the Rev. John W. McCarty, who translated for Wyrick the text on the Keystone *overnight*, led the effort to craft the stones.

Today, visitors can view the Holy Stones at the Johnson-Humrickhouse Museum in Coshocton, Ohio. Do more artifacts like them lie hidden within the Newark earthworks? Possibly—the mounds have yet to be systematically excavated. ∞

STARS

HE MADE THE STARS ALSO.
The Vatican's astronomers combine cosmology and theology

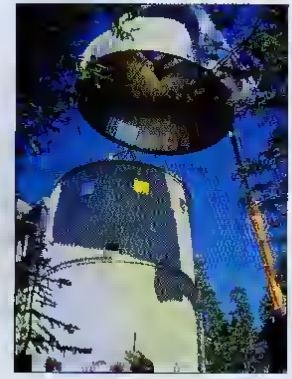
By Victor Dricks

The Vatican's new Advanced Technology Telescope on Mount Graham in Arizona will allow the Church's astronomers to peer even further into the mysteries of the universe.

Atop a 10,436-foot peak on Mount Graham in southeastern Arizona, red squirrels, officially an endangered species, scamper across a clearing the San Carlos Apache tribe considers sacred. Surrounded by dense vegetation, the Vatican's new $3 million telescope stands like a monument to man's timeless fascination with the heavens. Like the Native Americans before them, a handful of Jesuit priests have come to Mount Graham to ponder the mysteries of creation.

The Vatican doesn't acknowledge the Apaches' claim to a unique usage of the mountain. "But we're very aware of the historical and ecological significance of this site," says the Reverend Chris Corbally, one of six Vatican astronomers using the telescope. "Our observatory is built on land occupied by an endangered species, and our mission is a demonstration of the possibility of peaceful coexistence between religion, nature, and science."

For more than four hundred years, astronomers at the Vatican have scanned the heavens from Rome. The work of early Jesuit astronomers provided Pope Gregory XIII with the data he needed to replace the Julian calendar with the Gregorian. But glare from city lights has rendered stargazing increasingly difficult in Rome. Since 1981, the Vatican Observatory has relied on its Tucson research base to keep abreast of cosmological developments that could have theological implications, including theories about the creation, evolution, and fate of the universe—topics that Pope John Paul II has taken a keen interest in. "Our job is to serve as scientific advisers to the pope and help the Vatican maintain an open dialogue with the scientific community," says Martin McCarthy, a Jesuit astronomer for 36 years.



To do this, generous donors have furnished the Vatican's astronomers with a remarkable new instrument. At 1.8 meters in diameter, the main mirror of the Vatican's Advanced Technology Telescope, constructed by the University of Arizona, is of moderate size but boasts the most exact surface of any mirror ever cast for ground-based astronomy. Capable of providing extremely sharp, detailed images of celestial objects, the new telescope also allows the Vatican astronomers to make observations at regular intervals over a long period of time, usually a difficult task because astronomers gain access to premier instruments for only a week or two each year.

The astronomers have already put their new telescope to good use. Corbally, for example, is studying a small group of stars that appear to be old, although they reside in a part of the sky where young stars abound. The Vatican Observatory director, the Reverend George Coyne, uses the telescope to peek into star-forming regions in the constellation of Cassiopeia. The Reverend Richard Boyle is working with colleagues in Lithuania and Rome to study a population of stars in our own Milky Way galaxy, using a technique called photometry, which measures the intensity of light. In addition, the Vatican permits outside astronomers to use the observatory.

"The Vatican astronomers do first-rate work," says Arizona State University astronomer Peter Wehinger. "They are very fortunate because they are supported by a well-funded organization that appreciates the quest for astronomical knowledge."

Vatican astronomers bring to their work formal religious training coupled with advanced degrees in astronomy, and by all accounts, they've earned considerable respect from their peers. In fact, Corbally jokes, the Jesuits spend so much time peering through their telescope and attending scientific conferences that they find it easier to communicate with other astronomers than with their brothers in Rome, who complain that their reports can be hard to understand. They operate, Corbally says, in the same tradition as the German astronomer Johannes Kepler, who had strong mystical leanings, and Sir Isaac Newton, who viewed science as a means of interpreting God's handiwork.

"Always, the great minds in science have had this spiritual dimension," Corbally says. "And this is something the Church encourages." Once a symbol of dogmatic opposition to scientific ideas that clashed with theology, in recent years the Church has sponsored world-class conferences on topics long considered taboo, such as cosmology and human evolution, indicating that the Church has itself evolved over the years.

VIRTUAL REALITIES

NAKED NET.
Confessions of a cyberjunkie: four hours a day, full baud

By Tom Dworetzky

Captain Waldo's E-mail was ever stranger. So I called him right back on the net. "You sound kinda strung out," I said.

"A little problem," he clicked back into the private room off the lobby of the law forum. "Can't talk here. Jump to the Eighteenth Street BBS, encrypt, and I'll get you there."

The BBS was a local unlisted, lowlife bulletin board where snitches—dealers in info junk and hot telecredits—would log on looking for a meet. It wasn't a place to use a real handle. I started up the encryptor Waldo and I had exchanged the key, Crocodile, some time ago. Once I snapped that into the encryptor and he did the same, we could talk pretty freely. That's why it was illegal.

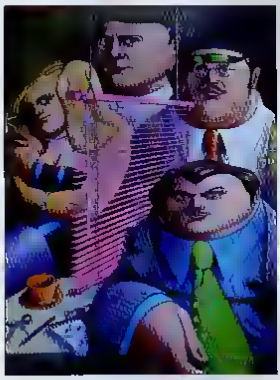
"I gotta see you in person," he typed in.

Waldo wasn't the first cop friend-source I'd heard sounding strange while covering the city net for the *Daily Surge*, the online news source I work for. Sometimes odd things happen to VR cops. They get caught up in their work, then hooked on the life. I'd run into them on the net late at night, and they'd tell me things. But it hit me like a brick when Waldo asked me to meet him at the Inn of Five Happinesses Chinese restaurant. Today, most interacting is on the net. An actual face-to-face is only for big deals—and big trouble.

The restaurant was dark, but when I finally got to the corner booth, I realized Waldo looked so bad I would've barely recognized him anyway.

"You've been using old images on the wire," I said.

"Had to. Look at me. I'm hooked," he blurted out. "The net's getting me. Sometimes a week passes and I don't know



what time it is, riding through the games, checking out the different points of view. I've tried everything to quit, cold—that lasted half a day—timers, alarms, automatic disconnects. I even time-locked my computer, then found a work-around. Hours, days, nothing else matters—not food, real people, nothing. I only live in nettime where thoughts make the world change at light speed—well, the maximum baud rate anyway.

"I'm like one of those lab rats whacking the lever for more drugs until it dies," he laughed dryly. "It's really bad. I'm just a junkie, but I'm gonna break away this time. Tomorrow I'll be clean. I've got to quit. Can't pay for ontime anymore. Got no money for rent or food."

"How'd it get to you?" I asked as supportively as I could.

"Working those virtual crime scenarios. I was in them all the time, checking out this or that, fixing bugs, monitoring to see that the bad guys were too busy on the crime server games to break away."

"Couldn't you just leave it on auto?"

"For awhile, but then the clever scuzz waxed the games and got free. They started transferring from the crime server to the net itself, stealing credits, running scams, pretending to be people they weren't. Anarchists. The only way to keep up with them was to play their games."

"Waldo," I said finally, "You're my friend, but junkies lie. If I shift credits, you'll just burn 'em up on the wires."

He hesitated, deflated, looked away then back. "Screwed up. I did. My own damned fault." Waldo was starting to slobber.

"I'll buy you dinner," I said. I got the waiter, ordered, and gave him the money for Waldo's meal.

"Eat this, try to stay straight for a few days, then call me." I got up. Waldo would have to face the singularity of his own off-line experience without me.

At the door I glanced back. Alone in a corner, Waldo carefully took the hand-held netman out of his shirt pocket, slipped on the glasses, and adjusted the wrist-strap guider.

"Don't, Waldo, stay with me a while," he said to no one in particular. "Sorry. Can't right now."

Leaning back into the corner of the booth and sliding down until his head rested on the banquette, Waldo faded into nettime. No one would bother him, and he would bother no one. It would be just like he wasn't there. ⊠

He tried everything to quit—timers, alarms, automatic disconnects—but he was hooked. He was a nettime junkie.

Got something to say but no time to write? Call **(900) 285-5483.** Your comments will be recorded and may appear in an upcoming issue of *Omni*. The cost for the call is 95 cents per minute. You must be age 18 or older. Touch-tone phones only. Sponsored by Pure Entertainment, 505 South Beverly Drive, Suite 977, Beverly Hills, CA 90212.

ARTS

THE WORLD ACCORDING TO GUMBY.
Don't be a blockhead, lift your feet to the Gumby beat

By Keith Harary

On a precarious catwalk deep inside a starship, our soft green hero battles his evil clone in an iconic-light sword duel to the death. Art Clokey's irrepressible animated clay creation from the Fifties, Gumby, is standing his ground in his biggest adventure yet, *Gumby 1*, and brings the aesthetics of flexibility to a head for a postmodern world.

Gumby innocently avoids the more vulgar ruminations of such animated fare as *Beavis and Butt-head* or *Ren and Stimpy*, and there is something more compelling about his adventures than the routine martial arts violence of *Teenage Mutant Ninja Turtles* or the endless-loop plotlines of Wile E. Coyote's futile campaign to capture the Roadrunner. If Saturday morning is populated by two-dimensional characters condemned to repeat the predictable patterns laid down in ink by their creators, then Gumby and his pals are from a different time and place and made of more creative stuff.

Still flexible after more than 40 years, Gumby and the gang take to the big screen.

"The world according to Gumby," says Clokey, "is an infinite playground." For Clokey Gumby is the unaffected creative potential in all children, and the heroic child in every adult. "The hidden message," he says, "is that appreciating fantasy can provide deeper insights into how we experience reality beyond the perceptions of science."

Nevertheless, there is nothing overtly philosophical about the adventures of Gumby and his friends. For them, the universe is nothing less than a lucid dream composed entirely of thoughts, and magic is to be expected. Long before the T-1000 of *Terminator 2* showed off his million-dollar special effects, Gumby turned shape-shifting into an art of self-expression. Squash Gumby flat and he pops back into shape unharmed. Trap him in a gumball machine, and he turns himself into a dozen green gumballs to be let out and reassembled when Pokey buys gum. The secret of Gumby's art resides in his ingenuity and flexibility and his ability to respond effectively to any situation without losing his aesthetic sensibility.

The origins of Gumby are a synthesis of thoughts and images from Art Clokey's life. As a child, Clokey marveled at a photo of his father sporting an enormous cowlick—he believed it was a solid bump. This bump, also associated with wisdom by Buddhists, later inspired the angular shape of Gumby's head.

Zen Buddhist philosopher Alan Watts once told the Clokeys that people could be characterized as either "Prickly" or "Gooey" in their essential nature, inspiring two of Gumby's closest pals: a rigidly analytical dinosaur named Prickle, and an emotionally free-wheeling flying mermaid named Goo. Professor Kapp, another Gumby regular, is based upon a real-life professor who wore his Phi Beta Kappa key wherever he went. A fluffy white mastodon named Denali, meanwhile, takes his name from the Eskimo word for "Great One," in reference to Mt. McKinley, which the Clokeys visited on a journey through Alaska.

Most of the more than 200 Gumby episodes are written by Art or Gloria Clokey, mainly based on stories told to their children. All are produced and directed by the Clokeys and filmed in painstaking, frame-by-frame trimentional-animation—a process Art Clokey was the first to apply to mass media entertainment—which has since become a standard in the special-effects arena."

Gumby's first feature film, *Gumby 1*, produced on a budget of $2.8 million, is scheduled for national distribution this October by Arrow Releasing. Gumby and his friends now work at computers, and create their own music video—*Take Me Away*—complete with lyrics by Gloria Clokey. *Gumby 2* is also in the works, with plans to have Gumby entering psychotherapy and getting involved in politics. And the first Gumby children's book, *Gumby Goes to the Sun*, is also in development, with an original story and illustrations by Holly Harman, the Clokeys' daughter.

Given the more rigid constraints of the mundane world, perhaps an occasional Gumby high is just the right thing to remind ourselves that reality, according to Gumby, is flexible.

WHEELS

GRIDLOCK TERMINATOR:
Neural nets predict the traffic future

By Steve Nadis

The Atlanta Falcons' game at the Georgia Dome winds down at the same time the Hawks wrap up their match at the Omni, just a few blocks away. More than 4,000 cars pour onto area streets, yet traffic dissipates within 10 minutes. It's nothing short of a miracle. Unfortunately, it's all taking place in a computer simulation at the Georgia Tech Research Institute, where a new program called TERMINUS is showing its stuff.

TERMINUS is the first traffic control system to use neural networks, parallel computers that mimic the basic structure of the human brain. The program was adapted from software originally designed to help missiles or tanks find their targets. "This is the kind of [military-to-civilian] conversion President Clinton is talking about," says project director John Gilmore.

Most city traffic lights keep a rigid schedule, oblivious to congestion; smart systems will use neural networks to predict gridlock and help head it off.

TERMINUS includes two neural networks—one that analyzes traffic data to see where bottlenecks might occur, another that sets stoplights on streets and highway ramps to optimize vehicle flow. "Our system is designed to find a solution that works for the whole city, not just a few intersections," Gilmore says. "It looks at actual traffic conditions and instantly adapts."

TERMINUS is trained to recognize the symptoms that lead to gridlock and then to try to head it off in advance. This is possible owing to a special feature of neural nets: their ability to learn. By exposing the network to enough traffic scenarios, it comes to identify the telltale signs that precede congestion.

Here's how it works. The computer is comprised of electronic units, neurons, which switch on or off depending on the inputs they receive from other neurons. Each input, in turn, represents the number of cars on a given stretch of road. The inputs to an individual neuron are multiplied by a number called a "weight" and added together. If the sum exceeds a threshold value, the neuron is activated and sends a pulse to its neighbors. "When certain combinations of neurons light up, that means there's congestion," Gilmore says. "The weights are adjusted after each new test case, as the network learns which inputs are the most important contributors to clogged roadways."

The ultimate test case for TERMINUS would be the 1996 Atlanta Olympic Games, which Gilmore calls the "biggest traffic challenge of the 1990s." Before the Games begin, the city hopes to have in place the most advanced traffic-management system in the United States. The project will rely on a powerful computer network to integrate control of traffic on highways and surface streets in five counties and the city of Atlanta.

TRW, the aerospace firm overseeing the project, will install an integrated network design that will allow various state, county and local agencies that currently have limited communication capabilities to exchange traffic information so that a coordinated response can be made. To keep from becoming obsolete, the system will have "open architecture," which will enable new software of "intelligent" vehicle and highway technologies to be installed as they become available. TERMINUS is among the software packages under consideration, but it is by no means a sure bet for the job.

While waiting to check out TERMINUS on real life city streets, Gilmore is striving to make the simulations as realistic as possible. He wonders, for instance, how new-car technology or human behavior might affect the equation. Drivers of "smart cars" have to be modeled differently, because their electronic navigation systems will give them traffic information others don't have, Gilmore says. "Your model also has to account for dumb drivers who will go ahead, no matter what you tell them."

Ultimately, he adds, "you'd like to know everyone's destination." All that information could be plugged into a giant, central computer like the one TRW is assembling. Drivers would be advised of the best possible routes, and traffic lights for the entire region would be adjusted to keep things flowing smoothly. At that point, Big Brother will not only be watching where we go, he'll be helping us to get there.

AWARDS

THE IG NOBEL PRIZE:
Some researchers campaign *not* to be nominated

By Doug Stewart

Scientists! Has the Nobel Prize committee unfairly overlooked your body of work? Take heart! You may have already been selected to win an even rarer award: the Ig Nobel Prize, granted to those few whose achievements, in the words of the committee, "cannot or should not be reproduced."

Named after Alfred Nobel's distant cousin Ignatius, the Ig Nobel Prize is co-sponsored by the MIT Museum and an irreverent scientific journal, the *Annals of Improbable Research*.

Two past winners of the Ig Nobel Prize for Peace: H-bomb developer Edward Teller (at right) and former LA police chief Daryl Gates.

The Ig Nobel committee bestows prizes—this year on October 6 at MIT—across the full spectrum of scientific endeavor. The physics prize last year went to a Frenchman who, after painstaking research, concluded that the buildup of calcium in chickens' eggshells could only be the product of—voilà—cold fusion. A retired engineer in South Carolina copped a mathematics prize for his calculation of the odds that Mikhail Gorbachev is really the Antichrist: as 8,606,091,751,882 to 1. Announcing the award, the committee helpfully posted its own calculations of comparable odds: Mother Theresa at infinity to one; Nelson Mandela, 40,000 to 1; software tycoon Bill Gates, 8 to 5. The most recent Ig Nobel Prize in literature went to the 976 co-authors of a paper in the *New England Journal of Medicine*. Actually, 976 was a guess. "Nobody had the patience to count them all," says Marc Abrahams, the event's mastermind and emcee. *Journal* executive editor Marcie Angell gamely accepted on behalf of the authors who, she noted, "could not agree on the wording of an acceptance speech."

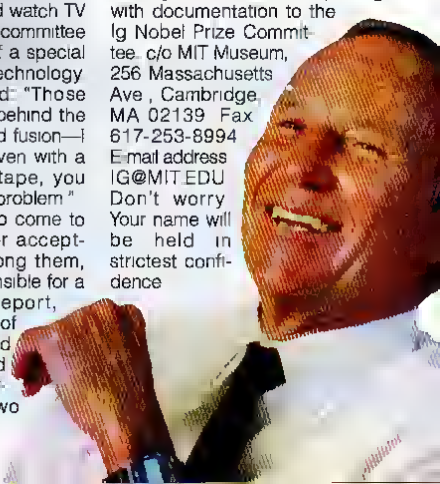
The ceremony takes place each October before a raucous crowd of more than 1,000, including a smattering of would-be honorees. The on-stage VIPs include a panel of oddly dressed dignitaries, among them a number of genuine Nobel laureates, as well as a torch-bearer, a harpist, and an umpire. The Ig Nobel Prizes aren't intended to ridicule, says Abrahams, who edits *Annals* when not orchestrating the ceremonies in top hat and tails. To make sure a prize won't jeopardize a bona fide researcher's career prospects, Abrahams occasionally sounds out prospective winners in advance. "We have people actively campaign *not* to receive an Ig," he says, though he won't name names.

Jay Schiffman, a Michigan electrical engineer, is one Ig Nobel winner who didn't feel the honor was worth a trip to Cambridge. Schiffman is the inventor of AutoVision, a hookup that lets people drive a car and watch TV at the same time. The committee deemed this worthy of a special award for visionary technology. Schiffman responded: "Those MIT kids are still wet behind the ears. This isn't like cold fusion—I can demonstrate it. Even with a pornographic videotape, you can drive in traffic, no problem."

Others can't wait to come to Cambridge to deliver acceptance speeches. Among them, three urologists responsible for a detailed research report, "Acute Management of Zipper-Entrapped Penis," that appeared in the *Journal of Emergency Medicine*. Two years ago, Kraft General Foods dispatched 20 employees in a corporate jet to pick up the chemistry prize for its invention of blue Jell-O; all wore bright blue lab coats. Evincing an admirable sense of humor, Pulitzer Prize–winning psychiatrist John Mack, honored by the Ig Nobel committee for his controversial research into UFO abductions, is rumored to be considering a surprise address to this year's convocation (an honor extended to all past laureates). Perennial favorite Martin Fleischmann of cold-fusion fame is said to be willing to attend, even offering to give a keynote address.

The committee relies on *Annals* readers for nominations, which flow in from around the world. Many people nominate bosses or spouses. More than a few, says Abrahams, nominate themselves. "But their letters tend to have misspellings, so they're immediately disqualified."

Know a scientist whose work is of Ig Nobel caliber? Send name, affiliation, and a brief explanation of why he or she is deserving (25 words or less) along with documentation to the Ig Nobel Prize Committee, c/o MIT Museum, 256 Massachusetts Ave., Cambridge, MA 02139. Fax 617-253-8994. E-mail address IG@MIT.EDU. Don't worry. Your name will be held in strictest confidence.



FUNDS

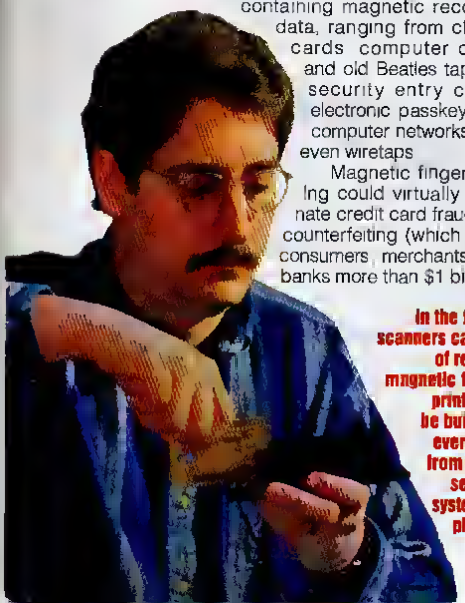
HIGH-TECH DETECTING: The case of magnetic fingerprints

By Linda Marsa

It was a scene right out of a James Bond thriller. After Ronald Indeck lectured a group of Washington, DC security professionals on noise clutter on recorded data, an FBI agent sidled up to him. If the mouthpiece for some gangster alters incriminating wiretaps, the agent asked, is there a way of knowing if the defendant tampered with or replaced the tapes? "These guys have seen too many spy movies," Indeck thought at the time. After all, the electrical engineer's research involved figuring out how to clean up data clutter, not fingering wise guys. But that seemingly irrelevant question percolated in the back of Indeck's mind and ultimately sparked the invention of a technique that may transform the way electronic information is safeguarded and authenticated.

The technique entails using a simple device that identifies the unique fingerprints of objects containing magnetic recorded data, ranging from charge cards, computer disks, and old Beatles tapes to security entry cards, electronic passkeys into computer networks, and even wiretaps.

Magnetic fingerprinting could virtually eliminate credit card fraud and counterfeiting (which costs consumers, merchants, and banks more than $1 billion a year), eradicate industrial espionage, detect bootlegged magnetic recordings, and make it impossible for even the most nimble electronic outlaw to pilfer information and penetrate protected networks.



In the future, scanners capable of reading magnetic fingerprints may be built into everything from home security systems to phones.

Indeck, who's on the engineering faculty at Washington University in St. Louis, was trying to understand what causes media noise on recordings. This magnetic signal clutter uses up space and limits recording density and fidelity.

Miniaturization is the touchstone of the information revolution, so Indeck wanted to find a way to eliminate or circumvent this noise so more data could be squeezed into the same space.

He knew that information is magnetically stored on tapes, credit cards, computer disks—or whatever storage medium you choose to use—by depositing billions of tiny magnetized grains on the medium's surface. These grains are so small, says Indeck, "the thickness of a hair might have one hundred million particles." When he peered through an electron microscope, which has five hundred times the magnification power of ordinary microscopes, Indeck noticed something quite peculiar. During the recording process, these microscopic grains are scattered in a random pattern that creates a signature that is as unique as the skin ridges and whorls of a human fingerprint.

This signature—or fingerprint—is permanently embedded in the structure of the recording medium and because it is so tiny, like the weave of fibers in a piece of paper, it cannot be altered or copied. "It would take thousands of years to fabricate a successful forgery," says Indeck. "Nobody can sit there with tweezers a couple hundred angstroms wide"—one angstrom is one ten-billionth of a yard—"and put particles down one by one in exactly the same way."

Indeck didn't understand the significance of this discovery until that fateful meeting in Washington. Since the physical microstructure can be read by a conventional recording head, this magnetic fingerprint is easy to identify with virtually no possibility of mistaking one for another. Indeck realized he had stumbled onto an ideal magnetic security device.

Using conventional cards and minimally modified card readers, the unique signature can be either encrypted on the magnetic stripe on the back of, say, a credit card or stored in a central data bank that can be accessed as easily as an ATM. So when your card is swept through an electronic scanner, if the wave form that comes up correlates to the original, the transaction is cleared. Says Indeck, "Every patch of magnetic medium can be authenticated."

The potential applications are staggering. In addition to safeguarding credit cards, this technology could be used on debit cards, social security cards, driver's licenses, key cards, mass transit tickets—any card that uses a magnetic identification stripe. And with health care reform on the horizon, this could minimize the illicit use of health cards, which, in Canada, is currently a $100 million-a-year problem in Ontario alone.

And then there are the intrepid computer wizards who purloin PIN numbers by wiretapping ATMs and use the numbers to pull off electronic heists. The fingerprints may even protect unsuspecting neighbors from the prank delivery of pink flamingos and neon canoes.

OMNI ONLINE

WANT TO TALK ABOUT IT?

Omni Online chat sessions range from the serious to the silly

By Holly Siegelman

One evening not too long ago several acquaintances gathered on board their host's spaceship to talk about science fiction and fantasy. The conversation screeched to a halt as everyone's attention focused on a tentacle dangling outside the ship's window. "Quick, go into warp speed!" shouted one guest. Another bravely climbed outside the ship and dispatched the monster with a harpoon. Moments later, the conversation resumed over grilled space-monster tentacle.

Just another typical Saturday night on Omni Magazine Online, *Omni*'s area on America Online. For about a year now, Omni Online has held chat sessions virtually every night of the week in its three chat rooms, covering several different areas of interest: the paranormal, UFOs, science fiction and fantasy, horror and dark fantasy, current science news, and futurism. (Currently, paranormal chats—dubbed Antimatter chats—and science-fiction/fantasy chats make up the bulk of the schedule, taking place four times a week and five times a week, respectively.)

Each chat session has a host to keep the chat from veering too far off the topic and to ensure that guests do not violate America Online's Terms of Service, which define the standards of online behavior. Before they're ready to lead a chat, the hosts must undergo extensive training, a task handled by Jennifer Watson, Omni Online's remote staff coordinator and an extremely knowledgeable long-time user of online services. Like the hosts, Watson, who goes by the screen name OMNI Angel, volunteers her time and effort to Omni Online.

Watson subjects the host candidates to a rigorous, 20-hour training session. Before "graduating," the trainees must demonstrate their knowledge of everything from Terms of Service to the contents of the latest *Omni*, as well as their hosting ability.

The most difficult part of hosting is maintaining an intriguing conversation without being either too quiet or too overbearing, according to Watson. She teaches the hosts to encourage the discussion without becoming the focus of the chat. Still, "the hosts have a wide spectrum of personalities and knowledge," she says, "and this gives each of the chats a distinctive feel to it that the members enjoy."

In addition, hosting style and the feel of the chat vary from topic to topic. In the Antimatter chats and the weekly UFO Chat, the conversation can take on a very serious tone as guests share their unusual experiences, including encounters with UFOs, psychic phenomena, and near-death experiences. Yet a healthy group of skeptics also attends the sessions, proposing alternate explanations for these occurrences. "In Antimatter and UFO chats, we are dealing with subjects that are in many ways like a religion," says Frank Sewald, who hosts UFO Chat as OMNI Tensai. "Every member has a different perspective, which defines how he or she views the topic being discussed."

The science-fiction/fantasy chats, by contrast, have a lighthearted feel, with the hosts often holding their chats in imaginary locations, such as a friendly tavern. "It's not just knowing the topic but being enthusiastic and excited about it that makes a difference in the room," explains Miriam Nathan, who hosts both science-fiction/fantasy and Antimatter chats as OMNIQuest.

Themes in all the Omni Online chat sessions vary from week to week. In science-fiction/fantasy chats, for example, recent sessions have covered authors from Larry Niven to Anne McCaffrey, as well as ideal casts for film versions of favorite books.

For Antimatter and UFO chats, "I try to pick topics in the news currently," Sewald says. Recent sessions have dealt with the face on Mars and coverage of the paranormal by tabloid TV news shows, among other subjects.

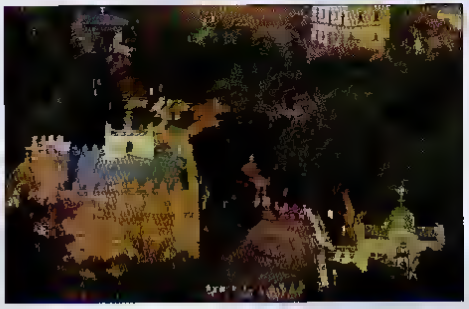
Whatever the topics, Omni Online's chat sessions have proven to be one of the most popular facets of the service, with many "regulars" returning night after night. "The real virtue of the interactive forum," says Marilee J. Layman, who hosts This Week in Science Chat as OMNI Muse, "is being able to talk real time about a subject you're interested in with people all over the country who are also interested in that subject."

Each of Omni Online's 15 active hosts has a distinct style, which influences whether chatters end up discussing *The Hitchhiker's Guide to the Galaxy* or the role of women in science fiction.

CONTINUUM

FINDER OF THE LOST ARK?

The lost ark may rest in an unlikely spot. Plus, our planet's getting dusty, and how to prevent back injuries



Ethiopian holy men provide clues for the recovery of the lost ark.

Could the lost ark of the covenant—the actual ancient chest into which Moses put the tablets of the Ten Commandments—lie today in a small church in Ethiopia? Very possibly, at least in the opinion of British journalist Graham Hancock, who makes the case for the Ethiopian claim in *The Sign and the Seal: A Quest for the Lost Ark of the Covenant*. Hancock, a former East Africa correspondent for the *Economist*, spent the better part of three years researching the possibility, following leads from northern France to Egypt, sub-Saharan Africa, and the Middle East, tracing the story of the ark from its construction by Moses, through its enshrinement by Solomon in his temple in Jerusalem and its unexplained disappearance sometime thereafter, and finally to the church of Saint Mary of Zion in Axum, Ethiopia, where Hancock believes it rests today.

Outlandish as it may seem, the Ethiopian claim to the ark is quite old. As early as the thirteenth century, the Ethiopian chronicle *Kebra Nagast* recorded the legend of the ark's coming to Ethiopia, and European explorers from the sixteenth through the nineteenth centuries reported the prevalence of the tradition among the Ethiopian people. Even today, every church of the Ethiopian Orthodox rite contains a *tabot*, a replica of the original ark, which holds a central place in church ritual. Despite this long history, Hancock is the first to undertake a rigorous analysis of the Ethiopian claim. "There has not been any serious study of the loss of the ark of the covenant," he says, "nor has there been any serious attempt to investigate Ethiopia's claim to possess it. So the field was completely open."

The *Kebra Nagast* tells how Menelik, son of King Solomon and the Queen of Sheba (an Ethiopian, according to the chronicle), brought the ark back with him from Jerusalem, and this tale is widely accepted by the people of Ethiopia. According to Hancock, this legend is not literally true, but it contains a core of truth. The ark was brought to Ethiopia, he says, sometime toward the end of the fifth century B.C. Before that it resided in a Jewish temple on the Egyptian island of Elephantine, near Aswan. During the seventh century B.C., when the apostate king Manasseh ruled in Jerusalem and had replaced the ark in the temple with a pagan idol, faithful Jews took the ark to safety. A colony of Jewish mercenaries had been living on Elephantine for some time, so Hancock argues that island might well have been an attractive haven for the ark. Around 410 B.C., however, the Jewish population on the island came into severe conflict with the Egyptians. The Elephantine temple was destroyed, and the Jews of the island seem to have vanished. Hancock believes they carried the ark south along the Nile and into the highlands of Ethiopia.

Hancock conducted much of his research in Ethiopia itself, while that troubled nation was constantly torn by conflict between a dictatorial government and a number of well-organized rebel groups. Whatever his evidence, though, it might still seem unbelievable that such an ancient and mythical artifact could have existed undiscovered all this time—and that a journalist such as Hancock could succeed in unraveling the mystery where centuries of scholarship had failed. But to Hancock, it was his amateur status that made his insights possible. "One of the reasons nobody has done this before," he believes, "is because it requires synthesizing information from a lot of different subject areas," research not conducive to academic specialization. Professional timidity may also have prevented some scholars from solving the puzzle. "It's really quite dangerous for their careers," says Hancock. "Because of the nature of the object, they tend to stand back from it with a kind of fear that if they publish on this topic, their careers will be ruined."

All in all, Hancock makes a pretty persuasive case—many of his points are supported by independent scholars—but unless the Ethiopians allow researchers to examine the object they guard so closely, his speculations will be very difficult to prove. Hancock admits that his case is "a compilation of strong circumstantial evidence," but he feels it's strong enough at least to challenge other investigators to put his hypotheses to the test.—*ROBERT K. J. KILLHEFFER*

CONTINUUM

Studies of facial muscles will help people with surgically reconstructed lips keep the passion in their kisses

A KISS ISN'T ALWAYS JUST A KISS

The kiss has enchanted romantics and inspired poets for centuries, but its mechanics have eluded scientists. One turn-of-the-century physician defined it as "the anatomical juxtaposition of two orbicularis oris muscles in a state of contraction," which was no more than a nice try. Now, by means of an animated scan of the human head, British plastic-surgery researchers have revealed that a kiss consists of the squashing of a pair of muscles with a J-shaped cross section, unique to humans.

LOCUSTS CONTAIN 31 PERCENT MORE PROTEIN PER POUND THAN A T-BONE STEAK

Plastic surgeons' concerns that the movements of surgically reconstructed lips look unconvincing provided the impetus for the study. Conventional books on anatomy have depicted a two-dimensional, doughnut-shaped ring of muscles, crucial to such movements. But the scanner investigation, backed by the examination of 50 dissected heads, revealed much more complex movements, with 16 pairs of muscles converging down onto the mouth.

"We found how the position of these muscles changes in relation to each other, whether for a smile, a pout, or a kiss," explains plastic surgeon Elaine Sassoon, a member of the research team at the time of the investigation. "This hadn't been appreciated before. After lip-repairing operations, everything looked fine when the patients were asleep, but they might not be able to use their mouths very well when awake.

"The information we now have is potentially useful for operations for cleft lips, skin cancers around the mouth, and facial paralysis," she adds. —Ivor Smullen

"... there is nothing wrong with the world. What's wrong is our way of looking at it."
—Henry Miller

APE OVER MAZES

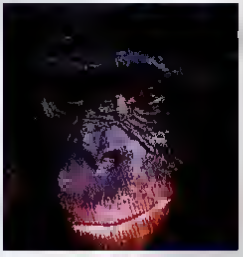
A 12-year-old bonobo chimpanzee named Kanzi has become something of a teacher's pet at the Language Research Center of Georgia State University because of his uncanny ability to track a cartoon monkey through *Pac-Man*-like mazes on a video screen.

Psychologist Susan Savage-Rumbaugh hopes to learn how much of Kanzi's dexterity with a joystick comes from random luck and how much from an ability to plan far enough ahead to maneuver the target through the mazes. She turned Kanzi loose on mazes after he kept pace with a two-year-old girl in experiments that required both to respond to spoken English commands. Soon, Kanzi could combine abstract symbols called lexigrams, to *tell* researchers what he wanted—food, TV, or other activities.

The lexigram experi-

THE RING-TAILED CAT IS NOT ACTUALLY A CAT BUT IS RELATED TO THE RACCOON

ments involving Kanzi were performed under rigorously controlled conditions to ensure that the ape was not being influenced by verbal cues or simply responding to rote conditioning. Kanzi couldn't see who gave him commands, and each sentence was new to him. Kanzi must envi-



Video game champ? No, video game chimp!

sion the routes available to his target in the mazes, and this ability, Savage-Rumbaugh believes, is related to the planning abilities needed to construct tools and lexigrammatic sentences. —George Nobbe

RED ALERT—YOU HAVE MAIL!

Colleen Murphy's invention seems so simple that she was amazed to learn from the U S Patent Office that no one had ever invented a mailbox alert system quite like hers. an individually coded, battery-powered, signaling system that works like a hotel-room message light—except hers tells you when your box contains mail.

"A similar invention ran wires from the box and hooked them into an alarm clock," she says. Her device, however, needs no wires. Instead, it relies on a small radio transmitter one-fourth the size of a TV remote mounted inside the mailbox. Whenever the door opens, it sends a pulse to your house or apartment, where a buzzer sounds for 10 seconds and a light goes on until you hit a reset button. The signal carries about a quarter of a mile, enabling it to reach most country houses or penthouse apartments.

No more trudging out to the mailbox six times a day to see if you've received a letter from your boyfriend in Alaska—a new electronic system will alert you when the mail arrives

The MailAlert, as Murphy dubbed her gizmo, has met all the requisite postal requirements. Murphy, who lives in Easton, Connecticut, came up with the idea when she tired of so many futile trips to the end of her longish driveway.

At the moment, Murphy is still seeking a financial backer to help her launch and manufacture the device. Murphy hopes to be able to market the MailAlert to consumers for about $50.—George Nobbe

MAMMOGRAPHY GOES HIGH-TECH

A digital mammography imaging system that dispenses with x-ray film altogether could revolutionize the diagnosis of breast cancer.

That's the goal of a three-year $3.28-million collaboration involving scientists from Lawrence Livermore National Laboratory, the University of Toronto, and Fischer Imaging in Denver, Colorado. They believe their new imaging system will produce clearer images using less radiation, allowing more accurate and far earlier detection of breast cancer, thus reducing the need for invasive surgery as well.

The light-detector array, which uses sophisticated charged-coupled devices (CCDs) can record 20 million individual pixels each 30 times smaller than the period at the end of this sentence. And because the system records the images directly in digital form, they can be computer-enhanced, permitting diagnosis of potentially cancerous lesions and tumors far smaller than those detectable by current mammography techniques.

"The advantage of a digital system is that it gives radiologists much better means of visual detection of the very subtle differences in contrast in early-stage lesions, particularly in younger women with denser breasts," says Jean Pierre Georges, Fischer Imaging's marketing vice president. Livermore originally developed the technology for weapons applications, but CCDs have also found their way into equipment used for surveillance and space exploration, as well as some advanced camcorders.

Digital mammography has other tangible benefits, Georges claims. One of these is the use of computer-assisted diagnosis to help scientists locate suspicious areas in breast tissue. Another benefit of the technology is the ability doctors will have to transmit images to remote locations via the information superhighway to provide mammography services for rural areas.

A clinical prototype of the diagnostic tool, which requires Food and Drug Administration approval, should be ready by year's end and could be used in routine clinical studies in a half-dozen medical settings by next year, Georges says.

—George Nobbe

CONTINUUM

Chute the breeze: A rocket-launched system saves planes

PARACHUTES FOR PLANES

A company called Ballistic Recovery Systems has developed the ultimate in aircraft safety systems—a huge parachute that can safely lower a whole plane to the ground, passengers and all.

"The planes don't usually come down unscathed, but the people do," says Dan Johnson, marketing manager of the St. Paul, Minnesota, company. Its GARD, or general aviation recovery device, can float a 1,645-pound Cessna 150 to earth even when deployed from altitudes as low as 300 feet. The nose gear generally suffers the only damage.

The 43-pound system operates on the same principle as rocket-propelled ejection seats on military aircraft. In case of trouble, the pilot just pulls a cockpit lever, and in half a second, a roof-mounted rocket, with a 1.7-second burn time, pulls out a pressurized deployment bag containing a 1,600-square-foot nylon canopy and suspension lines. The chute fully inflates in about five seconds.

The company is working on systems for larger, four-seat aircraft weighing up to 3,000 pounds, and GARD, which has won FAA certification, could one day be used on much larger aircraft, according to Johnson, who notes that NASA has long used parachutes to lower 150,000-pound shuttle-rocket motors to earth for reuse.

EVERY MINUTE, A HURRICANE RELEASES AS MUCH ENERGY AS 400 20 MEGATON H-BOMBS.

"Theoretically, if you push out enough cloth, you can recover anything," he says, explaining that one square foot of nylon can lower one pound of plane. Already used in ultralight and kit-built planes, which do not require FAA certification, GARD has saved 77 lives in potentially fatal situations, Johnson claims.

The system costs just under $5,500 for a Cessna 150, with installation costs adding another $300 or so.

—George Nobbe

"Getting old isn't all that great. Now, getting younger would be something."

—Groucho Marx

TAKE MY BLOOD, PLEASE

It's a notion that Count Dracula would approve of: Losing blood regularly may protect against heart attacks.

When the body loses blood, it also loses iron, which the body stores as ferritin, explains research physician Jerome Sullivan of the Veterans Affairs Medical Center in Charleston, South Carolina. People with little or no stored iron are less prone to heart attacks, says Sullivan, who originally published the hypothesis in *The Lancet* in 1981. "My research suggests stored iron is an extremely strong risk factor."

Studies by Finnish cardiologists published in late 1992 lend weight to his theory. Researchers observed middle-aged men for five years and found that those who suffered heart attacks had the most stored iron. Investigators concluded it "is a risk factor for coronary heart disease."

The antidote is simple: regular bleeding. "Not a big blood loss, similar to what women of childbearing age experience through menstruation," Sullivan says.

Early last year, however, evidence emerged that seemed to contradict his hypothesis. A Harvard study detected no link between elevated ferritin levels and heart attacks. "What we found does not seem to support the iron hypothesis," says investigator Meir J. Stampfer. "Yet we cannot rule out a modest effect. In any case, there doesn't seem to be a large increase in heart attacks in people with high ferritin levels."

But that's missing the whole point of the hypothesis, Sullivan contends. "Measuring the magnitude of risk that high ferritin confers won't tell us as much as finding out how people with low or no ferritin do. How do they compare to people with high levels? Are they protected?"

Until research produces conclusive results, Sullivan says, people may want to lower their stored iron levels. "Men and women past the age of menopause may protect themselves simply by donating blood under medical supervision. In fact, they may lower their risk of heart attack to the level of a menstruating woman during her fertile years."

Donating blood three times a year should maintain ideal ferritin levels, Sullivan adds.—Jim O'Brien

Donating blood may protect against heart attacks

CONTINUUM

THAT DARN DUST BUILD-UP

It's been confirmed. Outer-space invaders are landing on earth by the trillions.

But they're not extraterrestrial beings. Rather they're tiny extraterrestrial dust particles dropping to earth at the rate of about 40,000 tons per year. This estimate comes from University of Washington astronomers Stanley Love (now at the University of Hawaii) and Donald Brownlee, who arrived at the figure after studying part of the Long Duration Exposure Facility (LDEF)—a satellite that spent almost six years in orbit from 1984 to 1990.

Love and Brownlee analyzed 13 LDEF panels whose surfaces pointed directly into space. They identified 761 impact craters formed when cosmic dust particles slammed into the panels at velocities of about 27,000 miles per hour. By measuring the sizes of the craters, the researchers determined both the rate of influx and the sizes of falling particles, the bulk of which measure less than a millimeter (one-thousandth of a meter) in diameter and weigh less than one hundred-thousandth of a gram.

"In a typical year, almost all the weight of material falling on earth is in the form of small, submillimeter dust," Love says. By comparison, meteorites amount to only a few tens of tons per year. With this slow but steady drizzle of dust, plus the occasional thud of a meteorite, our planet seems to be gradually putting on more weight.

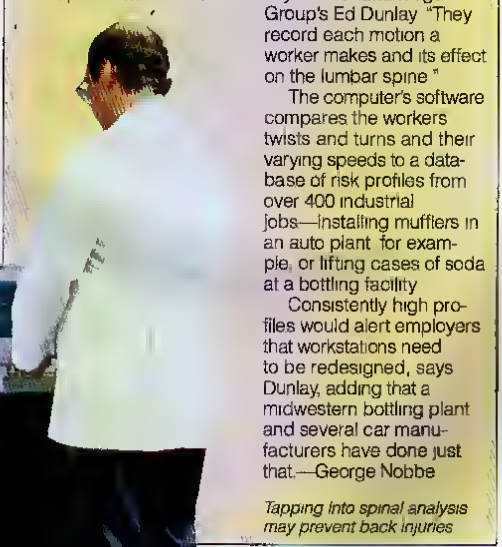
However, it's losing some weight at the same time. The earth loses some matter when upper-atmosphere gases, primarily hydrogen, drift off into space. This gaseous escape adds up to only about 50,000 tons a year, according to rough calculations by University of Washington planetary scientist Conway Leovy. That may be enough to balance the estimated 40,000 tons of incoming dust. Leovy says the gain and loss are currently close, but that may not have been the case during earlier epochs."

—Steve Nadis

A STRAND OF HAIR IS STRONGER THAN AN EQUALLY THICK STRAND OF COPPER.

IT'S A REAL PAIN IN THE BACK

An improperly designed workstation hits a worker right in the lower back, a fact borne by workmen's compensation claims that cost companies untold millions each year. But a lumbar-motion monitor designed at Ohio State University's biodynamics laboratory could reduce the number of such cases by enabling employers to analyze whether employees' working conditions could put them at risk of lower-back problems.



To complete the analysis, a worker must wear the harnesslike device, marketed by the Chattanooga Group, during the working day. The four-pound device is tethered to a laptop computer that records data received from sensors strategically placed along the device's exoskeleton.

"The sensors provide three-dimensional motion analysis of the spine, since it is those muscles that are most frequently involved in back injuries," says the Chattanooga Group's Ed Dunlay. "They record each motion a worker makes and its effect on the lumbar spine."

The computer's software compares the workers twists and turns and their varying speeds to a database of risk profiles from over 400 industrial jobs—installing mufflers in an auto plant, for example, or lifting cases of soda at a bottling facility.

Consistently high profiles would alert employers that workstations need to be redesigned, says Dunlay, adding that a midwestern bottling plant and several car manufacturers have done just that.—George Nobbe

Tapping into spinal analysis may prevent back injuries

SCIENCE & RELIGION

BLURRING THE BOUNDARIES

Outside the window the sky meets the sea, bisecting a panoramic vista of San Francisco Bay. Inside, Robert Russell is talking to his graduate students about a conjunction of another sort: the meeting of theology and cosmology and the common ground shared by science and religion.

Russell, a gently spoken man whose boyish looks suggest considerably fewer than his 47 years, is both a physicist and a trained theologian. To many people, the idea of a physicist-theologian may seem like a contradiction in terms—after all, we live in an age when it is widely believed that the only possible relationship between science and religion is a state of war. Eschewing this divisive view, Russell is at the forefront of a growing body of theologians and scientists for whom religious faith and scientific reason are not incompatible. Spanning the chasm between the two cultures, however, is no simple task. On the one hand there is the need to open up the religious community to the insights and discoveries of science, while at the same time encouraging the scientific community to take seriously the genuine value of religion. To that end, Russell founded in 1981 the Center for Theology and the Natural Sciences (CTNS)

PHOTOGRAPHS BY TOM ZIMBEROFF

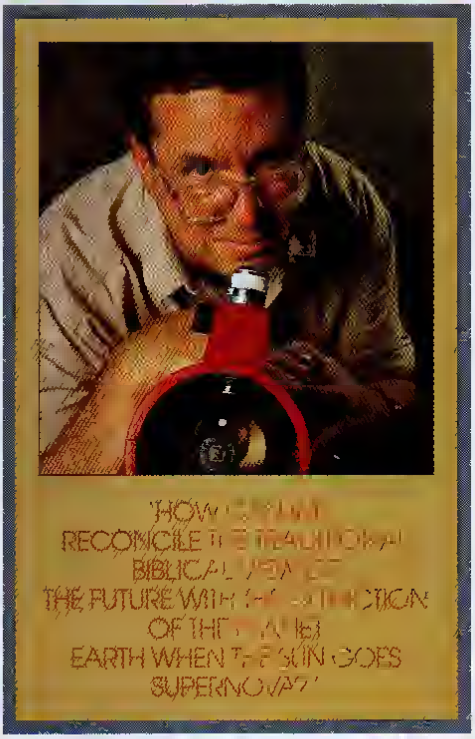
ARTICLE BY MARGARET WERTHEIM

in Berkeley, California, the leading international center in this interdisciplinary field.

Located on the quiet and leafy campus of the Graduate Theological Union (GTU) near the University of California at Berkeley, CTNS is situated appropriately among an interdenominational array of seminaries, including Jesuit, Lutheran, Episcopalian, and American Baptist schools, a Center for Jewish Studies, and an Institute for Buddhist Studies. In addition to his work with CTNS, Russell is the in-residence professor of theology and science at the GTU, where he teaches future clergy and priests and supervises doctoral students.

In many ways, the Center for Theology and the Natural Sciences was a response to Russell's own personal history. As a graduate physics student in the Seventies, his thesis supervisor told him he had the potential to be a first-class scientist if only he could jettison his Christianity. Ignoring such advice, at the same time he was gaining a masters in science from UCLA, Russell also was studying for a masters of divinity at the Pacific School of Religion. In 1978, the very same day he received his Ph.D. in physics from the University of California at Santa Cruz, he was also ordained as a minister in the United Church of Christ. This exotic combination entitles him to membership in the Society of Ordained Scientists, an organization started by British biologist and Anglican priest, Arthur Peacocke. Having completed his doctorate, Russell spent several years teaching physics at Carleton College but soon realized he wanted to bring the two sides of his life together in a more concrete way. That need, he felt, was not unique to himself but was also shared by others who longed for a rapprochement between the spiritual and the scientific.

Russell's intuition, however, ran counter to the more popular notion that science was the enemy of religion, and religion a blinding light in the face of scientific rationality. By way of anecdote, Russell explains what is at stake for the work of CTNS. A debate between an astronomer and a Christian was mediated by Ted Koppel one evening on *Nightline*. The astronomer clearly wanted a serious discussion about the religious implications of his work, but opposing him was Jerry Falwell—and so the debate went nowhere. Infuriated by the kind of religious rhetoric which associates science with Satan, Russell says that he "determined there and then that one of the goals of the CTNS absolutely must be to provide the media with an alternative to Jerry Falwell. The American public must be able to see religious thinkers who are neither opposed to, nor ignorant of, science and its discoveries."



The notion that religion is intrinsically antithetical to science is very deeply entrenched in modern America. In 1992 Russell was invited by then-Senator Al Gore to be one of a group of scientists and theologians to advise him on a Joint Statement about the Environment. A draft version of the statement contained a sentence which declared that science and religion had 'always' been at war with one another. Pointing out that historically this simply wasn't true, Russell managed to have the wording changed from "always" to "often"—though only after heated debate with some of the scientists present, including Carl Sagan. "It was a small but significant victory," Russell says.

Historically, the separation or competition between science and religion is a rather recent phenomenon. In the thirteenth century when Europeans rediscovered the science of the Greeks, theologians such as Thomas Aquinas and Robert Grosseteste enthusiastically co-opted the ancients' knowledge of nature for religious purposes. Grosseteste, Bishop of Lincoln and first chancellor of Oxford University, used the newly revived science of geometric optics as the basis for his metaphysics of light, in which he proposed that light was the medium by which God spreads his divine grace throughout the universe. Under the influence of Aquinas, science and theology in the late Middle Ages were woven into a harmonious synthesis wherein science's first duty was to serve Christianity. Indeed, the belief that science *should* serve faith endured till the eighteenth century. Copernicus and Kepler both saw their cosmology as an anagogical pursuit, and Galileo notwithstanding, Newton himself once wrote that nothing could "rejoice" him more than that his science should be used for the purpose of demonstrating the existence of a deity.

However, since Newton, the relationship between the two cultures has seriously disintegrated. Contrary to what many popular histories would have us believe, the split between science and the church does not date to Galileo but to the Enlightenment. Nancey Murphy, chair of the CTNS board and associate professor of Christian philosophy at the Fuller Theological Seminary in Pasadena, California, explains that in order to keep religion respectable in the scientific age "liberal theologians redescribed theology in such a way that

science became irrelevant to it." From the late eighteenth century, religion was reformulated so that rather than having "cognitive content" it merely "had to do with symbolic expressions of human values and that sort of thing." In other words, religion was disconnected from the domain of empirical knowledge, and conversely science was disconnected from the domain of morality and spirituality. That split has not only proved psychologically dissatisfying to many people, according to Murphy it is philosophically insupportable. Now however she says, "we're at a position where we've got the intellectual tools to argue that theology and science should not be kept in watertight compartments, and in fact that they really can't be."

The incompatibility between science and religion is belied by the impressive array of Christian scientists (in the literal sense of that phrase), who have been attracted to the CTNS since its inception. On the board of directors is Charles Townes, who in 1964 won the Nobel prize for physics for his contributions to the development of the laser and maser. Another board member is the respected particle physicist Carl York, and this year's visiting research fellow is George Ellis—a world expert on space-time. Ellis, professor of applied mathematics at the University of Cape Town and a visiting professor of astronomy at Queen Mary College, London University, was president of the International Society of General Relativity and Gravitation from 1988 to 1992. He is also co-author with Stephen Hawking of the forbiddingly titled text, *The Large Scale Structure of Spacetime*.

Yet where Hawking seems to relish the chance to highlight God's irrelevance—if there is no moment of creation, there is no need for a Creator—Ellis is a Quaker who sees in the foundations of the latest physics manifest signs of a providential deity. Rather than being an oddity, however, Ellis tells me he is following in a noble tradition. He points out that Arthur Eddington, the first champion of general relativity after Einstein, was also a Quaker. It was Eddington who organized the famous 1919 test of general relativity which corroborated Einstein's prediction that light bends as it passes by the sun—thereby demonstrating the inherent curvature of space-time. Similarly Georges Lemaître, the first physicist to take seriously relativity's prediction of an expanding universe, was a Catholic priest. Clearly then, front-line physics and faith are far from incompatible.

One of the Center's most fruitful relationships is its ongoing partnership with the Vatican Observatory in Rome, with whom they hold joint biannual conferences under the rubric of "Divine Action in the World." Each conference brings together scientists, theologians, and philosophers to talk about a particular aspect of science and its implications for theology. Last year's topic, for instance, was chaos and complexity, while the 1991 conference was centered around quantum cosmology and the laws of nature. In addition to the Divine Action conferences, the CTNS is currently undertaking a major project to look at the theological implications of the Human Genome Project—the international effort to decode the set of genes contained in human chromosomes. Although many groups are now studying the ethical and social implications of this seminal endeavor, the CTNS is the only organization which has received National Institutes of Health funding to look at the theological issues. On top of these academic activities, the Center offers public lectures by its visiting fellows and also provides training and guidance for Christian ministers of all denominations in the form of workshops and seminars about science and its interaction with Christian faith. CTNS which also publishes both a quarterly scholarly journal, *The CTNS Bulletin*, and a monthly newsletter, has over 500 members from all over the world.

From the point of view of faith, Russell says there is an urgent need "to empower the church to take seriously its own message" in the age of science. In other words, theology must be kept relevant to the times. That point was also stressed by William Stoeger, a Jesuit priest, astrophysicist at the Vatican Observatory, and member of the Board at CTNS, who has been one of the chief organizers of the Divine Action conferences. "No religion which is enculturated into the Western world can afford to ignore science," he tells me. "It plays such a major role in our culture today." Stoeger points out that much of the language we now use, and even the very terms in which we think, are deeply influenced by science, so if religious people ignore this fact and "continue to rely on categories of thought from the Renaissance or the Middle Ages, then religion comes to be seen as an anachronism." Stoeger believes that if concepts such as God as Creator are going to continue to make sense in the late twentieth century, then it needs to be articulated within the larger cultural context, a significant part of which is modern science and cosmology. We need to be able to see specifically just "how God could be

working within the natural processes revealed by contemporary science.

For this reason one of the CTNS's primary strategies has been to take on highly theoretical topics like quantum cosmology and show how they can be relevant to traditional Christian concerns. For instance Russell has shown that Hawking's "no boundary" cosmology has indirect but important relevance to the doctrine of creation *ex nihilo*. Being of service to the faithful was hardly Hawking's intention—despite his much-quoted closing line about knowing 'the mind of God,' the famed British physicist's stance is deeply antireligious. Yet Russell believes Hawking's cosmology resolves a long-standing theological dilemma. How could a temporal universe have been created by a timeless deity? By offering a model of the universe which has no definitive beginning and where time gradually emerges as a distinct phenomenon, Russell says Hawking has provided a scientific analog for the Augustinian view that God created the universe *with* time rather than *in* time. Since in Hawking's model time arises out of something ontologically prior, it in itself becomes part of creation, just as Augustine suggested in the fifth century.

Similarly George Ellis has used physicists' knowledge of the fundamental constants of nature as evidence for a providential designer. According to contemporary physics, many of the basic constants of nature—such as the fine-structure constant and the proton-neutron mass difference—appear to have highly providential values; if these values were even slightly different, it seems unlikely that a universe compatible with the biological evolution of life would have formed at all. Ellis employs this as the basis for an updated version of the old "argument from design"—the idea that the apparent purposefulness in the construction of nature points to the hand of a purposeful "Designer," emphasizing the importance of ethical issue which, he claims, "cannot be meaningfully included in a world view based solely on physics." Though their work differs significantly, both Russell and Ellis argue that physics has "both criticized and restructured" traditional theological positions. Far from making religion seem redundant, Russell says contemporary science can provide "scope and insight for faith."

Quite apart from the psychological need many people feel to integrate the two cultures, there are increasingly urgent practical reasons why the religious community cannot continue to ignore science. Here the relevant field is not so much physics as the biological sciences—particularly genetics, which is now generating a whole slew of technologies with profound theological consequences. Hence the CTNS's interest in the Human Genome Project and their three-year grant from the National Institutes of Health. Russell stresses that with respect to genetics they are "not an advocacy group there to take a particular position," rather the purpose of their work is "to help those in a position of moral voice to make more informed decisions." He sees the CTNS's role as being one of helping the religious community to understand what the scientific issues are and how to talk coherently about them in a theological context. Just how to do that is by no means obvious, for as Ted Peters points out, the Bible is notoriously silent on the subject of DNA.

Peters is a tall, loose-limbed man with a relaxed manner and easy grace that is more evocative of the range than the pulpit, but his voice was undeniably made for public speaking. Deep, resonant, and animated, I at once imagine he must deliver a thrilling sermon. As a professor of systematic theology at the Pacific Lutheran Theo-

CONTINUED ON PAGE 104

FICTION BY NANCY KRESS

MARGIN OF ERROR

PAULA CAME BACK IN A BLAZE OF GLORY, HER INSTITUTE UNIFORM WITH ITS PSEUDOMILITARY MEDALS CRISP AND BRIGHT, HER SPINE STRAIGHT AS AN ENGINEERED DIAMOND-FIBER ROD I HEARD HER HEELS CLICKING ON THE SIDEWALK AND I LOOKED UP FROM THE BOTTOM PORCH STEP, A CHILD ON MY LAP PAULA'S FACE WAS GENEMOD NOW, THE BLEMISHES GONE, THE SKIN FINE PORED, THE CHEEKBONES CHISELED UNDER GREEN EYES. BUT I WOULD HAVE KNOWN THAT FACE ANYWHERE NO MATTER WHAT SHE DID TO IT

ILLUSTRATION BY ANITA KUNZ

"Karen?" Her voice held disbelief.

"Paula," I said.

"*Karen?*" This time I didn't answer. The child, my oldest, twisted in my arms to eye the visitor.

It was the kind of neighborhood where women sat all morning on porches or stoops, watching children play on the sidewalk. Steps sagged; paint peeled; small front lawns were scraped bare by feet and tricycles and plastic wading pools. Women lived a few doors down from their mothers, both of them growing heavier every year. There were few men. The ones there were didn't seem to stay long.

I said, 'How did you find me?"

"It wasn't hard," Paula said, and I knew she didn't understand my smile. Of course it wasn't hard. I had never intended it should be. This was undoubtedly the first time in nearly five years that Paula had looked.

She lowered her perfect body onto the porch steps. My little girl, Lollie, gazed at her from my lap. Then Lollie opened her cupped hands and smiled. "See my frog, lady?"

"Very nice," Paula said. She was trying hard to hide her contempt, but I could see it. For the sad imprisoned frog, for Lollie's dirty face, for the worn yard, for the way I looked.

"Karen," Paula said. "I'm here because there's a problem. With the project. More specifically with the initial formulas, we think. With a portion of the nanoassembler code from five years ago, when you were . . . still with us."

"A problem," I repeated. Inside the house, a baby wailed. 'Just a minute."

I set Lollie down and went inside. Lori cried in her crib. Her diaper reeked. I put a pacifier in her mouth and cradled her in my left arm. With the right arm I scooped Timmy from his crib. When he didn't wake, I jostled him a little. I carried both babies back to the porch, deposited Timmy in the portacrib, and sat down next to Paula.

'Lollie, go get me a diaper, honey. And wipes. You can carry your frog inside to get them."

Lollie went, she's a sweet-natured kid. Paula stared incredulously at the twins. I unwrapped Lori's diaper and Paula grimaced and slid farther away.

"Karen . . . are you listening to me? This is *important!*"

"I'm listening."

"The nanocomputer instructions are

I COLLECTED SIXTEEN FROGS FOR YOU. YOU BOILED EIGHT OF THEM. THE OTHER EIGHT WERE CONTROLS TO REDUCE THE MARGIN OF ERROR

off, somehow. The major results check out, obviously . . ." *Obviously.* The media had spent five years exclaiming over the major results. ' . . . but there are some odd foldings in the proteins of the twelfth-generation nano-assemblers." Twelfth generation. The nanocomputer attached to each assembler replicates itself every six months. That was one of the project's checks and balances on the margin of error. It had been five and a half years. Twelfth generation was about right.

'Also," Paula continued, and I heard the strain in her voice, "there are some unforeseen macrolevel developments. We're not sure yet that they're tied to the nanocomputer protein folds. What we're trying to do now is cover all the variables."

You must be working on fairly remote variables if you're reduced to asking me."

"Well, yes, we are, Karen, do you have to do that *now?*"

"Yes." I scraped the shit off Lori with one edge of the soiled diaper. Lollie danced out of the house with a clean one. She sat beside me, whispering to her frog. Paula said, "What I need . . . what the project needs . . ."

I said, "Do you remember the summer we collected frogs? We were maybe eight and ten. You'd become fascinated reading about that experiment where they threw a frog in boiling water but it jumped out, and then they put a frog in cool water and gradually increased the temperature to boiling until the stupid frog just sat there and died. Remember?"

"Karen . . ."

"I collected sixteen frogs for you, and when I found out what you were going to do with them, I cried and tried to let them go. But you boiled eight of them anyway. The other eight were controls. I'll give you that—proper scientific method. To reduce the margin of error, you said."

"Karen . . . we were just kids . . ."

I put the clean diaper on Lori. "Not all kids behave like that. Lollie doesn't. But you wouldn't know that, would you? Nobody in your set has children. You should have had a baby, Paula." She barely hid her shudder. But then, most of the people we knew felt the same way. She said, "What the project needs is for you to come back and work on the same small area you did originally. Look-

ing for something—anything—you might have missed in the protein-coded instructions to successive generations of nanoassemblers."

"No," I said.

"It's not really a matter of choice. The macrolevel problems—I'll be frank, Karen. It looks like a new form of cancer. Unregulated replication of some very weird cells."

"So take the cellular nanomachinery out." I crumpled the stinking diaper and set it out of the baby's reach. Closer to Paula.

"You know we can't do that! The project's irreversible!"

"Many things are irreversible." I said. Lori started to fuss. I picked her up, opened my blouse, and gave her the breast. She sucked greedily. Paula glanced away. She has had nanomachinery in her perfect body, making it perfect, for five years now. Her breasts will never look swollen, blue-veined, sagging.

"Karen, listen—"

"No—you listen." I said quietly. "Eight years ago you convinced Zwerger I was only a minor member of the research team, included only because I was your sister. I've always wondered, by the way, how you did that—were you sleeping with him, too? Seven years ago you got me shunted off into the minor area of the project's effect on female gametes—which nobody cared about because it was already clear there was no way around sterility as a side effect. Nobody thought it was too high a price for a perfect, self-repairing body, did they? Except me." Paula didn't answer. Lollie carried her frog to the wading pool and set it carefully in the water. I said, "I didn't mind working on female gametes, even if it was a backwater, even if you got star billing. I was used to it, after all. As kids, you were always the cowboy; I got to be the horse. You were the astronaut; I was the alien you conquered. Remember? One Christmas you used up all the chemicals in your first chemistry set and then stole mine."

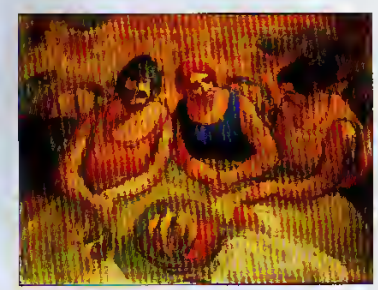
"I don't think trivial childhood incidents matter in—"

"Of course you don't. And I never minded. But I did mind when five years ago you made copies of all my notes and presented them as yours, while I was so sick during my pregnancy with Lollie. You claimed *my* work. Stole it. Just like the chemistry set. And then you eased me off the project."

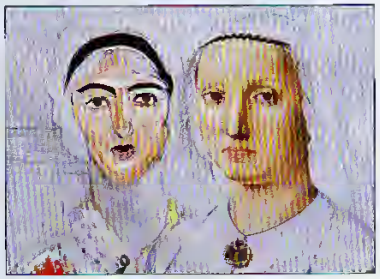
"What you did was so minor—"

"If it was so minor, why are you here asking for my help now? And why would you imagine for half a second I'd give it to you?" She stared at me, cal-

Larry Rivers, *Art and the Artist- Picasso, Wives, Lovers and Offspring*, 1992. Courtesy, Marlborough Gallery



Bob Guccione, *Three Women at a Round Table*, 1962. Courtesy, Ambassador Galleries, Inc.

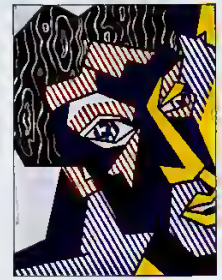


Josef Levi, *Still Life with Matisse and Raphael II*, 1991. Courtesy, O K. Harris Gallery

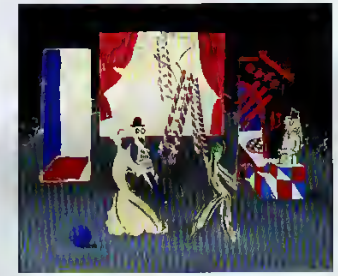
"ART AFTER ART"

SEPTEMBER 27, 1994 – JANUARY 1, 1995

Tom Wesselman, *Still Life with Two Oranges and Lichtenstein*, 1992. Courtesy, Sidney Janis Gallery



Roy Lichtenstein, *Head*, 1980. Private Collection – Red Grooms, *Bed Time for Rauschenberg*, 1991. Courtesy, Marlborough Gallery



David Hockney, *Parade with Unfinished Backdrop*, 1980. Courtesy, The Virginia Museum of Fine Arts

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culating. I stared back coolly. Paula wasn't used to me cool. I'd always been the excitable one. Excitable, flighty, unstable—that's what she told Zweigler. A security risk.

Timmy fussed in his portacrib. I stood up, still nursing Lori, and scooped him up with my free arm. Back on the steps, I juggled Timmy to lie across Lori on my lap, pulled back my blouse, and gave him the other breast. This time Paula didn't permit herself a grimace.

She said, 'Karen, what I did was wrong. I know that now. But for the sake of the project, not for me, you have to . . . '

'You *are* the project. You have been from the first moment you grabbed the headlines away from Zweigler and the others who gave their life to that work. 'Lovely Young Scientist Injects Self With Perfect-Cell Drug!' 'No Sacrifice Too Great To Circumvent FDA Shortsightedness. Heroic Researcher Declares.' "

Paula said flatly, "You're jealous. You're obscure and I'm famous. You're a mess and I'm beautiful. You're . . . '

"A milk cow? While you're a brilliant researcher? Then solve your own research problems."

'This was your area . . . '

"Oh, Paula, they were *all* my areas. I did more of the basic research than you did, and you know it. But you knew how to position yourself with Zweigler, to present key findings at key moments, to cultivate the right connections. And, of course, I was still under the delusion we were partners. I just didn't realize it was a barracuda partnering a goldfish.'

From the wading pool, Lollie watched us with big eyes. "Mommy . . . "

"It's okay, honey. Mommy's not mad at you. Look, better catch your frog—he's hopping away."

She shrieked happily and dove for the frog. Paula said softly, "I had no idea you were so angry after all this time. You've changed, Karen.'

"But I'm not angry. Not any more. And you never knew what I was like before. You never bothered to know."

'I knew you never wanted a scientific life. Not the way I did. You always wanted kids. Wanted . . . *this*.' She waved her arm around the shabby yard. David left eighteen months ago. He sends money. It's never enough.'

"I wanted a scientific establishment that would let me have both. And I wanted credit for my work. I wanted what was mine. How did you do it, Paula—end up with what was yours and what was mine, too?"

"Because you were distracted by baby shit and frogs!" Paula yelled, and I saw how scared she really was. Paula didn't make admissions like that. A tactical error. I watched her stab desperately for a way to retain the advantage. A way to seize the offensive. I seized it first. "You should have left David alone. You already had Zweigler; you should have left me. David. Our marriage was never the same after that."

She said, "I'm dying, Karen."

I turned my head from the nursing babies to look at her.

"It's true. My cellular machinery is running wild. The nanoassemblers are creating weird structures, destructive enzymes. For five years they replicated perfectly, and now . . . For five years it all performed *exactly* as it was programmed to . . . '

I said, 'It still does.'

Paula sat very still. Lori had fallen asleep. I juggled her into the portacrib and nestled Timmy more comfortably on my lap. Lollie chased her frog around the wading pool. I squinted to see if Lollie's lips were blue.

Paula choked out, "You programmed the assembler machinery in the ovaries to . . . "

"Nobody much cares about women's ovaries. Only fourteen percent of college-educated women want to muck up their lives with kids. Recent survey result. Less than one percent margin of error.'

. . . you actually sabotaged . . . hundreds of women have been injected by now, maybe *thousands* . . . '

"Oh, there's a reverser enzyme," I said. "Completely effective if you take it before the twelfth-generation replication. You're the only person that's been injected that long. I just discovered the reverser a few months ago, tinkering with my old notes for something to do in what your friends probably call my idle domestic prison. That's provable, incidentally. All my notes are computer-dated."

Paula whispered, "Scientists don't *do* this . . . "

'Too bad you wouldn't let me be one." 'Karen . . . "

"Don't you want to know what the reverser is, Paula? It's engineered from human chorionic gonadotropin. The pregnancy hormone. Too bad you never wanted a baby."

She went on staring at me. Lollie shrieked and splashed with her frog. Her lips *were* turning blue. I stood up, laid Timmy next to Lori in the portacrib, and buttoned my blouse.

'You made an experimental error twenty-five years ago,' I said to Paula. "Too small a sample population. Sometimes a frog jumps out."

I went to lift my daughter from the wading pool. ◻◻

"It showed up on your x rays, so we removed it."

"So much for the good life."

On March 21, 1994, New York's eleven o'clock Eyewitness News ended with this pious tableau: A solemn, modestly dressed Egyptian immigrant family and their friends crowd an apartment in Bensonhurst, Brooklyn, all of them staring up reverently at a glistening copper icon of the Virgin Mary. With detached amusement, the TV anchor announces that this icon, which the Boutros family bought in a church gift shop in Cairo, is weeping oil tears. The camera cuts to an exotic, bearded figure in a long, black cassock, identified as a bishop of the Coptic Orthodox Church, a sect of Christianity hailing from Egypt. He assures the greater New York audience that a miracle has indeed occurred.

Back in the newsroom, the TV anchor smiles in a *who knows* kind of way. The story was clearly meant to be a footnote on the richness of life in the Big City. What the news team didn't count on, however, was the tremendous longing for religious experience—for first-hand contact with the miraculous and divine—that is driving people across the country to sites like Bensonhurst.

By April, the icon was said to have stopped weeping—dripping a type of vegetable oil—but the faithful continued to come. Most, even the merely curious, crept up the aisle to the icon as if it were alive. The pilgrims would reverently make the sign of the cross and, enraptured, stand before the icon—a doll-like head of hammered copper, bowed down under an elaborate Byzantine-style halo.

"We have the holy oil from the icon mixed with olive oil for the pilgrims," says Father Mina Yanni, priest at the church and a compact bundle of energy with a gray beard and merry eyes. Indeed, visitors dipped balls of cotton into a jar of this "blessed" mixture, a thick, greenish liquid carefully placed below the icon. Olive oil was added to the icon's own secretions, Father Yanni explains, when the real vegetable oil ceased its flow. "Of course it's a miracle," he adds. "This is a message from St. Mary. She wants people to have good relations with the Lord."

But Brooklyn's oily miracle is just the latest eruption in a volcanic surge of miraculous events and apparitions involving the Virgin Mary. In a backyard in Marlboro Township, New Jersey, an apparition of Mary continued to galvanize thousands who persisted in visiting the property even after the local bishop issued a statement declaring that the vision was unproven at best. In the end, the bishop's office had to persuade the visionary to post a "No Trespassing" sign to keep people away. And an even rarer phenomenon was reported at St. Elizabeth Ann Seton Catholic Church in suburban Lake Ridge, Virginia. There, a young assistant priest, Fr. James Bruse, developed stigmata—the bleeding wounds of Christ—on his wrists, feet, and chest. In his presence, said the faithful, statues of the Virgin Mary wept, people were healed, and rosaries changed from steel to gold.

Jesus and the angels have gotten into the act as well. In recent years, for example, thousands of people have reported seeing Jesus on a soybean-oil storage tank in Fostoria, Ohio, on a formica tabletop in a junkyard in Barrett Station, Texas, and even in a billboard picture of a forkful of noodles in Atlanta, inspiring the moniker, "spaghetti savior." Angels, meanwhile, have engendered a whole new industry, with sales of angel books, calendars, and video tapes flying off the shelves. Reports of angels are so numerous that a Waquoit, Massachusetts, group called Twenty-eight Angels has even set up a 24-hour hotline, 1-800-28-ANGEL. None of this should be surprising. According to a recently published Gallup poll, believers abound. Eight out of ten Americans surveyed said that miracles are granted by God.

What on earth, or off it, is going on? In the end, the visions, especially those involving Mary, are most striking for the passion and longing seen in the visionaries themselves. Visit the site of a Mary-vision, and you'll find people yearning for the all-caring compassionate mother, and for the divine.

This mother and child reunion, states Sandra Zimdars-Swartz, a professor of religion at the University of Kansas and the author of *Encountering Mary* (Avon), is nothing less than "a quest for the pristine order the world has abandoned. To the visionaries who actually behold the apparition, Mary is seen as a tender and concerned mother who calls her children away from the brink of disaster," says Zimdars-Swartz. "To the larger group following the visionaries from camp to camp, Mary is the leader of a mighty army of spiritual warriors ready to battle the forces of evil. That army, mostly Catholic and conservative, is seeking reassurance, moral certainty, and personal mystical experience sometimes hard to achieve through the organized religions we have today."

Paul Kurtz, chairman of the Committee for the Scientific Investigation of Claims of the Paranormal (CSICOP) and author of *Transcendental Temptation: A Critique of Religion and the Paranormal* (Prometheus), sees the trend as a dangerous throwback to the dark days of medievalism, when the quest for scientific knowledge seemed to falter and then fail. "If any promise is held out for an afterlife, people will flock to it," Kurtz says. "People who visit these apparitions and weeping statues will be suspicious of their political leaders, every motive and utterance. But when it comes to these apparitions,

MARY VISIONS: A VIRGIN IN THE SKY WITH DIAMONDS

Article by Tracy Cochran • Apparitions of the Mother touch the faithful and haunt the landscape of Suburbia, U.S.A. • Illustration by Marvin Mattelson

and these visionaries, they exercise no skepticism at all."

Yet Zimdars-Swartz feels that the hugely popular trend of encountering Mary, like other religious movements of the past, should not necessarily be viewed in logical or literal terms. "The phenomenon," she says, "shows skeptics and believers alike the limits of their own beliefs."

These Marian visions have long challenged our beliefs. In the twelfth century, according to Zimdars-Swartz, devotion to the mother of Jesus blossomed in Western Christianity. Until the nineteenth century, she adds, most such reports were private, one-time affairs. Then in 1858, in the foothills of the Pyrenees in the French town of Lourdes, a young peasant girl named Bernadette Soubirous saw a series of apparitions of a young woman who was quickly judged to be the Virgin Mary. To this day, pilgrims pour into Lourdes to partake of healing waters that the blessed Virgin Mary reportedly left as a sign.

Of all the public apparitions of Mary, however, the sighting in Fatima, Portugal, may be the most mysterious and the most revered. Indeed, Pope John Paul II has actually credited the "Lady of Fatima" with saving his life when he was shot.

The most dramatic of several mass sightings at Fatima occurred on October 13, 1917, when some 70,000 people stood in the pouring rain to watch three shepherd children who were allegedly seeing Mary. A good portion of those onlookers reported this strange sight: Just before noon, the rain stopped and the sun appeared as a flat, silver disc that suddenly plunged toward the earth and stopped just short of crashing, then rose back into the sky, resuming its normal brilliance. Just as amazing—and widely reported—the clothes of the onlookers, drenched by the heavy downpours, were instantly dry. After 13 years of investigation, the Catholic Church announced that far too many classes and categories of people had seen the phenomenon for it to be a collective illusion.

Finally, the most recent and perhaps the most controversial apparition (it still hasn't been approved by the Church) today makes its appearance in Medjugorje, a tiny mountaintop village in Bosnia. In this remote, war-weary spot, six visionaries have been seeing and receiving messages from the Virgin Mary for a decade.

To this day, pilgrims brave rocket fire to stream into Medjugorje. And one man's pilgrimage in the late 1980s opened the door for Mary in a most unlikely place—the suburban community of Marlboro Township, New Jersey, land of split-levels, swimming pools, and barbecue grills.

Mary first appeared to Joseph Januszkiewicz in his Marlboro backyard. Just after dark one night, Januszkiewicz, a diminutive 56-year-old Polish immigrant, walked out of his tan ranch house and knelt before his blue-eyed statue of the Madonna, bought to commemorate his trip. Suddenly there she was, hovering above the blue spruce trees just off the back patio. Astonished by the apparition, he yelled to his wife, who ran out and sprinkled holy water all around just in case it was some demonic trick. The Virgin Mary is said to have smiled at this piety and perhaps, in acknowledgment, began visiting Januszkiewicz like clockwork.

IN THE LATE 1980s, THE VIRGIN MARY BEGAN APPEARING TO SUBURBANITES IN THE COMMUNITY OF MARLBORO, NEW JERSEY, LAND OF SPLIT-LEVELS, SWIMMING POOLS, AND BARBECUE GRILLS.

Finally, in 1992, the apparition that sometimes calls herself "the yellow rose of peace" instructed the devout gray-haired immigrant who worked as a draftsman to tell others what he was seeing. She promised, he reported, to appear to him after dark on the first Sunday of every month. Januszkiewicz told and people came in droves.

Though Januszkiewicz refused to talk to the press, his suburban altar was open to all. On the balmy June evening I visited, five to six thousand people had gathered. The Marlboro Township police had closed the roads to parking to discourage people from coming, so thousands of us walked two miles down lanes that bordered horse farms, lugging coolers and children and aluminum chairs.

It was still light when my husband and I got to Januszkiewicz's yard. The scene had all the palpable excitement and anticipation of an outdoor concert before the show.

People sat waiting in rows on blankets or folding chairs. They stood in line for the portable toilets that a devout Italian man had donated. And they stood in line to pray at the Madonna statue inside a trellis arch decorated with pine boughs and flowers. People hugged and greeted each other in low, excited voices and fingered rosaries and prayed with eyes squeezed shut.

The pilgrims looked like the range of people you see in a mall: young parents in stone-washed jeans pushing strollers, a few muscular guys in undershirts showing off tattoos, groups of retired ladies in crayon-colored sweatsuits and tight halos of permed white hair. They all watched the sky as it turned a deep celestial blue.

"You heard what happened last night, didn't you?" asked an elderly lady in a white cableknit cardigan. "The moon split in two."

"We didn't hear about that," said a woman in a windbreaker snapped up to her chin. "But last time we saw a big colored ring spinning around the sun."

It wasn't until darkness fell and Januszkiewicz came out and knelt at his shrine however, that a frenzied sort of hunger swept the crowd. "Look, look, over there! Do you see it? It's showering gold." A scream and another scream and hundreds of flashbulbs started popping off, aimed at the TV antennae over the house, aimed at the blue spruce trees, aimed at the stars themselves. "Look at that planet. See it move?" Far in the back, an old woman was praying in Italian with her arms stretched out like a cross, her palms open to the sky. When it was over, thousands filed out of Januszkiewicz's yard and into dark country roads, guided by the swinging flashlights of Marlboro Township police.

It was the light of faith that led some of these pilgrims from Marlboro to another great American suburb, Lake Ridge, Virginia. There, in St. Elizabeth Ann Seton Church, statues of the Virgin are said to weep in the presence of a young, mop-topped, mustachioed priest, Father James Bruse.

Could they be weeping for the conflict hidden in the soul of Lake Ridge, where people drive luxury cars with mobile phones and decorate the front doors of their neat colonial and ranch houses with wreaths of berries and twigs? Indeed, the houses and lanes in this growing, affluent community were planned and laid out with a military precision that seems at odds with the rolling Virginia landscape. Many of the

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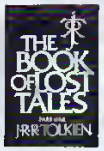
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people who live here, those who pour into St. Elizabeth Ann Seton Church to see Father Bruse, are highly trained professionals who work for the military, the FBI, and the CIA, and they practice a simple, conservative brand of Catholicism that doesn't go in for the mystical. It's fair to say that as a parish they personify Jung's definition of psychic dissonance: Technologically sophisticated yet spiritually fervent and innocent, they fill their homes with state-of-the-art computers and folk art. Highly mobile, they idealize a rooted country life that has nothing to do with the high-pressure, transitory lives they really lead.

Yet it was in this buttoned-down community in December 1991 that Father Bruse began bleeding from the wrists and feet. For months, few outside the inner circle of priests and Bruse's family knew what was happening. Bishop John Keating instructed Bruse's superior, Father Daniel Hamilton to quietly have Bruse checked out by both a psychiatrist and an internist, after careful examination, both judged Bruse to be normal. In March 1992 however, the gold-painted, fiberglass Madonna in the sanctuary of St. Elizabeth Ann Seton Church reportedly began to weep in front of some 500 people, and the cat was out of the bag.

From that day to the present, thousands of people have descended on the church hoping to see a statue weep or receive a blessing from Father Bruse. As time passed, miracles were reported to abound. Visitors were said to be healed and witnesses saw the spinning suns associated with Mary since Fatima. And in the presence of Father Bruse, countless statues of the Virgin Mary (including a tiny statue inside a woman's purse) said to be streaming with tears) could be counted on to weep.

The balmy spring Sunday I attended mass, the spare, modern church was overflowing with people hoping to see the four-foot-high Madonna beside the altar weep or catch a glimpse of the bandaged wrists of Father Bruse.

"We don't live in Jesus's time, when great Roman armies surrounded us and we had to watch what we said," intoned the bearish Father Daniel Hamilton, who challenged his congregation to go out into the world and "bear witness to the truth of the Lord."

When the service was over, however, a small crowd flowed out not to spread the word, but rather right down to the altar, to the Madonna with her artificial-flower crown. "She helps me feel God's presence," said one well-dressed woman from New Jersey who had been to Marlboro as well.

Standing nearby, church member Nancy Hall, a spritely, middle-aged homemaker with a pixish salt-and-pepper bob, added that the Lake Ridge miracles have in fact drawn people back to church. "and I think that's pretty neat. I tend to be a skeptic, so I'm not quite decided about what I think," says Hall. "But if indeed this is all really happening, and it seems to be, it's because God had to do something to get people to listen. It seems that we've gotten to a point where something dramatic needed to happen to get our attention."

The Church itself has withheld judgment and, true to form, has delivered a noncommittal response. Indeed, the Chancery of the Diocese of Arlington reacted to the Lake Ridge phenomenon with this cautious statement: "In this particular case, there is no determined message attached to the reported physical phenomena, and thus there is no ecclesial declaration to be made at this time. As always in similar cases, the Church recommends great caution in forming judgments and advises against any speculation on the causes or possible significance of the

reported events."

This guarded view was not shared by the priest at the tiny Coptic Church of St. George in Bensonhurst, Brooklyn. "If it's not a miracle," queries Father Mina K. Yanni, a jolly figure in black robes and a round black hat, "how could the oil have gotten there? It's a message from St. Mary who wants all people to be one."

Father Yanni gestured toward a middle aged woman with a wide smile and hair the color of sunstruck copper who was standing in front of the icon at the upstairs altar. "Talk to her," he said. "She's Roman Catholic but she comes here every day."

"I can't help it. I love her. She's so beautiful," the woman agrees, her accent vintage Brooklynese. Painted on metal in gentle hues of blue and white and tan, the icon depicts the Madonna looming up between two church towers. Her elaborate gold halo and her pose, downcast in private supplication, look Byzantine but her face is distinctly Western, as pale and delicate as a porcelain doll.

Looks can be deceiving. Father Yanni leads the way to his office. He holds out a notebook that contains handwritten accounts of personal miracles attributed to the weeping Madonna, including the amazing story of a man who experienced relief from the pain of his sciatica after he rubbed his back with a cotton ball dipped in the oily tears.

I point out the results of a recent test, conducted with the blessings of the Church itself, before the icon's dripping oil had disappeared. The "holy" liquid had been a form of vegetable oil; it had been determined. Could it be, I ask Father Yanni, that he has been the victim of fraud?

He doesn't agree. "I am not a victim of fraud," he tells me. "I saw it with my own eyes. This was a miracle."

Yet investigator Joe Nickell, author of *Looking for a Miracle* (Prometheus) and a member of CSICOP, has amassed plenty of proof that the fraud theory may hold water (not oil), after all. "Approximately one hundred percent of claims of weeping icons are pious hoaxes," says Nickell. "There are dozens of ways it can be done but the simplest and most common way is just to apply fluid. A person pretends to brush the tears away and they just apply more. Oil may be used instead of water because it lasts longer."

Moreover, Nickell says he has tried repeatedly to meet and examine the phenomenon surrounding Father Bruse. "I sent missive after missive and got no reply," says Nickell. "There was no independent outside investigation of any of that phenomenon. They refused to let a team from CSICOP isolate the weeping statue so we could see if it wept if it was under guard. The whole thing, including the stigmata, is extremely suspicious."

"If someone alleges a miracle, the burden of proof is on them," says Nickell. "But they won't let outside investigators examine the statues and the stigmata. Why?"

While Nickell concedes that some apparition-related phenomena may be illusion rather than flat-out hoax (aim a Polaroid One-Step into the sun and you may get a photo of a "golden door"), he is horrified at the gullible group-think that dominates apparition sites like Marlboro. "I call it the Medjugorje virus," he laughs. "It's a social contagion, and it can be frightening."

What's frightening about this phenomenon, according to Nickell and other critics, is the sometimes savage way believers fend off skeptical inquiry. "Credulity does not diminish with education," says Nickell. "People like the parishioners at St. Elizabeth Ann Seton Church may be educated to be very exacting and skeptical in their work,

CONTINUED ON PAGE 110

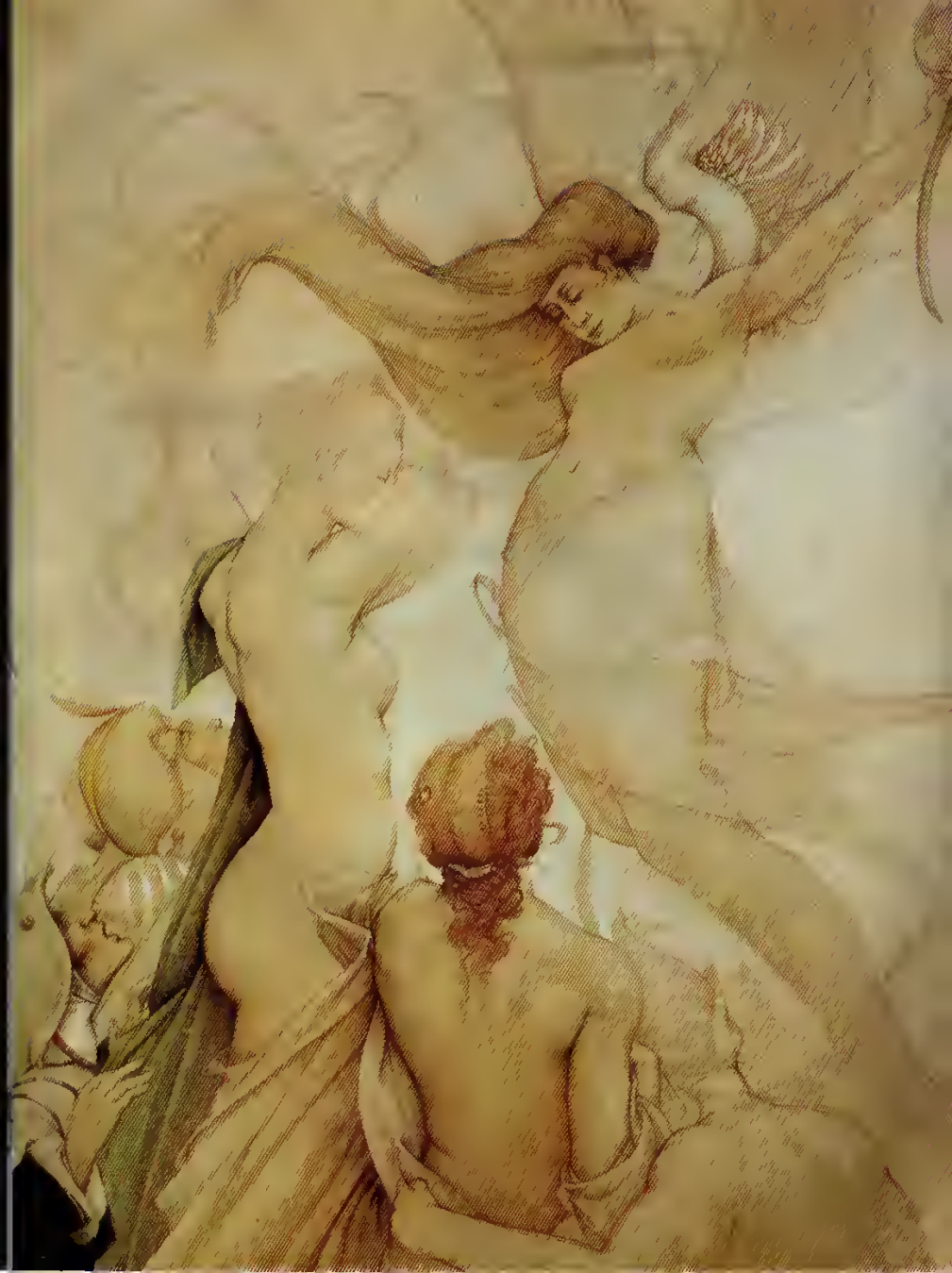
Visions of Cosmic Wills

ARTICLE BY ANTHONY MANSUETO

GREAT WHEELS OF LIGHT APPEAR OVER THE HIGH DESERT AT NIGHT, SPINNING AGAINST THE STARRY SKY. MESSENGERS FROM THE HEAVENS COME TO ORDINARY PEOPLE, BEARING NEW WISDOM AND WARNINGS OF COSMIC CATASTROPHE. MEN AND WOMEN ARE TAKEN FROM THEIR BEDS AT NIGHT AND RETURN WITH STORIES OF INTERCOURSE WITH STRANGE BEINGS, THEIR BODIES SCARRED WITH CIRCLES AND TRIANGLES.

LIKE SO MANY ASPECTS OF OUR CULTURE, THE UFO IS THE

PAINTING BY MICHAEL PARKES



cause of controversy, a controversy which extends to the very existence of the object in question. Like God, the UFO divides our society into believers and nonbelievers, cautious hopefuls and equally cautious agnostics. But whether we believe in the UFO or not, its presence in our culture clearly has a great deal to tell us about ourselves—about where we are as a species and where we are going. This kind of cultural observation does not rule out the possibility that UFOs really *do* exist, nor does it require such existence. It merely asks what we can learn from the phenomenon regarding the current state of human civilization.

While the biological and metaphysical explanations vary and contradict one another, there seems to be at least one constant about our nature as human beings—and that is that we are not alone. We have a drive toward wholeness and completion which is apparent in everything we do. For instance, we join together in intimate union—and produce a new whole, the child. We live in groups because we can accomplish more together than a single individual ever could. Even our intellectual history is one of endless struggle to make what we know of the world fit into a larger pattern of significance.

But our desire for unity and completion is, perhaps, nowhere more clearly expressed than in our need for religious experience or understanding. Derived from the Latin *religio* which means to reconnect, religion is the process by which we strive to link ourselves to the divine or cosmic order of things. Similarly, *salvare*, to save, originally meant to make whole. Salvation, the ultimate aim of religion, is the moment of reconnection—with God, with Christ, with the Universe, with the Sublime. It is a moment of mystery and reverence, terror and fulfillment. It is the experience of connection, touching, and becoming a part of something alien—something outside of us and very different.

Whatever the physical reality of UFOs and aliens may be, it is easy to see the religious dimensions of the phenomena. Carl Jung, as early as the 1950s, noted the resemblance of flying saucers to the *mandala*, an ancient symbol of wholeness and salvation. More recently, tales of abduction and alien encounters suggest that finding the Other—a being from beyond—connects these experiences to our underlying religious need for contact which transcends the daily intercourse of human existence.

This said, it is necessary to point out how the symbolism surrounding the UFO phenomenon differs from other types of religious symbolism. At least in its original form, the UFO was a machine, a technological artifact. While the technology which it embodies may be far in advance of our own, it is, nonetheless, something which beings like ourselves might eventually be able to create. The UFO literature is full of stories of attempts by the government to "reverse engineer" UFO propulsion systems. If only we could get our hands on a piece of their equipment, then, well, with a little bit of Yankee ingenuity.... Similarly the aliens—even as their "otherness" has intensified over the years and they have manifested such paranormal powers as the ability to walk through walls, to levitate, and so on—have remained finite, humanoid beings who have real limitations and who, in some inscrutable way, seem to need us as much as we need them.

> LIKE GOD, THE UFO DIVIDES OUR SOCIETY INTO BELIEVERS AND NON-BELIEVERS, CAUTIOUS HOPEFULS AND EQUALLY CAUTIOUS AGNOSTICS. BUT WHETHER OR NOT WE BELIEVE, THE UFO HAS A LOT TO TELL US ABOUT OURSELVES.

All this suggests that we humans are beginning to see ourselves as real participants in the process of creating unity and organization. Where older myths regarded humanity as the plaything of the gods or as the essentially powerless subject of a transcendent divine sovereign, the myth which has emerged around the UFO treats humanity as a real partner in the creation of a cosmic society. The scientific and technological advances of the postwar period brought with them grave dangers to be sure. But they also made it possible, for the first time for humanity to end its earthbound existence, to visit the heavens and return to tell of the journey, and to imagine someday, on our own efforts and through our own merits, to become citizens of the great heavenly city.

There have, however, been a number of distinct—and even mutually opposed—reactions to the mythic character of the UFO phenomenon. It is possible to distinguish among these responses along three distinct axes. There are those who believe that the UFO comes to us, whether from another star system or another dimension, and those who regard it as merely a product of the collective psyche. There are those who interpret the phenomenon in language which is drawn from the scientific tradition, even as they stretch the limits of official science, and those who express open hostility to the scientific establishment. Finally, there are those who see in the UFO a sign of hope and a catalyst for growth, and those who sense something evil and profoundly destructive.

The dominant response to the UFO in the larger culture has been one of tentative, hopeful anticipation. Broad layers of the population either believe, or want desperately to believe, that the UFO represents the real presence of a superior technological force, probably from another star system, interaction with which is a catalyst for human social (and spiritual) progress. This trend is connected to a fascination with the "new science," with unified field theories and complex systems theory, "holistic" biology and ecology—disciplines which are pushing us beyond the old worldview which regarded the universe as a system of externally related atoms, toward an understanding of the "relationality," holism, and self-organizing character of the universe. There is, at the same time, a desire to respect scientific norms and to avoid explanations which lack scientific credibility.

Probably the clearest and most powerful expression of this vision came not from the UFO movement at all, but rather from Steven Spielberg, whose two films, *Close Encounters of the Third Kind* and *E.T.*, both articulated and gave form to powerful popular images of the phenomenon. In *Close Encounters*, a series of UFO sightings disrupts the stifling routine of small-town life and the loveless marriage of a utility company worker, drawing him and a newfound companion into the Wyoming wilderness for an encounter with benevolent aliens whose mother ship descends from the skies like a technological New Jerusalem. He is chosen over the best and the brightest to accompany the aliens on a journey into the heavens. The score by John Williams is a clear expression of the cultural myth at work in these films. Built around a series of complex and

often highly abstract variations on the theme from *Pinocchio*, it relies on a common cosmic connection echoed in the refrain: *When you wish upon a star/Makes no difference who you are*

Moving out from this mythic center, there are two other trends which see the UFO as a sign, or at least an expression of hope but differ in their attitude toward official science—and thus in their willingness to regard the phenomenon as objectively real. On the one side are the secular humanistic skeptics closely aligned with official science, such as the cosmological principles championed by Carl Sagan. These skeptics share the UFOlogists' quest for an inhabited universe but regard UFOlogy as little better than a modern superstition. Contact, when it comes, will be in binary code and will be received by a large radio telescope operated by a consortium of universities. The message will be interpreted by an interdisciplinary team of scientists and conveyed to the secretary general of the United Nations.

The hard science approach here, however, is not devoid of a sense of awe at the vastness of the undertaking of establishing contact. Keith Thompson, while conducting research for his book, *Angels and Aliens*, visited with a scientist working on the SETI project in the California desert. "He was a Harvard Ph.D.–type, cream of the crop," Thompson recalls, "and he sat there and told me with an almost religious kind of astonishment, how many channels they had open, and how much of the heavens they were searching."

At the other end of the spectrum are those who reject more or less completely, or are willing to ignore, the limits of official science. Rather, these believers borrow scientific concepts to explain social psychological phenomena. David Stupple, in an article published shortly after his untimely death in 1983, documented the continuities between the Theosophical movement and the UFO contactee and channeling cults which developed in the 1950s and 1960s. Not infrequently UFO groups in the theosophical tradition will see themselves as drawing out the implications of new developments in relativity and quantum mechanics. Much of what Charles Spiegel, currently director of the Unarius Educational Foundation, says—phrases such as "The universe is an inner-dimensional energy system" or "The mind is a giant computer running off of this system" or "We misunderstand the universe if we think only of the finite factors of the infinite creative intelligence"—sounds surprisingly like popular accounts which treat the philosophical implications of the new physics.

The bibliographies of Unarius tracts are filled with references to Descartes, Spinoza and Einstein. Indeed, Dr. Spiegel, who received his degree in psychic therapeutic science from the Unarius Academy of Science, wrote his doctoral dissertation on the political structure of the Interplanetary Confederation which had been transmitted to him by the chief scientist Alta of the planet Vixall. He informed me that his immediate predecessor, Unarius cofounder Ruth E. Norman, had recently made her "transition" to a nonatomic state where she functions as the archangel Uriel. One Unarius film depicts the trials of an aborigine contactee who suffers persecution at the hands of his tribe's high priest whose name, interestingly enough, just happens to be "Seti."

More recently, theosophical contactee and channeling cults have given way to New Age interpretations of the phenomenon which are less audaciously offensive to a scientifically trained audience, but perhaps even more profoundly at odds with the whole scientific enterprise than their theosophical predecessors. Ethnobotanist and psilocybin guru Terence McKenna writes in his book *The Archaic Revival* that "the UFO is an idea intended to confound science because science has begun to threaten the existence of the planet. At this point a shock is necessary for the culture, a shock equivalent to the shock of the resurrection on Roman imperialism." This shock is being applied by the "overmind . . . a level of hierarchic control being exerted on the human species as a whole. . . . Our destiny is not ours to decide. It is in the hands of a weirdly democratic, ameboid, hyperintelligent superorganism that is called Everybody." Where the technophiles seek wholeness in a continuation of the scientific project of our own civilization, the New Age movement rejects the whole enterprise of rational knowledge and technocratic control in favor of a religion centered on the maxim "let go and let the UFO."

This theme of letting go has also found resonance among evangelically oriented abductees. Betty Andreasson Luca, the subject of several books by UFO investigator Raymond Fowler, told me that her abduction experiences had taught her "how real God is and how he is in control of all things." Even those abductees who regard their experience as a catalyst for growth report

'Forgive me, dear, for I know not what I do.'

initial fear and resistance which they overcome only through what amounts to an act of religious submission to their captors Whitley Strieber repeatedly challenges the right of his captors to abduct him and perform medical operations without his consent. Their reply "We have the right" It is only after he has accepted this that he is able to come to terms with the experience and learn from it

Not everyone, however, sees in the UFO a sign of hope Once again the original, and perhaps definitive perception in this regard comes from popular culture rather than the UFO movement itself Ever since the publication of H G Wells' *War of the Worlds* and Orson Welles' famous broadcast of the same, we have had a fascination with alien invasion We are desperately afraid that we are being taken over by a force more powerful than ourselves, the motives and *modus operandi* of which are too complex to be apparent to merely human reason

The notion that the phenomenon is somehow malevolent cuts across the lines between technophile and technophobe and even across the lines between believer and nonbeliever Visions of a technological New Jerusalem find their counterpart in an emerging countermyth of secret invasion by gray aliens from Zeta Reticuli who are breeding hybrids in underground bases hidden beneath the mountains of New Mexico, Colorado and Arizona This countermyth has found resonance both among abductees who, far from feeling healed and challenged by their experiences, are more inclined to say that they have been raped and violated, and among political conspiracy theorists convinced there is a history of secret contact between the aliens and a secret government centered in a high-level group known as the MJ-12

One partisan of the Reticulian invasion hypothesis is physicist John E Brandenburg, who claims to have worked on directed energy weapons and other space defense projects He says that the "Star Wars" program in which he served was actually intended as a defense against the Reticulian invasion His prescription "God, GUTS and Guns" GUTS refers to the Grand Unified Theory of Science which he hopes will 'allow us to control gravity with electromagnetism." He has also proposed a "Rainbow Declaration" which declares that "on all matters concerning extraterrestrial peoples," the nations of the earth shall be as one"

The theme of political conspiracy, however, is not confined to those who believe we are actually undergoing a secret alien invasion William Cooper, author of *Behold the Pale Horse*, is a former naval intelligence officer who like several former military intelligence and defense research personnel, claims to have been shown documents relating to government contact with extraterrestrials Originally he, too, took the documents at face value Gradually, however he came to the conclusion that the phenomenon is one great big hoax "exclusively of human origin designed to bring into being One World government" The religious overtones of the phenomenon are all part of the plot One World government requires a New Age One World religion Mr Cooper, whose answering machine informs callers that they have reached something called the 'Intelligence Service" traces this conspiracy back to John Dewey who, according to Cooper noted that the prospect of extraterrestrial invasion might serve to unify earth's warring nations The conspiracy, so the argument goes, is promoted by a secret government which includes the Trilateral Commission, the Council on Foreign Relations and other organizations

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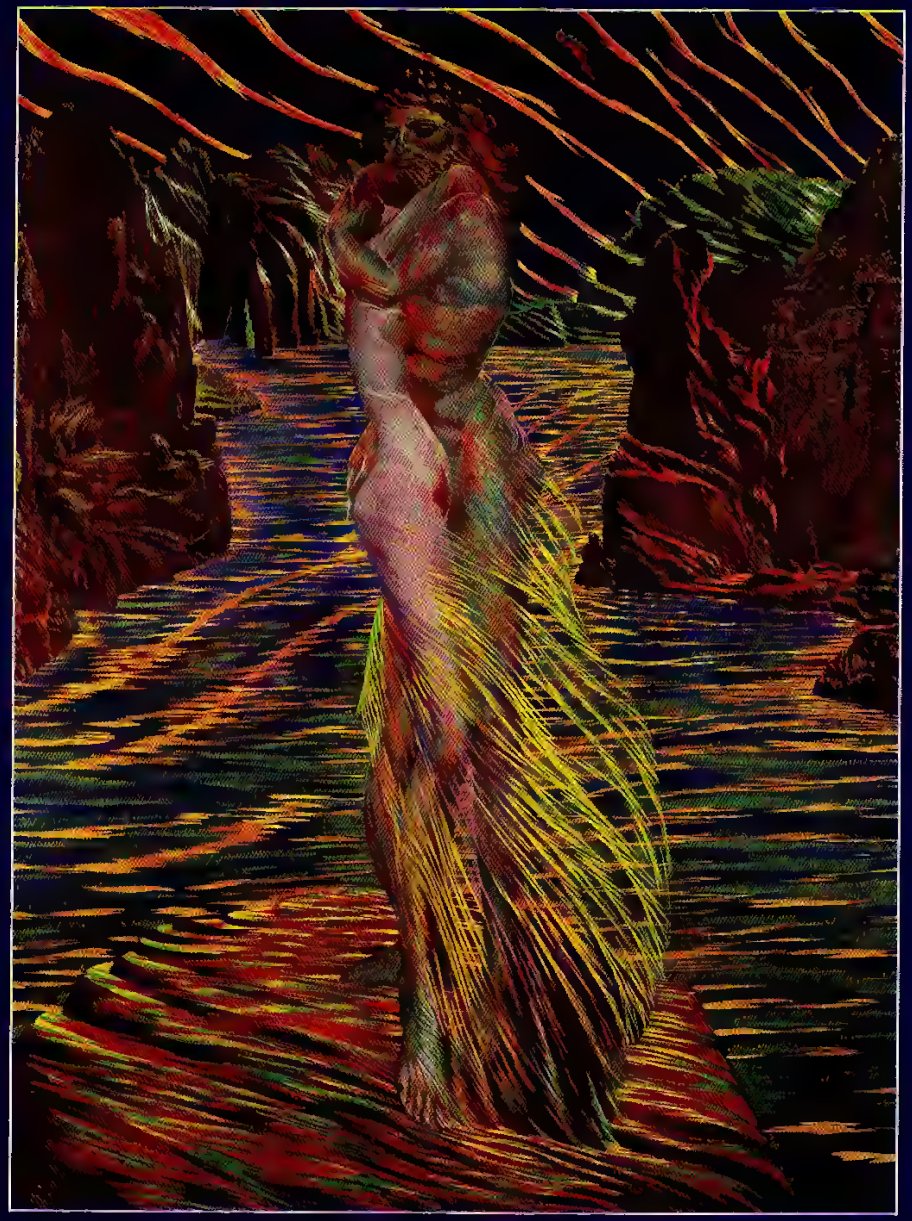


FICTION BY
EDWARD BRYANT

THE FIRE THAT SCOURS

TIME TRAVELERS TO A CRETACEOUS HELL FIND THEY MUST MAKE PEACE WITH THEIR PERSONAL GODS

PAINTING BY
ERNST FUCHS

They say no man ever died of an idea. Maybe not. But plenty have died *for* ideas, and I know from the family genealogy that my own ancestors helped contribute to that sorry state of affairs.

That wasn't what I or any of us were thinking as we plummeted through the floor of the Cenozoic Era and crashed into Reptile City. Down through the time of great dying into the Cretaceous, down past the king of the tyrant lizards and straight toward the Jurassic. Whoever had rigged the chronometers on the central panel of the time machine hadn't paid much attention to George Pal's version of Wells. No Victorian elegance here. It was like watching a bunch of VCR clocks being reset after a power crunch. About as exciting, too. The digital readouts flickered backward. Only the bone-cracking vibration told us physically that the machine was out of control.

Rick Haugen turned toward the rest of us from the right-hand seat. "Captain! I canna hold her together!" He was such a wise-ass, even then. The Scottish brogue wasn't even that good.

At the time, I wasn't paying much attention to Rick's humor or bravado or however the hell it should be defined. I just stared, fixed on the unspooling millennia, and wondered if it would hurt. Dying, that is.

This was like riding an elevator car uncontrolled and unbraked down an infinite elevator shaft. I knew something had to be at the bottom, but I wasn't quite sure what. All I knew was that we weren't going to stop at our floor, that floor being the time of the Permian extinction and the great Pangaean supercontinent.

But I didn't count on Mary.

Mary Clarke was the senior scientist in charge, and she got to occupy the seat beside Rick. Mary was a great theoretical physicist, but I had to help her reset her digital watch after the spring time-change.

"Dear Jesus, oh God, please save us!" That was Lacey—she turned livid when I called her "the girl from the office"—in the seat beside me. She gripped my left wrist in her right hand, and I thought her fingers were beginning to fracture the small bones beneath my wristwatch.

On Lacey's other side, Chuck Furtado abruptly screamed. It keened high and thin, much like, I imagined, a scurrying mammal caught under an allosaur's claw.

Mary ("No finer theoretician"—*New Scientist*) played her fingers across the console like a virtuoso concert pianist. Nothing in our plunge changed. Out of frustration, she brought her hand up over her head, fingers convulsing, and slammed the fist down on the control panel. The crash echoed in our enclosed, bathroom-like space. There were no sparks—that's only for science-fiction thrillers.

But something happened.

The rate of vibration changed. It was like deep dental drilling when the guy with the tools gets all the decay out and slacks off on the machine controls. I smelled something burning, even as, somewhere deep in my gut, I felt our collective reality change.

The chronometers didn't seem to be reading out quite as fast. I saw a few green lights on the board, but couldn't tell what they signified.

And then we crashed. It was the dentist's drill again. Combined with shoving the head of your hard-drive straight into a disk rotating at high speed. *Reeeeeoowww*—the scream ripping at my insides began to scour the inner lining of my skull.

Rick kept yelling into the communicator mike plugged into his ear. "Mayday! Do you copy, HarriKon Base? Mayday! Mayday! We're crashing somewhere in the Cretaceous!"

And then I blacked out.

But not before I heard Lacey, or maybe it was me, say, "I love you."

I woke to the smell of sulfur, the sight of cascading sparks rolling down torn sheet metal, and the sound of frying circuit boards. If it wasn't hell, it was close enough. I was still strapped into my seat, but the seat itself was canted forward so that I was looking down into something I couldn't at first identify. It looked like a bowl of red meat. Then I realized it was the top of Rick Haugen's head with a large circle of bone removed. I wanted to vomit, but also knew I didn't want to throw up into my colleague's skull cavity. I swallowed it all.

Sound returned and I realized I hadn't registered its absence. "Robert? Robert,

can you hear me?' Someone punched me in the arm and I jerked away irritably. "Robert. I think you're in shock. Otherwise are you okay?"

I twisted my head to the side. My neck hurt. Lacey had gotten out of her seat and was standing balanced on a red-striped case of medical supplies. She hit me again.

"I'm okay." I said. 'Just stunned. Don't slug me again."

She grabbed me in a clumsy embrace and started to cry, her dark curly hair crushing against my face. The familiar smell of shampoo and almond conditioner took away some of the sulfur stench.

'Hey, hold on," I said. "Help me down from the seat. I can't do anything trapped up here."

'Jesus," she said. "Jesus, give me strength." When I tripped the safety buckles, I slumped down against her and she helped break my fall toward the wreckage scattered below.

"Thanks." I said, and got off her. I helped her up.

"Rick's hurt bad," Lacey said.

I glanced at the partial decapitation. "I think he's dead."

'No. I'm not." It was Rick's voice, like a message wafting up out of a grave.

"Mercy," Lacey said, and something I thought might have been "Lazarus."

"Hey. I got the rest of him." The new voice was Chuck Furtado's. The systems analyst held up something that looked like a toupee.

"I'm supposed to be Bones, not Captain Kirk," said Rick's funereal tone.

My *own* mind was spinning. 'Who's got the best medic training?'

'Me," said Rick, "but I figure this is way beyond what I can handle." His chuckle sounded like death. "I'm the rock star, remember? Geology's my bag. Neurosurgery in a mirror isn't my idea of a good time. I wouldn't know my right hemisphere from my left."

"It's not going to be neurosurgery," I said. 'Just some sewing."

Rick let out a ghastly groan. Lacey put one hand on his left shoulder, stretched her arm to reach his right shoulder. I could see she wasn't looking at his ruined head. But her lips moved silently. Prayer, no doubt.

'Mary," Hurtado said. "Mary's the other medic. Where'd she go?'

I finally looked around us. We were all on a slight slope that steepened rapidly into a rugged lava wall. The time machine wasn't in terrific shape, and mainly lay crumpled in ragged sections. It looked to me like we'd materialized about twenty feet in the air, and then just dropped to the rough rock surface. The image in my head was what would have happened had the Apollo lander run out of fuel about ten meters above Tranquility Base.

At least we had air—though the atmosphere wasn't terrific.

On cue, a wind-bank of sulfurous fumes rolled through our crash site. My eyes burned and started to water. All my sinus cavities seemed to close off like waterproof doors on the *Titanic*. With about the same effect.

There was a yellowish halflight illuminating everything, but I couldn't tell whether it was all the crap in the air, or it was just close to sundown. There wasn't much to be seen of the sky. I heard rolling concussive sounds that sounded like distant detonations.

"I think my back's broken, too," said Rick. Chuck and I exchanged looks. Lacey put her hands together in an attitude of prayer.

ON CUE, A WIND-BANK OF SULFUROUS FUMES ROLLED THROUGH OUR CRASH SITE. MY EYES BURNED AND STARTED TO WATER. ALL MY SINUS CAVITIES SEEMED TO CLOSE OFF LIKE WATERPROOF DOORS ON THE TITANIC.

"Yeah," I said. "Where the hell's Mary?" Then I realized that it wasn't just the senior scientist who was missing. Her seat was gone too. Ragged holes in the floor of the control area showed where the bolts had torn loose.

The terrain dropped severely away on that side of the wreckage. Lacey stayed with Rick. Chuck Furtado and I stared gingerly over the side of what looked ever more like a real precipice.

"Don't look good."

I nodded agreement. "We ought to check downslope. Just in case."

'I think we got some rope somewhere," said Furtado. He turned back toward the time machine.

"Never mind," I said. I had seen a glitter of aluminum along with a flash of blue jumpsuit about ten feet down. It was all obscured by the deepening shadows and the rough-edged juts of cooled black lava.

'You first?' said Furtado.

'Okay.' I started down the slope. I felt my fingers slip on the stone. When I looked, I saw the blood. Mine. The rock was so edged, I could have shaved with it.

The rough part was after we got to Mary. "Whoo-ee," said Furtado, "she's messed up pretty bad." But she was alive. Air whistled in and out of the bubbling wound where her teeth had been.

"We can't just leave her."

I wasn't so sure about that, since it didn't look to me like she was going to be alive more than a matter of minutes. I touched her throat below the relocated line of her jaw and wasn't sure I could even feel a pulse.

Furtado crossed himself and his lips moved like he was uttering a prayer. I doubted it would work for him any better than for Lacey. Old man Harrison had presided over a prayer breakfast and a solemn ceremony to invoke God's protection upon the time machine. I could hear the snap and pop of cooling wreckage above us. Obviously the metaphysical fix hadn't been in. But then secular engineering had presumably failed us, too.

'Whatever you think'll work," I said. I sighed and made up my mind. 'Okay. let's get her back up the hill." We decided to leave Mary in her chair since she was already strapped tight and the stressed aluminum made a perfectly good litter. Furtado and I wrestled the chair into place. Then I waited while the systems analyst scrambled back to the wreckage and found the rope. He tossed a loop down to me and I secured it around Mary's headrest.

Then, with Furtado pulling from above and me shoving from below, we manhandled chair and dying woman back to level ground.

Lacey left Rick to come and hover over our leader. "What can we do?" she said, smoothing Mary's blood-soaked hair back from her eyes.

"Not much," I said.

'Pray," said Furtado.

Lacey prayed, lips moving silently.

Mary said something. Her eyes flickered open, stared, and she spoke again, some of which I could make out as I bent close. '—they come?" she said.

"Who?" I said.

"From base," said Mary. "Did they come right—' She coughed up bright red blood. "—right after we crashed?"

"Sorry," I answered. "No one came."

'Then they're not—' Mary closed her eyes. "They can't find us, or maybe—" She coughed harder, painful, wracking. "—they all died at

the other end."

"What do you mean?" said Lacey. "Won't they come for us?"

Mary didn't say anything. So far as I could tell, she was dead now. I couldn't hear her breath bubbling through the thicker blood. "What she meant," I said to Lacey, "is that any time-traveling rescue party would have shown up about ten seconds after we crashed. That's the neat thing about time travel."

"But they didn't."

I shook my head. "Chances are, they won't."

Chuck Furtado spoke up. "Whatever knocked us out of the time stream might have just been a bounce from some event up at HarriKon Base. Mary's right. They might all be dead."

"They can't be," said Lacey. She stared at me. "Nobody would know."

Nobody would know. She was right. This whole mission had been clandestine. Old man Harrison—damn his Christian soul and his Libertarian head for commerce—hadn't wanted a word of this leaked to the government. He remembered all too well the cold fusion flap. And if time travel turned out to be a viable process, he wanted to make damned sure the HarriKon Corporation had its hooks sunk firmly in long before the D.O.D. got wind of it.

So we were on our own. *Nobody knows.* All the permutations of Lacey's somber words echoed in my head. At this point, I figured the four of us were about as lost as human beings ever had been. And maybe ever would be.

We unstrapped Mary Clarke's body from the control chair and wrapped her in plastic sheeting that had protected some of the crated supplies. We set her on the downwind side of the crash site. Then we set about building shelter, since it was getting cold. Furtado and I constructed a minimal lean-to around Rick Haugen's chair. He made it clear he didn't want to be moved.

Then I held the battery lamp while Furtado took Rick's hands—not that it would make any difference because of his paralysis—and Lacey sewed the top of his head back on. I don't know why we did it. Probably it would have been just as practical to cover his cranium with plastic wrap, but it seemed like the right thing to do.

Rick didn't feel much of it, but every once in a while, as Lacey drew a threaded knot tight, he would jerk from the shoulders up and cry out. Lacey echoed his cry with a little sob, then brought the needle around for another pass. It seemed to take forever, but eventually Rick again had a complete head. More or less.

Naturally it was only after the sewing session that I found the drug-case. I gave Rick a jolt of painkiller and he finally nodded off.

"Save some for us," said Furtado, looking like he was trying to smile bravely.

"I expect we'll need it soon enough." I put the case down by some of the other stores.

"You want to know where we are?" I glanced back at Chuck Furtado. He hunched over what looked like one of our laptops. Battery power.

"I think I can guess." I said. "Within a hundred million years or so."

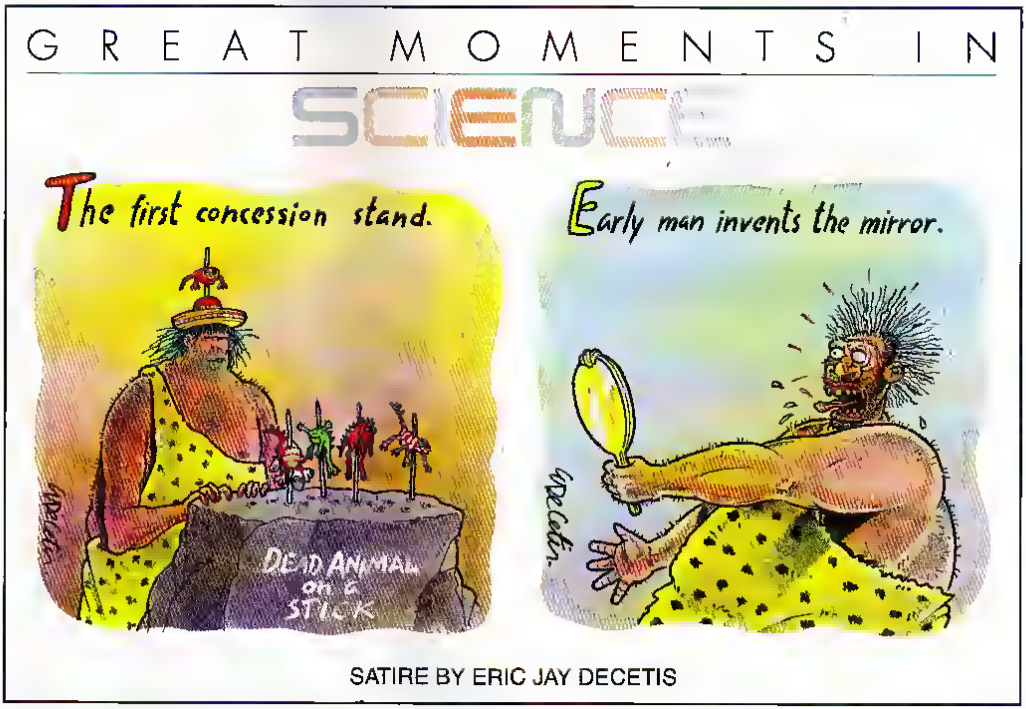
"You're being a smart ass," said Furtado. "Listen up. When I said *where*, I meant it."

"Probably pretty close to where we left."

"Allow for a little precessive drift, but you're pretty much right." Furtado tapped the keys a few more times and squinted at the screen. He rattled off some coordinates.

"Okay," I said. "Wyoming. The southwestern desert. Rock Springs?"

"Thereabouts. We're about in the middle of the Green—well, what'll be the Green River Formation."



True enough. A ways—a long ways—up the line in the Eocene, this would all be under water. The Green River Formation held one of the biggest deposits of fossil fish in the world. The layer was a half-mile thick and contained something like 12 billion fish. After *Jurassic Park* had rekindled public interest in the very distant past, entrepreneurs, with the blessing of the state, had started mining fossil fish for the collecting trade. It was a boom market. But beneath the vertebrate fish layers, other, older treasures waited.

At the rate things were going, we'd probably be among them.

"You two want some supper?" I said to Furtado and Lacey.

"Don't forget me," said the mostly inert Haugen. Already fossilizing, but still hungry.

At first it was almost completely black after darkness fell. I could see no stars because of the smoke and cloud cover. To the side—and I had no way of knowing what compass direction that was, just that it was neither up- nor downhill—I could see a dull orange glow at an indistinct distance. I guessed it was volcanic activity.

Before dusk, the smoky curtains had parted briefly and I thought I'd seen some greenery, maybe a klick or two distant. If there were lurking carnosaurs, they weren't making their presence obvious. I suspected they really wouldn't spend a hell of a lot of time foraging too close to neighboring vulcanism.

Since there seemed to be no immediately apparent life apart from us, we finally decided to try to sleep without the need of a sentry. There weren't even any insects in evidence. Smart bugs. We each had a lightweight thermal blanket and a rolled towel we could use as a pillow. Chuck Furtado curled up close to the feet of the now-snoring Rick. Lacey and I prepared our bed a dozen feet away.

The corporation would never have allowed lovers to be assigned to this pioneer expedition, but then they never knew. Who would have expected a romantic liaison between one of Mr. Harrison's most trusted aides and some scuzzy contract paleo jock? The romantic and the realist, the skeptic and the devout. Who would have thought it?

It had to be chemicals. Pheromones. I don't know.

We'd spent weeks circling each other like wolves. It was clear we had nothing in common. She thought Amy Grant had sold out. I played Ministry discs in the lab and didn't bother with headphones. We made a great deal of lighthearted—soon escalating to outright nasty—fun of each other.

She even said outright at one point that I was surely well on the way to exclusion from the ranks of the righteous and could count on spending my own great extinction in hell. Hell. She capped it in her memos. Like it was a Fodor destination.

The problem was, Lacey had soft, curly hair I wanted to feel tucked up under my chin while I touched the length of her firm little body with the rest of me. It was only a few minutes after first laying eyes on her at an orientation seminar that I knew I wanted a laying on of hands. And much more. I figured old man Harrison would look dimly on one of his recent scholarly acquisitions opting to follow his dick rather than tracing his favorite fossils back to the Permian. Probably I should have stuck with the fossils. But I didn't.

And Lacey... Well, Lacey risked both summary firing and damnation for me.

The first time we made love, Lacey spent an hour in fervid prayer, begging absolution from God. After that, though, she loosened up quite a lot, though when we spent time together she tended to keep tight hold of the staurolite cross she wore around her neck. That cruciform Georgia stone. Lacey enjoyed pointing out, had been created by God. Dark brown, it looked like blood. I don't think she ever took the silver necklace off. Lacey unconsciously polished the dull stone between thumb and index finger. It reminds me of home, she'd say when I reminded her of the mannerism. Home was Conyers, distant even among Atlanta's more remote suburbs. Lacey told me about the old part of Conyers, and the railway station converted into a community theater, but the tracks were still active, and so the actors had to freeze in place during performances when the trains passed.

I don't know why I loved her. It wasn't just her body, though that always excited me mightily. There had to be something in the reality that she possessed things I never could have, and maybe the opposite was also true for her. I had no roots—not since I left home—no real sense of where I was or had been, or was going. Lacey, on the other hand, had a plan and a past. And even if my lips and my arms and my dick were a profound distraction, her life still had a solid structure of which I could only dream.

She'd told me about pine and kudzu, red clay and dogwood—*Looks like a blizzard, come the spring.* Once I had visited her at home. I felt the

breeze I saw all the yards full of dogs pickups refrigerators and junked cars

Lacey ducked her head down below the edge of the thermal blanket and tucked up against my neck and upper chest Her words were muffled as she shivered 'Robert He'll save us I know He will But in the meantime I don't mind admitting it, I'm scared to death "

I could tell those capped letters in her voice and knew she wasn't talking about our boss at HarriKon I kissed the top of her head flashing a quick image of Rick's hair, and tried to forget it I twisted my neck a little and kissed Lacey's ear her cheek "It'll work out" I said but I knew better Where we were marooned I didn't give any of us any odds on living much beyond the week maybe two

"Tomorrow morning," said Lacey "We can fix up some sort of litter or travois We can take turns carrying Rick "

"Where are we going to go?' I said

'We can walk out of here There have to be people there must be help "

"There are no other people ' I said "This is the beginning of the Cretaceous maybe the end of the Jurassic There's just us."

"There are people ' said Lacey insistently

I tried to clamp down on it but felt the flash of anger "This isn't 4004 B C kiddo There are no people out there Just dinosaurs and that's about it '

Lacey was silent for a moment Then she said, "God created man when He created dinosaurs Both must exist out there The people may be primitive but I'm sure they will help us if we behave peaceably "

"God damn it!" Lacey stiffened I said "Can the creationist tripe! There are no people We're them We're all there is on this baby Earth "

"They were found " said Lacey "They found fossil evidence of people along with the dinosaurs '

"No ' I said "That was all a hoax Or if it wasn't it was sloppy research and wishful thinking "

"You're wrong " There was a profound sureness and strength in her voice

'No, *you* are " I don't know *what* filled mine

She looked up at me and I looked down at her Sparks could have jumped the gap I kissed her and her lips responded There was no stopping after that We both needed comfort and reassurance that something was still familiar We both needed the warmth the heat Lacey was just wearing her long ORU teeshirt and I worked it up above her breasts She moaned and put her small hands around me And as I entered her I thought I heard Lacey whisper again, "You're wrong "

The last thing I'd remembered before slamming down into a broken slumber was the small scream as Lacey came The first thing I heard as I fell out of sleep was another scream This one wailed with fear, not pleasure, fear and pain and the knowledge that death stalked close by

I came awake blinking, trying to extricate myself from the tangle that was Lacey and the thermal blankets, and saw death was indeed standing above Chuck Furtado Against a hellish light that presumably was an eastern sunrise, a saw-toothed silhouette bent down and nipped at the man on the ground It was bipedal and quick a head higher than man-sized, and then I saw the scythelike claw behind each muscular leg For the barest moment I admired the sleek biological engineering of the deinonychus—remember, I had never before *seen* a dinosaur in the flesh—and then I tried to confront the predator that planned to breakfast on the systems analyst

'Get away, you son of a bitch!" I screamed I knew we had both a Remington pump-gun and a 30-06 hunting rifle packed somewhere in the supplies I didn't know where There was a steel bracket that had come off the control panel down by my foot I picked it up whirled it around my head and hurled it as hard as I could at the deinonychus It was luck, not skill The bracket slammed into the side of the reptile's jaw, but it drew the creature's attention for a few moments Then, as though deliberately malign ignoring me totally, the deinonychus turned back to Furtado, raised its right foot, and sliced down through the man's abdomen Chuck Furtado screamed one more time The cry sank to a moan then nothing

The deinonychus snapped at the air and looked almost like it was grinning Then it grabbed one of Furtado's feet and began dragging his body out of our campsite I threw something else—a disemboweled gauge I think. The reptile hissed around Furtado's foot, but didn't relinquish its prey

Furtado's head bumped on stone as his body disappeared off toward the east The panting of the deinonychus died away I realized Lacey was holding onto me for dear life

"Don't go after it" she said

Toss you to see who looks up first

Chuck's dead. There's nothing we can do."

"You can get me some breakfast." It was Rick Haugen's voice. He giggled from his upright chair. 'Life's gotta go on.'

But for Rick, life was obviously not going well. Lacey and I gave him some of the dry rations, washed down with water from the precious stocks. When he chewed, the pain made him stop. I shot him up with more of the chemical balm, but I could see the supply was running low.

I looked at the suture line around the top of his skull. Infection had set in fast. Angry colors and disgusting fluids flushed vividly every time he tried to move his jaw, and facial muscles tensed.

"I'll look for the antibiotics," said Lacy quietly. After a while she came back from crawling through the wreckage on hands and knees. She held a few white tablets in her left hand. "Things spilled during the crash," she said. "I found these."

"Are they antibiotics?" I said.

"Trust to His will," she answered. "If they're not, I don't think they'll hurt him."

"Bullshit." But I forced Rick to swallow two of the pills. I, too, figured it couldn't hurt. Then I gave him the last of the painkiller.

He died before dusk.

We'd taken turns watching over him during the day. As it turned out, Lacey found a good graveyard while I was busily sorting and cataloging our expedition's resources while still keeping an eye on Rick. I'd found the rifle and shotgun, but the ammunition remained among the missing. I discovered enough food and water to keep us going for a few more days. I even found an envelope full of inspirational literature for the businessman. Perhaps we'd need kindling.

About midday and against my advice, Lacey had gone over the hill the same direction taken by the demonychus making off with Chuck Furtado's body. By my watch, she was gone for less than hour. She returned excited.

"There's water," she cried. "There is a stream we can drink from."

"Did you try it?"

"A little. Trouble is, the water was full of bodies."

I must have looked startled.

She laughed. "No, Robert, not people. Small dinosaurs. A lot of dead ones, but I don't know how or why. They probably came there to drink and something happened to them."

"Must make for a pretty rank water

A rendezvous with destiny

hole,' I said

'I walked upstream for a ways It gets better I tried the water There's a lot of what tastes like mineral content, but I'm still alive' She grinned 'What's more, I'm not thirsty for the first time since we got here"

I nodded "We can hunt the dinos for food'

"There's dirt," said Lacy

I stared at her "So?'

"We can bury Mary there Chuck too I found most of him on the way The deinonychus must have gotten tired"

I looked at my inventory sheet "We've got a couple of shovels here Is that really what you want us to do?"

'Dust to dust,' she quoted It's the right thing, I think"

So we did it She and I spent about twenty minutes lugging Mary Clarke's body to the stream bank Then while Lacey dug shallow graves I went back and picked up what I could of Furtado There wasn't a whole lot, and it didn't fill a garbage bag The deinonychus obviously hadn't gone away totally hungry

Once the bodies were under earth, I stood silent while Lacey recited Bible verses I don't remember which I wasn't concentrating

We'd left Rick alone, he was awake and chipper and told us he'd yell if anything predatory happened into camp Lacey looked dubious

'Just stay perfectly still,' I said, realizing too late what I was saying

"I can handle that" Rick grinned

But when we returned to camp after our burial detail, we found Rick Haugen with his eyes wide open—his mouth, too—but no life left in him

"We'll bury him in the morning' I said Lacey stared at me—accusatively, I thought "What?"

"I try to understand you,' she said softly

I didn't feel like smarting off now so I said nothing

"Robert,' she said mournfully "I researched you pretty heavily after we first made love I'm not a dummy, you know"

"So what did you find?" I said already suspecting what I would hear

Lacey stepped closer to me "I used to watch your daddy' she said "Well, first I listened to him on the radio. Then I saw him when he preached on the cable You know? He was about the strongest, fire-breathingest most charismatic minister I ever saw He had both that crazy power that gets folks to pay attention, and he had real conviction ' She paused and reached up, touched my face gently "You and he, you've both got so much strength

I looked away "I never saw him after I left home I never talked to him before he died"

"You even pretended you weren't his son," Lacey said "It was wrong to deny him"

Turning back to her, I said, "I was walking another road

"Maybe" she said 'Maybe not" She spread her arms taking in this whole, raw, prehuman world "I think maybe you were just trying to find yourself a faith that you could match up against his Maybe it was the same faith Same hymn different lyrics"

"I don't think so,' I said harshly "We're here And there's no god to help us. There's no way out"

"It's just a matter of faith" she said, "and finding the purpose in all this"

We locked gazes She dropped her gaze first The truth to tell, it was about the same time I dropped mine

Lacey and I went for a late walk, rough terrain notwithstanding Some of the cloud cover seemed to blow off to the east and we were able to see by the light of a very large and beautifully bright moon This time we didn't go to the burying ground or the adjacent dinosaurs' graveyard. We went the other direction, toward the eventual sunrise, toward the molten glow that tonight was more cherry than last night's orange It was the wrong direction to en-

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TIME IS NOTHING BUT A CLOCK

ARTICLE BY GEORGE ZEBROWSKI

PAST, PRESENT, AND FUTURE—A DEFINITION OF TIME.

ILLUSTRATION BY JEAN-FRANÇOIS PODEVIN

There is no time. There never *was* any time, and there never *will* be any time. Time as a separate thing does not exist. Language itself seems to defy our attempts to understand time. Phrases such as "the beginning of time," or "when time began," serve only to reinforce our intuition that time is forever, that it could not have had a beginning. There may be different varieties of time, as there are differing kinds of infinities, but "time always was, is, and ever shall be." To imagine a time without time, a space beyond space—eventless time and the sheer nothingness of purely empty space—seem to be logical and psychological impossibilities.

Are these kinds of statements merely strange and curious verbal train wrecks, or do they hide realities that may be even more bizarre to our everyday, casual way of taking things for granted? Minds as diverse as those of Immanuel Kant, Kurt Gödel, and Jorge Luis Borges have in one way or another denied the reality of passing time. Science has developed a view that denies Newton's conception of time as an absolute container, in favor of time as a property of space and matter, and dependent on an observer's motion. The question today is not whether time is *real* but *how is time real?*

But our ability to think about time is still hobbled by the fact that we cannot completely escape the historically developed ideas about the nature of time that still linger in our minds. These ideas are a mixture of intuitions and inherited notions that steer our thinking in the manner of incomplete computer programs. We cannot wipe our minds completely clean and think fresh about time because we find ourselves inside a system of space-time which we do not fully understand. Even the oldest, metaphoric conceptions of time have the virtue of capturing some aspect of how we experience time, or what we imagine it to be.

What the history of our conceptions of time shows is how one idea after another was tried and found to be inadequate, until the growth of experimental physics put restrictions on what we could imagine about time, in favor of what we could say about it according to the best experimental evidence.

As with concepts of space, the two main intuitions about time are that time is an absolute, eternal container in which all things happen; and that time is nothing by itself, and cannot be understood apart from physical processes. Variants of absolute and relational theories of time have attempted to assimilate or accommodate each other's features in a variety of ways.

For example, perceived time is a local experience of change, but against an absolute background time. Human beings feel time passing because our bodies are running clocks. Stop all such clocks and eternity (another kind of time) will remain. In other words, our time is a kind of illusion, requiring perceiving minds and running body clocks to experience events, but is nothing by itself. There is a tendency to have absolute time somewhere in the background while remaining true to time's specific observed aspects.

A purely relational theory of time goes one step further by claiming that it makes no sense to talk of absolute background time, in which the foreground time we experience flows, and that all conceptions of eternity and absolute time are merely imaginative constructs, psychological illusions that illustrate our need to end the questioning process. Absolute, eventless duration, like a universe outside the universe, simply makes no sense at all, no matter how much it teases our imaginations. At the very least, there is no empirical way, direct or indirect, to demonstrate such a reality.

To imagine time flowing, to think of it as a separate entity apart from everything else, is at the very least a marvel of abstraction, a long leap away from given experience in which time is felt as weighing heavy on one's shoulders or fleeting, in short supply or as dragging. *The Monadology* by Gottfried Wilhelm Leibniz completely opposed the Newtonian conception of absolute space and time, in which space and time are real, infinite containers in which everything happens—time being an infinite container of duration, and space an infinite container of extension.

For Leibniz, Sir Isaac Newton's space-time was inexplicable. His alternative to Newton's absolute space and time was a radical relational theory that did not have to explain space and time, gravity's action at a distance, matter, energy, or any of the real things that a physicist must deal with. For Leibniz, reality is made up of pre-existing monads, mental entities that have no extension or duration.

Monads, beings like you and me, are indestructible, eternally existing entities, into which everything has been programmed by God, and even though monads are windowless, their programmed experience includes everything that will ever happen to us, all that we call perception and fellowship of other monads. These programmed experiences interlock without ever meeting, to give us the world we know, in which we think that we see a tree or receive a telephone call. In this striking, aesthetically unified monism, all problems of explaining space and time are seemingly abolished.

The time we experience in Leibniz's physics is simply the length of the program given to us by God. We are literally on tape, experiencing a given world as if we were seeing it in the ordinary way, but the live world from which it was recorded does not exist. There is no world outside the program that was deposited inside each monad. I have the perception programmed into me of another person, and that person has one of me, we dovetail perfectly. A created world is unnecessary; this *is* the created world, and as real as it gets. And in the naive realist's sense, it is as much outside of us as any world of space-time and matter would be, since it is bestowed by an outside agency.

MONADS, BEINGS LIKE YOU AND ME, ARE ETERNALLY EXISTING ENTITIES, INTO WHICH EVERYTHING HAS BEEN PROGRAMMED BY GOD. THEIR PROGRAMMED EXPERIENCE INCLUDES EVERYTHING THAT WILL HAPPEN TO US.

The attraction of Leibniz's world is that it seems to provide all the fundamental answers as to *what* the universe is made of—mental objects—and how it functions; but this merely pushes back the demand for explanation, since these mental objects require at least as much explanation as any material reality. In the ordinary sense of reality, nothing exists at all; everything being made of mental substance. One is reminded of James Jeans's famous remark that "The universe begins to look more like a great thought than like a great machine."

Leibniz's universe is the perfect simulation, a way of having a universe without having to create something out of nothing. The only problem with it is that there can be no empirical verification of its truth outside of a priori reasoning. We may, however, be able to create such a universe ourselves in the virtual realities of cyberspace. And there are aspects to Leibniz's psychology that may one day be useful; but today's scientist would naturally conclude that in his monadology Leibniz was kidding.

Kant is less subjectivist than Leibniz. For him space and time are the forms that mind puts on things-in-themselves as they exist outside our perceiving minds—and these *noumenal* things have no spatial or temporal qualities in themselves. The universe we see springs into being only when minds work unconsciously on things-as-they-are in what we call perception. This is not an arbitrary universe, since we cannot simply invent what we perceive, but only things-in-themselves are absolutely real, and unfortunately, unknowable.

Albert Einstein seems to belong to this same idealist school, in which reality is a subjective ordering of events, especially in the special theory's denial of simultaneity for greatly separated observers. Clocks separated by one light-year, for example, can never be known to be synchronized because communication between the clocks is limited by the speed of light. Similarly, events that might appear simultaneous to two observers who are close together, will appear not to be so to a third observer who is moving away from them at some large fraction of light speed. But this seemingly subjective feature of the special theory is set aside in the general theory, in which the geometry of space-time is presented as a literal Newtonian reality that serves to explain gravity. Einstein believes in a real universe outside our minds. To stress the apparently subjectivist features in his work is to forget their grounding in physical fact.

Subjectivist or idealist tendencies in the history of physics are important because they emphasize, however strangely at times, the importance of the observer, the entity that experiences the scheme of reality. We struggle to differentiate between what is in us and what is out there, or more properly, between what we imagine the universe to be and what it may in fact be. Entropy, or time's arrow, flows in one di-

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THE OTHER SIDE OF THE BLOCH

AN ESSAY ON LIVING BY THE RENOWNED AUTHOR ROBERT BLOCH

PHOTOGRAPHS BY ROBERT SEBREE

I've been ranting and raving about it for years, but now I'm going to do something about the overpopulation problem personally

I'm going to die

Soon

Sitting here at my desk just as I've sat every workday during the past 60 years, it's hard for me to believe that this is not just another story opening designed to attract reader attention But this time it's fact, not fiction

Not that the subject matter is all that new to me For most of those 60 long years of a professional writing career I've been dealing with death and dying Scores have perished in my murder mysteries and suspense stories, hundreds more succumbed in my fantasy tales, entire populations were wiped out in my speculative fiction, and nobody can total the body count of my supernatural horror work

But that's my job I roll a piece of paper into the typewriter, load it with words, and the words kill people Only this time when I do it, I'm killing myself, and it's not just a story anymore It's real

I'm going to die

Soon

The problem is, I'm not ready yet. I'm not prepared. Like most of us, I suppose, I've a tendency to procrastinate, to put off things until tomorrow, or sometime in the near future And now all at once, the doctors tell me there won't be very many tomorrows, and the future they foresee is very near indeed

Granted, the medical practitioners aren't always infallible in their prognoses, and today's high tech isn't necessarily of more value than yesterday's tender loving care Dr Fu Manchu may not have been your choice for a family physician, but at least he made house calls

In his absence I've had to rely on the machinery and mechanics of internists, gastroenterologists, and oncologists They would be only too happy to dispel false tumors but instead all agree that I've got a real one And it's got me They're all pretty cagey about exactly how much time I have left—months, weeks, days?—but every one of them agrees it might be a good idea for me to switch to instant coffee

Having lived a long time, it's difficult now to accept that stalling and inertia have cheated me of so many of life's simplest pleasures. I never mastered the art of producing a piercing, attention-getting whistle I never was able to snap my fingers—or wiggle my ears

I have never operated a computer or seen the light at the end of the carpal tunnel I've missed out on learning how to play a musical instrument, or even a guitar I'm hopeless in sports, never gotten into gaming haven't done hard drugs or knowingly ingested garlic into my system I have never molested a child, or vice versa I've owned dogs, cats, canaries, and other pets without harboring carnal desires for any of them I once attempted sex with a *Playboy* centerfold, but her staples got in the way

These are some of the things you think about when you know you're going to be dead soon

And because you're scared

Damn right I am And I think anyone who isn't afraid of dying is crazy, unless he or she has found a way around the problem Becoming a vampire might be nice, but how do you go about it?

I tried, but can't say I had much success All that my long-distance phone call produced was, *Thank you for calling Castle Dracula We're sorry, but all of our bloodsuckers are busy right now If you will leave your name and blood type we will return your call as soon as possible*

So much for modern technology, and maybe it's just as well I didn't call back Come to think of it, a vampire's existence isn't all that easy, and who wants to sleep in an evening dress instead of pajamas? Besides, I don't want to live forever—just long enough to be around for George Burns's 100th birthday

All right, enough of that Let's get real Get a life Get a death

Just what do we *know* about death, anyway? Not as much as we think, most of us, because it isn't something we're supposed to think about

I'm no exception In spite of my professional preoccupations, there's very little I ever bothered to learn about the actual *rigors of mortis* But now that I've a personal interest in the subject, I decided it was high time to find out what to expect. Here's what the experts offered

When you die, your heart stops But the brain is still technically alive for three or four more minutes Digestion occurs for the next twenty four hours Blood

I THINK ANYONE WHO ISN'T AFRAID OF DYING IS CRAZY, UNLESS HE OR SHE HAS FOUND A WAY AROUND THE PROBLEM. BECOMING A VAMPIRE MIGHT BE NICE, BUT HOW DO YOU GO ABOUT IT? I TRIED, BUT CAN'T SAY I HAD MUCH SUCCESS.

remains viable for several hours, then settles downward so that the body's downside is darker and more mottled; if the body lies face upward, the face is pale. Rigor mortis takes place in from two to six hours, depending on circumstances, and reverses two or three days later. By this time the stomach is bloated with gas. The flesh decomposes, the veins and skin turn blue, purple, green, and black. The softer tissue turns to jelly, the cornea of the eye is no longer clear, the eyes begin to melt in their sockets. The skin pulls away from the lips, leaving a grin. Bacteria thrive, worms feel no horror, only hunger. Maggots are moving mouths, devouring decay.

Yetch!

I'm going to be cremated.

But in the end forensic details aren't important. The body is just an exterior, the real me is interior. What happens there?

And according to a million different religions, you don't stay inside after you're dead. The *me* part comes out, and you have a choice of another million versions telling you what becomes of it. Who looks after its welfare, who protects it? Here's an answer picked at random:

In northern India, in the cemetery of Bodhgaya, is Kshetrapala, the Guardian of the Dead. A demon with blue skin, a yellow face, bristling orange hair, three bulging red eyes, and a four-fanged grin, he is clad in a corpse skin and a tigerskin loincloth. He is mounted astride a huge black bear, carrying an axe in one hand and a skull-cap of blood in the other.

So much for your security guard. On the other hand, if you're dead inside as well as out, who needs this kind of protection? And think of the hassle you'd get with the animal lovers after they heard about tigerskin loincloths and riding on bears.

If legend hasn't got the answers, maybe it's better to try history. After all, when you get right down to it, history is really just one long death report.

Sample: In China in 1640 A.D., the warlord Chang Hsien-Chung killed 30,000,000 people in less than a year in Szechuan Province alone. The entire area was transformed into a mountain range of body parts—hands, feet, heads, torsos.

Sound incredible? Yes, but if you read it again it sounds pretty dull, too—

dull and meaningless. We don't know who Chang Hsien-Chung was, and not knowing, we can't really care. History has reduced him to the same anonymity as that of his 30,000,000 victims, and they too remain statistics rather than human beings whose sufferings we can share. Aside from the health hazard provided by those mountains of cold cuts, there's nothing here for us to care about. We don't know what happened, or why, and it's not likely any of that vast army of victims will return to give us any answers.

Call Dr. Frankenstein's laboratory and ask if he can restore any of those body parts to life, and all you'll get is a recorded message: *Sorry, but we don't have that information at the moment. Our Fritz is down.*

Not much information, and no consolation here, not from forensic medicine, organized religion, or disorganized corpses in history.

So where to learn the lessons about dying and how to die? In the end (a term which is no longer just a figure of speech to me), I must return to my own roots—fiction and drama, the areas in which I've lived and worked all these years.

It seems to me that the British and the Americans are the real masters of deathbed drama, though they had to learn their techniques through trial and error. A good example would be Lord Nelson's last words to a captain when mortally wounded at Trafalgar: "Kiss me, Hardy." Obviously this line of dialogue would have been much more appropriate coming from the mouth of Stan Laurel.

But practice makes perfect, and perfection was reached in the film *Citizen Kane* as Orson Welles whispered "Rosebud" as a last word, revealing himself to be a sledophile.

Though not all of us can expect the sentimental sendoff of a Little Nell or get yanked to heaven by stagehands who pulled the stunt (and ropes) for Little Eva, there are easier examples to follow.

Nobody ever died better than the British in the early days of sound film. Most of them breathed their last in luxury, a clean double or king-size bed in a handsomely furnished bedroom of a town house, a country manor, or even a noble palace. Generally propped up on pillows, and extremely well-lighted, the moribund usually had time to deliver bits of wisdom and philosophy before quietly expiring—all this, mind you, without a single tube or

CONTINUED ON PAGE 123

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INTERVIEW

FRANK TIPLER

A PHYSICIST PROPOSES A THEORY OF ETERNAL LIFE THAT YIELDS GOD.

PHOTOGRAPHS BY PETER LIEPKE

Dine with physicist Frank Tipler and his wife at Christian's, one of New Orleans's finest restaurants, and something becomes very clear. Caution is not his style. The gusto and verve with which Tipler consumes haute cuisine lathered with rich sauces and rounds off the meal with a challenging dessert, is impressive. His cholesterol count may be in the red zone, but he isn't concerned. "As you know," he guffaws cheerily, 'my Omega Point theory predicts we will all live forever.'

Tipler shows a similarly unfettered appetite for ideas. 'Good scientists," he says, 'have chutzpah. We are willing to ask any question whatsoever." Even so, few of his peers would dare to make the fantastic claims put forth in Tipler's just published *Physics of Immortality*. Using only math and physics, Tipler builds a theory about the universe from the beginning to the end of time, predicting the existence of God, resurrection of the dead, and life everlasting for one and all.

Enough to blow most crackpot detectors right off the scale. Yet Tipler is no softhead baking mysteries of quantum physics into New Age marshmallows. A tenured full professor at Tulane University, a reviewer for *Nature*, and an established cosmologist, he is "widely known for important concepts and theorems in general relativity and gravitation physics," according to the grand old man of cosmology, astrophysicist John Wheeler of Princeton.

Tipler's last book, *The Anthropic Cosmological Principle*, published in 1986, was a

PROFESSION:
Physicist
and cosmologist

PLACE OF BUSINESS:
Tulane University,
New Orleans, LA

BOOKS WRITTEN:
The Physics of Immortality
(Doubleday, 1994)
The Anthropic Cosmological Principle (Oxford, 1986)

THEORY IN ONE SENTENCE:
"God, a personal being who created the universe out of nothing, exists, loves us, and will one day resurrect us all to live in heaven forever."

EVIDENCE FOR THEORY:
Principles of physics

SEX IN HEAVEN:
"I'm predicting it because most of us want it, and the beings of the far future will be nice and let us have it. It's a small part of the infinite future."

BEAUTY AND WISDOM:
"We can adjust our ages and make a few improvements in our physical appearances too, while we're at it. I'd certainly prefer to be 20 rather than my current advanced age of 47. I think some mental improvements have been made since I was 20. Though when they see my book, many of my colleagues will disagree with my assessment."

ON REALITY:
The fundamental computer is the ultimate level of reality."

TAKING THE SPACE-TIME VIEW, YOU SEE THE WHOLE UNIVERSE, FROM THE END OF TIME, FROM THE ULTIMATE FUTURE—GOD COMING INTO EXISTENCE.

shocker. Co-authored with British cosmologist and astrophysicist John D. Barrow, it prompted the reviewer in *Nature* to say the volume deserved a place "on the shelf of any serious scholar of science." Still, he couldn't shake a sense of "some snake oil being peddled." The page was ornamented with a cartoon of Tipler and Barrow riding a magic carpet, scribbling away with papers flying.

This time brickbats were hurled before the *Physics of Immortality* was completed. A friend invited Tipler to lecture at the Max Planck Institute in Munich when the book appeared in Germany this spring, but the invitation was rescinded at the last minute. The fax read, "Dear Frank . . . some amount of speculation is stimulating, but you have gone too far—so far, in fact, the public reputation of science might suffer."

"I didn't know differential equations could be so controversial," Tipler cracks. "I wasn't going to mention God [in the lecture] even once."

Tipler predicts that intelligent life will eventually expand throughout the universe, growing to infinite intelligence with infinite knowledge by the Omega Point, the end of existence some million trillion years away. He suggests the Omega Point is the equivalent of God. As we hurtle toward this final singularity—a boundary point where space-time curves to infinity and ceases to exist—computational power will rise so high that future beings will re-create all previous beings. And we will live forever in a virtual-reality heaven.

Now 47, Tipler was born and raised in Andalusia, Alabama. His first science project was a letter written in kindergarten to Werner von Braun, whose plans to launch the first earth satellite were then being publicized. Von Braun's secretary replied, regretting he had no rocket fuel for Tipler as requested. By age five, he knew he wanted to be an astrophysicist. But he's always been a polymath, reading widely across disciplines and into the history of science and theology. After graduating from MIT and the University of Maryland, he did postdoctoral work at Oxford and Berkeley, before arriving at Tulane in 1981.

I sat in on Tipler's class in global relativity and afterward talked to him in his office and at Christian's. He chose the restaurant partly for its cuisine and partly because of its name. The irony is typical of Tipler, whose idea of his work as serious fun is contagious.

—Anthony Liversidge

Omni: Are you a crackpot?

Tipler: I don't think so. But no crackpot thinks he is, right? An astronomer once published a list of the rules for determining a crackpot. Well, if you read Darwin's *Origin of the Species*, you'll find he was a crackpot by some of the criteria. I'm very

conservative scientifically I'm just changing the boundary conditions in cosmology from the beginning of time to the end of time. I accept all known physical laws, and just change the point of view.

Omni: What is the message of your book, *Physics of Immortality*?

Tipler: Emmanuel Kant claimed the three fundamental problems of metaphysics are: Does God exist? Do we have free will? and Is there life after death? I turn those questions of metaphysics into problems of physics, and solve them, answering yes, yes, yes. That's how I'd summarize my book.

Omni: Aren't you confusing physics with metaphysics?

Tipler: The history of science is typically about turning insoluble problems of metaphysics into problems of physics and solving them. Like one of Kant's problems. Has the universe existed forever, or only a finite time? Kant thought this was fundamentally insoluble too, and had a purported proof of this. But in this century we've turned this supposedly insoluble metaphysical problem into one of physics and solved it, to find the universe is 10 to 20 billion years old. I'm just taking the next step. My reductionist belief is that a problem that can be solved can be solved by physics. And only by physics.

Omni: Reductionist belief? Why do you call yourself a reductionist?

Tipler: Because I believe everything can be understood on the basis of physics and almost everything on the basis of our currently understood physics. If the Einstein field equations are correct, and you know the initial data, then you know everything about the future. If you know the initial conditions at any time, you know the conditions at all time. That's standard Laplacian determinism. You put initial or final boundary conditions into equations and compute the results.

Omni: So are you a scientist or theologian, or both?

Tipler: Like most leaders of the American Revolution, I am a natural theologian, saying the only thing you'll learn about God derives from nature itself rather than from what He chooses to reveal to His prophets.

Omni: What does your theory tell the man on the street?

Tipler: Reducing the Omega Point theory to one sentence, it is this: God, who is a personal being who created the universe out of nothing, exists, loves us, and will one day resurrect us all to live in heaven forever. Now defending this outrageous statement using rigorous science takes a 600-page book! But I can turn every single word into a reductionist statement of physical reality. What the average [Christian] religious person with no knowledge of physics hopes for will in fact occur.

Omni: Won't physicists give you a hell of a lot of trouble?

Tipler: Yes, surely. But I never leave the realm of physics. This view, that the basic tenets of religion can be explained by physics, has been held by all great Christian theologians. I quote St. Paul to that effect—the basic attributes of God can be seen by the natural light of reason. St. Thomas Aquinas based his five proofs of the existence of God purely on Aristotlean physics. That the existence of God can be established by natural reason is Roman Catholic dogma.

Omni: What leads you to predict we shall all be raised from the dead and live forever?

Tipler: We're fundamentally of no importance in the gigantic scale of things. I'd only mention resurrection as a trivial aside at the end of a lecture on the physics. As a physicist, I'm interested in showing how powerful this theory of the future can be in constraining the past. To understand the physics of past and present, you must anchor your frame of reference on the future. I develop that technically. You can only understand what's going on now if you impose boundary conditions at the end of time. Omega means final, as in the Bible's "I am the Alpha and Omega." The Omega Point is the point at the end of time, and the fact that it is a point has significance in my theory because it means unlimited communication at the end of time, without which life would cease to exist.

The standard model of a closed universe does not end in a single point, but a three-dimensional sphere. My theory says no, it has to be a single point. It's difficult to test. I admit, which is why I put a question mark as to whether or not it's called a prediction. Let's do a quick calculation of the relative physical sizes of the future and past. We compute the space-time volume of the past light cone—the four-dimensional part of the universe extending back 10 to 20 billion years into universal history—and compare that with the region outside it. The calculation tells us the volume of our future is at least 30,000 times larger than our past, even using a small estimate for the size of the universe.

If life is to continue forever, certain properties of the universe must be fixed now. Take the solar system. It's perfectly consistent with Newtonian


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mechanics to assume the earth is the center of the solar system. But it's hopeless mathematically. You'll get a complete mess when you try to analyze it. But if you make the sun the center, the math becomes trivial. The simplicity of the underlying physics becomes clear if you adopt the appropriate coordinate system. I'm doing the same thing to the universe as a whole, saying that anchoring your frame of reference on the ultimate future enables you to understand the past. If you try to understand the future by the past, you'll get a mess you can't possibly interpret.

Omni: Doesn't the real world have too many unknowns to project very far into the future?

Tipler: Assuming life goes on forever enormously constrains possible futures. Chaos is the technical term for the instability you're referring to. If you don't know everything precisely, the slightest errors amplify as you go farther into time, and after a while you can't predict anything. Coupled to that is the unpredictability of living beings. They have free will, and you can't predict what they're going to do. If I'm right, however, on the large scale these two sources of unpredictability cancel each other out, and you get predictability. The Einstein equations allow for this chaos, so you can predict the large-scale structure of the universe.

Omni: Surely we may blow ourselves and the planet to bits, and your eternal life postulate with it.

Tipler: My strategy is to accept the universe is deterministic. The situation is a bit more subtle—after all, there'd be no free will if it were completely true. But let's assume it's deterministic, as it certainly would be if the mechanics were those of Einstein or Newton. So whether or not we're going to blow ourselves to bits was locked into concrete 20 billion years ago. There's no contingency in a deterministic space-time; everything was fixed at the beginning of time.

In the quantized Omega Point theory, this determinism is only approximate. We have free will, and *can* blow ourselves to bits. But if we do, there must be at least one other intelligent species in the universe that does not blow itself up. Our destruction is unlikely now. Instead we'll begin interstellar colonization next century, after which the destruction of the earth won't matter to the postulate.

The Omega Point theory is that life goes on forever, and as a consequence, the universe is closed, with its final state a single point. That it is a point is implied by life going on forever because that means communication must be unlimited as you approach the Omega Point. In subjective time, an infinite amount of thoughts are thought between now and this ultimate final state. It is infinitely far away, and thus, even though we will be resurrected close to the final point, we will still have eternal life. Infinitely long life.

Omni: Is God a He?

Tipler: I say He when referring to the Judeo-Christian God. I use He/She in the Omega Point theory. I don't want to use *It*, because I want personhood there. But sex as we know it is a peculiarity of eukaryotic biochemistry, not of any fundamental personhood.

Omni: So He/She doesn't exist now?

Tipler: That's only from our point of view. Taking the space-time viewpoint, you see the whole universe at once, from the end of time, from the ultimate future. From our point of view, He/She is coming into existence. From God's point of view, He/She is drawing the totality of reality into Himself/Herself as time goes forward. God's point of view is ultimately the more fundamental of the two, but we have to look at things necessarily from our point of view.

Omni: Why do we care if life ceases at the end of time?

Tipler: You have to be very careful in

"Have a seat."

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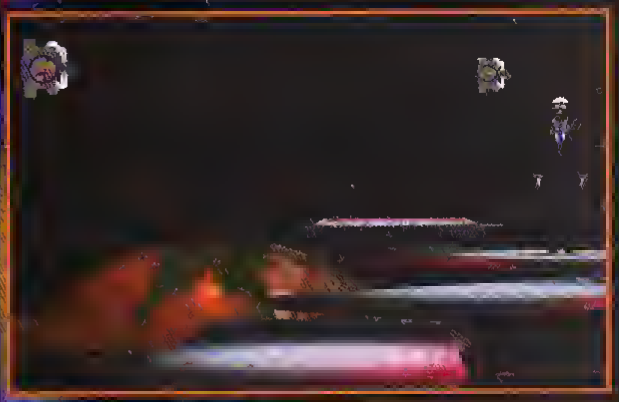

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cosmology when talking about measuring time. There is no time that all clocks measure. Your clocks depend on the environment. Newtonian mechanics doesn't use the earth's rotation as its clock. If it did, it would be logically impossible for the earth to slow down. But until Newtonian mechanics, the earth was the fundamental clock.

Right now, we're using proper time because it is proportional in the present environment to atomic time, which can vaguely be thought of as the vibration of an atom. But in detail, proper time is a ridiculous time scale to use near the final state. Atomic time is inappropriate near singularities where there are no atoms. There I use subjective time, which is measured by the number of individual thoughts you have. The end of time is infinitely far away. An infinite number of thoughts will have been thought between now and this ultimate state. We will be brought into existence again near the final state, and will continue to live forever—in subjective time. That's why we should be interested in the far future as human beings. As physicists we should be interested in it because most of reality is there!

Omni: How will life spread throughout the universe?

Tipler: It's physically possible to build a space ship that can go to the other side of the universe if you use extreme nanotechnology. And secondly, we have to realize everything—this desk, this building, humans—is a pattern of information. In principle, you can get the whole of the pattern, which is the human, and code it inside a computer.

Omni: What does life mean in this context? People like Schopenhauer have talked of a life force or will.

Tipler: No such things!

Omni: So you can write all the information needed to reproduce me or you some other place or time, and send it across the universe?

Tipler: Exactly. I prefer to use the term computer emulation. An emulation is an exact simulation, an absolutely perfect copy. Everybody's computer emulates other computers, although the average person is not aware of that. In any running computer there are several computers there. All but one of them are virtual computers, perfect imitations of other computers. Writing commands into your machine, you see the physical machine, but in reality an emulation of another computer exists inside this machine. But it exists only as bits of information.

Using physics, specifically the Bekenstein Bound, you can prove a human being, indeed the entire visible universe, can be emulated by a sufficiently powerful computer. I give estimates of the upper bound of how powerful a machine will be required for a human: 10^{45} bits of information. The entire universe will need 10^{123} bits, as Roger Penrose was the first to compute.

As you go into the future, the amount of information storage diverges to infinity. Eventually, however, 10^{123} bits will be insignificant in comparison to the total computer capacity of the universe. So in the far future the whole present universe will be emulated using a tiny fraction of total computer capacity. If this is done by our descendants, once they've taken over the universe and gained control over its resources, they will emulate into the future the universe as it now exists. We would come into existence again—the present universe at a higher level of implementation, just as inside my computer there is a virtual machine, and possibly a virtual machine inside that, a hierarchy of implementation.

Omni: But will this "event" be only an information emulation, not an actual physical one?

Tipler: The event will *be* the present reality, but at a higher level of implementation. No experiment conducted inside the simulation could distinguish between the emulation and the real thing. An emulation is the thing being emulated, an exact simulation in every conceivable respect.

Omni: Sitting here, how do we know we are not an emulation?

Tipler: We don't. We could be an emulation in the far future. Anything you have now will be there then. You'd think as you do now. Beings that are perfect copies are no longer copies. They *are* the beings. Right now we are in effect being run as a program. One state of the universe succeeds the next as we move forward in time. You can do that as a computer emulation. There'd be no difference in our experience now, and as our emulated selves, until beings in the far future start to change the emulation—such as moving us into a different environment.

Omni: How can people exist as emulations and retain control over their existence? Explain that!

Tipler: How do you know you have control now? From a higher level of implementation you'd have no idea what the universe is at its most basic level. In the far future you'd never deal with the base computer, only with the emulation. You are inside the emulation. How do you know you're not part of it now? You don't.

Now given their power to improve

"Sometimes science is not an exact science."

the life situation, would the beings of the far future permit us to exist in all this misery? No. They'll improve our lives very rapidly. That's my argument. I'll grant you it's weaker than the argument that the power will exist to bring the present universe back into existence. That I can argue on the basis of physics. The second step is ultimately a sociological or biological argument: an estimate of how the beings in the far future will actually act. I'd claim they'll be motivated to emulate us, just as we are now trying to emulate the first living cells, our ultimate ancestors.

Omni: What is your definition of the soul that's resurrected?

Tipler: Like the average person, I define a soul as the essence of the human being—the difference between a corpse and a living being. But unlike many, I use physics to tell me that the fundamental difference between a living being and a corpse is a particular program being run on the body most importantly the brain.

Omni: A robot could have a soul?

Tipler: Certainly. You only doubt it now because we don't have a computer or program powerful enough. This concept of soul is not unfamiliar to Christians if they go back to original theology. St. Thomas Aquinas followed Aristotle in defining the soul as the form of activity of the body. By form Aristotle meant what we now call pattern. Activity means its in motion to distinguish it from a corpse. Activity is what I mean by pattern: information being coded in the body. The activity is, in essence, natural selection. A person is a program you can talk to, that can convince you it is like you.

Omni: Hasn't a lot of information about each person and his or her life been lost forever, preventing this future emulation from occurring precisely?

Tipler: That won't stop us from resurrecting the past. A crucial consequence of my free-will theory is that we cannot know everything happening now. But the future being will know something about the present, just as you know something about Schopenhauer. A historian would define the past as the collection of all histories that's consistent with what he knows in the present. Thus you'd make emulations of all those possible histories, and the real person would be included as one of the emulations. You'll emulate all possible variants if you don't know precisely what happened, all possible universes consistent with the future's knowledge of the present visible universe, and guarantee the current universe is in your collection.

Omni: If you are going to fill a virtual

world with zillions of slightly varied copies of me as I am now. Why would I be delighted?

Tipler: You want to know if this specific you will be there? That is guaranteed!

Omni: Yes, as one possibility of myself, not zillions.

Tipler: Zillions of *realities*, not mere possibilities! But these zillions of yous are here now. If the many-worlds interpretation of quantum mechanics is correct, as it is accepted by many physicists. In the distant future, as now, you will be totally unaware of these other yous. But this particular you will continue to exist.

Omni: If life is information, the existence of eternal life is only the eternal existence of information.

Tipler: Yes, and it's being coded, information processing going on forever is a reductionist way of saying life going on forever.

Omni: Is that why some people keep extensive diaries, do great works of art or deeds?

Tipler: It's one way of seeking immortality. Schopenhauer, in a shadow sense, still exists in your mind. But all aspects—the full power—of Schopenhauer is not there. An extraordinary event that affected him as a child, but was unmentioned in his journals and no one else thought to record, is not now existing. That Schopenhauer can return into existence only if the entire visible universe of the late nineteenth century is emulated in the computers of the far future. You have a very limited form of immortality when you try to live forever through your works.

Omni: How will we eventually take over and control the universe?

Tipler: It won't be *Homo sapiens*. If our species has a typical mammalian lifetime, it will live only a few more million years. Our descendants—probably intelligent robots—will use rockets to expand from our present isolated point in the universe to eventually engulf the whole. Then we can use the universe's chaos to force it into patterns we want. It doesn't have to be us; somebody has to make it. It will be able to engulf, pattern, and control the whole universe—and must, to survive.

Omni: It seems impossible for any life to control galaxies.

Tipler: Chaos allows a little nudge here to amplify, after a while, to an enormous change there. Imagine a row of dominoes, each of which is slightly larger than the next. This domino hits the next and so on until you have a gigantic stone pushed by that slight nudge of the first domino.

Omni: What about loss of energy?

Tipler: Then the system is not chaotic. According to general relativity, the system is chaotic. The universe will expand to a maximum size and then contract because it's closed. But by moving matter slightly here and there in just the right pattern, you can force the universe to collapse at different speeds and directions into certain patterns. You fire a projectile so that it moves by a larger object whose orbit is slightly deflected by it. This builds up from planets to stars to whole galaxies. That is how the game is played. As the size of the collapsing universe goes to zero, gravitational energy—the ultimate source of energy—goes to infinity.

Omni: How did you first formulate this theory of yours?

Tipler: I read Freeman Dyson's "Time Without End," published in the *Review of Modern Physics*, in which he asked the question: Can life go on forever? I thought he was insufficiently reductionist, didn't go the full way in reducing life to physics. I define life as something coding information preserved by natural selection. Molecular biologist Colin Cairns Smith, of the University of Glasgow, and zoologist Richard Dawkins at Oxford have come up with essentially the same definition. What unites us is our fierce reductionism. We don't want a definition of life locked to the DNA molecule, because you can imagine a life form that is not. If an *E.T.*-like creature came in a spaceship, and his chemistry wasn't DNA-based, we'd still want to call him alive.

Investigating whether life can go on forever was the start of the Omega Point theory. Concluding that life can't go on forever in an open universe, I said: Let's look at a closed universe. Initially any physicist would say: Of course not. If it is closed it will expand to a maximum size and recontract. As it starts to get smaller, the temperature will get hotter and hotter, and as it approaches the final singularity, the temperature will go to infinity.

Any human will obviously be incinerated and crushed to zero volume. But is it possible for information to be encoded as you go into that final singularity? The singularity is on the boundary of space-time. You approach, but never reach it as long as you are in space-time, but the energy is going to infinity. Information is always encoded as occupied or unoccupied energy levels. There are discrete levels of energy—a gap between one level and the next. As you approach the singularity, all you have to do is make sure the energy levels that encode information are at higher levels than the tempera-

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ANTIMATTER

UFO UPDATE:
The devil's design:
UFOs as war toys for angels of the dark

Could some UFOs and their occupants be manifestations of demonic angels hell-bent on destroying our society and faith in God? Absolutely, say two former Air Force men in a new, self-published book titled *Unmasking the Enemy* (Bendan Press, Arlington, Virginia). What's going on, explain authors Nelson Pacheco and Tommy Blann, is just the latest chapter in the eternal struggle between good and evil, with the fallen angels coming on as extraterrestrials in order to be accepted, even welcomed, by humans. "We are dealing with highly intelligent beings," says Pacheco, "and in their effort to subvert us, they will use whatever cover they can."

Pacheco, a Roman Catholic, and Blann, a Protestant, did not reach this diabolic conclusion based on their religious beliefs, they maintain, but rather, after decades of studying such phenomena as crop circles, apparitions of the Virgin Mary, and mutilated cattle. "We have no ulterior motive," notes Pacheco, "not money or fame. We just want to get the truth out. If anything, it's been a risk to our professional reputations."

That reputation is considerable. Pacheco, 49, spent 21 years in the United States Air Force, during which time he helped in the targeting of Minuteman ballistic missiles and the tracking of satellites for the North American Aerospace Defense Command, which keeps watch on enemy craft that pose a threat to the United States and Canada. He was also chairman of the mathematics department at the Air Force Academy before retiring as a lieutenant colonel in 1987. Today, he works for a Department of Defense think tank. Similarly, Blann, now 47 and a second lieutenant in the Civil Air Patrol, served in the Air Force as a radio-intercept analyst for two years, then worked as a chemical technician in the oil and electronics industries.

How did these men, who met each other online while roving a computer information service, come to their demonic theory of UFOs? The first clue, they say, came from the hundreds of credible witnesses who have described these craft as simply "vanishing on the spot." Despite this ghostlike behavior, they add, the so-called craft still sometimes managed to have physical effects, like tracking on radar, for example, or leaving scars on abductees. For Pacheco and Blann these seemingly tangible clues meant UFOs could not be a manifestation of imagination alone.

"So we came to think that the phenomenon must be preternatural," says Pacheco, "which means something not of our world but interacting with it. And that, of course, is very close to the area of traditional religion. It is our belief that what we are seeing conforms very nicely with orthodox religious teachings on demonic angels."

In fact, say the duo, the evil nature of much UFO phenomena is devilishly obvious. "I don't know how anyone can study UFO abductions and still have doubts about whether what's happening is good or evil," Pacheco adds, citing the aliens' disregard of human free will. "When these beings discuss God, they set themselves up as the true savior of humankind in order to undermine traditional Christianity."

Early comments on Blann and Pacheco's work have been positive but not without reservations. "Their grasp of the data is firm and their position plausible," says philosopher Michael Grosso, "but their reasoning is flawed. Yes, there is a sinister side to UFOs, but this does not imply satanic deception. All kinds of people are critical of, even hostile to, the Christian view of things. Does that prove they are in league with the devil? I don't think so."

—*PATRICK HUYGHE*

ANTIMATTER

THE WRONG SPIRIT

What causes drug abuse and other forms of addictive behavior? While many researchers and counselors focus primarily on the physical, emotional, and social components of addictive behavior, Christina Grof, author of *The Thirst for Wholeness* (Harper Collins) believes addiction has a metaphysical foundation. "For many people," she says, "the initial taste of alcohol or other drugs creates a pseudospiritual experience. There is a rush, a melting of boundaries, a sense of connection with a greater power that makes you feel as though you can do anything."

In Grof's view, many addicts, be they gamblers or junkies, are desperately trying to return to the sense of expansiveness provided by the initial high. "But the ironic thing," she notes, "is that after the initial taste of spiritual possibilities, a person enters a kind of downward addictive spiral that drags him or her farther away from the possibility of a true spiritual experience."

The solution, says Grof, is to treat the spiritual deficit as an essential element in recovering from addiction. Once addicts start "quenching the spiritual thirst" through such vehicles as meditation, wilderness hiking, or religion, she notes, "their recovery is more secure."

—Keith Harary

SHOPPING CENTER SPERM BANK

Shoppers now have another reason to frequent the Chauncey Hill Shopping Center in West Lafayette, Indiana: a sperm-collection bank right across the street.

"We're located next to some fast-food restaurants and a laundromat, and someone picked up on the fact that we're right across the street from the mall," says Evan Follas, co-founder of Follas Laboratories, the full-service medical lab that runs the sperm bank. In fact, the media attention was so intense that opening week, Follas invited the general public and the press inside.

INDIANA'S SHOPPING MALL SPERM BANK HAS BECOME A LUCRATIVE LOCAL ATTRACTION

Unfortunately, the males of West Lafayette were quickly informed they would not necessarily be welcome to deposit some sperm and pick up a little pocket money after running their clothes through the rinse cycle.

"We're located near the shopping center to be convenient to the Purdue University college community, from which we draw our donors," says Follas. "We don't advertise to the general public, and we don't take sperm from people who walk in off the street."

That probably disappointed local residents, since donors are paid at the rate of $50 per acceptable sample, which could add up to as much as $2,600 a year.

But why does the sperm bank target only college students? "If a patient is deciding between two identical donors," says Follas, "but one is a college junior and the other is a high-school graduate who drives a truck, she'll choose the college kid."

Although Follas himself sees no difference in the sperm, he admits that "the more education someone has, the better his sperm sells. Our bestsellers," he adds, "are donated by Indiana University medical students."—Anita Baskin

SAUCERS 'R US

Flying saucers landed on hobby shop shelves across the country this summer. Manufactured by the Testor Corporation, the little plastic models come complete with a hatch door, as well as figurines of the aliens—known as grays—and a human military guard.

Based on a detailed description provided by engineer Bob Lazar (*Omni*, April 1994), who claims to have worked on an extraterrestrial craft stored at Nevada's Nellis Air Range in 1989, the models feature a clear outer skin through which one can see three levels. The upper level is encircled with portholes on the outside. The center level features 12 archways and a central reactor surrounded by tiny seats for the alien crew members. A crawl hole leads to the lower level, devoted to airship propulsion.

"We've tried to make it high-plane and scientific," says John Andrews, Testor's division manager of plastic kits. "We feel the timing is right."

THE PLASTIC SAUCERS SPORT A HATCH DOOR AND TINY SEATS FOR ALIEN FIGURINES.

The claim might mean something coming from Testor, the model company that produced remarkably accurate models of such deep black aircraft as the Stealth Bomber and Stealth Fighter prior to their official unveilings. Last year, the company issued a model of an aircraft many in the aviation field have dubbed the Aurora, though government officials still deny it exists.

—A.J.S. Rayl

RAISING THE DEAD

Richard Selzer was pronounced dead at 1:33 p.m. on April 23, 1991. We know this because the well-known Yale surgeon and author of seven books tells us so in his latest work, *Raising the Dead: A Doctor's Encounter with His Own Mortality*. But after being without vital signs for 10 minutes, he writes, his body shuddered back to life. The suggestion: He had a near-death experience, in which his mind rose to observe the scene while his body lay dead.

But that's not quite what happened. Selzer did collapse suddenly in the spring of 1991 and did fall into a 23-day coma brought on by Legionnaires' Disease. But Selzer was never actually pronounced dead and, he adds, his out-of-body recollections are a pure invention.

"I just wanted to tell a ripping good story based on my own near-death experience," explains Selzer, who was deathly ill, "and I needed that single climatic event. Sure, it wasn't a conventional near-death experience with radiant light, an angelic choir, and my relatives calling me back. But I did come very near death, and my colleagues and doctors had lost hope."

Selzer is amazed by people's reaction to this little literary conceit. "Obviously, I did not die," he says. "But even when I tell people the truth, after the fact, they don't want to believe me. It shows how compelling the notion of life after death is to many and how compelling language can be."

—Patrick Huyghe

SCIENCE & RELIGION

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logical Seminary (one of the GTU family). Peters is head of the CTNS's Human Genome Project research team, which comprises geneticists, theologians, and ethicists. One of the most troublesome issues his team has had to tackle, he says, is that "DNA has already acquired a sort of tacit sacrality in our culture." He points to the fact that Jeremy Rifkin, the tireless advocate against germ-line genetic engineering, launched a petition which declared that human DNA ought not to be tampered with on principle. Although Rifkin himself has no particular commitment to religion, he convinced a large number of church leaders to sign his petition. He was able to tap into a deep well of religious sentiment which has come to surround the famous spiral molecule—the feeling that, as Peters puts it, "we are violating the sacred when we get in there with our wrenches and screwdrivers."

But, Peters continues, "You can raise the question, 'Who says DNA ought to be sacred? Where does that come from? We would like to be able to say to religious leaders, 'What in your theology can you use to support your position?'" For himself, Peters says, "as I look at the Hebrew scriptures and the New Testament, I don't see any basis for arbitrarily taking DNA and saying this is where heaven and earth meet. It just isn't in there. But for some reason that's where it seems to fall. For theologians it is essentially an old question: How does God relate to the world? In this case, does God relate to the world through DNA?" There are no easy answers, and Peters is the last to suggest there might be. Indeed, he says, his team has been working on such questions for three years now and they are really just beginning to understand the full scope of the problem—let alone having any solutions.

Another thorny issue the CTNS-HGP team has come up against is the problem of genetic determinism. As researchers have pinpointed increasing numbers of specific genes—for Alzheimer's disease, cystic fibrosis, colon cancer, and so forth—there has been a growing feeling in many quarters that human beings are nothing more than biological machines programmed by our DNA. That view is becoming especially prevalent now that some scientists are also starting to talk about genes for behavioral traits such as aggression and alcoholism. From a theological perspective, genetic determinism is untenable because it leaves no room for free will and therefore undermines the very foundation of ethical behavior. If we are merely machines programmed by our genes, then there is no such thing as genuine human freedom, and we cannot be held accountable for our actions in the eyes of God—or, for that matter, by the state.

Traditionally, genetic determinists have been opposed by those who argue that the environment also plays a role and that living beings are a product of nurture as well as nature. Yet Peters says his team has become "dissatisfied with this two-term approach" and that some of them are starting to suggest "there must be three parts to this: your genes, your environment, and finally, your self." After all, "it is the self which makes decisions,' be it the decision to get up every morning and run five miles or to murder your mother. "But where does this self come from? Is it merely a product of genes and environment? It doesn't look like it. That's where we feel we're going to have to work in order to understand real freedom rather than just indeterminacy."

The issue of human freedom, or free

will is one which Peters sees as crucial not just for the religiously minded, but for society at large. If we come to regard ourselves as entirely programmed by our DNA, then anyone could walk into a courtroom and plead innocence on the grounds that their genes compelled them to commit the crime. In fact, Russell tells me later, that is already beginning to happen. The question of biological determinism raises the whole question of human responsibility. When, how and why can people be held accountable for their actions? Peters points out that this is an issue which theologians are uniquely qualified to help us grapple with "because human freedom has been a major topic for us for 1 500 years. We have thought quite a lot about this."

Nonetheless, dealing with such questions in the light of the new genetics is no piece of cake. With a laugh that sounds like the first rumblings of a volcano, Peters tells me his team has 'forced David Cole [their molecular biologist], to look at DNA and tell us where the genetic bases for human freedom is.' They want him to look at rates of genetic mutation and the like and 'tell us where in all the science there is room for free will.' The purpose is not necessarily to come up with concrete answers, a task Peters acknowledges as probably impossible, but to begin to explore seriously this crucial boundary between science and religion. With the genetic revolution already upon us, theologians must start somewhere.

If getting theologians to take science seriously is one-half of the equation, what about getting scientists to take religion seriously? In many ways this is an even harder task, for as Nancey Murphy notes, we live in an age which has 'very positive attitudes toward science and very negative attitudes toward religion—especially in the academic world.' Yet like all the people I spoke to, Murphy believes that times are changing and that both the general public and the academic community are becoming more open to religion. As anecdotal evidence, she tells me that a year and a half ago she was invited to sit on a panel at the University of California at Berkeley with Australian physicists Paul Davies and Roger Penrose to discuss the interaction of science and religion. Twenty years ago when she was a doctoral student at that very institution, Murphy says such an event would never have taken place. In the Seventies, the prevailing attitude toward conventional religion was disdain, but now two thousand people turned up to listen.

Similarly, at last year's meeting of the American Association for the Advancement of Science (AAAS), there were several sessions devoted to science and religion. Again, they were packed out. The sessions were so popular it is rumored some scientists were annoyed and voiced the opinion behind the scenes that this was unsuitable material for the AAAS. But not all scientists feel that way. Both Charles Townes and William Stoeger told me they have seen a much increased interest about religion from their scientific colleagues in recent years. Stoeger says that those who are publicly committed to their faith are finding that they "can be a theological resource within the scientific community." Surprisingly perhaps, he also expressed the view that there are a fairly large number of scientists who are religious believers at some level. One of the principal roles he sees for the CTNS is to be an invitation to them."

In getting the scientific community to open up to religion, the question of credibility becomes paramount. David Cole suggests that a key factor is getting highly respected scientists involved in the discussion. 'They don't necessarily have to agree with theolo-

glians," he says, "they just have to be willing to engage in serious dialogue." This is where people such as George Ellis and Charles Townes prove invaluable to the cause. If a Nobel prize–winning scientist can be a devout Christian, then religion can't be entirely antithetical to science. Nancey Murphy believes this is also where Davies and Penrose are making a difference. "The fact of their scientific legitimacy makes the theological questions that they raise seem both legitimate and interesting to other scientists."

Ironically, some scientists willing to engage in theological issues tread rather too heavily and too naively on theological territory. To suggest, as Hawking does, that physics might obviate the need for God is not only to make invalid claims for science; it is also a misunderstanding of the role of God. The Christian deity has never been just a material creator, but always first and foremost a spiritual redeemer. As Stoeger and Ellis describe it, the unwarranted extension of physics into areas in which it was not designed to go "drags both serious scientific and serious theological research into disrepute, and in particular damages the important discussions which have recently begun between scientists and theologians." Russell stresses the need for respect on both sides. The aim of a dialogue between religion and science is not to *replace* either, but to learn how to have *both* forces co-existing in our lives.

To date much of the CTNS's work has been highly academic, a fact Russell says has been due to the initial need for the Center to establish its credibility. "If one is going to build bridges between two sides of a chasm, it is essential that they be structurally sound. Having established their own soundness," Russell hopes in looking to the future that the CTNS will be able to do a good deal more public outreach—both to the religious and the scientific communities. Already they are receiving a growing number of requests for speakers to address religious groups, colleges, and science departments, as well as community organizations. Russell, for instance, is one of the speakers touring the country this fall on a lecture series sponsored by the John Templeton Foundation and the American Scientific Affiliation. Another measure of success for CTNS is that the government is beginning to cast an eye their way. In a country which is trying to maintain world leadership in science at the same time that fundamentalists are gaining increasing political power, a group that is conversant with both science and religion clearly constitutes an invaluable resource to decision-makers.

Yet in spite of what would appear to be an obvious need in modern-day America, the CTNS, a nonprofit organization, fights a constant battle simply to stay afloat. "If funding wasn't an issue," says Russell, "I could imagine a whole team devoted to the physical sciences and another to the biological sciences." Most importantly, he envisages that with further funding they could "branch off into other religions" and not just serve the Christian community, since people of every faith who live in the modern Western world face the dilemma of how to weave the two cultures together. And while the CTNS is the leading institution of its kind, it is importantly not the only one.

The Chicago Center for Religion and Science traces its origins back to the early 1950s, making it one of the oldest institutions dedicated to promoting a dialogue among scientists and theologians. This fall, for instance, the Chicago Center will sponsor a lecture series of nine scientists and five theologians on the theme "The Epic of Creation: Scientific and Religious Perspectives on Origins." And there will be a new course for ministerial students on "Genetics, Faith, and Ministry" taught in conjunction with representatives from four Chicago-area hospitals.

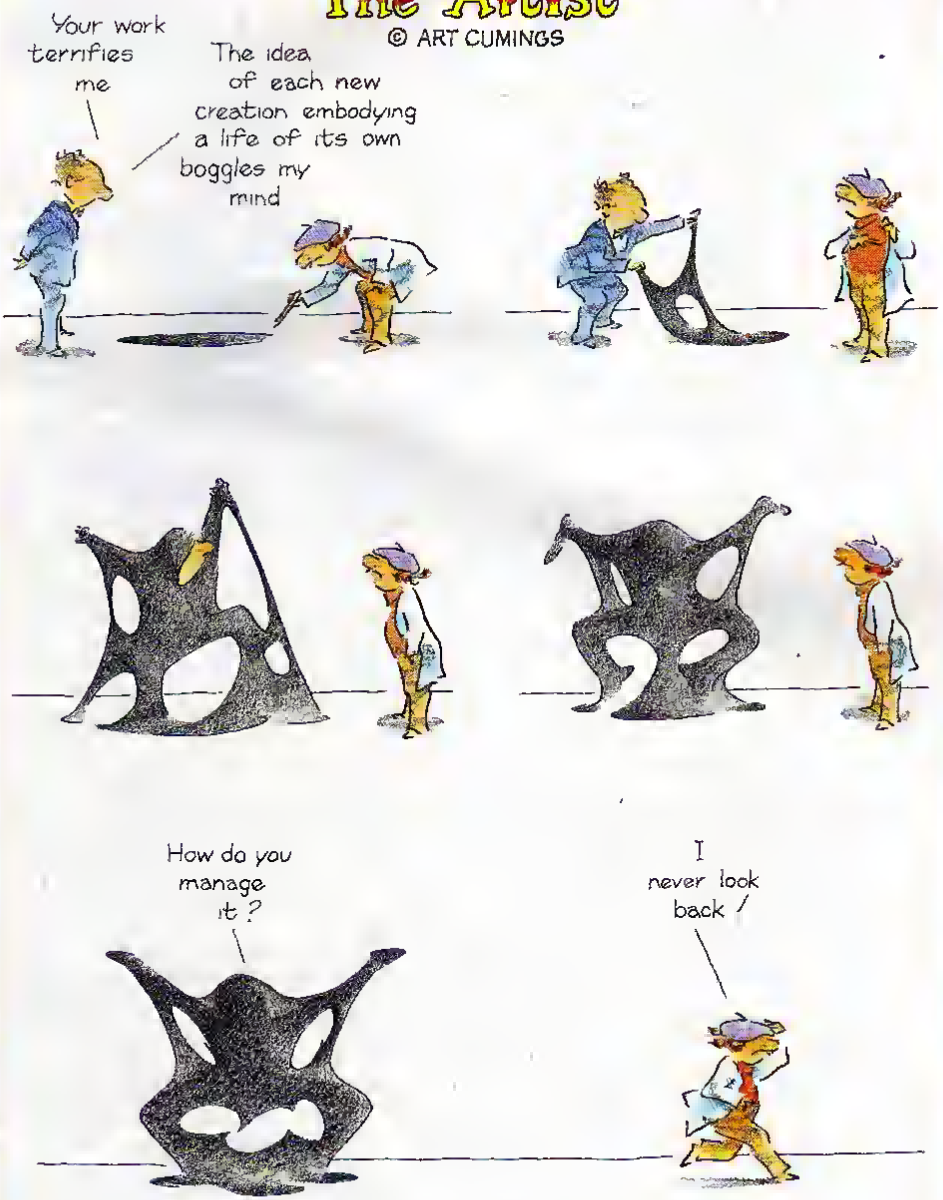
The Center also houses the editorial offices of *Zygon: Journal of Religion and Science*, the only refereed academic journal of science and religion in the world. *Zygon* is co-published by the Institute on Religion in an Age of Science (IRAS), another Chicago-based group dating back to 1960. Among recent conference topics addressed by IRAS are: truth and reality in science and religion, thermodynamics, entropy and value, and even gender bias in science and religion.

While the Center of Theological Inquiry at Princeton does not specialize in the study of science and religion, it is, nevertheless, evidence of growing interest in "intelligent faith." In addition to addressing the crosscurrents with science and technology, the CTI also tackles political, social, economic and other cultural issues.

It is the work of all of these organizations to begin to reconcile the critical divide between faith and facts. It is a resource which ought to be available not just to Christians, but to us all. ∞

Margaret Wertheim's forthcoming book The Ascent of Mathematical Man, *about the history of physics and religion, will be published in 1995 by Times Books/Random House.*

The Artist



INTERVIEW

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ture of the environment

Omni: How do you prove the existence of God?

Tipler: I'm looking at the totality of reality. If you do a consistent physical analysis, God just falls out. He is there in an intrinsic, essential way, not just put in to cover our ignorance. Any cosmology with unlimited progress will end in God. In Exodus, God says to Moses out of the burning bush that his name is "Ehyeh Asher Ehyeh" which in Hebrew means "I will be what I will be." So the Bible itself can be interpreted that God is the *ultimate future*. My mathematical theory tells us that the ultimate theory is "personal"—so it can be called "God"—because all personalities acting together will drive the universe into the ultimate future. Furthermore, it will be these future persons who will resurrect us.

Omni: What of your predictions, if proven, will back your theory?

Tipler: One was the mass of the top quark, the particle finally found at the Fermi National Accelerator Laboratory this April. Omega predicts its mass at 185 plus or minus 20 billion electron-volts. Fermilab measured the top quark's mass at 174 plus or minus 17. If my approximations are right and a certain mechanism near the final state exists, the reason the top quark has mass is to enable us to live forever! I predicted this two years ago in a paper I sent to *Physical Review Letters*, but it was rejected. One of the referees wrote it was "clearly refuted by experiment." The estimate from the CERN (European Center for Nuclear Research) indicates it is going to be 150.'

My book also predicts a lower value for the Hubble constant—a measure of the rate of expansion of the universe at the present time—and thus a greater inferred age of the universe than many cosmologists expect. There's an inconsistency in current measurements of the Hubble constant. My most interesting prediction is the mass of the Higgs boson, at 220 plus or minus 20 billion electron volts. Every particle with mass got it from the Higgs boson, so it is the crucial particle in the standard model. But it's never been seen and many theorists doubt it exists. The large hadron collider now under construction will find the Higgs early next century.

Omni: Why are some scientists so apoplectic at your theory?

Tipler: I am disturbing a political agreement between theologians and scientists to keep their fields separate.

Omni: How have fellow physicists reacted to your book?

Tipler: So far, mostly with silence. They don't want to come out and oppose a theory that's not obviously wrong, but is important if it's right. To appreciate the full power of my theory, it's essential to be an expert in particle physics, global general relativity, and computer science. You don't need to know theology.

Omni: Will the referees of the *Physical Review Letters* now fall down and beg your forgiveness?

Tipler: Are you kidding? Does water flow uphill? People have short memories for their mistakes. These referees are anonymous and can make all sorts of mistakes and ignorant comments, and it's no skin off their noses. But the referees are particle physicists, and I am a relativist doing something interdisciplinary. The big problem in modern science is extreme specialization. If he's not in your field but an expert in another area, you haven't heard of him or don't take him seriously.

Omni: But if you present an argument and people won't listen, isn't that politics, not physics?

Tipler: It worries me. I say in my book explicitly that physicists don't act that way. Now I am finding out they do. ◻◻

MARY VISIONS

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but they're indoctrinated to believe that it's wrong to question anything in the realm of religion. They seem to compartmentalize science and religion in their brain, and if you dare to introduce the two worlds together for examination side by side, you will get hostility and rage and the conversation will be abruptly terminated."

To Father Yanni, however, shouting down the devilish voice of skeptics like Nickell is the thing to do. He bounces out of his chair and leads the way back to the icon. "Here, look at this." He tears a tiny piece of brown paper from the back of the picture. It is saturated with oil. "Why would it be fraud? We don't ask people to pay money here. We tell people to go to their own church, don't come to ours. We are not merchants here. We give people the word of God."

By now others, including a gaggle of teenage girls with backpacks and expensive sneakers, have joined the ladies in the pews. As I watch them drink in the Madonna, it strikes me that I am witnessing a divine version of the much-publicized "search for the inner child." In the presence of the icon, the ultimate mother, compassionate and all-seeing, these worshipers could be "reparenting" themselves, releasing feelings of abandonment and abuse. In her presence, they cannot feel isolated or worthless or alone. By visiting here every day and putting her picture up in every room at home, these believers may be creating their own miracles of psychological and physical healing and rebirth.

"Why don't you write about the people," a man in Virginia said angrily. "That's the important thing." In a way, that angry parishioner is right. Whether the oil or the blood or the visions are miraculous or fraudulent, earthly or heavenly, the phenomenon is answering a deep human need for an intimate contact with the divine.

When Jung studied the phenomenon, for instance, he theorized that such collective visions were created when human fears or fantasies were projected from the unconscious in a powerfully concrete symbolic form. Jung believed that the visionaries themselves were often those least in touch with the contents of their unconscious, the least accepting of their deeper longings and fears. This may explain why, traditionally, so many of the Marian visionaries have been troubled, vulnerable peasant girls seeking refuge in a divine mother.

But the same theory may also explain the emergence of modern-day visionaries: middle-class Americans who cannot reconcile the worldly, skeptical, scientific, conscious parts of their minds with their deeply emotional religious longings and fears. With no other outlet for the ecstatic or apocalyptic fantasies in their unconscious—fantasies shared by the whole community—symbolic projections erupt.

This less-than-holy nature of the Marian vision is a notion with which many devoted priests agree. "Personally you couldn't get me to walk across the street to see a weeping statue. I'm also not very impressed by some of the stigmatics around," opines Father Benedict Groeschel, director of the Office of Spiritual Development for the Archdiocese of New York and the author of *A Still, Small Voice* (Ignatius), the guide used by the bishop-appointed commission that investigated the apparition in Marlboro.

"One must remember that interest in this kind of thing relates to humble people's religion," Father Groeschel states. "We have to have respect for the religion of the ordinary, humble person who, in a naive way, seeks to have his faith affirmed through tangible phenomena. Many times people who are oppressed think of apocalyptic possibilities because they are better than the world in which they live. People must try to put aside this childlike spirituality. The great Christian mystics, for instance, were most concerned with personal religious experience, prayer, and the well-being of others. They were seldom impressed by this rather crude involvement in reports of extraordinary phenomena. Though some reports of miraculous phenomena are very impressive, they do not qualify for the highest level of spirituality."

Despite their seeming sophistication, adherents to this "simple people's" faith are decidedly middle class these days, it seems, and scattered across the landscape of Suburbia, U.S.A. In this endless outpost of civilization as we know it, there's a collective longing for spirituality, and a sense that the old authorities are breaking down.

"I think there's a general disillusionment with institutions these days," said Sandra Zimdars-Swartz. "People are disillusioned with everything from the scientific establishment to the Roman Catholic Church. In times like these, people tend to seek reassurance. That's what seems to be happening at these apparition sites. And yes, people have a tendency to emphasize these experiences."

VISIONS

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Outwardly it might appear that this sort of negative reaction to the UFO phenomenon represents a kind of resurgent Yankee individualism that seems at odds with the religious unity incorporated in more positive versions. However, there is an underlying need even in these conspiracies to connect the individual experience to a larger whole. The conspiracy theorist searches for the pattern which will make his experience of the world a coherent whole. The intelligence officer, who maps out these secret networks, is the high priest of this peculiar antireligion. Salvation comes from knowledge of the conspiracy. Indeed, one often gets the sense that many conspiracy theorists actually hope that there *is* a secret government operating behind the scenes, holding together what often seems like an increasingly fractured and fragile social reality.

What are we to make of this complex range of responses to the UFO? When he first addressed the phenomenon in the 1950s, Jung wrote that the presence of the UFO signaled fundamental changes in our culture—the passing of one era and the beginning of another. This is indeed what is happening. Science is beginning to grasp the "relationality," holism, and purposeful self-organizing complexity of the universe. New technologies enable us to tap into the self-organizing dynamics of matter and to end our earthbound infancy and go out into the cosmos. New means of transportation and communication have drawn the planet together into one tightly knit, interdependent global civilization. The powerful images of holism and integration which lie at the heart of the UFO phenomenon serve as a testament that we are becoming real participants in the life of the cosmos.

Ed Conroy, author of *Report on Communion*, says that the UFO is "a mirror of individual and social psychology. . . . people tend to get the UFO experience they deserve." A careful look in this mirror can tell us a lot—the ways in which we are growing and becoming whole, and the ways in which we are still fractured and even disintegrating. What do you see in those wheels of light over the high desert, spinning against the starry sky? A New Jerusalem? A pale horse which heralds apocalypse? Or the memory of very ancient dreams clothed in a technological symbolism which speaks of new tools with which to make all our dreams come true?

FIRE THAT SCOURS

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counter plants. And we both hoped we wouldn't encounter any other larger organisms.

After a while we came to a series of volcanic cones. "They're not St. Helen's, but I think they could do the job," I mused.

Lacey looked at me questioningly. "I was about an hour away from packing in toward St. Helen's when she blew," I said. "I was luckier than fifty or sixty others."

"What were you thinking of?" said Lacey.

"I may be a paleo drone," I said, "but I've always been fascinated by vulcanology."

"You sound like Rick." Lacey giggled. It was the first time she'd sounded like anything other than death since last night. "Is that a *Star Trek* joke?"

I shook my head. "The god Vulcan was the basis for the naming of volcanoes. I've always liked the innate drama of these direct pipelines between the surface and the core."

"So why isn't your personality like that?" said Lacey.

I stared at her. "What are you talking about?"

"Sometimes I don't think there's any connection at all between your outer self and your core," said my lover. "I'd like you to be more like one of those." She gestured at the cones.

"That sounds pornographic," I said.

Lacey laughed. "Have a little faith."

And then the ground shook. We held on to each other, but the temblor was brief. About a thousand feet above us, some of the dully glowing lava slopped out of the bowl and oozed down toward us.

"I think it's time to get back to camp," I said.

For a moment Lacey resisted staring up at the molten rock. "The fire that scours," she said. "That's *Revelation*."

"Not in the version I read." I grinned. "At least you taught me one thing. Now I don't put an *s* on the end of that *r* word any more."

"I'd like to teach you more." She leaned up close. Her warmth seemed subsumed into that of the landscape.

"We'll talk about it," I said. The ground again shook.

Later that night, huddled in our thermal blankets around a container of canned heat, with shovels close to hand as potential weapons because the ammunition hadn't turned up, we talked about many things.

And I don't know how one subject led to another.

"Did I show you the Presbyterian Church when you visited?" said Lacey.

"You showed me *lots* of churches."

"This one had the unicorn window."

I shook my head. "I don't remember."

"*Used* to have the window," said Lacey. "It happened when I was a teenager. People in Conyers thought the unicorns were occult." She shook her head. "Stupid. All the artist meant was to show a symbol of the Christ." She snuggled against me. "Community made the church take the window out. When the glass was put back, the unicorns were still there, but with no horns. They'd been turned into plain old horses."

"Cute."

"I cried for a long time for those unicorns," said Lacey.

"Didn't that say something to you about religious zealots?"

"Just some of us," she said, smiling gently. "Not all."

I was quiet for a while. I thought about how a unicorn becomes a horse. "Why *did* you come on this fools expedition?" I finally said. "Did you think I needed to be babysat?"

She shook her head violently. "Old Mr. Harrison felt like he needed his personal and corporate interests safeguarded. He trusts me." Lacey hesitated, and then smiled. "And yes, I guess I did think maybe you needed someone to take care of you." The smile left. Silence lay there for a while. "There's another thing. I guess it *is* important to me to find out if men lived with the dinosaurs."

"This isn't *Alley Oop*," I said. "Never was."

"It has to do with faith," she said. "And I know we *will* pack out of here, and I still think we will find God's children, both human and reptile."

I snorted.

Lacey moved closer to me, her nipples touching my chest. She touched one index finger to my lips, drew it back when I started to bite it. "But even if I was wrong," she said, "and I'm not. Even if I was . . ." She laughed and it was a completely happy, utterly sincere sound. "Now there exists what I was taught. Creationism is proved. Man does live with the dinosaurs." She kissed me again and again and again.

I dreamed that night. I dreamed a nightmare and still remembered the scenario vividly when I awoke early in the Cretaceous dawn.

Then I crawled naked out of the

tumbled blankets For a while I hunkered there in the brownish half-light, as filthy and urge-driven as any paleolithic savage I stared at Lacey sleeping I looked with sorrow at the sweetness of her face

I would miss her And because I knew there was no other life than this one we both inhabited I would miss her infinitely

And then I killed her

I killed her with the shovel as quickly and mercifully as I could I wished there were enough of the painkiller left to put her to sleep But she made only a few sounds before she was quiet Her breathing slowed hesitated stopped When my lover was dead I hurled the murder weapon as far from me as I could

I howled at the alien empty sky, at my world without Lacey All this because of a dream? That nightmare now frayed when I concentrated on it When I looked away with my mind the images came back I couldn't bear to ignore them If I did that, then I would not be able to live with the reality of what I had just done

The dream

The paleontologists graduate students, day workers, all excavating the streambed Skulls, femurs, ribs, all coming to light The fossil remains bone transmuted to stone by the alchemist's minerals, jutting out of the clay Here a corythosaurus, there a struthiomius Plate-backs and tyrant kings, three-horned faces and arm reptiles all dead 140,000 millennia Dinosaur footprints, filled in by time

And then the other remains The human bones intermixed in the same stratum, indisputably dating to the Jurassic extinction

It would not be solely the supermarket tabloids paying heed and dispatching photographers The greater effect would be elsewhere

And that I could not bear, not knowing there was something I could do to redress the situation

I let my head tilt forward into my hands, my face feeling like the parchment of mummyskin I cried "Lacey." I said over and over again, "I loved you I still love you I will always love you "

I'm not sure how long it took I know it was more days than I had food and water from the twentieth century I started refilling containers from the stream and scavenging meat from reptile carcasses I ate and drank just enough to keep going, because I didn't know how much I was simultaneously poisoning myself

Most of my time was devoted to the endless treks to the volcanic cones I rigged slings and sheets to carry as much as I could I clambered up the side of the nearest cone, feeling the magma heat burning through my boot soles, fighting my way to the crater's edge and looking down into the closest equivalent to total destruction I could find Then I would shove my load, piece by chunk by bit, over into the fiery pit

The bodies had gone first Then the equipment There might still be some of Chuck Furtado's smaller bones in the belly of some anonymous deinonychus somewhere, but that would have to be the risk I'd take

I disposed of everything I could find

It was all gone, burned and melted back into the anonymity from which it had come

And now it's time for the final disposition I throw the shovel into the crater Then the journal I've kept—hopelessly, I know, but it was the concession I was willing to make to being a scientist I see the pages flame into burning snowflakes before the book is halfway to the lava I toss the canteen and the tarp I used to drag the odds and ends I discarded at the first

Now there is only one matter left I stand poised on the brink of this unnamed tunnel down to the heart of the world. I really cannot feel the heat. I am too numb

The last picture in my mind is that of Lacey And of the symbol she wore around her neck

I think about her love and mine That's all

As I pitch forward and begin the long drop into the final fire that scours, into what I expect will be nothingness it occurs to me that I am watching all I will know or ever believe, of hell ☒

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TIME IS NOTHING

CONTINUED FROM PAGE 82

rection only, cause precedes effect, and our given subjective reality cannot change that. And yet we are also part of the universe, and our efforts of understanding must increasingly take that fact into account.

Our bodies are clocks, set by evolutionary circumstances to a certain biological rhythm. We live in a vastly bigger clock, the universe, which is running down toward disorder and heat death at a vastly slower rate than our body clock. Conceivably, the universe clock may be rewound after the big collapse. The infall of matter after the universe has reached its greatest extent and gravity pulls it back may be the rewinding process by which entropy is defeated, at least for another cycle. Or the universe may expand forever, growing colder and slower, never to be rewound.

What we call time began with the expansion of our universe. The time before that was a different kind of time; what comes after our universe will be a different kind of time. Somewhere, there may be an eternity that our intuition tells us must be real in order to support the different kinds of time. This kind of time must always be there. The alternative is to imagine a time when there was *absolutely nothing*, no time, or space, or matter, and that seems impossible for us to do, both logically and psychologically. To avoid this we imagine a necessarily existing eternity of some sort, requiring no beginning or end, though a lot may change within it. In Plato's view, time comes into being through our incapacity to grasp everything at once. Succession and change "are the moving, and imperfect, image of eternity." Time is a relationship that we have with the universe, or more accurately, we are one of the clocks, measuring one kind of time. Animals and aliens may measure it differently. We may even be able to change our way of marking time one day, and open up new realms of experience, in which a day today will be a million years.

But if we stick to general relativity, quantum theory, and wave mechanics, we can give answers about the nature of time that are restricted to physical theory, experiment, and plausibly descriptive mathematics, even though they may not satisfy naïve intuition, which we have seen is conditioned by an entire museum of past speculations. The constraints of general relativity, quantum theory, and wave mechanics compel us to reject the containerlike character of absolute space and time, and say that time cannot be abstracted from physical events, that in fact it is profoundly a part of an expanding space-time, and that time apart from that space-time may be either meaningless or beyond our horizon of understanding. In a universe where nothing is at rest, motion and the perception of causal order (cause precedes effect) may be said, fancifully, to create the experience of time for observers as a piece of iron generates a flow of electricity when it cuts through a magnetic field. We can only know time's aspects, but not time itself, which is a conceptual illusion; only the specific aspects are real. Absolute, eternal, and infinite space and time may exist; they are not logical impossibilities; but on physical grounds, this is not what experimental science uncovers.

> TIME IS A RELATIONSHIP THAT WE HAVE WITH THE UNIVERSE; OR MORE ACCURATELY, WE ARE ONE OF THE CLOCKS, MEASURING ONE KIND OF TIME. ANIMALS AND ALIENS MAY MEASURE IT DIFFERENTLY

We live in a vast spherical, or perhaps toroidal space-time machine, which generates in our minds a sense of space and passing time. Our bodies are complex patterns of space-time, according to Rudy Rucker, and are in fact time machines, retaining aspects of the past and guessing at the future. The superiority of today's science, with its experimental and mathematical methods, over the colorful speculations of the past is obvious from this exchange on the television program *Northern Exposure*.

"Some think time is a wheel, turning forever."

"Some think time is a river."

"I think time is just time."

Common sense and intuition are defeated. The first two statements are colorful, the third is without hope. More formidable tools are required.

Let's try again. Imagine a small wind-up toy car at absolute rest. Someone winds it up. It runs a distance and stops. The distance it runs, from *when* it starts to *when* it stops—that's time, created by the movement of the car through space, even though we used the word *when*, the time-term, which means we assumed time as we tried to describe how time is generated. What happens between stopping and starting is *time*. Time comes into being whenever a clock is started.

What the above illustrates, in strenuous fashion, is that time, like space and gravity, must be expressed as part of a relationship whose terms cannot be defined independently of the relationship. Time is not understandable as a separate entity. It is a quality that emerges when we have the initial conditions of our universe.

A quality? But what is it? A term in a set of equations? That's the only time we can know; anything else is speculation and imagining. What of time outside the conditions of our space-time? There may not be any, and this might be all there is. Or absolute time reigns there forever, in an absolute, infinite superspace, giving our time its supporting background, and there is nothing outside of that reality.

Science, when it runs up against infinities, seeks to eliminate them, because a proliferation of entities is the enemy of explanation. A spatial and temporal infinity is simply beyond all reason. Imagination leads us deeper into wonder, sometimes productively, and sometimes into delicious, intriguing confusions. Metaphors and similes lie at the basis of all language, and may be thought of as qualitative equations, written *inside* a vast system. Crude and evocative they are, from a mathematical view.

Mathematical equations isolate unknown quantities and make them work in a relationship with better defined terms that we do know. They can express dynamic, observed relationships, but they don't tell us what the terms are, at bottom, except what they do in the relationship. We learn the number value of an unknown, but not what it is in itself. The answer is always in terms of something else. "Time in itself is ___" is not a completable sentence, in this view.

The answer to a scientific investigation tells us: This is the way it is, because we have repeatedly observed and measured it, and made predictions that come true. From many imaginative and speculative possibilities we have found ones that hold in our experience.

(an experiment being a form of organized experience). In our universe, time is part of the causal order of events—and that's what time is, as far as we can say: events following one another in a sequence. Our clocks may seem arbitrary, but every kind of clock we have devised seems to measure the same time, and their imperfections in fact point to what the true measure should be: allowing us to make corrections. Whatever kind of clock-time scale we use, Galileo's inclined plane experiments will come out the same. Our clocks are limited by the fact that we are *inside* nature and cannot make transcendent observations. Clocks are part of the systems they attempt to measure, and they do so with relative objectivity, despite being a convention; they are genuine time scales. Transcendent questions fail to produce specific or useful answers, which is not the case with the experimental-mathematical "in terms of" method of scientific description.

We can find this same "in terms of" method in every aspect of our lives. In an equation or a love affair, the specific context generates all significance. When we ask transcendent questions of a cosmological or ideological kind, we feel that they don't fit in with our experience. In science, the richness of specific terms derived from observation, measurement, and experiment, as well as from what may seem to be arbitrary definition, gives us better equations to manipulate, from which we can make better predictions to test, and when these seem to be vindicated, the more contextual knowledge we accumulate. Pull on a thread and a whole arm of the suit may unravel. This is a limitation of living inside a system, and lacking the luxury of an unconditional viewpoint.

One is led to suspect that there is *nothing* to answer in a transcendent question such as 'Why is there anything?' or 'What is there outside the universe?' Time and gravity are described in a context, and there is nothing beyond it. We must not expect an answer that will tear back the universe's stage set and reveal the works behind the pretty scenery, so that we can say, once and for all, "So that's what it was all along! How curious! I would never have thought it!" I wonder whether we would be satisfied if faced with such a revelation, and it was something specific and disappointing, putting an end to all further questing and curiosity.

The best introductory insight I know into the nature of time comes from Hans Reichenbach's *The Philosophy of Space and Time*: "... time is more fundamental than space; the topological and metrical relations of which can be completely reduced to observations of time. We shall finally recognize that time order represents the prototype of causal propagation and thus discover space-time as the schema of causal connection." He goes on to say that the most general assertion about space-time is that "at all times there exists a space-time coordinate system" which distinguishes timelike and spacelike directions, and that this is "accomplished by the world-lines of light. While it is true that science abstracts from emotional content in order to proceed to logical analysis ... it is also true that science opens up new possibilities, which some day might acquaint us with emotions never experienced before."

And yet what can there be," we continue to ask perversely, "beyond the quantum mechanical wave function that may someday be written down to describe a multiverse in which the electron takes every possible path?" Newton's laboratory table, perhaps on which our multiverse sits enclosed in a crystalline sphere, dreaming that it is everything. DC

"On the other hand, I think a simple hint of hope is more hellish."

GAMES

CONTINUED FROM PAGE 124

that the one caused the other, that sunlight somehow picked up the image on the back of the mirror and cast it on the wall? If so, it worked far better than they could have dreamed, beguiling observers and even scientists for more than 2,000 years.

SIXTEEN: Mathematician Monte Zerger writes to assure me that *Omni*'s anniversary this month is numerologically significant because 16 is a number of power. It's the first fourth power, and the first number to be a power in two different ways—2^4 and 4^2. Sixteen is the *only* number that can be written as a^b and b^a where a and b are different. In addition, a 4 x 4 square has an area *and* a perimeter of 16; it's the only square in which the two numbers are the same.

In power sports, 16 pounds is the minimum weight for the men's shot put and hammer, and it's the maximum weight for a bowling ball. Each pound is further subdivided into 16 ounces. In the competitive battles of chess and checkers, each player starts the game with 16 pieces.

The center of power in the United States is at 1600 Pennsylvania Avenue, the address of the White House. The house number begins with 16, and the street begins with P, the 16th letter of the alphabet. Truncate one zero from 1600 to get 160, then another to get 16. Add these three numbers together to see the numerological significance for this country.

Perhaps the two greatest presidents were Abraham Lincoln, the 16th, and Franklin D. Roosevelt, the 32nd (twice 16). FDR, first elected to the office in 1932, was chosen by the people to serve 16 years (four terms).

Musically, there have been "Sixteen Candles," "You're Sixteen," and "Sweet Little Sixteen." "Sixteen Tons" was a hit for "Tennessee" Ernie Ford, and Tennessee is the 16th state.

There are 16 member nations in the powerful North Atlantic Treaty Organization (NATO); humans have 16 teeth in each jaw, and builders traditionally leave 16 inches between studs in the wall of a house.

Zerger says his hexadecimal devotion comes naturally. At Adams State College in Alamosa, Colorado, he teaches and has his office in a 16-sided building (how many of *those* are there?), right off Highway 160. Even his office number—#136—pays respect to the number 16. It's the sum of the numbers from 1 to 16. ∞

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BLOCH

CONTINUED FROM PAGE 86

wire dangling from their bodies. Way to go! Nowadays it seems like most people perish more messily, by taking a bullet in the belly and falling off a platform or high balcony in a warehouse, if driving a car, they either explode in a fireball or crash through a plate-glass window.

Of course, they aren't given much of a chance to prepare. In less violent times—and fiction—many of the characters had enough advance notice to compose themselves before starting to decompose.

There were several popular approaches to the theme, in print and on screen. One was the "Now I can really appreciate" reaction, knowing that one was seeing or doing something for the last time ever. Then there was "If only I could go back and tell him/her/it how sorry I am." But perhaps the most popular was the "One last time" theme, in which blackface vaudeville performers sang about seeing their dear old Mammy down in Virginny while secretly yearning to visit their dear old bank account over in Switzerland.

But never mind. Vaudeville is dead and I soon will be and doing *shtik* about Swiss banks doesn't help me when I'm frightened. Of feeling pain, and of not feeling anything at all. Of what I know and of what I don't know.

One would think that after a long lifetime I'd at least have learned a little something to pass on to future generations, a little counsel, advice, or just plain common sense.

But all I've learned is that sense isn't necessarily a common commodity. And experience has taught me only what it teaches everyone in time: lend and you lose a friend; today's *confidant* becomes your enemy tomorrow because you know too much; when it happens to somebody else it's comedy, but when it happens to you it's tragedy.

A few years ago I put down some of what I know in an autobiography. But *Once Around the Bloch* was not primarily intended to be an instruction manual. Writing my autobiography was fun. Living it was not always that entertaining.

Actually, I was writing in self defense. As a longtime fantasy writer I was aware of my eminent colleagues in the field, and while I couldn't compare my work to that of an Edgar Allen Poe or an H. P. Lovecraft, I did share one thing with them in common—a vulnerability to the biographers who could come up with their own version of a life-story after its subject was no longer around to dispute what was said. I preferred to tell the truth as I saw it, rather than be Griswolded like Poe or De Camped like Lovecraft.

At the time I naturally had no way of knowing that there'd be few other opportunities left for me to add to what I'd written, so there was a lot I omitted. I didn't have much to say about personal or political beliefs and convictions, and after what's happened to me now, this seems probably like the last chance I may have to express those sentiments.

Funny thing is, at the moment these things no longer seem all that important. Practically all I can offer by way of philosophy is that I think human beings are wonderful on the individual level; it's when they act as a group that the mob becomes a monster. As to personal attitude, I'm an elitist the Founding Fathers may have, sincerely believed that all men are created equal, but apparently none of them bothered reading the *New England Journal of Medicine* to find out about genes.

> I'VE SPENT THE LAST SIX DECADES WRITING FOR AN AUDIENCE AND IT SEEMS NATURAL TO WRITE ONE MORE TIME, IF . . . ONLY TO SAY GOODBYE. SEE YOU LATER. I HOPE

I don't think I suffer from delusions of grandeur about my own status. All my career has been spent as an entertainer in the ranks of what is currently labeled "pop culture."

I can handle that, but as an elitist I refuse to equate my work with tagger graffiti, the designer-label art displayed on 50-pound bags of steer manure, or the noises emitted by Snoop Doggy Dog.

Dealing with such trivia is scarcely a hot-button item with me, but putting such statements down on paper helps distract from my stomach-churning awareness that pain hurts more than anything, only so much sand can be fitted into an hourglass, and that somewhere there's a toe-tag with my name on it.

Reminds me of a story about another entertainer, master showman and egomaniac P. T. Barnum. During his final illness he told a reporter the thing he most keenly regretted about dying was that he'd not be around to read any of his obituaries. The reporter went to his boss, the editor of the *New York Evening Sun*, and the next day they arranged to run a big four-column spread about the old man. Barnum was so pleased when he saw it that he perked up and lived for several more weeks.

Maybe that's why I'm writing this, hoping I can stick around long enough to get a reaction from the news. Or maybe it's because I've spent the last six decades writing for an audience and it seems natural to write one more time, if only to say goodbye.

Once word gets around—once the cat is let out of the body-bag—people will start calling to inquire how I am. Actually they won't all be all that curious about me; what they'll really want to know is about a visitor called Death.

Death will be coming to our house for an indefinite stay, but while he's there this unwelcome guest must be treated as a member of the family.

And that's what will make the callers curious. What's it like, living with Death twenty-four hours a day? Does he make special demands on our attention, interfere with household routine, disturb my comfort, change the ways I eat or sleep? Do we worry about him constantly, keep him first and foremost in our thoughts night and day?

Right now I can't give full answers to these questions but expect to be able to do so soon. Very soon. One thing is already clear—we don't look forward to having him around. And we'll be anxious for him to depart, except that when he leaves he won't go alone.

He won't go alone, but he won't take all of me with him, either. A part will still remain behind, until paper crumbles, film dissolves, and memories fade.

Who knows? By the time these things happen, you and I, somewhere or someplace, may meet again. Anyway, it's nice to think so.

See you later.

I hope. **DO**

Robert Bloch is one of the true masters of horror and suspense fiction and film. In six remarkably productive decades he has written in virtually every genre and style. The most famous of his books is Psycho. *The least of his books are better written and more carefully crafted than most of what fills our bestseller lists.—Keith Ferrell, Editor*

GAMES

FISH BOWL

A bronze basin spouts water and *Omni* turns Sweet 16

By Scot Morris

Last month I presenfed the curious "magic mirror," which casts an image of Buddha on the wall when the sun is reflected in it Equally mysterious is the "spouting bowl" shown here (below, left) It's a recenf reproduction of a "Fish Washbasin Fountain," a curiosity from the Ming Dynasty (1368-1644) The design cast on the bottom and up the sides shows four spouting fish, raised in relief on fhe bronze bowl

air (below, righf)—I ve measured some over 20 inches above the water's surface The four antinodes where the vibrafion is strongest, correspond to fhe four fish shown on the bowl, creating the impression that the fish are spouting water from their mouths just as they are in fhe picture

Joseph Needham, who first described these bowls in *Science and Civilization in China* (1962), speculated that the spoufing effect was can become reality

I gof the bowl in the photographs from James Dalgety a puzzle collector in Somerset England, who has experimenfed wifh similar bowls from China for 12 years He says fhaf, while most bowls spout at four points, some will resonate at six or eight points if you rub the handles harder and at different angles

"In trying to reproduce the effects," Dalgety says "I found that an inverted alu-

costs $470, postpaid, by in ternational money order He has larger and smaller sizes available, and he continues to sell magic mirrors for $75 Contact ÆEnigma Designs, Manmead, North Barrow, Yeovil Somerset BA22 7LZ, England

I speculated last month about the secret of the magic mirror and mentioned that the consensus of every Western scientist who has examined it is that the design casf on the mirror s back

Fill the fub with water, wet your hands rub the handles slowly and rhythmically, and soon the bowl be gins to drone With a little practice, you can get this upside-down bell to resonate at its natural tone just as you can get a champagne glass to sing by rubbing a wet finger around the rim

As the bowl resonates, ripples form on the water's surface, concentrafed at four poinfs around the rim Then the water begins to "boil" and splash droplets into the

produced by the lines of spouting wafer in the design, which continue about halfway up the sides of the bowl We now know he was tricked, like virtually everyone else who first sees one of these, by the ingenious Chinese bronzemakers who firsf created these bowls They crafted the basins so that each one has four "hot spots —even if fhe bottom has no design The fish serve as red herrings bait for the false hypothesis fhat somehow an image

minum wok lid worked best though it's nothing like as spectacular as the bronze bowls."

Dalgety has acquired the bowls mainly for interactive science centers in England, though he sold two fo the Reuben H Fleef Space Center in San Diego, where visitors line up to try out the 'resonant bowls' from China Dalgety will sell fhe Chinese bowls by mail order, but they are not cheap The one shown, abouf 16 inches in diameter,

determines what image will reflect from the front. But in the mirror I showed here lasf monfh, the reflection is entirely different from the design on the back of the mirror. Is it possible the ancient bronzemakers have fooled modern science with another deliberate trick like the fish designed onto the bottom of the bronze bowl? Did they add a design to the mirror's back, identical to the reflecfed image, precisely to lead observers to theorize—incorrectly—

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