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**HOW TO
PREVENT AIDS**
P. 76

**DESIGNER GENES:
MADE-TO-ORDER
ANIMALS**
P. 56

**STONES THAT
SPEAK TO
THE FUTURE**
P. 62

**THE WORLD'S
BEST/WORST PUNS**
P. 128

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Photo-illustrator Steven Hunt designed Exploring a Window for a corporate client to represent states of being. The blue sphere is caught inside the box; the red sphere begins to emerge; the yellow transients its area.

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FIRST WORD

By Timothy Ferris

Big defense projects produce first-rate science about as often as magic spells conjure up angels.

In prescientific times when magi thrived, the kingdom was divided into two domains—also described as “white,” the other “black” society speaking. If J. K. Rowling had to do with the choice between knowledge and power, White magic learned from nature, black magic sought to force nature to serve the insatiable demands of old dreams and fears.

Black magic was rigidly conservative. Its hero was the sorcerer, a charismatic but rather ignorant figure whose role was to command rather than to understand. He (or she) would repel an ancient incantation in hopes that the pot of gold would appear or the beautiful maiden fall in love with the corpulent merchant who had sponsored the spell. An error of a single word could spoil the trick, even kill the magician, without his ever knowing why.

White magic took an approach that more nearly resembles that of science. The white magicians—among them alchemists, healers, astrologers, and diviners—were inclined to learn from experience and to stir their procedures upon the basis of what they learned. Like scientists, they tended to be relatively modest about the extent of their knowledge and power.

Twelve Experiments with Gassendi and Some of Them, True, was the title of one 17th-century tract. The idea was to understand nature's rules rather than to wield supernatural power to bludgeon nature into submission.

The principal dreams of white magic—to relieve human suffering and to sustain a sense of wonder in the world—live on today as the staples of science. Smallpox, once treated by drinking the patient in red robes and suspending a powdered lion over his heart, has succumbed to Jenner's vaccine. Magical apparitions, like the dragon and snake that Michael Stenhus, the meteorologist, watched lighting in the sky for two full hours in September 1951, have been supplanted by physicists' visions of curved space and exploding stars that rain gold.

But black magic is still with us, too. It likes whoever power is valued over knowledge. Nowhere does it thrive more vigorously than in the nuclear-arms race, a blind stagger propelled by the conviction that science is subordinate to force.

Like the sorceries of old, today's believers in the efficacy of power favor the misrecitation of antique formulas. The deployment of thousands of missiles is described as being essential to “national security” as if the mononuclear warheads were comparable to bullets or arrowheads. Nor are the new magicians willing to be judged by their results any more than sorcerers were expected to prove that pebbles carried by waves could restore sight to the blind. Early warning radars read the rising moon as a cloud of incoming missiles, and the red phone at the White House rings unanswered, but we are asked to ignore the failures of these devices and to ascribe our failures ever more deeply to machines.

It's power that counts, not understanding. So says the voice of black magic.

Black and white don't mix, and this seems very essential to black magic in modern times. Recently I visited CERN, the giant particle accelerator near Geneva. As I loitered throughout the laboratory, I was struck by the scientists' candor. They cheerfully interrupted their work to explain, as clearly as possible, exactly what they were doing. The atmosphere was one of reverse secrecy—a white hole gulping both information, as opposed to the black holes of secrecy that one finds at military installations.

As the world becomes increasingly militarized, this scientific spirit of openness and mutual respect is eroding. The super powers (the prela denature nukes, ne- in superlunus) have hoarded as much of their human and economic resources to the quest for military might that in many fields of research it has become difficult to conduct serious research without getting involved in building weapons.

Military R&D is defended on the grounds that scientific breakthroughs can be expected to result from, say, a billion dollars' worth of star wars spending. But in practice, big defense projects produce first-rate science about as often as magic spells conjure up angels. The innovations currently most covered by the military—lasers, nuclear bombs, particle beams, and a panoply of electronics ranging from computers to communications satellites—were not born in crash programs aimed at enhancing national power and prestige. They grew instead from the impractical dreams of Maxwell, Einstein, and other white magicians who sought not to rule the world but to improve their understanding of how the world works. To treat such dreams as if they were by the raw material of power is to make the mistake that Jacob Bronowski called “trying to buy the corpse of science.”

In the centuries immediately preceding its demise, magic was customarily described as morally neutral. The question was the use to which it was put. Black magic, with its invitations to the devil, was said to be harmful, while white magic, with its efforts to cure disease, might aid good. Science today faces a similar moral choice. It can continue in the tradition of white magic, operating openly, in the sunlight, with knowledge as its goal. Or it can descend deeper into the dimly lit caverns of power, working at secrecy to invent ever more sophisticated ways of conjuring up the angels of death.

This choice may be difficult to explainers, but it is as easy to see as night and day—or black and white. Our future may depend upon whether that old black magic still has us in its spell. □

Timothy Ferris teaches at the University of Southern California, the first television science special, The Creation of the Universe, less on PBS November 20.

CONTRIBUTORS

OMNIBUS



SPACE ART



STONE



STONE SENTRY



DOUGLAS



A NEW LEAF

Two thousand years from now huge monoliths cloaked with photographs soar over a sage-studded plain in what had been the western USA. Like the pyramids, these sentries carry stories not of pharaohs and gods but of atomic waste left from an earlier age.

If this scenario comes to pass, it won't be an accident. Keeping the human race safe from inadvertent contact with radiation may depend on novel, long-term communication systems that scientists are now developing. And in "Stone Sentry" on page 62, writer Carole Douglas examines one such system, based on a concept called nuclear deep time communication.

"Because if it will take more than engineering to protect our descendants from radioactivity," Douglas says, "nuclear planners are taking a fairly sophisticated look at how to send messages to the distant future. The point is to give at least some lifesaving information an kind of immortality."

"What really strikes me about the project," Douglas adds, "is that it demands a lot of hope: hope that future humans won't interpret the warnings to be glib attempts to conceal treasure, like the pharaoh's prophesies of doom to those who disturbed the pyramids; hope that no matter what history brings, our fundamental institutions and scientific knowledge will persist; and above all, hope that we or our descendants won't deliberate the human race before the dangers of nuclear waste disappear."

Nuclear storage will present hazards

to future generations. But there are also plenty of challenges for today's researchers. One of the more publicized modern woes is acquired immune deficiency syndrome, or AIDS. In this month's interview (page 76), Dr. Mathilde Krim, director of a new AIDS laboratory at St. Luke's Roosevelt Hospital in New York City, outlines precautions everyone should take to prevent the spread of the disease. Krim, perhaps best known for her controversial advocacy of interferon, was interviewed by writer Bill Lawren.

If a solution to AIDS still eludes us, another dream, the quest for the chimera, has become real. In "1980's Designer Beasts" (page 56), writer Bill Lawren describes new breeding techniques that will allow us to meld two distinct animals into one amalgamated beast. Goats are a mixture of goats and sheep, Lawren explains. Beestoes are a result of the marriage between buffalo and cow. Some scientists even suggest combining the genes of an ape and a man. "Many of the emerging hybrids will be a good source of food in the future," Lawren adds, "and all can teach us more about the nature of life."

Hybrids may seem like the stuff of fantasy, but other creatures of the earth are more illusory still. In this month's pictorial, "A New Leaf" on page 68, Kyll B. Sandved's photographs depict leaf memes—creats that camouflage themselves by parading as twigs, specks of bark, or the common forest leaf. "Their bodies assume shapes and textures that let them so easily fit the

border between reality and illusion," says writer Sandra Sincor. These finely wrought reproductions represent the force of millions of years of evolution.

But transmutation of form is not restricted to the forest. It will soon take place among the stars. Already, according to "The Articonsults" (page 44), by Rhonda Hoban, artist Joe McShane has sent a set of computer-operated glass bubbles up with the space shuttle, when heated in zero g, these light-bulb-size spheres, filled with precious-metal filaments, begin to glow. Says Hoban, a technology columnist for *New York magazine*: "I was astounded at the number of artists who have not only given serious thought to launching art into space but have actually done something about it. The response I got—from people ranging from MIT conceptual types to writers like miniature Anna Dillies—was sensitive, articulate and humanistic. And whether or not the art works aesthetically, the attempt to create it is a welcome relief from the usual killer satellite scenarios."

Finally, two sci-fi/fantasy authors have contributed stories about love and loss. One of Latin America's foremost storytellers, the late Julio Cortázar, wrote "The Most Prolonged Cane" (page 84), a Kafkaesque fantasy about the inconveniences of sinking slowly into the floor. And John Crowley, author of the novel *Little, Big*, has written "Snow" (page 50), about a man trying—with the help of technology—to recapture memories of a marriage. **DO**

COMMUNI

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LETTERS

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Turned Off

As a practicing psychiatrist for 18 years, I feel that Ronald K. Siegel's notion of a problem-free "mind drug" ("Chemical Ecstasy," Continuum, August 1985) is both medically false and socially dangerous.

Human emotions—both pleasant and unpleasant—are not useless biological baggage. They serve essential adaptive purposes, and coping with them helps foster personality development, self-esteem, and strength of character. Drug-induced, artificial states of euphoria—although delightful—erase the need for coping and growth. All mental-health practitioners know the potential for emotional shutting associated with this abuse phenomenon.

Siegel's dream drug is impossible because the addiction potential of such a substance cannot be removed simply by molecular manipulation. Compulsive traits are too common in people today—addictions to food and work, for example.

People have been deceived before. Such drugs as cocaine and Demerol are two recent examples of substances that were thought to be safe and nonaddictive but have since been proved otherwise.

Herbert N. Hurwitz, M.D.
San Diego

The Decades After

It has been some time now since *Omni* published John G. Fuller's chilling article "The Day We Bombed Utah" [May 1983] about the deadly aftereffects of wind-borne radiation from aboveground nuclear tests conducted in Nevada from 1951 to 1962.

In the past two years citizens of the Utah towns where the fallout settled have continued to wage their legal battle. They won the first round in May 1984, when federal judge Bruce Jenkins ruled that fallout from the tests was the "proximate cause" of ten cancer deaths. No settlements have been made, and the case is still tied up in the courts. While several bills to provide compensation and/or research are before Congress, the residents of the region have taken matters into their own hands.

With support from Incommunitarian Health Care and Dose Medical Center, a cancer treatment facility is now being built in St.

George. Citizens are raising the \$260,000 needed to purchase a linear accelerator for the center. (Ironically, such a device utilizes nuclear radiation to treat cancer patients.) Other self-help programs are under way directed by the Arthur F. Bruhn Memorial Foundation. This nonprofit community group is named in memory of the former president of Dixie College in St. George. Bruhn was also a victim of leukemia.

Slowly but surely momentum is building. There is a growing sense of self-sufficiency, providing a bright light in a grim, ongoing story. To the west, in Nevada, the bombs continue to be detonated—underground—and continue to leak, but the people here are quietly taking care of the aftermath themselves. It is something that we are all proud of.

Elizabeth Wright
Chairman
Arthur F. Bruhn Memorial Foundation
St. George, UT

Drug Bust

The so-called iodine pill or KI (potassium iodide), which protects the thyroid against radioactive iodine and which is being promoted by some pharmaceutical companies for distribution to people living near commercial nuclear-power plants [Earth, August 1985], is really a solution looking for a problem.

During the accident at Three Mile Island in 1978, virtually no radioactive iodine escaped. After six years of intensive research, one conclusion reached is that during a nuclear accident radioactive iodine would remain within the reactor and settle, where it would be trapped in the cooling water.

Health officials in many countries now conclude that distributing KI pills to the public would be hazardous because of the risk of misuse and allergic reactions.

Please note that in 31 years of commercial nuclear power generation there has never been a single death or injury to the public from radiation.

Donald C. Winston
Director of Media Relations
Atomic Industrial Forum, Inc.
Berkeley, MOOO

THE ECOLOGY OF WAR

EARTH

By Rick Boing

Pity the nation that wears a cloth it does not weave, eats a bread it does not harvest... pity the nation that boasts not except among its ruins... and those whose art is the art of patching and mending."—Kahlil Gibran

When Kahlil Gibran, patron saint of Lebanon, wrote these words he never imagined that the country he was describing would be his own. For like Henry David Thoreau, Gibran was first and foremost, poet laureate of the land. "Every time I close my eyes," he once said, "I see those valleys full of magic and dignity and those mountains covered with glory and greatness trying to reach the sky."

But according to Lebanese ecologist Ricardo Haber, Gibran could never describe those magical mountains and valleys today. Where would he get his inspiration? asks Haber, founder of a conservation group called *The Friends of Nature*. "What landscape would he see?"

Reflected in Haber's despair is the environmental devastation that has left his once-lush country under an avalanche of physical and psychological debris. From

the destruction of its famous cedar forests to the now-sinced shores of the Mediterranean, Lebanon is reeling under perhaps the worst ecological disruption suffered by any country in history.

Once a nation whose staple foods included an abundance of fish drawn from the sparkling waters of the Mediterranean, Lebanon, for the first time in its history, is now forced to import fish from Syria and Turkey. According to Haber, the scarcity has resulted from the beleaguered nation's inability to enforce laws protecting the integrity of its seas. Perhaps the major problems, he notes, are the new preferred tools for fishing—dynamite and poison bait. These illegal techniques allow fisherman to catch huge numbers of fish, notes Haber, a professor at the American University of Beirut. But they also destroy the ocean habitat. The sea is further polluted by solid wastes and chemicals scattered along the rocky beach. "Treatment facilities were being built," Haber explains, "but we can't construct a plant or regulate an industry with the Shiites on one side of town and the Druse on the other."

At the other end of the ecological spectrum, Haber adds, stand the pitiful remains of the famous cedar forests, whose trees have been cut for camouflage and firewood. Another less direct cause of deforestation is the vicious shooting of birds—a psychological manifestation, says Haber, of the anger and frustration accompanying the war. In the past ten years, he notes, some 400,000 people have been involved in a "virtual massacre of birds" in the skies over Lebanon. As these birds, including storks, falcons, eagles and swallows are killed, he notes, "the forests' tree-eating insects reproduce unchecked."

Destruction of the forests, moreover, has caused soil erosion and diminished the supply of fresh water. Without forested watersheds, says Haber, much of the topsoil and mineral just runs into the sea.

Finally, the disruption of war has also taken its toll on Lebanon's agriculture. Land not destroyed by the negligence of the feuding Lebanese has been devastated by occupying forces, who build trenches and burn crops. And lack of government planning has allowed uncontrolled urbanization at the expense of fertile plains. For Haber, this is where the war has had the most drastic effect: "To my mind," he says, "the worst oppression one can inflict on a people is to destroy their agricultural potential and leave them wanting for food."

But hope for the Lebanese environment appears to be as elusive as an end to the hostilities. A reversal of the situation would require an enormous cleanup effort based on cooperation among all citizens; adherence to existing environmental laws; and creation of an environmental body with full political support.

Such far-reaching changes in a country already losing its identity in the violence among various internal factions may be little more than pipe dreams. For Haber, however, such actions are not just pie-in-the-sky ideas. Unless steps are taken and pressure is brought to bear from the international conservation community, any hope of an ecological reversal may evaporate. "We cannot afford the pace and magnitude of the damage," says Haber, "for the point of no return is imminent." □



Lebanon's beaches, wastelands of litter and pollution, have caused a rash of disease

HOT-LINE SHAMANS

MIND

By Lesh Wallach

It is a cliché that confidences kept from friends and lovers are sometimes shared with strangers. For many, a sympathetic voice at the other end of a phone line is the ideal stranger. "The telephone allows the caller to remain anonymous and in control," explains Reverend Robert E. Larson, Jr., director of Contact Teleministries USA, the umbrella organization for 100 church-affiliated help lines, or hot lines.

Today the hottest hot lines are those kept open 24 hours a day to provide the despondent and distressed with someone to talk to. Most are run by churches, community groups, and self-help organizations and are sponsored by publicly supported institutions—hospitals, universities, and government agencies. But a new kind of hot line, one that may become more widespread in the future, is the for-profit system that uses the telephone and computer to deliver counseling.

Most hot-line workers today are volunteers. They are trained to be wise strangers as part of 30- to 60-hour courses: half classroom work, half role-playing practice and on-the-phone training. Almost all learn some variant of a technique called Rogerian active listening. Volunteers are told to take their cues from callers, expressing sympathy ("It sounds like you're under a lot of pressure"), helping them to clarify their feelings ("You seem frightened as well as angry"), and encouraging them to think about their choices ("Is there anything you can do to be happier?").

One purpose of the training program is to give those running it the opportunity to screen out unsuitable volunteers. "Most people volunteer because they want to help others," explains Robert Leone, director of psychology offices at the United States International University in San Diego. "But occasionally, they could be in need of help themselves."

The ideal volunteer, according to Larson and Leone, is a good listener who is articulate, can deal calmly with anxious people, and can cultivate a nonjudgmental attitude. "If a caller says he raped someone or beat up his child, a hot-line worker may have a strong gut reaction of anger or disgust," Leone says, "but you can't

communicate a feeling of 'Well, you deserve to suffer. You have to be open-minded.'"

Although few of the people who call a help line are about to kill themselves, most are seriously troubled. Hot lines generally are not set up to help people deal with the smaller problems in life. People are usually left to tough it out with or without a little help from their friends. But if their employers subscribe to EAR (Employee Advisory Resource), these people can get expert guidance for the most troubling tribulation anytime they want it. All they have to do is pick up the phone.

In 1974 EAR was set up as an in-house program for employees of the Control Data Corporation in Minneapolis. By 1977 Control Data made it available as a nationwide service to other corporations. There are now about 160 EAR subscribers, ranging from the National Basketball Association to the Federal Reserve Bank of Chicago.

In a nutshell, our program provides immediate access to counseling services twenty-four hours a day, seven days a week," EAR director David Robinson explains. "And by the way, ninety-five percent

of the people who receive counseling get it on the phone." Unlike many hot lines that use volunteers, EAR employs experienced counselors with higher degrees in such fields as psychology, law, social work, industrial relations, and finance.

In contrast to nonprofit hot lines, the major service offered by EAR is early intervention. "Every day we deal with a major life-threatening situation—everything from an employee threatening someone at work to spouse abuse, to suicide," Robinson says. "But dealing with emergencies is not our primary service." Most people call EAR about legal problems. Financial problems are next in frequency, followed by problems in relationships, mental health (especially depression), alcohol and drug abuse, and the wide-ranging other, which includes everything from work grievances to the problem of finding a baby-sitter last when yours has just called in sick.

When someone calls EAR he is instantly hooked into a nationwide network geared to move into action. From 7:00 a.m. to 10:30 p.m. Central Time, the EAR line is answered by a professional. The rest of the time it is answered by a service that pages a professional who is required to return the call within ten minutes.

While most callers get what they need from the phone counseling, they may also be referred to specific individuals in their part of the country. EAR can call up a computerized database listing of community resources and professionals, all checked out by an EAR evaluator, in cities across the United States.

Corporations are happy to pay EAR an annual fee (roughly \$15 per employee) because problems like alcoholism, divorce and depression cost them money in lost productivity and higher insurance. The employees themselves like this instant, no-commitment required help line.

If these early signs are indicative, there could be a growing market for EAR-type telephone/computer counseling networks of professionals. Perhaps the shamans of the twenty-first century will be telephone professionals, using the power bestowed on them by invisible electronic impulses to counsel disembodied minds. ☐



A cry for help: The National EAR will listen.

BUTTERFLY HOUSE EXPLORATIONS

By Jane Bosveld

I've always been obsessed with butterflies," says Clive Fennell, a thirty-nine-year-old amateur lepidopterist and businessman, whose London Butterfly House is the world's largest collection of two butterflies and moths.

"It started when I was a schoolboy. I caught a caterpillar, put it in a matchbox, and hatched it. I watched it form its wings and dry them. It was a garden tiger moth, a beautiful thing." He kept on hatching butterflies and learning about them, often by looking at mounted specimens at local museums. But then he discovered a museum exhibit that was to be his inspiration: a small glass container filled with live butterflies. "As I was looking at them, it occurred to me that I longed to be inside with the butterflies to observe them more closely," he recalls. Years later, still captivated with that small box, he came up with the idea of building a bigger box and "letting people walk around among butterflies on the way."

After experimenting with several small backyard butterfly houses and obtaining several loans, Fennell's fantasy took shape in four public butterfly farms. The London house, in Syon Park, was the first to open, followed by ones in Dorset, Scotland, and Stratford-on-Avon. The greenhouses vary in design, but each is landscaped with turtle-laden lagoons, small wooden bridges, and an array of plants and other food sources (such as rotting fruit) suited to the tastes of the various species of butterfly and moths inside: fuzzy milkweed plants for the monarch butterfly, for instance, or tangy mustard plants for the British orange-tip butterfly.

Many of the more than 100 species of butterflies in the London house have been sent to Fennell by colleagues around the world. The chrysalides (pupae)—and sometimes adult butterflies—are carefully packed in moist cotton and mailed. After the chrysalides are unpacked, they are hung in an "emerging" cage where one by one they shed the last remnants of the caterpillar life and reenter the world as winged creatures.

Transferring butterflies from their natural habitat to the butterfly garden is a tricky

affair, and for some species it may never be possible. A large blue, for instance, spends part of its caterpillar life in an ants' nest. In this strange symbiotic relationship, the ants bring the baby caterpillars into their nests and allow them to feed on ant larvae. In return, the caterpillars exude a type of honeydew that the ants love. "It must be like a drug to the ants," says Fennell, "because they allow their offspring to be eaten for it." Eventually, the caterpillar evolves into a butterfly and makes its way back into the world.

Fennell has also built accommodations for local species, which find the tropical temperatures of the greenhouse oppressive. The area is a large, screened-in meadow divided into sections, each landscaped with soil and flora that grow naturally in different parts of England. There is a chalky area for most English blue butterflies; an acid heath covered with heather and gorse favorite of the silver-tipped blue butterflies; and a damp, shady area for the speckled wood and orange-tip butterflies.

"What we've done with the British section is to show people how to build their own

butterfly garden," says Fennell. He and entomologist Miriam Rothschild have written a book, which has recently been published in England, on backyard butterfly gardens. In addition to the book, they are offering wildflower seed packets to schools, businesses, and individuals interested in growing wildflower meadows. "All sorts of people want to have areas of wildflowers rather than ordinary lawns," Fennell explains. "And once wildflowers are there, the butterflies will come of their own accord. It's quite mysterious how they suddenly appear, but they do."

Unfortunately they suddenly disappear too. The average butterfly life span is two to three weeks. The heliconia butterfly can survive for up to six months, primarily because it can digest pollen as well as nectar. But brevity is the heart of lepidopteran life. For instance, the giant atlas moth, which is the size of a bat, has no stomach and no tongue. It lives just long enough to mate and lay eggs before dying. "It's quite sad," says Fennell. Sadder still to Fennell is the inevitable dwindling of numbers during the winter months. "That's when you start recognizing individuals. It's difficult, then, when they die," he says.

Fennell has done everything possible to tip the scales in the butterfly house in favor of their survival. Butterflies have many predators, including most birds and numerous insects that feed on caterpillars and chrysalides. But in the house, the only birds present are zebra finches, which feed exclusively on seeds, and Chinese painted quail, which peck the garden like ancient Chinese magistrates, sentencing unrelated species and ants to a quick and just demise.

Still, the greatest threats to butterfly survival don't come in the form of birds or other insects. "An area of rain forest the size of Wales is being destroyed every year," he explains. "That wipes out countless butterflies. People must begin to realize that if butterflies are to survive in the modern world, some measures will have to be taken to preserve their natural habitats. My hope is that people who see the dangers of such habitats flying around in all their glory will make that connection. ☐"



Clive Fennell's zoo, stuffed with the six-legged

MERCURY MOUTH

THE BODY

By Sherry Baker

Millions of Americans have found relief from dental pain with a procedure long thought to be benign—having a tooth filled. And for nearly a century, dentists have used "silver fillings," a durable, relatively inexpensive material made from an alloy. Today's amalgams contain about 50 percent silver with small amounts of tin, copper and zinc—plus about 50 percent mercury, one of the deadliest toxins.

A growing number of researchers are questioning whether these fillings are safe or whether they are indeed leaching their heavy metals into the body with some dangerous consequences.

The effects of relatively high concentrations of mercury are well-known. Acute mercury poisoning can result in kidney failure, skin burns, vomiting, and even death.

Virtually everyone is exposed to some levels of mercury. It's found in seafoods, alcoholic beverages, cigarette smoke, and certain medications. There's little information, however, about the consequences of prolonged exposure to low levels of mercury. Until recently, scientists considered amal-

gams containing mercury safe because the filling appeared to be inert. Now researchers at various institutions have found that mercury can leak from the amalgams.

"Before, we just looked at dental amalgams as they sat in the air," says Carl W. Swene, professor of fixed prosthodontics at the University of Iowa. "But in the mouth, these fillings begin to corrode, especially after you chew."

Swene's research has shown a correlation between the number of amalgams and blood levels of mercury. Mercury volatilized from the surface of fillings, Swene theorizes, reaches the bloodstream after being absorbed in the lungs. But proving that mercury from fillings finds its way into the body does not necessarily mean that these amalgams are hazardous to your health.

The potential health effects remain undefined. We just don't know at this point what we are dealing with," says Swene.

Despite the lack of definitive laboratory evidence, many dentists insist that amalgams are taking a toll on Americans' health. Colorado Springs dentist Hal Huggins believes mercury toxicity can be

diagnosed from a pattern that emerges from case histories: skin patch tests, blood counts, and urine tests. According to the American Dental Association (ADA), fewer than 1 percent of all Americans—about 2 million people—are sensitive to metal fillings. But estimates from Huggins and other dentists run as high as 80 million.

One of the most outspoken figures in the mercury controversy, Huggins says he has documented more than 500 cases of people with a variety of medical problems. These include fatigue and headaches, epilepsy, multiple sclerosis, angina, allergies and immunological disorders. All of these patients regained their health after Huggins removed their "silver" fillings.

Huggins recently founded the nonprofit Toxic Element Research Foundation to study amalgam toxicity. "The bottom line is: Do people get better when you remove their fillings? The answer is yes, eighty percent of the time," he says.

After taking out the original fillings, Huggins repairs the teeth with lightly cured plastic composites.

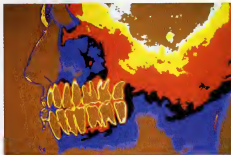
Bernara Emiler, associate professor of dentistry at Oral Roberts University, says Huggins is "way out on a limb. He may be right! But you have to back this kind of thing with good scientific research."

Emiler studied a group of children with no known environmental exposure to mercury. Half of the group had nonmercury fillings placed in their teeth; the other half had "silver" fillings. The first group had no mercury vapor in their breath; the second group did.

"These conclusions are preliminary, but I'm very concerned," Emiler adds. "I'm a pediatric dentist, and if I put an amalgam in a child's tooth, I am giving that child a lifetime of exposure to mercury."

According to Emiler, mercury toxicity for the most part, is slow and insidious. "It mimics aging—with muscle tremors and loss of memory," she explains.

Unfortunately, it's difficult to tell how much mercury is in a person's body. Toxicologists have been taught that if a person has mercury poisoning, he'll excrete 50 micrograms or more of mercury in his urine during a 24-hour period.



Mercury using. First it was the lazar, now it's dental fillings. Where will it end?

BONES OF CONTENTION

LIFE

By Steven Schwartz

Sometime in the distant past, in "Dreamtime," superbings broke through the crust of a dry, dead Earth. Part human and part beast, these beings created all humans and animals; they also caused the sun to shine and the stars to fall. When they had done all this, the creators turned themselves into sacred rocks, trees, mountains, and rivers, where their spirits dwell to this day.

To the aborigines of central Australia, this creation myth forms the heart of their culture. The beings from Dreamtime are their ancestors and gods. When aborigines die, they believe, their souls return to the sacred ground of the gods until the time comes to be reborn. If for some reason their bodies are not put properly to rest, or if a burial site is defiled, the souls of the dead cannot be reborn and are doomed to wander the earth in despair.

Nonaboriginal peoples have not always respected the beliefs—or burial grounds—of the aborigines. For more than a century remains have been dug up for both anthropological and strictly profane reasons. To counter this abuse a law was passed in the Australian state of Victoria that may allow aborigines to reclaim the bones of their dead. It may also signal the end of physical anthropology in Australia.

The law, really an amendment to the Archaeological and Aboriginal Relics Preservation Act, was originally intended to prohibit the marketing of human skeletons. But the legislation was written so broadly that any institution, even a state-run university that possesses aboriginal remains, could be forced to hand over its collection to aborigine-rights organizations.

Already the collection at the University of Melbourne is in jeopardy. Dr. Geoffrey Kenney, the museum's curator, has described the collection, which includes 15,000-year-old specimens, as the most important of its type in the world. Nevertheless, Jim Berg, executive officer of the Victorian Aboriginal Legal Service and a warden under the new relics act, would like to see most of the material returned "home" to be reborn. Other aborigine leaders agree with Berg. Reburial, they say, would permit the spirits of their dead ancestors

to return home and await rebirth.

The government has moved the university's collection off campus to a "neutral" site until it decides which bones belong to science and which to the aborigines. The move created an uproar in the international scientific community. Anthropologists, aided by universities and museums, immediately organized a lobbying campaign. So far, they have managed only a temporary reprieve. The political mediators called for a 12-month cooling-off period during which the collection will be studied and various options for its final disposition discussed. Berg, who describes himself as a political realist, believes that the most significant remains will be preserved. But it is likely he believes, that the government will permit the burial of a large part of the collection.

So far aboriginal leaders have shown little sympathy for the scientists' point of view or for their work, an attitude that has more than a little historical justification. Nineteenth-century anthropologists used skulls removed from aboriginal burial grounds to support the notion that aborigines

were an inferior race. An 1895 issue of the *Australasian Anthropological Journal*, for instance, carried an article claiming that once aborigines pass puberty "the sutures of the cranium begin to consolidate, and the development of the brain ceases to develop as it does in other races."

In addition, aboriginal graves were sometimes robbed without any scientific purpose at all. One particularly egregious example occurred with the death of Tugernin, an elderly aboriginal woman who died in 1876. Although her skeleton had no anthropological value, it was exhumed from the earth and displayed at the Tasmanian State Museum. Not until 1978 did public protests finally force museum officials to return her bones.

Ironically, anthropology has also played an important part in creating more favorable attitudes toward aboriginal culture among both whites and aborigines. Although the first white colonists considered aborigines to be Stone Age primitives, cultural artifacts unearthed by anthropologists have shown that the aboriginal way of life was particularly well suited to the harsh Australian environment. The aborigines of the eighteenth century, anthropologists have revealed, not only had thriving commercial networks and medicines; they were also excellent hunters who probably ate better, and more regularly than the average European of the time.

Despite these image-enhancing discoveries, aborigines continue to view anthropology as a vestige of colonial exploitation. As Wayne Anderson, an aboriginal-research officer in the prehistory department of Victoria's La Trobe University, puts it: "It's the relationship between the two groups that puts them at odds with each other. One are the students, the other, the studied."

Anthropologists have clearly underestimated the resentment of aborigines and are now trying to demonstrate the relevance of their research to aboriginal life and welfare. Their science depends on their success. In the current climate of confrontation, it is possible that aborigines, in an attempt to gain control of their cultural heritage, may succeed instead in burying much of it forever. **CD**



Who owns the bones? Scientists or aborigines?

SPACE TOURISTS

SPACE

By Owen Davies

The vacation merchants are tapping into the ultimate dream: a holiday in space. "Perhaps it is your goal to be among the pioneers in space tourism," the brochure reads. "If so, your time has come." The Seattle-based Society Expeditions, a firm that packages luxury tours of the Amazon, Antarctica, New Guinea, and other exotic regions, has set a target date of October 12, 1999—500 years after Columbus discovered the New World—for its first flight.

One analyst has said that the tourism business could become the largest and fastest growing industry in space. William Brown, of the Hudson Institute, the think tank founded by the late Herman Kahn, delivered a report to NASA called "Space Ventures and Society: A Long-Term Projection." In it, he weighed such factors as population growth, rising incomes and leisure time, and falling launch costs to estimate the number of tourists traveling to space each year for the next century. Within the next 15 years, he believes, that figure could top 800 per year. In the most optimistic scenario, the figure could reach

100,000 travelers a year by 2025.

T. C. Swartz, executive director of Society Expeditions, is even more optimistic: "We hope to take at least ten thousand people a year into space by the year 2000," he says. His itinerary is a 12-hour flight—up, around the earth, and down again. Eventually, the company would like to offer three-day excursions that include "assessing space experts and astronauts in conducting scientific experiments."

Key to Swartz's plans is an add-on passenger module to be carried in the shuttle's cargo bay. Society Expeditions has not announced details of its module, but four designs that have been suggested by various companies give a good idea of what may be possible.

- In 1976 Rockwell International, under contract to NASA, designed a module carrying 50 to 80 passengers in airline-style seats. The largest version would have required a "stretched" shuttle. The estimated cost was some \$200 million in 1976 currency, not counting any modifications made to the shuttle.

- Space Habitation Design Associates, of

Los Angeles, has proposed a module with six decks stacked in the shuttle bay so that passengers could simply walk onboard from catwalks added to the shuttle launch tower. Each deck carries 12 people, for a total of 70 passengers and two stewards. The seats would rotate for landing so that passengers would be upright at the end of the flight as well as at the start.

- Three years ago, Dean Jordan Taylor, of Planet Earth Productions in North York, a suburb of Toronto, suggested a 60-passenger module designed especially for brief tourist flights. Again, the shuttle would basically just orbit the earth and return. Taylor's was the first formal proposal on the topic of tourism that NASA received. But the plan has gone no further.

- John Spensor, a Los Angeles-based aerospace consultant, has made a preliminary design for a module based on SpaceLab. It would have two floors, with 20 passengers on one and 12 on the other. Two such modules would fit into the shuttle's cargo bay.

Adapting the existing SpaceLab design should cut development costs, according to Steve Duns, publisher of *SpaceNews*, a daily newsletter that sponsored a study on passenger modules. He says the 1976 Rockwell plan—with a projected price of \$200 million—would cost much more today. At this point, it could be as much as five hundred million, "he says. "We don't have a cost figure for a module based on SpaceLab, but it would certainly take less than two years and cost less than the Rockwell design."

Swartz offers another suggestion for cutting costs: Design a module constructed from airplane parts. "A five-hundred-million-dollar price tag is almost inevitable if you build something from scratch," he says. "Instead, look at the fuselage of a 737 airliner. They are made to operate at forty thousand feet. They're almost in a vacuum anyway at that altitude; it doesn't take much more to make it spaceworthy. We are only talking about a twelve-hour flight, so we don't have to worry about where they sleep or how they are going to take a shower."

Even with such budget-cutting measures, price remains a problem. "The cost of



Cosmic charter: a day trip in space, for the nominal fee of \$1 million

PLANET FANTASY

STARS

By Shendan Simon

My hobby is designing planets. Ordinarily this is the sort of avocation that could get most people sent to quiet places to recover. Fortunately, my cover identity as a mild-mannered physics professor at a small institution (Guilford College) in North Carolina protects me from such a fate.

For the last four years I've been performing a service for science-fiction writers: For a modest fee I provide them with scientifically accurate, custom-designed planets complete with unexpected environmental quirks to spur their creative powers.

One of the most popular requests has been for descriptions of planets around the Alpha Centauri system. A little more than four light-years away, it is the closest star system to our sun and one of the best known. Alpha Centauri is made up of three stars. The closest to us is Proxima. It is a red dwarf and is nearly a tenth of a light-year away from the other two Centauri stars, known simply as A and B.

For the sake of simplicity, let's assume that our imaginary habitable planet is very similar to Earth. In other words, suppose

we magically teleported Earth to an orbit around A or B. If we do that, we also know the distance it should be from the star in order to be the right Earth-like temperature. Because A is slightly brighter, larger, and hotter than our sun, a habitable planet like ours would have to be farther from A than we are from our sun. This would mean a larger orbit and a year about four months longer than ours.

The situation of a planet orbiting B would be a little different. Because B is less massive than our sun and a little cooler and dimmer as well, a planet like ours would have to be closer to B than we are to our sun. Its orbit and its year would be about seven Earth months long.

From B's planet, the A star would be the most imposing object in the sky, next to B itself. Even at its farthest distance away, the A star would be visible as a tiny, intensely bright disc, casting as much light as 600 full moons—bright enough to read by. It would be visible even during the planet's day, after B had risen. When A was at its closest point to B, roughly every 80 years, it would be so bright it might be perceived as

a sun. Then it would beam down as much light as nearly 6,000 full moons.

Sunrise on the planet would be an ambiguous affair. For a short time each year there would be two suns, A and B, very near each other in the sky. If the orbits were right, the two stars might go into a stellar eclipse, with the more distant A sliding behind the closer B. Both stars would rise and set at nearly the same time.

Over the year, A would gradually separate from B, and eventually the two stars would be opposite each other in the sky. There would be a continual day. As B set, a lesser light, A, would rise, bringing with it its own day. True night would occur only when both stars were down, a fourth of the year.

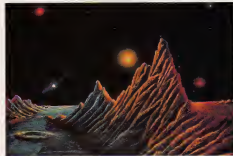
Nights on the planet would be like our twilight, only without the long shadows. If the planet's plants were evolved for this environment, very unearthly conditions could result. With the added light in the sky, plants might photosynthesize all the time instead of just part of the daytime, as they do here. That could lead to significant differences in the planet itself. If there were continual photosynthesis, the planet might be richer in oxygen than the earth is.

Aside from the local environment of one planet, a particularly intriguing facet of Alpha Centauri is that each star might have a habitable planet orbiting it. A planet of A would be clearly visible to one of B after A-set and before A-rise. Similarly, B's planet could be seen from any planets in orbit around A.

The two fictitious planets would be solar system-scale distances apart. Something like a Pioneer or a Voyager probe would find it easy to carry a message from one star to another. If the inhabitants of the two planets were intelligent, technologically advanced, and as ambitious as we Earthlings are, there might be all sorts of interesting possibilities—which is where science leaves off and science fiction begins.

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CONTINUUM

HOW TO BUILD A CREATIVE SCIENTIST

Remember the Solides? Remember the free-wheeling schools that are produced—you know, bend invariant rules for brilliant oddballs, we are all Leonardos and so on? Presumably, such institutions have all gone the way of tie-dyed shirts and Moby Grape black-light posters, destroyed by Egghair's counterevolutionary second thoughts. Except for one: the College of Creative Studies (CCS), founded back in 1967 by Marvin Mudnick, the Hiate phonics University of California at Santa Barbara (UCSB). English professor who pioneered student-led seminars, noncompetition (no grades), and a take-it any way-you-want-it curriculum.

The school's record of distinguished science and mathematics graduates, plus prime gallery artists and band-setting composers, suggests that despite its quasi-fake tie and California location—CCS is an autonomous part of the Tahir-like UCSB—it offers far more than metaphysical motorcycle maintenance.

The way "Creatives" are produced by UCSB biologist Ian Rose is the clearest example of CCS philosophy. "I will often give a seventeen-year-old freshman an unsolvable problem, like, What is the chemistry behind aging? Most scientists agree that humans should live to be one hundred and ten, so why don't they? the immune system? the nervous system? an X factor? How do you design an experiment to find out? Why do even the Nobel laureates know so little about it? After a few years of that kind of thinking, the student is ready to work in any lab in the world. I want my students to be professionally competent biologists by the time they receive their bachelor's degrees—many years before the doctorate—and I don't care how they get there," Rose explains.

David Ciemniak, professor of physics, adds another wrinkle to the CCS method. "As early as the first meeting or two with a new CCS student, I might ask that he or she figure out how to measure the surface tension of water—and I forbid looking it up in the library. We want to stimulate the kind of originality that the professional physicist has to use every day."

Max L. Wassa, the mathematician who helped design the original CCS curricula and is now its chief academic officer, puts it another way: "On the very first day I tell students I don't teach content. I teach them the language of math [sets, Peano's postulates for the natural numbers], its art and spirit. CCS is a trade school, a master-and-apprentice shop."

And Bruce Rickborn, a former CCS organic-chemistry professor now at UCSB, took his Creatives out into the field the last day: "We gathered leaves, sap, lichens, and so forth, then went back to the lab where I showed them how to isolate, identify and purify the compounds. And within two quarters, these freshmen were as good as juniors and seniors."

The man who spawned this all, the caustic Professor Mudnick, served as provost of CCS until his still-contested firing of last year. Mudnick, it seems, had a habit of referring to other educators as "mediocre" and "incompetent." ("Marvin doesn't really mean it," says one admirer; "he's just practicing his craft.") Regardless of the Mudnick nondiplomacy, potentially hostile UCSB investigators concluded that his no-grade, no-sequence, nonpunitive, early-research approach has produced hundreds of able professionals. In its 18 years, nearly 85 percent of CCS mathematicians and scientists have gone on to graduate school—many to the Harvard-Princeton-Berkeley-Caltech class of university (which some Creatives have written of as being no better than CCS).

Headliner graduates include Mohan Putha, who published 12 professional papers in mathematics journals by the time he was a CCS sophomore, and twenty-six-year-old Alex Filippenko, who in 1985 (as a Berkeley astrophysicist) not only published subtle evidence that the Milky Way and many other galaxies evolved from quasars but also discovered an entirely new type of exploding star, an oxygen-rich supernova. Then there's Timothy May, Silicon Valley's INTEL genius, who concluded that cosmic rays damage highly miniaturized microprocessor circuits and who then perfected new particle-proof designs; and Clowee Lwiza, composer of electronic music whose works were performed by the New Orleans Symphony while he was still a teenager. The College of Creative Studies also lays claim to mathematical analysts of obscure South Seas dialects, advisors to French symphony orchestras, and adolescent founders of software companies—these are Marvin Mudnick's Creatives.

While CCS has produced fewer than 700 graduates, more than 300 of them have written testimonial letters endorsing CCS as a unique educational experience. "The CCS annual budget is only about seven hundred thousand dollars," notes biologist Ian Rose. "We've shown we can produce a better can of beans cheaper than any other university."—WILLIAM K. STUCKEY



CONTINUUM



Both men and women find distorted images of themselves

PERFECT MEN, INSECURE WOMEN

Men tend to view their own bodies as perfect, but females generally dissatisfied with themselves, mistakenly believe that men want them over-girl thin.

These are the findings of a recent survey of almost 500 college students, according to the *Journal of Abnormal Psychology*.

"Men prefer women considerably heavier than women think men like them, so the women make themselves miserable by shooting for a target that is thinner than the men actually like," psychologist Paul Rozin of the University of Pennsylvania

says. He and psychiatrist April Fallon, of the Medical College of Pennsylvania, conducted the survey.

Participants, when shown sketches of bodies that ranged from skinnier to fat, chose the one they thought resembled their own body, the one they would like to look like (that is, their ideal body weight), and the one most attractive to the opposite sex. Men, viewing themselves as perfect, tended to pick the same body for each selection, but women generally indicated their body was heavier than their ideal and that even their ideal was fuller than men wanted.

Yet men, when asked to select the most attractive body for the opposite sex, chose a more ample female form than the women thought they liked. And the women chose a heavier male than the men thought they liked.

"Although both males and females have a distorted view of what the opposite sex likes," Rozin says, "the males are content because they think females like them just the way they are."

The dissatisfaction women feel toward their own bodies, Rozin and Fallon suggest, is likely related to the much higher incidence of such eating disorders as anorexia nervosa and bulimia in women — Eric Mishara.

"Time is a great teacher, but unfortunately it kills all its pupils."

—Hector Berlioz

"A little inaccuracy saves a world of explanation."

—C. E. Ayles

HALF A BRAIN

The hallowed seat of our intellect, that quivering lump of gray matter crowned by the skull, may not be so indispensable after all. Some people can get along fine with only half a brain.

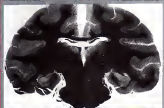
Harry Whitaker, research director of the Neuropsychiatric Institute, in Fargo, North Dakota, and Maureen Dennis of the Hospital for Sick Children, in Toronto, examined school-age youngsters who had an entire cerebral hemisphere removed shortly after birth because of screaming epileptic seizures associated with Sturge-Weber syndrome, a rare congenital disease. When tested, the investigators discovered that these children had normal IQ's. Apart from having lost fine motor control on one side of their bodies, reports Whitaker, "they seem well adjusted. They have sufficient control of their movements to get around unaided, and they are also in the appropriate grade for

their age at school."

To be sure, there are some subtle differences between the brain-damaged children and normal youngsters. Whitaker and Dennis found that children lacking the left cerebral hemisphere usually associated with language capability, sometimes had trouble understanding sentences with complex grammar. And children missing the right cerebral hemisphere may struggle with difficult visual-spatial tasks. "But you have to be looking for these deficits," says Whitaker. "They don't show up in ordinary day-to-day activities." By contrast, even the tiniest brain lesion in an adult can lead to total paralysis or rob the victim of language and personal history. So how can children overcome neurological damage that would be devastating to someone older?

"These kids," declares Whitaker, "are testimony to the tremendous plasticity of the young nervous system."

—Kathleen McAuliffe



The human brain: Neurological damage that would be devastating to an adult may interrupt the normal development of a child.



Aborigines are complaining about the black mist of 53

ABORIGINAL FALLOUT

On October 16 1953 say the aborigines of the Yankurijana tribe, a "black mist" swept across the desolate Australian outback and descended upon them, causing vomiting and skin rashes and killing vegetation. At the time the backward aborigines believed the event to be supernatural. They've since learned that a ten-kiloton British A-bomb was detonated just 100 miles away that day, at the remote Emu testing range.

"We're now saying the black mist was a concentrated fallout cloud that proceeded from the bomb site," explains biologist

Andrew Collett, attorney for 4,000 aborigines (including the Yankurijana) who lived in the vicinity of British A-bomb blasts during the Fifties. These tests, he says, "were conducted" almost universally without regard for the existence or special needs of the aboriginal communities around the sites.

The British government, though, claims all 12 of its Australian A-bomb tests were perfectly safe, and the aborigines, who have few medical records, have found it difficult to prove a heightened incidence of deaths and disease.

But a special commission appointed—after public pressure—by the Australian government is now investigating the matter. Testimony has been given by scientists, by the British, by former servicemen who say they were contaminated while participating in the tests, and by the aborigines themselves.

As soon as the findings of the commission are public, Collett says, his aborigine clients will press their legal grievances accordingly. Some with health problems such as cancer or blindness want financial compensation; others want a cleanup of the radioactivity said to contaminate their tribal lands, and many want exhaustive medical tests to determine any unknown aftereffects of the fallout. —Eric Mishara

"You can only see a thing well when you know in advance what is going to happen."

—John Tyndal

BAKING BRICKS ON THE MOON

Microwaves, like those generated in a kitchen microwave oven, could someday be used to cook lunar dust into building blocks for the construction of a moon base, say researchers at Los Alamos National Laboratory, in New Mexico.

Using such a kitchen microwave oven, Los Alamos research engineers Tom Meek and Rodger Blake melted volcanic ash at 2500°F so that it solidified into a tough, concrete-like block. Volcanic ash—actually the chemical compound alkali metal—is almost identical to the lunar dust that covers the moon's surface.

The basic difference between the two materials, Meek says, "is that the lunar dust, because it has been bombarded with high-energy particles for millions of years, is highly activated, so we expect it to couple to microwave radiation more efficiently and to work even

better than the material we've been using."

Lunar dust could be cooked in fewer than five minutes, he says, perhaps in big microwave kilns set up on the moon or by a "remotely operated lunar rover" with a whole bank of microwave generators on it, that drives over the moon's surface, heating the lunar dust. The hardened surface could then be cut into building blocks or used as a road.

The energy source to generate the microwaves would likely be the sun, Meek says, with large quantities of solar panels manufactured right on the moon from the mineral ilmenite, an iron-titanium compound in abundance there. "Solar power could be converted into huge amounts of electricity for making microwaves," he says. "Or whatever else you want." —Eric Mishara

"I love being a writer. What I can't stand is the paperwork."

—Peter de Vries



Volcanic cinders (shown with coin for scale) can be melted and baked into tough, concrete-like blocks in microwave ovens.

CONTINUUM

PSYCHIATRIC IMPOSTOR

A twenty-four-year-old West German mailman, who envied the lofty social status of doctors, forged medical papers to wrangle himself a job as a psychiatrist, then had two dozen patients committed to mental institutions before he was exposed as a fraud.

"They didn't catch me on a medical blunder," boasts Gert Postel, the exposed impostor. "I believe I made decisions that were just as good as any of the psychiatrists I worked with."

Posing as Dr. Clemens Bartholczyk, hotshot thirty-year-old psychiatrist, Postel was appointed deputy health officer of Flensburg, West Germany. He was in charge of a team of doctors and rendered psychiatric opinions as to whether patients should be legally committed to mental institutions.

"I used a lot of complicated

medical jargon that nobody understood," says Postel, who also sought advice from legitimate doctors and referred to medical texts to compensate for his professional inadequacies and lack of medical and psychiatric knowledge.

"He was very thorough in his examinations," Dr. Wolfgang Wedarg, Postel's former medical chief, says, "and we were content with his work." But six months into the job Postel lost his wallet, and police suspicions were aroused when they found it contained two sets of conflicting identification. Last December he was convicted and sentenced to mere probation, despite a previous fine for posing as a doctor on another occasion.

There is a bright side to the story, however. Of the two dozen patients Postel institutionalized, only two have been deemed competent and have been released.

—Eric Mahars



Jack Nicholson as a mental patient in *One Flew Over the Cuckoo's Nest*. In Germany, two patients were erroneously committed.

HARASSING GRIZZLIES

Wyoming biologists want to harness grizzly bears. They plan to bop the bears with rubber bullets, zap them with electric shocks, offend their sensibilities with ghetto blasters, and subject them to repellents, unpleasant tastes, and smells.

It's all part of a plan to save the big bears' lives by teaching them that humans are an unpleasant lot to be avoided at all costs.

Larry Roop, bear expert with the Wyoming Game and Fish Department, explains that grizzlies presently associate humans with food and respond by nesting camps and garbage dumps. The object of the new study is to alter bear behavior by teaching the bears to associate humans with pain and noise.

Dale Strickland, chief Wyoming game warden, says the idea is to inflict adverse conditioning upon the bears when they encounter humans instead of rewarding them with food.

Humans come into contact with grizzlies around campgrounds, dumpsters, or lodges. Roop says that in the past 15 years grizzly bears have killed 11 people and seriously hurt many others. Difficult bears and repeat garbage raiders got a death sentence. The problem facing wildlife managers is how to avoid human-bear confrontations when you're dealing with an animal that has no apparent fear of humans.

Biologist Roop hopes that entire bear populations will



Garbage receptacles can be fatal attractions for bears.

learn that meeting Joe Homo sapiens is unpleasant. Ultimately, this information might be passed on to other bears in the wild so that grizzlies, like other big-game animals, will flee from humans.

—Charles Rushing

"Nature is by and large to be found out of doors, a location where, if cannot be argued, there are never enough comfortable chairs."

—Fran Lebowitz

"Welcome thy neighbor to thy fallout shelter. He'll come in handy if you run out of food."

—Dean McLaughlin

"More things are possible in a 4-D world than in a 3-D world. To a person in a 4-D world, the going-on in a 3-D world looks as flat and confined as the action on a movie screen looks to us."

—Michael Guillen

"If I had read as many books as other men, I should have been as ignorant as they are."

—Thomas Hobbes

FINGERPRINTING MICROBES

Ever since Pasteur found penicillin in a bread mold, scientists have hoped for the kind of happy accident that can be the mother of invention. A scientist may now be on the verge of earning a fortune owing to one such accident.

It happened to Dr. Robert Silman of St. Bartholomew's Hospital in London. Silman was doing electrophoresis—a process in which proteins are separated into bands on a gel by an electrical charge—when he noticed some bands he had never seen before. The experiment was ruined. He had accidentally contaminated his proteins with bacteria. But when he looked again he noticed something remarkable. Each bacterium made its own pattern of bands, patterns as unique as fingerprints.

The result after two years of development: a computer-

ized device that identifies bacteria and other microorganisms faster and more accurately than any previous method.

To use the device, called the Microbiology ID System, you put a sample of unknown cells into a vial and add a radioactive label. The mixture then goes into the electrophoresis unit, which separates the material into weakly radioactive bands. Then it goes to a special radiation counter where a computer matches the bands to any of scores of microorganisms. The whole process takes a few hours. With conventional means, it might take a week.

It has applications in hospitals, the food industry anywhere you need to identify a source of infection," says Lynn Nye, of the Automated Microbiology Systems Corporation, the San Diego firm that produces the system. It could also be used to fingerprint new forms of biotechnology—an inval-

uable tool in experiments with new microorganisms. Each unit, which has so far been approved for all but hospital uses, is expected to cost about \$40,000.

—Douglas Starr

"The more worthless the manuscript, the greater the fear of plagiarism."

—Sir Stanley Unwin

"When you wake up in the morning and nothing hurts, you can be sure you're dead."

—Herbert Achtembusch

TALKING DRYER

"Wake up, dryer!" Donald Vander Moen blithely shouts in his lab at the Whirlpool Corporation.

"Hi, I am ready," the dryer responds, and the front door pops open. Vander Moen deposits his wash.

"Please check lint filter," the dryer reminds him. Vander Moen closes the door.

"Please select drying cycle," Vander Moen replies obediently. "Permanent press." And in a few seconds the cybernetic dryer begins to spin.

The laboratory prototype is part of the appliance maker's practice of seeing how new technologies could make household chores easier. The effort has produced some practical results from dryers that sense moisture to refrigerators that carefully monitor their internal temperatures. Now Whirlpool may have produced the ultimate in home aids: a clothes dryer that listens, talks, and obeys.



Most people don't want to listen to their appliances.

The heart of the machine is a 16-bit microcomputer coupled with an off-the-shelf voice-recognition and synthesizer package. Vander Moen connected the system to microphones, speakers and electronic circuitry within the dryer. Then he modified the software to accept only two-word initial commands with two-second pauses between the words. "We did that," he explains, "to prevent the dryer from responding to random talk."

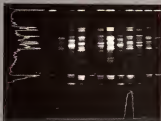
The result is a recently patented system that Vander Moen says works without a hitch. But Whirlpool has no plans to produce the talking dryer because early market research shows the public won't buy it.

"Most people feel self-conscious talking to a machine," says Vander Moen, "and not many want the machine to talk back."

—Douglas Starr

"Newton became not so much the name of a man as the name of an ineluctable world outlook."

—J.W.N. Sullivan



"Fingerprints" of a bacterium. Dr. Silman's precise results in a pattern that resembles a supermarket bar code.

CONTINUUM



George Burns and friends pull off a heist. One expert claims that increasing numbers of senior citizens are turning to crime.

SENIOR MUGGERS

A scene in a recent movie, in which George Burns, in his twilight years, wears a Groucho Marx mask and robs a bank, may be an entertaining life. So says Steven Egger, forty-three, an ex-cop and doctoral fellow in criminal justice at Sam Houston State University, in Huntsville, Texas. He speculates that we may be in for a senior citizen crime wave.

The elderly may still be well behaved today. Egger says, but because of poverty and fear they're likely to become a sizable criminal group in coming years. By 2000, there will be more than 30 million Americans over sixty-five, he points out. Reduced incomes will probably have changed their attitudes for the worse. He says fearful senior citizens will fight back against shabby government treatment and victimization by muggers and confidence men.

"I hesitate to use the word vigilante. But I project that

as inflation clobbers their fixed incomes, and with the feeling that the criminal-justice system is not very responsive to older Americans, they will take the law into their own hands and strike back at the system."

In fact, as inflation strides their Social Security, pension, and savings checks, senior citizens may turn predatory to survive, he speculates.

To back his contention, Egger points to the ballooning numbers of older (over fifty-five-year-old) adults arrested for such crimes as shoplifting, in Miami and Tampa.

Does this mean we can expect to meet graying in her tennis shoes in a dark alley? "I am not saying that they will be necessarily mugging people. I'm saying we are going to have older offenders perpetrating violent crimes of a vigilante nature or, like Bernhard Goetz, lashing out at people who look as if they are preying on older citizens."

—Anthony Livessidge

DRUG CLOCK

Forgot to take your medicine on time? A solid-state microelectronic timepiece built into the cap of a standard pharmaceutical vial can help you remember. The newly patented device, called CAP (Compliance Aid for Pharmacocauticals), is a reusable digital clock with liquid-crystal display to show the precise time, A.M. or P.M., and day of week the container was last opened.

It's a reminder system," says its inventor, Bert Zolitan, a Lederle Laboratories senior research engineer. "Every time the cap is removed, the time displayed automatically catches up to the correct time of day. That time then remains on display after the cap goes back on the vial."

CAP is designed to keep patients on schedule with prescription medications. The invention is aimed especially at the elderly, infirm, and chronically ill, many of whom are on multiple medications hard to keep track of.

Compliance with drug regimens is a major problem much greater than the public realizes, says Zolitan. A national survey showed that about 40 percent of the 1.4 billion prescriptions filled annually for Americans are not taken in accordance with proper dosage schedules. Result: Consumers waste money on drugs never taken; pharmacists and drug manufacturers lose revenues on prescriptions never filled; and physicians must unnecessarily attend to patients who deviated from medical

orders, only to get sicker.

CAP is outfitted with a tiny sensor based on the miniature microprocessor-controlled electronics of a typical digital watch—with a special twist. An electrical contact snaked through a partition in the timepiece touches a conductive membrane only when the cap is secured to the vial, creating an electrical short circuit that stops the clock display from advancing (although the clock itself, of course, continues keeping time).

Patients can take the device to the pharmacist to be placed on prescription containers. CAP can also be rigged with an alarm to signal when the next drug dosage is due. Zolitan has already sold several thousand units, is negotiating with various manufacturers for licensing rights, and expects CAP to come onto the market soon for about eight dollars.

—Robert Brody



A new drug cap tells when your last pill was taken.



Trump of the wild: The Puerto Rican white-lipped frog chases away other males and propositions the females by banging the ground.

THUMPING FROGS

A previously unknown form of animal communication thumping the ground, has been discovered by two California scientists.

The male white-lipped frog, indigenous to Puerto Rico, thumps its throat pouch against the ground each time it calls out. Resultant ground vibrations are detected up to 12 feet away by other white-lipped frogs.

"This frog is the world's most sensitive vertebrate with respect to detecting sub-sonic vibrations," says Peter Nanna, University of California at Los Angeles biologist and sensory physiologist.

Nanna, during a research expedition in a Puerto Rican rain forest, first noticed the white-lipped frogs' acute skittishness in response to vibrations from his slightest footstep. Upon observing the frogs more closely, he and fellow researcher Edwin Lewis, of the University of California at Berkeley, saw the male frogs thumping the

ground, and with special "geophones" heard the resultant ground vibrations. They reported their findings in the journal *Science*.

The male frogs thump Nanna explains, because at night the rain forest is filled with many noisy animal sounds. "The background noise in the air is very, very high," he says, "but in the ground it's very, very low. So these white-lipped frogs have exploited the ground as an open channel of communication."

The male frogs, Nanna says, probably thump to chase away males and to attract females.

"Females," he says, "use the thumping sounds as a kind of seismic epicenter to which they can localize."

—Eric Moshier

As long as there are postmen, life will have zest.

—William James

Think of death as a pie in the face from God.

—Jerry Nelson

BEAUTY VERSUS BRAINS

There's good news for nerds: creeps and four-eyed geeks. A new study by a pair of university psychologists shows once and for all that beauty and brains don't necessarily go together. In fact, says John McCullers of Oklahoma State University and James D. Moran II, of Virginia Polytechnic Institute, less attractive people tend to score higher on at least one standard intelligence test than do the belles and beaux of the ball.

McCullers and Moran selected yearbook photos of 320 students (160 of each sex) at a high school in central Oklahoma. Students at another school then selected the 40 most attractive and the 40 least attractive faces. When McCullers and Moran subsequently compared the scores of the two groups on the American College Test, they found that the plain students had outscored the pretty by an average of about 7.5 points.

McCullers admits to being surprised by the findings. "In previous social-psychology studies," he says, "attractive people were judged to be more intelligent." We thought there might be a self-fulfilling prophecy at work that people who were judged unattractive might take on some of the baggage of that judgment and see themselves as less intelligent as well, thus winding up with lower scores.

The two psychologists conclude that physical unattractiveness is a handicap

that can be overcome. "If you're not so attractive that you have a very active social life," says McCullers, "you may fill in the time by working harder on your schoolwork."

—Bill Lawren

"The temperature of our atmosphere decides that no liquid carbon shall be found on the face of the earth, but we do not suppose that the form of the diamond has been gradually achieved by a process of selection."

—William Bateson

"I suppose you could never prove to the mind of the most ingenious mollusk that such a creature as a whale was possible."

—Ralph Waldo Emerson

"Personally I'm interested in history, but not in the past. I'm interested in the next twenty-four hours."

—W. H. Auden



Beauty isn't always the key to high college test scores.

CONTINUUM



Real dragon: Lizard at San Diego Zoo relaxes on heated water bed covered with eighth-inch-thick, puncture-proof aluminum.

WATER BEDS FOR ANIMALS

Animals at the San Diego Zoo have been sleeping on trendy, comfortable heated water beds.

"Those beds are exactly the same as human water beds," says zoo research physiologist John Andy Phillips, the developer of the water beds. "except the mattresses are made of one-eighth-inch-thick aluminum so that the animals can't puncture them."

The water beds, he explains, appeal to the animals as secure nesting spots. So pregnant females give birth to their offspring on the beds, which give off heat that keeps the fragile newborn from catching cold and succumbing to hypothermia. And because the adult females feel so secure on the water beds, they don't go

str-crazy and kill their babies—a common problem that afflicts cage-confined zoo animals.

Among the animals using the beds, Phillips says, are small lizards (which sleep on minibeds measuring two feet by six inches each), monkeys, wild dogs, leopards, jaguars, and the giant 250-pound Komodo dragon (which sleeps on an eight-by-eight-foot model).

"The standard-size bed we use," Phillips says, "is two and a half by four feet."

To order a water bed for your animal, write to: General Manager, San Diego Zoo, Box 551, San Diego, California 92112.—Eric Mahara

"When insects take over the world we hope they will remember, with gratitude, how we took them along on all our picnics."

—Bill Vaughn

SCIENCE-FICTION QUIZ NO. 6

Some science-fiction writers started their careers with a bang, a story that immediately attracted the attention of the readers. Others began more modestly with stories that are pretty much forgotten today. (And some, like me, started with a novel that I wish everyone would forget about!)

Given below are brief descriptions of five of the top authors in science fiction today. Can you tell who they are and what the titles of their very first published short stories were? Give yourself extra credit if you know when and where each story was originally published.

1 The "dean of American science fiction," famous for his *Future History* series and for novels ranging from tales of an alien invasion of Earth to the tribulations of a man bedeviled by God.

2 "The good doctor" who is known for his robots and lost scientific foundations.

3 A former talker and composer who invented a crazy wonderful season.

4 A novelist famous for dragons and, earlier, for a stamper that could sing grand operas.

5 A plasma physicist at the University of California at Irvine whose award-winning novel became the trademark for a publisher's line of science-fiction books.

—Ben Bova

ANSWERS

- 1 Robert A. Heinlein's first published story was "Life in the 19th Century," which appeared in the July 1939 issue of *Amazing Science Fiction*.
- 2 Isaac Asimov, "The Logical Possibility of Future Sentience," *Analogue*, March 1939.
- 3 Spider Robinson, "The Guy with the Eyes," *Science Fiction Review*, 1973.
- 4 Anne McCaffrey, "Firefall," *Science Fiction*, October 1959.
- 5 Gregory Benford, "Stand-In," *The Magazine of Fantasy and Science Fiction*, June 1955.



Imaginary dragon: Creatures such as this, as well as opera-singing stamper, helped make one novelist's reputation.

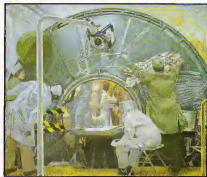
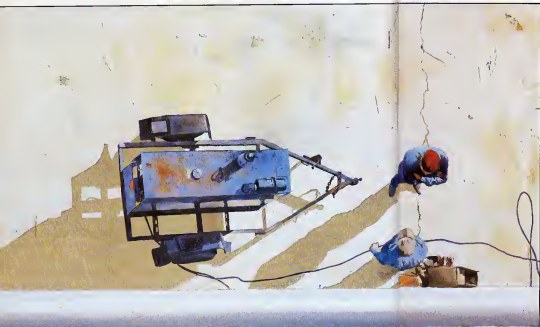
*They're making art out of space and
creating a renaissance of lofty proportions*

THE ARTRONAUTS

BY PHOEBE HOBAN

When shuttle flight 17 lifted off in October 1984, artist Joe McShane had reason to be excited. It had taken him seven years, \$60,000 of his own money, four file cabinets of correspondence with NASA, and the assistance of several technicians at General Motors to do it. But the world's first specially designed extraterrestrial artwork—McShane's brainchild—had finally made it into orbit. And with it had come a new age of artistic expression, potentially more cosmic than any before.

The stars have inspired artists throughout the ages, but so far firsthand experience of space has been limited to astronauts and scientists. NASA



The space program has inspired a museum's worth of art, including Kent R. Sullivan's portrayal of welders at work on the Challenger (left), Robert Schuchman's *After Touch-down* (top right), which shows the site where a day earlier a paved had watched the shuttle land, and Charles Schenck's painting of astronauts and technicians at work on Skylab (below), and retail artist Robert Rauschenberg's *Hot Shot* (top left).



Launches and landings of the space shuttles have inspired many paintings including Robert McCall's *Threshold* (above), which shows the launch of the shuttle *Challenger*, and Alfred McAdams's *Space Port* (top left), a pictorial parody of the launch of the *Columbia*. B. E. Johnson depicts a worker examining the shuttle after touchdown (top right). And Alvin Hildebrandt shows the drama of the first nighttime shuttle launch (right).

●A new age of artistic expression, potentially more cosmic than any before, has begun.●

however, has plans to change that. As Chel Jensen, an artist who has done paintings of space events for NASA, says, "It is time that those who can best communicate the wonders of spaceflight to the rest of the human race be allowed to do so." NASA also knows that the creative arts may be able to excite public interest. And that could well mean the difference between a well-funded space program and substantial cutbacks. As the saying goes, "No bucks, no buck Rogers."

Already the agency's "Get Away Special" (GAS) project has sparked the interest of numerous artists, who envision new forms. McShane's sculpture, for example, was designed to capture "outer space" inside a glass bubble. "The sculpture," says McShane, "is not the glass but the outer space contained within. This is my personal exploration of space." McShane's sculpture is a series of battery-operated, computer-con-



boiled glass bubbles, each containing electrical filaments coated with gold, silver and platinum. When heated, the filaments deposited a thin lining of precious metals inside the globes. The largest bubble was fitted with a metal valve that automatically opened during the shuttle's flight. "This work with its own onboard computer and power supply processed and created itself in orbit," says McShane, "but I see that as an extension of my eye and hand, a modern-day tool on the cutting edge of technology."

McShane may have been the first to see his project off the ground, but already some half-dozen other artists have booked GAS payloads. Since 1976 the GAS program has been available on a first-come, first-served basis to anyone in the free world who wants to put an experiment aboard the shuttle. The shuttle is designed as a cargo carrier for all sorts of payloads and has proved to be a successful commercial venture for NASA. The agency has signed on 606 GAS payloads submitted by everyone from science students to foreign governments. So far 39 have flown.

Artists who want to launch a GAS payload must provide NASA with a down payment and a description of their experiment. Regulations demand that the experiment cannot pose a danger to the astronauts or shuttle equipment; it must be self-contained and self-powered and cannot require the astronauts to perform more than three on and three off operations. The project must also satisfy NASA's umbrella definition of a "scientific" experiment, which means essentially that it must attempt to perform some basic scientific research.

If the project meets the requirements, the artist is assigned a payload number and given a NASA Payload Experiment Handbook as well as a list of other GAS participants. The \$3,000 fee buys the basic GAS payload, a 2.5-cubic-foot canister that can carry up to 60 pounds. A 100-pound canister is available for \$5,000, a 200-pound one costs \$10,000.

NASA had problems at first with the idea that artwork could qualify as basic science. But artist Joe Davis, a fellow at MIT's Center for Advanced Visual Studies, helped convince the agency that it was possible to design a piece of art that could be scientific research. Davis—who is a motorcycle aficionado—sold his Harley-Davidson to finance an art and science project he wanted NASA to take into orbit. After bombarding the agency with proposals and letters, he was finally given the go-ahead.

Davis's payload is called *New Wave Ruby Falls*, after the famous Tennessee tourist attraction, and is designed to produce artificial auroras. Davis plans to trigger the celestial light show with an electron gun, a power supply, a sequencer and cameras packed in a \$10,000 GAS canister. When the electron gun fires, it will send streams of electrons spooling along the earth's magnetic field and into the atmosphere. As the electrons encounter atmospheric gases of sufficient density those gases will orbit and

produce visible light. Each column of light will be about "the size of fifteen full moons stacked up," Davis says, and will shimmer in the atmosphere just a fraction of a second before disappearing.

Davis is also working out the details for another GAS payload, called *Light Flight*. He recently created an Earth-based artwork in which lasers and machine tools were instructed—by remote control—to carve simple runes on the faces of boulders. (Davis was 1,000 miles from the site and controlled the machines through a telephone hookup.) His goal is to design similar "boulders" that would be capable of imprinting patterns on lunar seas and the deserts of Mars.

Not every artist interested in exploring the possibilities of space has the desire or ability to satisfy NASA's science requirements. In fact, the agency has received so many unusual proposals that last year it created the "nonscientific payload program" to field the increasing number of unconventional experiments proposed by artists and other

● Davis is a motorcycle aficionado who sold his Harley-Davidson to finance an art and science project that he wanted NASA to carry into orbit. ●

"nonscientists." "Of course the shuttle's primary purpose is for research, defense, and economic development," says Tony Mauli, a member of NASA's payload evaluation committee. "But if we have leftover room on-board, it makes good sense to make it available for other purposes, including art."

The "nonscientific payload" is like a first-class seat on the shuttle. It costs more—\$1,600 a pound plus a \$1,000 processing fee—but you don't have to prove the project has scientific value. The only restrictions: The payload cannot be ejected into orbit and it cannot be dangerous, vulgar or purely for promotional purposes. [NASA has already been burned once. In 1971 Dutch artist Paul Van Hoydonck sent a small figure to the moon on Apollo 15. Called the *Fallen Ape*, it was reproduced and sold in quantity on Earth as the *First Art on the Moon*.]

We've gotten some wild requests," Mauli reports. A Detroit carmaker, for instance, wanted to use the shuttle to send its latest model into space as an advertising ploy. Another request came from a group that suggested using the shuttle to ferry moral reforms or literary aches, to a peaceful rising orbit. (A commercial rocket venture

with a similar mission has recently been established.) Even late-night comic David Letterman was intrigued by the possibilities of the shuttle. He worked out a comedy act that he wanted to tape in orbit, involving a number of sight gags. In one routine a little green man was to appear at the shuttle window. Although NASA officials thought the gags were funny, they didn't feel they were appropriate for the cockpit. Letterman's mission was turned down. "Still, we're pleased as punch that people are as excited as we are about space," says Mauli.

Lowry Burgess, a Cambridge, Massachusetts-based conceptual artist affiliated with MIT's Center for Advanced Visual Studies, is the first artist to sign on the new program—and to have his "nonscientific" project approved. Surely Burgess's slightly wacky and convoluted *Boundless Aperture* piece must have been the ultimate lemons test for the nuts-and-bolts-oriented NASA staff. "They couldn't make heads or tails of it," says Mauli, who helped explain the proposal in simpler (if still rather obscure) terms.

Burgess's work (accepted but not yet scheduled) is a five-inch cube made of bronze-filled transparent glass, which contains water distilled from 18 of the world's rivers, including the Nile, the Amazon, the Ganges, and the Mississippi. Dissolved or suspended in the water will be minute quantities of each of the elements in the periodic table or a substitute for those too dangerous to include. Also within the water will be a second smaller cube filled with "holograms of nothingness." [Burgess plans to make the holograms by exposing film to laser light but without bouncing the light off an object. This will create a blank hologram.] When the project has returned to Earth, it will be embedded in a gigantic piece of petrified sycamore and placed near an ancient, sandy pond close to both Walden Pond and the artist's home in Lincoln, Massachusetts. Burgess, a professor of art at Massachusetts College of Art in Boston, thinks the message of his piece is clear: It is a plea for peace. Art can play a big part in taking a shot at war wars," he says.

The GAS program, though, is only one form of artistic expression NASA's own elite corp of space artists has been lobbying to send an artist up with the shuttle. Most of NASA's artists express no interest in the GAS program. Some couldn't even comprehend the concept of sending unaccompanied art objects into space. But they do see a need for artistic interpretation of the space experience. "Why should we be chained to the launchpad?" laments Chet Jezebski, who painted his first space work at the age of fifteen and gave it to John Glenn in a Washington ceremony in 1982. "We are not just another special-interest group seeking a junket at the taxpayers' expense."

Indeed, artists have been employed by NASA since 1962 to record the history of space exploration. Over the years, the corps participants have ranged from Robert McCall, whose space murals decorate the Smithsonian's Air and Space Museum, in

CONTINUED ON PAGE 74



FICTION

*When the time came, he
could access her, as she had
been, fresher than memory*

SNOW

BY JOHN CROWLEY

I don't think George would ever have got one for himself. She was at once unsentimental and a wife in awe of death. No, it was her first husband—an immensely rich and (from George's description) a strangely weepy guy who had got it for her. Or for himself, actually, of course. He was to be the beneficiary.

Only he died himself shortly after it was installed. If installed is the right word. After he died, George got rid of most of what she'd inherited from him. He sold it. It was cash that she had liked best about that marriage anyway, but the Weep couldn't really be got rid of. George ignored it. In fact the thing really was

PAINTING BY HUBERT KRETZSCHMAR

about the size of a wasp of the largest kind, and it had the same busy and mindless flight. And of course it really was a bug, not of the insect kind but of the surveillance kind. And so its name fit all around: one of those bits of accidental poetry the world generates without thinking. O Death, where is thy sting?

George ignored it but it was hard to avoid; you had to be a little careful around it, it followed George at a variable distance, depending on her moods and the numbers of other people around her: the level of light, and the tone of her voice. And there was always the danger you might shut it in a door or knock it down with a tennis racket.

It cost a fortune (if you count the access and the perpetual-care contract, all prepaid) and though it wasn't really fragile, it made you nervous.

It wasn't recording all the time. There had to be a certain amount of light, though not much. Darkness shut it off. And then sometimes it would get lost. Once when we hadn't seen it hovering around for a while, I opened a closet door, and it flew out, unchanged. It went off looking for her humming softly. It must have been shut in there for days.

Eventually I ran out, or down. A lot could go wrong, I suppose, with circuits that small, controlling that many functions. It ended up spending a lot of time bumping gently against the bedroom ceiling, over and over, like a winter fly. Then one day the maid swept it out from under the bureau, a hulk. By that time it had transmitted at least eight thousand hours (eight thousand was the minimum guarantee) of George's life days and hours, her comings in and her goings out, her speech and motion, her living self—all on film, taking up need to no room, at The Park. And then, when the time came, you could go there to The Park, say on a Sunday afternoon, and in quiet landscaped surroundings (as The Park described it) you would find her personal resting chamber; and there, in privacy, through the miracle of modern information storage and retrieval systems, you could access her her alive, as she was in every way, never changing or growing any older, fresher (as The Park's brochure said) than in memory ever green.

I married George for her money, the same reason she married her first, the one who took out The Park's contract for her. She married me, I think, for my books, she always had a taste for books in men. I wanted to write. I made a calculation that more women than men make, and decided that to be supported and paid for by a rich wife would give me freedom to do so, to "develop." The calculation worked out no better for me than it does for most women who make it. I earned a typewriter and a case of miscellaneous paper from Boca to Gstaad to Bali to London, and typed on beaches, and learned to ski. George lived me in ski clothes.

Now that those looks are all but gone, I can look back on myself as a young hunk and see that I was in a way a pretty, a type that you run into often among women, far less among men, the beauty unaware of his

beauty, aware that he affects women profoundly and more or less instantly but doesn't know why, thinks he is being listened to and understood, that his soul is being seen, when all that's being seen is long-lashed eyes and a strong, square, tanned wrist turning in a lovely gesture, stubbing out a cigarette. Confusing. By the time I figured out why I had for so long been indulged and cared for and listened to, why I was listening, I wasn't as interested as I had been. At about the same time I realized I wasn't a writer at all. George's investment stopped looking as good to her, and my calculation had ceased to add up, only by that time I had come, pretty unexpectedly, to love George a lot, and she just as unexpectedly had come to love and need me too, as much as she needed anybody. We never really parted, even though when she died I hadn't seen her for years. Phone calls, at dawn or four a.m. because she never, for all her travel, really grasped that the world turns and cocktail hour travels around with it. She was a crazy, useful,

•She cherished things and lost them and forgot them things, days, people. She had fun, though, and I had fun with her. That was her talent and her destiny. •

happy woman, without a trace of malice or permanence or ambition in her—all easily pleased and easily bored and strangely serene despite the hectic pace she kept up. She cherished things and lost them and forgot them things, days, people. She had fun, though, and I had fun with her, that was her talent and her destiny, not always an easy one. Once, hung over in a New York hotel watching a sudden snowfall out the window, she said to me, "Charlie, I'm going to die of fun."

And she did. Snow-falling in Austria, she was among the first to get one of those snow leopard's silent beasts as fast as speedboats. Alfredo called me in California to tell me, but with the distance and his accent and his eagerness to tell me he wasn't to blame, I never grasped the details. I was still her husband, her closest relative, her to the little she still had and beneficiary too of The Park's access concept. Fortunately, The Park's services included collecting her from the morgue in Gstaad and installing her in her chamber at The Park's California unit. Beyond signing papers and taking delivery when George arrived by freight ship at Van Nuys, there was nothing for me to do.

The Park's representative was solicitous and made sure I understood how to go about accessing George, but I wasn't listening. I am only a child of my time. I suppose. Everything about death, the fact of it, the fate of the remains, and the situation of the living faced with it, seems grotesque to me, embarrassing, useless. And everything done about it only makes it more grotesque, more useless. Someone I loved is dead, let me therefore dress in clown's clothes, talk backwards, and buy expensive machinery to make up for it. I went back to L.A.

A year or more later the contents of some size deposit boxes of George's arrived from the lawyer's: some bonds and such stuff and a small steel case, velvet lined, that contained a key, a key deeply notched on both sides and headed with smooth plastic, like the key to an expensive car.

Why did I go to The Park that last time? Mostly because I had forgotten about it. Getting that key in the mail was like coming across a pile of old snapshots you hadn't cared to look at; when they were new but which after they have aged come to contain the past, as they did not contain the present. I was curious.

I understood very well that The Park and its access concept were very probably only another cruel joke on the rich, preserving the illusion that they can buy what can't be bought, like the cynics had of thirty years ago. Once in Ibiza, George and I met a German couple who also had a contract with The Park, their Wasp hovered over them like a Phrelole and made them self-conscious in the scheme—they seemed to be constantly rehearsing the eternal show being skyped up for their descendants. Their deaths had taken over their lives, as though they were pharaohs. Did they, George wondered, exclude the Wasp from their bedroom? Or did its presence there stir them to greater efforts, proofs of undying love and admirable vigor for the unborn to see?

No, death wasn't to be cheated that way, any more than by pyramids, by masses said in perpetuity. It wasn't George saved from death that I would find. But there were eight thousand hours of her life with me, genuine hours, stored there more carefully than they could be in my porous memory. George hadn't excluded the Wasp from her bedroom, our bedroom, and she who had never performed for anybody could not have conceived of performing for it. And there would be me, too, undoubtedly caught unintentionally by the Wasp's attention. Out of those thousands of hours there would be hundreds of myself and myself had just then begun to be problematic to me, something that had to be figured out, something about which evidence had to be gathered and weighed. I was thirty-eight years old.

That summer, then, I borrowed a Highway Access Permit (the old Happy cards of those days) from a county lawyer I know and drove the coast highway up to where The Park was, at the end of a pretty beach road, all alone above the sea. It looked from the outside like

the best, most peaceful kind of Italian cemetery: a low stucco wall topped with urns amid cypresses, an arched gate in the center. A small brass plaque on the gate: PLEASE USE YOUR KEY. The gate opened, not to a square of shaped tombstones but onto a ramped corridor going down. The cemetery wall was an illusion, the works were underground. Silence, or near-silent Muzak like silence: solitude—either the necessary technicians were discreetly hidden or none were needed. Certainly the access concept turned out to be simplicity itself: in operation anyway. Even I, who am an idiot about information technology, could tell that The Wasp was genuine state-of-the-art stuff, but what we mourners got was as ordinary as home movies: as old letters tied up in ribbon.

A display screen near the entrance told me down which corridor to find George, and my key let me into a small screening room where there was a moderate-size TV monitor, two comfortable chairs, and dark walls of chocolate-brown carpeting. The sweet-sad Muzak George herself was evidently somewhere in the vicinity, in the wall or under the floor; they weren't specific about the chameleons' repertory of the place. In the control panel I below the TV were a keyhole for my key and two bars: Access and Wait. I sat, feeling foolish and a little afraid, too, made more uncomfortable by being so deliberately soothed by neutral furnishings and sober tools. I imagined, around me, down other corridors, in other chambers, others

continued with their dead as I was about to do, that the dead were murmuring to them beneath the stream of Muzak that they wept to see and hear as I might, but I could hear nothing. I turned my key in its slot, and the screen lit up. The dim lights dimmed further, and the Muzak ceased. I pushed Access obviously the first step. No doubt all these procedures had been explained to me long ago at the dock when George in her aluminum box was being off-loaded, and I hadn't listened. And on the screen she turned to look at me—only not at me, though I started and drew breath—at the Wasp that watched her. She was in mid-sentence mid-gesture. Where? Where? Or put it on the same card with the others, she said, turning away. Someone said something, George answered, and stood up: the Wasp panning and moving ecstatically with her, like an amateur with a home-video camera. A white room, sunlight, wicker. Ibiza. George wore a cotton blouse, open, from a table she picked up later, paused some on her hand, and rubbed it across her beeked breastbone. The meaningless conversation about putting something on a card went on, ceased. I watched the room, wondering what year, what season I had stumbled into. George pulled off her shirt—her small round breasts topped with large, childlike nipples, that's breasts she still had at forty: shock, delicacy. And she went out onto the balcony, the Wasp following, blinded by sun, adjusting. If you want to do it that way some-

one said. The someone crossed the screen, a brown blur naked. It was me, George said. Oh, look, hummingbirds.

She watched them, rapt, and the Wasp crept close to her cropped blond head, rapt too, and I watched her watch. She turned away, raised her elbows on the balustrade. I couldn't remember this day. How should I? One of hundreds of thousands. She looked out to the bright sea, wearing her sleepwalking face, mouth partly open, and absently stroked her breast with her oiled hand. An indolent glitter among the lowers was the hummingbird.

Without really knowing what I did—I felt hungry suddenly, hungry for pastness, for more—I touched the recent bar. The balcony in Ibiza vanished, the screen glowed empty. I touched Access.

At last there was darkness, a murmur, then a dark bank moved away from before the Wasp's eye, and a dim scene of people resolved itself. Jump. Other people or the same people, a party? Jump. Apparently the Wasp was turning itself on and off according to the changes in light levels here, wherever here was. George in a dark dress having her cigarette lit: brief flares of the lighter. She said, Thanks, Jump. A foyer or hotel lounge. Here? The Wasp jerkily sought for her among people coming and going, it couldn't make a movie, establishing shots, cutaways—it could only doggedly follow George, like a jealous husband, seeing nothing else. This was frustrating. I pushed recent Access. George brushed her teeth, somewhere, somewhere.

I understood, after one or two more of these feeble leaps. Access was random. There was no way to dial up a year, a day, a scene. The Park had supplied no program, none, the eight thousand hours weren't tied at all; they were a jumble, like a lunatic's memory, like a deck of shuffled cards. I had supposed, without thinking about it, that they would begin at the beginning and go on till they reached the end. Why didn't they?

I also understood something else. If access was truly random, if I truly had no control, then I had lost as good as forever those scenes I had seen. Odds were on the order of eight thousand to one (more? far more? probabilities are opaque to me) that I would never light on them again by pressing this bar. I felt a pang of loss for that afternoon in Ibiza. It was doubly gone now. I sat before the empty screen, afraid to touch Access again, afraid of what I would lose.

I shut down the machine (the light level in the room rose, the Muzak pouted softly back in) and went out into the halls, back to the display screen in the entranceway. The list of names slowly greenly rolled over like the list of departing flights at an airport. Code numbers were missing from beside many indicating perhaps that they weren't yet in residence, only awaited in the Os, three names, and directors—hidden among them as though he were only another of the dead. A chamber number. I went to find it and went in. The director looked more like a janitor or a night watchman, the same staid type you



"After spending 2.8 billion dollars and eight years on this project, I've forgotten what the hell we were trying to find out."



1990'S DESIGNER BEASTS

Science is tinkering
with the roster
of species, creating a
utopian stable
of hybrid animals

BY BILL LAWREN

It takes only a glance to see something weird about Oliver. There's the quizzical face, the protruding nose, the small soft chin, and prominent ears the head, strikingly bold, and the upright, splay-footed stall. Indeed, though Oliver has the long arms and heavy coat of a chimpanzee standing there, sipping his RC, he looks like a back-alley denizen on Red Street blues.

And therein lies the fascination. There's no scientific reason, says his owner, geneticist and animal trainer Ken De Coo, why you couldn't have a chimp-human hybrid. The chimp is genetically much more related to man than he is to other apes.

In fact, the first chimps taken out of the wild were roared on milk. De Coo is quick to point out that there is no scientific evidence for a human component to Oliver's physical characteristics.

No one has yet studied his blood proteins, comparatively enough to establish his true nature and origins. Oh, there was the Japanese actress who offered to "lay" with Oliver as a sort of ultimate limit, says De Coo. (But what would that prove? There's nothing unusual about humans copulating with animals; they've been doing it all through history.)

Whether Oliver is truly a hybrid mixture of man and ape (De Coo pretends to see him as a chimp with an interesting mutation), he is a striking symbol of a quest that has intrigued mankind since the dawn of time: the search for the chimera, for the melding of two disparate animals into one.

PAINTING BY
BRALD BRALDS

•The quest for the chimera began hundreds of thousands of years ago, when man began to domesticate wild animals. •



best. Never completely satisfied with the gifts of nature, man has subjected the roster of species to a seemingly endless series of tinkering, creating hybrid combinations of everything from horse and donkey to lion and tiger. And now, given recent developments in genetics and embryo transfer, the future may hold not only an exciting menagerie of hybrid animals, but also a collection of entirely new species built one gene at a time.

The quest for the chimera may have had its beginnings hundreds of thousands of years ago, when man first began to domesticate wild animals. Kurt Benirschke, research director of the San Diego Zoo and an acknowledged expert on hybridization, thinks that the earliest efforts may have focused on dogs.

"I imagine," he says, "that at some point early man found some wolf cubs, raised them on the bottle or the equivalent, and domesticated them. Then his may have migrated somewhere else where the wild dogs or wolves looked different to him. He may have captured and interbred them with his domesticated dogs out of necessity—to keep the population going when there were no breeders available—or out of pure curiosity to see what the offspring would look like."

Thousands of years later, this same curiosity led some enterprising farmer in Asia Minor to ask what would happen if he interbred a donkey and a horse. The result, of



course, was nothing less than the indomitable mule, one of hybridization's most spectacular success stories. As the first mule colt grew to maturity, its human "engineer" must have seen that the animal combined the best traits of both its progenitors: the strength and size of the horse combined with the patience, surefootedness, and remarkable stamina of the donkey. From that point on, the man with the mule had an ongoing advantage over his fellow farmer, and the notion of hybrid vigor or heterosis was born.

The obvious advantage of heterosis, so beautifully embodied in the mule, inspired generations of farmer-breeders to carry on the quest. In the Middle East, the one-humped desert dromedary was crossed with his mountain cousin, the two-humped Bactrian camel, to produce a pack animal that

could travel well in either hot or cold climate. In Indonesia, colonizing Indian sailors interbred zebu cattle with native Baliang oxen to produce the Madura, which became not only one of the world's closest and most useful cattle breeds but undoubtedly the fastest. (Madura cattle can run as fast as the average horse. In fact, the island of Madura is still the site of what may be the world's only annual cow races.)

There is little record of further hybrid experimentation in farm animals until the late nineteenth century, by which time the torch seems to have passed from Europe and Asia to the United States. There it came to rest in the hands of an unlikely crusader by the name of C. E. Beal: a Jones, a Southwestern rancher and renowned buffalo hunter who, by his own admission, had killed thousands of North American beaver. Jones ultimately grew intrigued by the hardness of his prey. From 1885 to the first decade of the twentieth century, he dedicated himself to the creation of the beafalo, a hybrid of cow and beaver that, he thought, would become a "race of cattle equal, if not superior, to all ruminant heritages known."

Jones never succeeded. But his work inspired a latter-day quester—Montana rancher Jim Burnett—to try his hand. In 1958, intent on succeeding where Jones had failed, Burnett captured a beaver bull with 100 of his best cows. Four years later, after a disheartening series of failures and stillbirths, Burnett was finally presented with his first live hybrid calves. In the ensuing 20-odd years, Burnett and other enterprising breeders have built up a lively trade in beafalo, complete with shows, contests and auctions all supervised by a national breeding association based in Louisiana.

Today, with the beafalo taking its place in the American commercial marketplace, the restless search for the chimera continues. A recent series of experiments at Utah State University successfully crossed domestic sheep—which are easy to handle but whose meat is palatable only when the animals are young—with such temperamental but decidedly tastier wild varieties as the American bighorn, the European mouflon, and the Middle Eastern argali.

In Israel, researchers at the University of Tel Aviv have hybridized the hardy but inedible Sinai desert goat with the tender ibex, producing an ideal desert livestock animal called the yaker. In Australia, University of Monash animal physiologist Roger Short is conducting experiments with hybrids between wild and domestic geese, hoping to create a breed with the intractability of the domestic bird and the rapid growth characteristics of its wild cousins.

Undoubtedly one of the most interesting

A combination of a bison and a cow, called the beafalo, is shown at top left. Center column: a computer-generated hybrid of a lion and a lamb.

recent experiments involves a unique partnership between Texas A&M animal geneticist Ned Kieffer and his longtime neighbor rancher Bert Wheeler. It all started back in 1974, when Wheeler—a multimillionaire landowner with a gambler's flair and a penchant for exotic animals—acquired a 1,400-pound Banteng bull named Buddy. Thinking there was absolutely no possibility of interbreeding, Wheeler decided to have the bull pastured with a group of Chandrae cattle on a section of his 10,000-acre spread near Enderly, Texas.

The next spring Wheeler's ranch manager noticed a group of calves whose faces were remarkably like those of the fieriest, claw-toothed cow gleefully on the faces of the other cattle. Knowing that resistance to insects and parasites was a salient trait of the Banteng, the manager put two and two together: The calves must have been the product of the Chandrae cattle and Buddy, the Banteng. The manager informed Wheeler, who in turn called his old friend Kieffer. "Wheeler was very excited," Kieffer recalls. "He thought he might have a viable new breed with commercial potential."

Kieffer tended to agree. He knew that in addition to its resistance to parasites, the Banteng grew fast and gave less, flavorful meat without requiring much feed other than pure pasture. In those days of oil embargoes and escalating feed costs, these traits looked especially attractive.

Over the next ten years, Kieffer and Wheeler set out to breed a herd of

crosses between Banteng and various breeds of domestic cattle, artificially inseminating the cows with Buddy's semen.

Today a herd of about 100 Banteng cows roams over Wheeler's sprawling ranch, sharing space with an exotic assortment of imported wildboars, Asian deer and African gazelles. Ongoing measurements of the Banteng cows have shown that Kieffer and Wheeler were essentially right. Though slightly lighter than domestic cattle, the hybrids—which have the slanted eyes of the Banteng combined with the coloring of various domestic breeds—give meat that is just as tasty as standard beef but with significantly less fat.

But a crucial problem remains. The re-

searchers have been unable to breed a fertile male, the rare and treasured sign of a viable new species. Looking into the problem, Kieffer has recently found that his hybrid bulls have lowered levels of testosterone. Apparently, he notes, "mixing the genomes renders something hormonally amiss. It seems as if the animals are not producing enough hormone to precipitate the production of sperm."

The solution, Kieffer now believes, is reducing the percent of Banteng genes. If the animal is mostly one species, he explains, it may begin to exhibit the "homological purity" of the normal, domestic male. Toward that end, he has recently begun to back-cross hybrid heifers with male Banteng.

Deli, India, when a circus unveiled an unprecedented new animal act. The performers included not only the expert trainers and a group of lions and tigers but three hybrid offspring, complete with short, black-and-white and the dark brown stripes of a tiger. The male parent, an Indian lion, had been captured earlier in the Gr forest, the only region in Asia where lions still survive in the wild. The circus managers immediately caged him with a mature tigress, whom the proud lion steadfastly ignored. Only after three frustrating years did a mating finally take place. Months later the circus celebrated the birth of three hybrid ligers.

Intigued by the ligers, the Calcutta Zoo decided to take the experiment one step fur-

ther. Zoo staff first crossed a female Indian lion with a male tiger, producing a hybrid liger. Then they decided to cross a female tiger and a male liger, a union that engendered a second-generation hybrid dubbed, not surprisingly, the tigon.

The male tigon named Cubancan is now a living testament to the decline of hybrid vigor. In fact, he is so much bigger and more ornate than his parents, confesses zoo director A. K. Das, that he has been "too uncooperative to weigh." Das is considering housing future ligers released in Indian wildlife sanctuaries where, given their obvious genetic endowments, they would have an excellent chance of competing successfully enough to become a new—albeit entirely human-engineered—species.

Despite the Calcutta breeders' success, the site of the chimera quest is increasingly passing from zoos—which are now more interested in preserving existing species than in creating new ones—to scientific laboratories. There researchers are using sophisticated new hybridization techniques to probe some of the more mysterious secrets of reproduction itself. At England's Cambridge University animal scientist Steen Wiltschko is conducting a massive program that he hopes will shed light on the organization and early development of mammalian embryos.

As part of that effort, graduate student Claire Fahaly recently embarked on a novel experiment. First she removed the inner membranes of a number of sheep ova. She

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"We found some viable sperm in the male hybrids that were one-fourth Banteng and one-eighth Banteng," he explains. "But we didn't find enough of these sperm to call the animals fertile. I really hope we'll finally reach that point when the Banteng component is one-sixteenth."

From the y-axis to the Banteng, all these farm-oriented experiments have had a common goal: the production of hybrid animals that would be bigger, work harder or taste better than their parents. But while farmers and agribusinesses pursue these practical objectives, others are carrying on the chimera quest out of pure scientific curiosity.

One of the most spectacular products of the impulse surfaced a while back in New

then replaced those membranes with blastomeres—the first group of preembryonic cells formed after the fertilization of an egg—from goats. These hybrid ova combined to form composite embryos, which were cultured through the first stages of development and later implanted in the wombs of female goats.

After five months of suspenseful waiting, the researchers performed a cesarean section on the first of the pioneering parents. When the kid was extracted, Willadsen recalls, "we could tell immediately that there was something very strange going on. The kid had patches of goat hair in some places and patches of wool in others. It looked like a combination of sheep and goat." Blood-protein tests soon confirmed what scientists had observed with their own eyes: The kid was in fact a chimera, a living, breathing incorporation of two entirely different animal species. Inevitably, the spectacular amalgam was dubbed the gop.

Encouraged by this resounding success, Willadsen went on to attempt an even more radical experiment. Using similar methods, he combined embryos from even more disparate species: the sheep and the cow. When implanted in sheep mothers, some of the hybrid embryos did indeed develop to term, and a few of those resulted in live births. Willadsen says that all the babies born so far look at first glance like normal lambs. "But in a few cases," he notes, "they've shown blocks of cowlike coloring—a white sheep, for example, whose embryo was coupled with a black cow, produced a lamb with black spots." Recent laboratory tests have shown that while the blood proteins taken from these animals were all decidedly sheeplike, other bodily tissues have in fact been a definite combination of sheep and cow.

Compared to the gross hi-or-mies breeding techniques that have been used in the past, Willadsen's methods represent a clear breakthrough in the direction of precision and elegance. But even if his work does lead to the production of hybrid animals with attractive combinations of traits—a sheep, say, whose meat retains the felting tenderness of beef—the process itself is still subject to the vagaries of gene recombination and will

probably remain somewhat difficult to control. Perhaps more promising is a recent and unusual collaboration among American geneticists, whose work may ultimately enable us to construct new superanimals, gene by desirable gene.

The goal of the collaboration, which involves researchers from the University of Washington, the University of Pennsylvania, and the Salk Institute for Biological Studies in La Jolla, California, has been nothing less than interspecific gene transfer: the expression of one animal's characteristics in the body of another. Specifically, the researchers wanted to see whether growth-hormone genes from the rat could be transferred to and expressed in ordinary laboratory mice

some 80 percent bigger than the norm. Obviously, the inserted genes had taken hold of the cellular machinery and begun to churn out proteins of their own.

Since that experiment, which was reported late in 1982, Brinster and Evans have created giant mice with growth-hormone genes from no less a mammal than Homo sapiens. Although his own goals are limited to the scientific investigation of the recombination process, Evans nonetheless sees a broad and glowing practical future for this radical new form of test-tube gene-by-gene hybridization.

"The technique," he says, "could be incredibly powerful in manipulating traits that are under the control of a single gene. For

example, you could increase milk production by manipulating the gene for the pituitary hormone prolactin. Fat and muscle disposition could be controlled by manipulating the gene for growth hormone, which could be used to make, say, a leaner animal. In fact," he says, "if you could identify hormones that were responsible for tranquility, you could possibly even produce an animal that was more docile."

In secret experiments around the country, agricultural companies and research laboratories are applying these gene-hybridization techniques to the ultimate undertaking—the search for the perfect beast. "I know of no domestic animals that are in fact growing larger because of this approach," Evans says, "but it is being attempted, and it's only a matter of time."

San Diego's Bernitschke agrees. "In another ten to twenty years," he says, "we'll know where the genetic qualities we want are located on the animal's chromosomes, and we'll be able to introduce the genes that will make for better animals."

The prospects are exciting indeed. Imagine, for example, a backyard full of low-fat cows, edible ewes and sweetheart stallions. Imagine the Secretariat of the future: a 70-mile-per-hour thoroughbred, turbo-boosted with the speed genes of a cheetah. Picture an experiment that is already the subject of serious discussion: the hybridization of animal and plant genes to produce meat bushes and cheese trees.

For that matter, picture Oliver... ☐

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In other words, would genes for rat hormones make mice grow?

First, Salk's Ronald Evans isolated and cloned the gene itself. Then, using a mouse DNA sequence known as a promoter which acts as a sort of trigger for genetic activity, Ralph Brinster, of the University of Pennsylvania, and Richard Palmiter, of the University of Washington, fused the promoter sequence to the rat growth-hormone genes. The hybridized genes were then injected into 170 mouse eggs.

When the mice were born, it was quickly obvious that the experiment had been a smashing success. The young mice grew three times faster than their unaltered siblings, and one grew to be a veritable giant,



Millennia from now, humans will
hear our warning, conveyed in the cold language of the

STONE SENTRY

BY CAROLE DOUGLIS

The year is 4085.
On a broad, sage-
studded plain in
what had been the
western United
States of America,
250 monoliths
stake out a 32-
square-mile rec-
tangle. Inside are dozens of arid
hills, each ringed by more towering
monuments. Photographs and Old Era
warnings etched into these huge stone
slabs warn of danger and demand that
people not dig into the mounds. The
monoliths and their messages date
from the time, two millennia ago, when
humans were still obtaining energy
from splitting atoms and developing
weapons by processing plutonium.
Within the bounds of the giant slabs,
beneath the hillocks, acres of radio-
active earth have been turned to black
glass, and tanks containing millions of
gallons of deadly radioactive sludge
lie in earthen crypts.

Local residents shun the area, be-
lieving it to be cursed, but outsiders
consider the enormous memorial one
of the wonders of the Old Era, how-
ever, they bring eager tourists daily. The
monuments' builders washed these
stones to "speak" for at least another
8,000 years, while the lethal and mu-
tagenic substances they warn of
slowly exhaust themselves.

Radioactive waste has been piling
up since the dawn of the nuclear age,
five decades ago. Some nuclear
waste, called low level, takes up to 300
years for most of its radioactivity to
decay. But the most potent remains,
high-level wastes that include the
spent fuel from power plants, could
stay radioactively "hot"—more poten-
tially toxic than naturally occurring
uranium ore—up to 3 million years.



Temporary stor-
age pools in place
at the nation's 58
operational com-
mercial nuclear
power plants house
nearly 11,000 tons
of spent fuel await-
ing permanent

disposal. Facilities in Idaho, South
Carolina, and Washington State col-
lectively shelter more than 65 million
gallons of high-level defense wastes
in temporary containers, one of which
has leaked part of its lethal contents
into the ground.

Once the waste is entombed for
eternity, how do we warn future gen-
erations of its potential danger? Signs
faint, documents crumble, buildings
fall, languages change, places are
forgotten. Ten thousand years ago,
small groups of nomads were just be-
ginning to learn agriculture. Life 10,000
years into the future may be radically
different from what we know today.
How do we communicate with hu-
mans who may have little concept of
the world of 1985 and its symbols?

If the recommendations of commis-
sions sponsored by the U.S. Depart-
ment of Energy (DOE) become reality,
300 generations of our descendants
will hear our message, spoken in the
silent language of monoliths.

The unprecedented challenge of
radioactive-waste disposal has often
stimulated unconventional proposals.
Although experts have suggested that
nuclear waste be shot into the ocean
floor or launched on a perpetual jour-
ney into deep space, the National
Waste Policy Act, signed into law in
1983, has committed the United States
to a land-based storage method on
our own continent. Spent fuel from
commercial nuclear reactors has been

PAINTINGS BY ERIC PAETZ

lated for permanent burial in tombs. Instead, deep rock or salt formations. About 70,000 tons of waste would be shrouded in steel canisters, then sealed in a catacomb of tunnels bored half a mile or more under the surface of the earth. The repository would spread over 2,000 subterranean acres. The last commercial burial ground, to be selected in 1987, will likely be in Washington State, Nevada, or Texas. It is scheduled to open in 1995 and shut—ostensibly for eternity—around the year 2050, when the facility will have lived to capacity.

Some high-level military waste, created primarily by processing plutonium for nuclear bombs, is scheduled for deep burial in New Mexico. But under a controversial new proposal yet to be approved by the government, some of the longest-lived wastes may be solidified in place where they are now stored or have leaked into the soil at the federally owned Hanford Nuclear Reservation in southeastern Washington State. These radioactive materials would be covered with a mere 20 feet of soil and stones.

Controversy still rages over where long-lived nuclear waste may best be buried. But if all goes as planners hope, a combination of natural and man-made barriers will see to it that neither tornado nor terrorist, flood nor war will disturb the sanctuaries of the nuclear genie's offspring for unimaginably far into the future.

Yet there remains one danger that even the most careful technology and planning cannot eradicate: the possibility that our own descendants may unwittingly release the lethal contents into the environment. Some experts consider the possibility of "human interference" the most significant hitch in long-term geologic disposal plans. One fear is that teams of prospectors thousands of years hence might puncture canisters kept in a deep underground repository. Evidence indicates that even small doses of radiation entail risk. And if, for example, future people were to breach a repository carved into salt, then mine the salt for public consumption, millions of people could eat contaminated salt. Perhaps more ominously, critics contend that there is no guarantee that underground water flows will not shift and carry to the surface some of the radioactivity that will likely leak from the canisters. If wastes are solidified in topical radioactive materials would be relatively close to the surface from the beginning.

As a first step in protecting humans from disturbing a nuclear-waste repository, the DoE set up the Human Interference Task Force in 1980. In effect, the goal of the committee, assembled by privately owned Battelle Memorial Institute (which was the prime contractor), was to determine how to influence people across a vast chain of time—people with unknown language, culture, and interests. To that end, the panel commissioned reports from experts in assorted fields ranging from linguistics to archaeology and anthropology to materials science. The task force mission accomplished: disbanded in 1984. According to Ginger King

a DoE spokesperson, "The basic finding is that means do exist for communicating across generations."

Federal law now requires nuclear waste specialists to implement, after waste repositories close, warning systems of the type the task force originally investigated, which include monoliths and written warnings. So researchers at the University of Washington and at Indiana University and nuclear planners involved with the Hanford restoration are working out the details of the DoE's recommendations. They are continuing to refine techniques for "deep-time" communication—sending explorations and requests into the almost inconceivable future.

Some of the suggestions made by the original task force proved impractical. One recommendation was to crutch the waste with a long-term stench. "I considered the possibility of a leak on the highway sign," says Thomas A. Sebeok, chairman of the Research Center for Language and Semiotic Studies at Indiana University. "But no stunk

levels there were already a few thousand years old, so I knew that things can be built to last long periods," Kaplan says. "It is a question of trying to analyze ancient monuments and incorporate the features that work into a contemporary marking system."

Kaplan tried to pry the secrets of longevity from a few monuments aged 1,000 to 5,000 years. These included Egyptian pyramids, the Acropolis, the Great Wall of China, the Serpent Mound of Ohio and Stonehenge. Each teaches lessons about monuments that were meant to defy time. The pyramids, for instance, have lasted 5,000 years partly because the material they were built from, stone, was not valuable enough to be carted away in great quantities. But Kaplan says, "The monument alone is not enough to provide meaning for later generations. You must have written records, too." Literature contemporary with the pyramids translated into later languages: clues historians in about the purpose of these monuments and who built them.

Twentieth century historians also know the purpose of the 2,400-year-old Acropolis because of documents composed in ancient Athens, not because of the buildings themselves. Acid rain has severely damaged the remains—a fact that Kaplan says demonstrates that the relatively soft stones of the Acropolis, limestone and marble, cannot tolerate 10,000 years of air pollution. The state of the monument also helped convince Kaplan that metals, while extremely durable, cannot be trusted as markers because they tend to be recycled for other uses, as were the original bronze shields and inscriptions on the Parthenon.

The Great Wall of China, built mainly of such small components as bricks, has required frequent upkeep during its 2,200-year history. Successive rulers took the trouble to maintain it because they recognized its value as a means of defense. While the U.S. government is anxious not to make demands on future generations for nuclear waste generated today, the example of the Great Wall indicates that, if future peoples think the markers are important, they may spend to upkeep. Again, literature related the purpose of the Great Wall through invasions and changes of government to the present day. Impressive as the survival of the wall and its recorded history is, the two millennia that they span are but a fraction of the time that high-level nuclear waste will remain hazardous.

The ancient Serpent Mound of Ohio provides an example of what not to do, Kaplan says. The Serpent Mound, a 1,254-foot-long earthenwork, looks like a snake uncoiling. There is an oval shape near its open mouth, and the mound can best be seen from the sky. Experts speculate that it may have been a religious symbol. But no one really knows what it meant to its creators because no documentation about it exists. "It lies in the dark, the Serpent Mound shows that earthenworks do survive, but that's about the best you can say for it," Kaplan adds.

Based on lessons from antiquity, Kaplan derived a basic formula for a deep time

How do you
talk to the future? Signs
rust, documents
crumble, buildings fail,
languages change.
Yet the markers for nuclear
waste must warn
300 future generations.

glands will last for thousand years." He also pondered the use of human genetic engineering. "Since DNA is designed to carry hereditary information, I see no reason why, in principle, it couldn't be used to transmit other types of information, too. Maybe a thousand years from now you could use microautography to encode warnings about nuclear substances into genes."

The DoE found that the most viable plan was a long-lasting marker system at nuclear-deposit areas, coupled with in-depth information that would be easily available off site. But researchers could find no precedent for trying to contact members of civilizations of the distant future.

Nevertheless, the distant past unexpectedly yielded the most promising prospects. Maureen F. Kaplan, archaeologist, waste-management expert, and statistician at Analysis and Inference Inc., near Boston, was a consultant to the DoE panel. She recently helped planners at Rockwell Hanford Operations, one of the DoE's contractors, devise a scheme for issuing an eternal warning about the dangers of shallowly buried, long-lived radioactive waste.

As an archaeologist, I'd worked with ma-

For these insects, imitating
foliage is not just the sincerest form of flattery:
it's a matter of survival.



A NEW LEAF

BY SANDRA SINCLAIR

If you stand in the midst of an Amazonian rain forest—and are glued with the disconcerting eye of photographer Kjell Sandved—you could see screens straight out of *Alien* in Whodunnitland. You might see twigs shoot up and swoosh away. Leaves appear to come alive and flutter off into the sun. Flecks of bark seem to suddenly stir themselves, sprout wings and legs, and fly away on

an opportunistic breeze. The reason is that the rain forests of South America are where a fascinating breed of insect, the leaf mimic, thrives.

Complicated camouflage in the animal kingdom is a luxury only the quick or the deadly can afford. Most creatures have had to survive by staying out of the way of their natural enemies. For many creatures, that

PHOTOGRAPHS BY KJELL B. SANDEVED



means blending in with the environment as best they can.

Some undergo a simple color change—the technique adaptations of the chameleon or the summer-white cool change of the snowshoe rabbit, for example. Others are equipped at birth with shapes and colors that let them shade the border between reality and illusion.

The most spectacular example of the wild insect world is leaf mimicry. And the most talented leaf mimics can be found in the lush tropical undergrowth of the Southern Hemisphere.

The verisimilitude achieved by these insect impersonators is sometimes astounding. These are praying mantises that appear to be part of the debris on which they wait for their next meal to land, and caterpillars that arrange themselves on the stem of a plant like a decayed, dying twig.

But flying insects, especially moths, are the most abundant and gifted leaf impersonators. The simulation is nearly realistic. The *Nyctanassa* moth of the Amazon, for example, adopts the precise shape and hue of a freshly grown red leaf (inset, page 66). The Amazon pyralis moth (bottom right) is a walking, flying replica of a dead leaf, complete with faded brown coloration and withered, papery texture. Other insects, like the patterned katydid (at right on this page), do a more three-dimensional imitation of a mottled, highly damaged leaf. The markings are so complete that the wings even have what looks like a fine network of leaf veins running through them. Predators see them and, unaware, pass on.

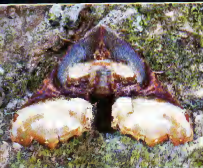
Some moths disguise themselves as patches of tree moss or lichen with crystalline drops of dew beaded on their surfaces. And nowhere is nature more phyllic and bizarre than in the creation of creatures like the Phryga moth, which looks exactly like a splash of bird droppings.

This mimicry is so true to life that ex-



Moths are, capriciously, talented mimics, able to imitate everything from the fiery foliage (top of the *Springalis* moth, boxes 66 and 67) and the dead-leaf effect of others (opposite page, and left) to a snow ball, branching look (top right). It is an ability shared by others in the world of Amazonian insects: like the patterned katydid (large photo, left), the *Chrysobothris* tree moth (top left), and the plant hopper (middle photo, above) miming a plant leaf.

Jungle insects are capable of duplicating almost any color in the palette of the animal. There are the earth tones of the Noctuidan moth (bottom) and the Geometridan moth (left photo right). And there are the more vivid colorations: the fly-like shown by the Heteropodinae moth (right) and the Geometridan specimen (left; middle), and the flecks of orange in the Lasiocampinae moth (far right), barely distinguishable from the bark background.



perienced naturalists searching for these creatures can pass within inches of a talented leaf mimic and not see it until it releases a moan.

These finely wrought reproductions are shaped by the forces of natural selection. Millions of years of evolution were at work here. We know that flying insects and flowering plants evolved at the same time in Earth's history. And their mutual interdependence is part of a symbiotic relationship almost as old as life itself.

While the relationship is unchanging, its expression is not. The purpose of this elaborate mimicry is survival, and ultimately that is what dictates the aesthetics of life as a leaf mimic.

We can get some idea of the flexibility of evolution from the saga of the peppered moths of England. For centuries these creatures were light gray in color, with a pattern of dark spots and stripes. This camouflaged subterfuge allowed the moth to blend in perfectly with the light bark of birch trees, so do the moths on these two pages.

When the Industrial Revolution made its debut in the English midlands during the nineteenth century, the peppered moth began to disappear. The reason was that the trees became darkened from factory soot, and the light-colored moths no longer blended with their surroundings. Deprived of their protective background coloration, they suddenly became fair game for hungry birds.

But certain individuals of the species were darker, and these more somber colored moths survived to produce offspring. And thus their offspring that came to be the dominant variety of that darker-hued species. Years later, as the effects of pollution dissipated, the birch trees reverted to their earlier, lighter tones. In symbiotic response, the delicately flecked, light-colored strain of peppered moths returned and once again were common in the English countryside. □

ARTRONAUTS

CONTINUED FROM PAGE 45

Washington, to famous innovators like Robert Rauschenberg, who has created at least 38 works about space. He even contributed to a piece of art that was carried to the moon by the Apollo 12 mission. Called Moon Museum, it was a small ceramic tile on which Rauschenberg drew a straight line, Andy Warhol drew a penis, Claes Oldenburg drew the image of Mickey Mouse, and John Chamberlain, Forrest Myers, and David Novick all drew geometric designs.

But for NASA art director Bob Schuman and his cadre of artists, the most important works of art will be produced when an artist makes the ascent into space. "I'm quite disappointed that a teacher is the next category in the Flight Participant program," he says. "NASA's next step should be to send an artist with an easel up there."

Toward that end, Jezewski submitted a comprehensive proposal to NASA officials outlining the role of artist as mission specialist. As part of the proposal, Jezewski designed a special zero-g palette and an extravehicular painting station that would allow an artist to paint within the confines of the shuttle or actually be tethered out in space. Velcro tabs would restrain brushes, pens and pencils; an enclosed mixing area would prevent tubed paints from squirting randomly into the zero-g environment; and a

small, hand-held vacuum would suck up excess liquid or dirty water. Jezewski says that the automated pressurized painting station would be attached to the manned maneuvering unit, the astronaut's rocket pack, for extravehicular work. He's done everything but build a working prototype. NASA's priorities, however, are scientific, not artistic. Jezewski's proposal was turned down.

Literary artists and musicians also see the importance of experiencing space firsthand. In 1983 James Prodigeon, a Seattle-based sculptor, circulated a questionnaire among 3,000 artists, writers, musicians and other members of the art community, canvassing their interest in an artist-in-space program on the manned space station. Shortly before the survey went out, Senator William Proxmire, of Wisconsin, gave a Golden Fleece award to NASA for its foray into the arts. He said that the agency's plans were a waste of money. Still, Prodigeon's questionnaire drew responses from more than 600 artists, including Doris Lessing, Isaac Asimov, Ken Kesey, and composer Steve Reich.

One of the most positive responses came from avant garde jazz composer Ornette Coleman, whose album to be released, "Saxes of America," album features a photograph of the Columbia shuttle, which he says served as inspiration for the album's music. Coleman believes that the dramatically different environment of space will influence the course of modern music. "Music is becoming

more technologically oriented," he wrote. "The interaction between sound and the new technology can lead to artistic and scientific breakthroughs."

In contrast to the gang-bro visual artists, writers have not contacted NASA. But in their replies to Prodigeon's questionnaire, they make a cogent argument that language itself may be the best medium for communicating the magic of space. "When I interpret the world to their readers," wrote science-fiction author Ursula LeGuin, "The chance to perceive firsthand in the space program means the chance to interpret and understand a frontier of modern life that has been closed to all but the experts. People are outside the rocket on the TV screen, inside it when they read about it."

Science-fiction star Isaac Asimov believes that the chance to experience space firsthand may also help artists—especially science-fiction writers—to develop their craft. "Science fiction writers have kept the dream of spaceflight alive for the general public through all the years when politicians and serious scientists have not given a damn," he explains. "When spaceflight becomes a common experience it will provide writers with new ideas, new knowledge, and new plots."

Author David Blavitt was more skeptical, however. The idea of sending writers into space, he writes, "suggests that NASA is either in desperate need of public support and funding or that it has money burning out of its ears that I would rather spend stupidly than return unprompted to Congress." Blavitt could think of only one sensible way the space program could benefit the arts. "All people who write or paint or dance or compose badly might well be sent up into space and left there," he writes.

But Annie Dillard, author of the best-selling book *Pilgrim at Tinker Creek*, places more importance on space-bound writers. They could, she believes, become NASA's best publicists. "As long as NASA depends on the public for support, it would do well to keep the public interested in the romance of space," she explains. "It is the romance, the adventure, the beauty, the novelty of using space that appeals to people. But it would be silly to send up a ballet dancer, abstract painter, or composer. Any feelings that artistic work could arouse would be based on fact, not on private, vaguely expressed feelings. We all want to know what space is like. But we want to learn what it is like from someone trained to communicate."

Those chosen as the first space communicators may do more to enlarge our concept of the universe than have all the earth-bound artists of the past. At the least, their presence will add depth to the space program. "If we don't go into space with all of our faculties, with the cognitive, intuitive part of our mind as well as the hard-edged, analytical part," explains Joe McShane, "we'll be going into space as half a species. If we don't make full use of our intellect and psychology, we'll end up polluting space the way we've polluted Earth." □

IT HAS BEEN SAID
OF THE ARTIST'S FLAIR FOR
COLOR THAT THE PAINTING
LITERALLY LEAPS OFF THE
WALL AT THE VIEWER....





This brilliant researcher and spokeswoman for interferon reveals some sober and hard-won truths about AIDS, the power politics of cancer, and the place of women in today's science

INTERVIEW

MATHILDE KRIM

Late one spring night in 1948, after everyone in the lab had gone home, the twenty-two-year-old graduate student sat down at one of the world's first electron microscopes to resume the search that had consumed her attention for weeks. As sparks danced like lightning between the machine's insulators, she focused the scope on the contents of a frog's egg. Moving in systematic, millonth-of-an-inch increments, she scanned for hours, finally arriving at a new area of the preparation. Suddenly a set of perfect double threads jumped into view—for the first time in history, neat bundles of DNA molecules had become accessible to the human eye. "I looked at them in ecstasy," recalls Mathilde Krim. "I knew I was hooked on science for the rest of my life."

It was a fortuitous addition. Since that time Krim's work has traveled across an impressively broad spectrum of microbiology, from the genetics of frog eggs to the virology of cancer and the immunology of AIDS. But perhaps Krim's best-known—and most controversial—work is her research with interferon, the antiviral

protein whose research history rivals the political career of Winston Churchill in about-faces and melodramatic ups and downs.

Discovered in 1957 by virologists Alick Isaacs and Jean Lindenmann, interferon was known to be produced by cells in response to a wide variety of viral infections, including mumps, herpes, and the common cold. And it was known to have antiviral properties. Krim and interferon first joined company in the early Seventies, when the Swiss-born researcher was investigating cancer-causing viruses at New York's Memorial Sloan-Kettering Institute for Cancer Research. She had been following interferon since the Sixties, when early animal studies had indicated that interferon could also suppress tumor growth.

In 1974 Swedish physician Hans Stander announced that interferon might have halted the recurrence of disease in a number of patients suffering from a highly malignant bone cancer. At this news, Krim never once to suppress her enthusiasm, kept to the foreground, pressing to establish an interferon laboratory at Sloan-

PHOTOGRAPH BY MALCOLM KIRK

Kettering and battling the National Institutes of Health (NIH) and the National Cancer Institute (NCI) to support interlaron research at labs around the country.

But interferon and Kim's advocacy of it soon became mired in controversy. Requiring a laborious isolation process from human blood cells, the substance was prohibitively expensive—up to \$500 for a single injection. Reports of noxious side effects began to mount: chills, fever, and loss of appetite. Preliminary results in some of the cancer trials at first were equivocal and generally disappointing. Worse, the findings of Strander's landmark study were questioned and ultimately discredited. Public confidence in interlarons' promise waned. The drug was held up by many as another example of a miracle cure turned mirage. For her enthusiasm, Kim herself was excoriated by scientists, including at least one former colleague.

Interlaron had in fact not disappeared, it was being studied quietly and laboriously. In 1980, at the University of Zurich, Charles Weissman managed to assemble the interlaron molecule by genetic engineering, pointing the way toward "biological factories" to manufacture the substance at affordable prices. Kim and other researchers, meanwhile, continued to experiment with interlaron, patiently accumulating the evidence necessary for FDA approval. And most recently, interlaron has indeed been found effective in the treatment of some forms of cancer—and other diseases.

As she waged her campaign for interlaron, Kim turned her energies in other directions. She continues to investigate relationships between viruses and cancer and has become increasingly prominent both as research scientist and public spokeswoman in the struggle against AIDS. Kim recently resigned from Sloan-Kettering to launch a new AIDS laboratory at New York's St. Luke's-Roosevelt Hospital.

Now fifty-nine, with her thick black hair drawn up in an elegant bun, Kim looks as much a classically trained musician or opera diva as a laboratory biologist. Married to Onon Peckman, chief executive Arthur Kim, she commutes between her home on Manhattan's Upper East Side, her lab, the nearby AIDS Medical Foundation (of which she is the chairman), and public appearances around the country. Frequent. Only contributor Bill Lawler last caught up with Kim while she was still operating out of a crackler-box office at Sloan-Kettering, with the sounds of Manhattan's traffic-choked First Avenue in the background.

Q: Some of interlaron's critics call it a "wonder drug in search of a disease." Do you agree?

K: Interlaron is a remarkable substance—very ordinary in chemical composition but fantastically active, as active as the most potent hormones. As little as one molecule of interlaron per cell can elicit a measurable effect. This is amazing. And interlaron does very important things. It induces

the expression of certain genes and suppresses the expression of others. It changes cell functions and makes cells resistant to various infections. For all these reasons, interlaron is a miracle molecule. From a substance this powerful and specific you would expect miraculous results in the clinic. Well, we haven't yet seen miracles. Because in biology there is always a yin and a yang—erect and countererect. There is an action, plus a feedback mechanism to suppress that action. To make interlarons really useful, we must enhance their action by suppressing feedback effects.

Q: Why did you first become interested in interlaron?

K: In 1970, I spent six months putting together a report on cancer research for a Senate panel. My work led me to realize that interlaron is a substance that can inhibit cell growth, reduce the growth of tumors, and modify some properties of the immune system in animals. Well, it struck me as being the wave of the future. I decided right then

“The rate of AIDS infection is much faster than the rate of people who develop the disease. Maybe next year, instead of one million people infected, it is going to be ten million.”

to go into that field, because although we knew very little at the time about interlarons, I was certain that a big push would come.

Q: Why were scientists initially skeptical about interlaron?

K: First of all, nobody believed that a biological substance whose structure was as ordinary and unimpressive as this little protein could be an effective antitumor agent. Only one study, Strander's, showed it at all likelihood to be effective against tumors. Or, if Strander's study was so impressive why was it discredited?

K: Strander was really unlucky. He was studying the bone tumor osteogenic sarcoma, a highly malignant tumor that strikes young people otherwise in good health. The diseased limbs are usually amputated immediately, but even so, tumors reappear elsewhere within a year in eighty percent of the cases. Strander took past amputees and gave them interlaron every day to see if the tumors' recurrence could be suppressed. After eighteen months he found fewer recurrences in the treated patients than in the control group. But this control group included people who had been amputated twenty years before and then followed to see

if their tumors recurred. Well, a few years after Strander began his trial it suddenly became apparent that this darn disease had changed. More recently for unknown reasons, the rate of recurrence became less than that of twenty years earlier. This invalidated the control and was really bad luck. So Strander had to develop a new contemporary control group. The trial is still going on, and it's holding up. They have fewer recurrences in patients treated with interlaron. But the circumstances of the earlier trial left a bad taste, and his results are not really considered solid evidence as yet.

Q: Were there other scientific objections to interlarons?

K: One quasi-scientific argument involved evidence from work in animals. It soon became clear that most mouse tumors are induced by—or at least carry—viral particles. We could see the particles in the electron microscope. Since interlaron is an antiviral, people said it works in mice because viruses are involved as tumor-inducing agents, but it won't work in humans because in human tumors viruses are not involved. Then there was the objection that interlarons are species specific. More interlarons work only on mice; human beings need human interlarons. The human animal is five thousand times larger than a mouse, so you need five thousand times as much interlaron. So you would need expensive tissue-culture systems producing enormous amounts of human interlaron, which you then had to purify and bottle. So before we could produce it cheaply by genetic engineering, producing interlaron for clinical trials was very expensive. Still, if spending five million dollars will accelerate cancer treatment by ten years, it is well worth it. But bureaucrats are not known for their daring.

Q: Why did you push so hard for interlaron in the face of all these objections?

K: By the late Sixties we already knew that to obtain an antitumor effect, we needed much less pure interlaron protein than the amount of any chemotherapeutic drug that could produce a similar effect. Convinced that interlaron was the most effective antitumor agent known, I couldn't understand why we weren't moving into clinical trials on humans.

Q: It's been charged that in promoting interlaron you used your personal charm and political skills to influence public opinion and the opinion of the funding agencies.

K: Sure. I used everything I could. Why not? But let me tell you what happened. You know the politics of science are fascinating—a little depressing but fascinating. In those days interlaron research was supported by the National Institute for Allergy and Infectious Diseases (NIAID). But they supported research only on the antiviral properties of interlaron, never anything that had to do with antitumor properties. So I tried to interest the National Cancer Institute (NCI), telling them that interlaron does two different things and that the NIAID was looking only at antiviral effects. The NIAID people didn't like it. They considered interlaron their

thing, and why should the NCI get mixed up in it? Well, the NCI was sympathetic and offered me a few thousand dollars to support a little workshop on interferon as an anti-tumor effect. But my little workshop turned out to be a tremendous meeting. There was a ferment at that meeting. It was absolutely catalytic. Ultimately the NCI decided it should support basic research on interferon. Orme: Even to your critics imply that you were acting irresponsibly as a scientist?

Krim: History will judge I had compared all the approaches to cancer treatment that were extant at those days, and I had come to the conclusion that interferon was at least as good as any other avenue we had and in the long run, probably better. I wanted the people at the NCI to see the evidence and come to their own conclusions.

Orme: Has interferon shown significant results in cancer treatment?

Krim: Certainly. First of all, alpha interferon is highly effective in most people with a form of cancer called hairy-cell leukemia. You give them interferon alone, at moderate doses, and the leukemia cells disappear. I will undoubtedly be the standard treatment from now on. There are several categories of lymphoma (tumors of the lymph nodes), each responding differently to different treatments. We can now say that while interferon alone is not as effective as some combination of drugs, it is at least as effective in treating lymphomas as any single drug. Also studies with myelogenous leukemia indicate interferon is effective. And soon interferon will be approved by the FDA for the treatment of melanoma. There the rate of response is only 10 percent to seventeen percent, which is rather dismal, but at least as good as the response to other treatments.

Orme: How does interferon work as an anti-tumor agent?

Krim: We can't make up our minds. Interferon is capable of doing all sorts of things to cells. In the case of hairy-cell leukemia, the interferon probably induces a differentiation in the leukemic cells so that they can grow and die following a normal life cycle instead of growing indefinitely. Lack of interferon seems to be the simple 'lock' preventing those cells from differentiating and functioning properly. But it may be that in this cancer, interferon is the missing factor. We now believe that for other tumors, a combination of interferon requires is relevant: the reduction of the tumor cells' growth rate, the induction of antigens that target the tumor cells for destruction by the host's own immune system, the activation of dormant enzymes, and the enhancement of the activity of the immune system's T cells. Endonucleases and natural killer cells that can selectively kill tumor cells.

Orme: Has interferon also been shown to be effective against viral diseases?

Krim: Amazingly, there's been little experimentation with interferon as an antiviral agent in humans. In some work on chronic active hepatitis interferon was found effective in as many as forty percent of the patients. Those people had been diseased for years and so



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were probably going to die of their disease. Then there's laryngeal papilloma, a benign tumor, probably due to a virus, occurring in the larynx, usually in children between the ages of four and ten. It's rare but dreadful because it's like a wart that continues growing. The tumor grows incessantly and, by completely blocking the breathing tract, suffocates the child. Many treatments have been tried, but nothing worked until Brander gave these children interferon. It takes several weeks of injections, several times a week, but slowly these laryngeal papilloma tumors stop growing and finally regress. This really is miraculous.

Orme: Haven't there been some research on interferon and the common cold?

Krim: Yes. We now know that interferon is effective in preventing the common cold. You can't spend a whole winter sniffing interferon, so people will take it to avoid contamination when someone in their family is sick or when they have the first symptoms of a cold. Interferon will probably not stop the symptoms immediately, but colds will last three to eight days.

Orme: What's currently going on in your lab in regard to interferon?

Krim: One of the most interesting things is our study of synthetic interferon. I mean chemical synthesis of the whole molecule. This has always been theoretically possible but practically difficult because the interferon molecule is relatively large, and so far only the smaller peptides have been made synthetically. Well, the charm of this work is 1984 Nobel laureate Dr. Bruce Merrifield. He worked with Mrs. Merrifield on this for three years—synthesizing little pieces, assaying them for activity, and then putting two little pieces together. He had almost assembled the entire molecule and still hadn't gotten any biological activity. But one day all of a sudden, he added a piece and there it was, an antiviral effect and a cell-growth inhibitor. So this showed that the synthetic molecule really behaved like natural interferon. The Merrifields plan to modify these molecules. They substitute certain amino acids to try to establish the correlation between the conformation of the molecule and its functions. This will eventually tell us which parts of the molecule are important regarding the antiviral and other effects.

Orme: What role do you envision for interferon in the future?

Krim: It will be the standard treatment for hairy-cell leukemia and will have a place in many cancer therapies. Interferon is the best potential antiviral drug because it has activity against all viruses and its toxicity is produced only by stopping treatment or reducing by lowering the dose.

Orme: Do you blame the media for interferon's bad image?

Krim: No. It's just you an example of how things sometimes happen. Last year the AIDS Medical Foundation organized a seminar for science writers to alert the press to possible approaches to treatment. We wanted to mention antiviral substances. One

called HPA-23, was being studied in Paris, so we brought the researcher over. During his address he said, "This is not a miracle drug; we don't know anything about it in AIDS." The press behaved responsibly. I didn't see one article saying HPA-23 is a cure for AIDS. Nevertheless, letters streamed in from people saying, "I want to go to Paris for treatment." We now get hundreds of calls a month, and the researcher tells us he's going crazy over there with desperate people calling him. One person committed suicide when the researcher didn't return his call. The researcher's duty is to continue his work and not spend all his time on the phone being a psychotherapist. But he has to do it. He now answers every phone call and letter.

Omni: Many novelists have written scenarios for apocalypse by virus. Do you think AIDS is a candidate?

Krim: That's not so outlandish. Right now there's nothing stopping it. The Centers for Disease Control now says that by the end of 1985 there will be forty thousand cases in the United States and that there are already one million people infected with the AIDS virus. Who knows how many of those one million people will come down with the disease—maybe all of them. Meanwhile, it continues to spread. The rate of infection is obviously much faster than the rate that people actually develop the disease. Maybe next year, instead of one million people infected, it's going to be ten million.

Omni: What are the chances of it spreading

outside the current risk groups?

Krim: One always hears that the risk groups remain the same—gay men, intravenous drug abusers, and hemophiles—and the proportion of "others" remains very small. Of course, "others" means the rest of us. Since 1981 the number of AIDS cases has doubled every year, the number of cases in the "others" group also doubles annually. What that says is that the "others" are no more resistant to AIDS than the people in the "at risk" groups. The number of cases in the "other" group is now actually the same as it was among the "at risk" groups three years ago. And it's growing! What's especially worrisome is that intravenous drug users are largely heterosexual, and the fact that they use drugs doesn't keep them from having sex. Many prostitutes, for example, are prostitutes because they are drug users. Well, they continue to practice their profession. And of course, teenagers tend to be very promiscuous these days, and this puts them at a higher risk of meeting someone who's infected. It's really frightening.

Omni: Can AIDS be transmitted casually, without sex?

Krim: We don't think so. We believe it requires the exchange of blood or bodily fluids that usually occurs during sexual intercourse. Some evidence from Africa, where the disease is thought to have originated, looks bad, superficially. The incidence of people there having antibodies to the virus, meaning they've been infected at some

point, is four percent. But in families, where one person has been infected, the incidence triples among people who presumably have no sexual relations with the infected person. Superficially, this looks like evidence of casual transmission, but the degree of intimacy in African families may be quite different than that of American families. For example, African mothers often chew food for their babies and then lead it to them prechewed.

Omni: What are some possible treatments?

Krim: Right now we have absolutely no medical handle on this disease. The AIDS virus, HTLV-3, is a retrovirus, and it's the first disease-causing retrovirus we know of in humans besides HTLV-I, which causes a form of leukemia. HTLV-3 kills cells of the immune system. Because it is a retrovirus, HTLV-3 integrates itself into human chromosomes. So it's very difficult to imagine how to eradicate it from the body once it's there. If we're lucky, we'll be able to suppress its multiplication and keep it at bay.

Omni: Don't any treatments look promising?

Krim: Maybe in two or three years we'll develop an effective antiviral regime. Also, three researchers say they have detected certain neutralizing antibodies [proteins that neutralize viruses] in people infected with HTLV-3 that make it impossible for the virus to infect cells. I hope to God they're right, because that will eventually lead to a vaccine. But even so, developing a vaccine won't be easy.

Omni: What are some possible collectors in developing AIDS?

Krim: Several viruses are suspected in people with some forms of hepatitis, DNA from the hepatitis virus has been found in their T cells. This suggests that both the hepatitis virus and the HTLV-3 virus [which attacks T cells] can invade the same kinds of cells. The Epstein-Barr virus, which causes mononucleosis and at least one kind of lymphoma, invades the immune system's B cells [that search out, identify, and bind with foreign molecules] and then can be passed on to the T cells. Then CMV [cytomegalovirus], which is known to bring on immune deficiencies, is suspected. Recently Lawrence Drew at Mount Zion Hospital, in San Francisco, found that about fifty percent of homosexual men who had recent CMV infections also had the kind of abnormal ratio among their T cells sometimes seen in AIDS patients. The problem is that it's a chicken-or-egg question. We don't know if these viruses make people more susceptible to AIDS or if it's the reverse. The only way we'll be able to tell is to find people without AIDS antibodies but with these other viral infections. We can then see if they will subsequently have a higher rate of infection by the HTLV-3 virus.

Omni: The FDA recently approved HPA-23 for experimental use. Does it still seem promising as a possible treatment?

Krim: HPA-23 is a strange substance—a synthetic drug containing fungus and antimony that seems to be toxic to some viruses, including retroviruses. It's been studied extensively in animals and also in the virally caused human brain illness, Creutz-



"Oh, nothing too earth shattering."



FICTION

THE MOST PROFOUND CARESS

BY JULIO CORTAZAR

No one at his house said anything to him about it, but he couldn't believe they hadn't noticed it would have been possible for them not to have noticed it first, and he had felt sure that the hallucination, or whatever it was, would go away.

* PAINTING BY NAN KUSTURA

but now that he had to go around buried up to his elbows it seemed incredible that his parents and sisters didn't see what was happening and do something about it. It's true that so far he had not had the slightest difficulty moving around, and while that was the strangest thing, what disturbed him the most was that his parents and sisters didn't realize that he was going around buried up to his elbows. One day, crossing the patio, he felt that his feet were pushing something soft, like cotton. Looking closely he discovered that his shoelaces lay barely above the ground. At first he was so dumbfounded that he was speechless, unable to say anything to the others, afraid that he would sink away altogether and wondering if the patio had melted from being washed, for his mother washed it every morning and even some times in the afternoon. But in a moment he grew bold enough to lift a foot and take a step carefully all went well, except that he again sank up to his shoelaces. He took several more steps, then shrugged and went to the corner to buy La Ralón because he wanted to read a film review.

Since he was not one to make a fuss, he gradually got used to walking around this way, but several days later his shoelaces disappeared, and now Sunday he could no longer see the cuffs of his pants. After that his only way of changing his shoes and socks was to sit on a chair, raise his leg, and set it against the edge of the bed. So he managed to wash and dress himself, but as soon as he stood up he would sink back down to his ankles, and he went about that way everywhere, even on the stairs to his office or the railway platform. It seemed clear that he was the only one who noticed that he was sinking little by little, but what was intolerable (and therefore the most difficult thing to mention to others) was his suspicion that there might be witnesses to that slow immersion. The first time that he analyzed the situation calmly in the shelter of his bed, he was struck by his incredible estrangement from his mother, his fiancée and his sisters. How could his fiancée, for example, when she left her hand on his elbow, fail to notice that he was several inches shorter? He now had to stand on tiptoes to kiss her when they parted in the street, and he felt that in so doing he sank a bit deeper still, and more easily down, that is why he decided to keep her as little as possible and limited himself to life terms of endearment she seemed to find disconcerting. He decided that his fiancée must be pretty dumb to put up with such treatment. As for his sisters who had never loved him, they had a unique opportunity to humiliate him once he no longer rose above their shoulders, and yet they continued to treat him with that cordial rony that they had always considered as pitiful. He never much wondered at the blindness of his parents because they had always been

like that with their children, but the rest of his family his colleagues, and all of Buenos Aires saw him and acted like it was nothing. He thought logically that it was all logical, and the rigorous consequence of this was a brass plaque on Sorrento Street and a doctor who examined his tongue and legs, x-rayed him with his little rubber mallet, and chafed about the hair on his back. On the examining table all was normal, but when he got up it was the same story, he mentioned this to the doctor. With a condescending air the man of science leaned down to feel his ankles below the ground, the floor must have become transparent and intangible for him because not only did he explore his tendons and toes but he also tickled the bottoms of his feet. Then he asked him to be seated again and listened to his heart and lungs; he was a very expensive doctor and he had to use up a good half hour before delivering a prescription of sedatives and the classic advice of a temporary change of scene.

After that there was nothing he could do

•One day
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but endure his torment stoically, go to work every day and rise desperately on his toes to meet the lips of his promised one and reach his hat on the office rack. Two weeks later he sank to his knees, and one morning when he got out of bed he again felt the sensation of moving through cotton, but this time it was with his hands, and he saw that the floor had risen to mid thigh. Nonetheless, he still could not detect any sign of surprise in his parents or his sisters, even though he had been watching them for a long time trying to catch them in some flagrantly hypocritical expression. Once he felt that one of his sisters bent over a little to render the cold kiss on the cheek that they exchanged on waking, and he thought that they had discovered the truth and were attempting not to betray anything. But no he still had to go on stretching up a little more each morning until the ground reached his knees, whereupon he said something about the stupidity of these buccal greetings that were just primitive vestiges, and limited himself to a smile and a greeting. With his fiancée he resorted to more drastic measures. He arranged to take her to a hotel and there, having won in twenty minutes a battle against

two thousand years of virtue, he crept her without stopping until it was time to get dressed; this strategy succeeded perfectly and his love did not seem to notice that he kept himself at a distance between times. He stopped wearing a hat so he wouldn't have to hang it up at the office; he managed to find a solution to every problem, modifying them in measure as he sank, but when the earth reached his elbows he felt that he had exhausted all his resources and would have to ask for help.

He then stayed in bed for a week, taking the flu, he managed to get his mother to give him her undivided attention and his sisters to position the television at the foot of his bed. The bathroom was just a few steps away, but to be safe he got up only when no one was near. After those days when the bed, like a lifeboat, kept him afloat, it seemed less likely than ever that his father, if he entered unexpectedly, could fail to notice that he rose above the floor only from chest up and that to get his toothbrush glass he had to climb on the back of the toilet seat. That is why he stayed in bed when he knew someone was going to visit and why he telephoned his reassurances to his fiancée. He sometimes imagined, chiefly tentatively a system of communicating beds that would allow him to pass from his own to the one where his fiancée awaited him, then to another at his office another at the movie house the café, a whole system of beds bridging Buenos Aires. He would never entirely sink into the ground so long as he could hold onto a bed.

That night he had a nightmare and woke up crying, his mouth full of earth, it wasn't earth but saliva, a bad taste and light. In the darkness he thought that if he stayed in bed he would be able to believe that it was only a nightmare, but immediately he began to fear that he had actually got up in the middle of the night to go to the bathroom and had sunk up to his neck, so that the bed would no longer protect him against what was coming. He managed to convince himself that he must have been dreaming, yes, certainly, he had dreamt that he had got up during the night. He told himself that once he had forgotten his nightmare he would be able to get up and that it would be almost pleasant to sink only up to his waist.

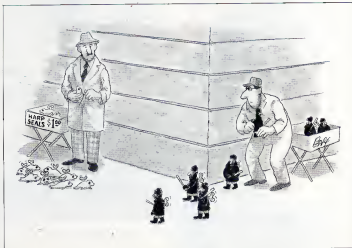
The next day he had to find out, he couldn't stay away from work forever. Sure enough the dream had been an exaggeration, the earth didn't enter his mouth, there was just that cottony contact that he had noticed at the beginning, the only important change was that his eyes were looking out almost at ground level, he discovered a spot on quite close to him, he saw sippers, and a little cockroach that looked at him with an attention that his sisters and his fiancée had never given him. To brush his teeth, to shave, were arduous operations, to have to put himself up by his arms onto the toilet then to sink, exhausted him. His family breakfasted together, but since his chair had rungs he could climb up and get on his seat very quickly. His sisters were reading Clarín with the concentration appropriate to such a pathetic

morning paper, but his mother looked at him for a moment and pronounced him a bit pale from all the days in bed and lack of fresh air. At which his father said to her that he was the same as ever and that she would ruin the boy by spoiling him. Everyone was in a good mood because the new government had announced salary increases and pension adjustments. "Buy yourself some new clothes," his mother advised him. "You will surely be able to buy on credit now that salaries are going up." His orders had already decided to replace the refrigerator and the television. He occupied himself with these bits of news and trivial observations, so when everyone got up to work he thought he was back in his preinfirmity state, having grown accustomed to sinking only to his waist, suddenly he saw his father's shoes quite close in front of him. They grazed his head and went out to the patio. He hid under the table to avoid the sandals of one of his sisters who was taking up the tablecloth and tried to calm himself. "You dropped something?" his mother asked. "My cigarettes," he replied, staying as far as possible from the sandals and slippers that cluttered the table. In the yard there were ants, geranium leaves, and a piece of glass that nearly cut his cheek. He quickly reentered the house and climbed into bed just as the telephone rang. It was his fiancée, who asked if he was still feeling better and if they could get to gether. He was so upset that he couldn't col-

lect his wits in time, and before he knew what he was doing he had set up a meeting for sex at the usual street corner, after which they could go to a movie or the hotel depending on how they felt. He stuck his head under the pillow and slept, he couldn't hear himself crying in his sleep.

At a quarter to six he dressed himself, seated on the corner of his bed and taking advantage of a moment when there was no one around, crossed the patio, keeping his distance from the sleeping cat. When he got to the street he began to worry that all the shoes that were passing at eye level would step on him. The first hundred yards he made a series of sprints, especially to avoid the women's shoes, the most dangerous because of their spike heels and pointed toes. Then he realized that he could proceed without all these precautions, and he got to the street corner before his fiancée did. He had a stiff neck from looking up to try to make out something besides the soles of the passersby, and finally the crimp became so painful that he stopped looking up. Fortunately he knew all his fiancée's shoes quite well for having so often helped her take them off, so when he saw her green shoes approaching all he had to do was smile and listen attentively in order to respond to her greeting as naturally as possible. But this evening his fiancée said nothing, which was quite unlike her; the green shoes remained fixed not far from his eyes, and he got the

impression that his fiancée was waiting, in any case, the left shoe was turned in a little, while the other supported her weight. In a moment there was a change, the right shoe turned out and the left was set more heavily on the ground. "It's been quite hot all day," he said, to open the conversation. His fiancée said nothing, and perhaps that is why, waiting for a reply as banal as his comment, he noticed the silence, the roar of the street, the clack of shoes on the pavement, and then, suddenly nothing. He waited a little longer, and the green shoes advanced slightly and then waited again; the heels were worn—his poor fiancée did not make a lot of money. He waited and, wishing he could do something to express his affection, he stroked the more worn of the heels, the one on the left shoe with two fingers. His fiancée did not move, as if she continued absently to wait for his arrival. It must have been the silence that gave him the impression of time being drawn out interminably. With an almost unbearable pain, he raised his head once more to look at the face of his fiancée, but all he saw was her heels: this time at such a distance that he no longer noticed their imperfections. He raised an arm, then another, trying to caress those heels that spoke so poignantly of his poor fiancée; he managed to touch them with his left hand, but already his right hand could not reach them, and then neither could. And so she went on waiting. **DO**



•The identity of the donor is so guarded that even his money is invisible•

ANTI MATTER

Last summer newspapers reported that J. Allen Hynek's Center for UFO Studies received \$2 million from an anonymous donor. But according to John Timmerman, the center's treasurer, "The identity of the benefactor is so closely guarded that even the money has been invisible." That's too bad, he adds, because "I would enjoy having a few dollars available to expand activities."

"What happened to the bucks?" has long been the plaintive lament of ufology. Even the most powerful UFO group ever, the National Investigations Committee on Aerial Phenomena (NICAP), which once boasted 6,000 dues-paying members, eventually expired from a lack of funds. Founded in 1956 by retired Marine major Donald E. Keyhoe, NICAP members once included Rear Admiral Delmar S. Fahneny and Vice Admiral R. H. Hillenkamp, the last director of the Central Intelligence Agency. By 1970, though, NICAP was essentially defunct, embroiled in financial difficulties and rumors of CIA intrigue.

Other organizations are following suit. Jim and Carol Lorenzen, founders of the Aerial Phenomena Research Organization (APRO), have just announced the cessation of their newsletter. Carol Lorenzen says the reason is her ailing health, but rumor has it that funds aren't flowing too well either. The Maryland-based Fund for UFO Research also teeters on the brink of extinction, during the first quarter of last year it posted a loss of \$1,830, attributed partly to a meager seeking increased funding.

The diemna extends down through the ranks of individ-



UFO UPDATE

ual ufologists, too. Consider the plight of Jimmy Randles, Brenda Butler, and Dot Street, three Englishwomen who began investigating a Suffolk, England, UFO landing—one they claim is confirmed by an official document describing lights, depressions in the ground, and low-level radiation.

Thinking that they were on the verge of a breakthrough, the three tried to go to the press. Randles, director of investigations for BUFORA, the British UFO Research Association, attempted to interest her publisher in a book on the sighting. But Ran-

dles notes, "The idea was rejected flat, on the grounds that if the events at Suffolk had actually occurred, then they would be common knowledge."

Eventually she triumphantly contacted with Neville Spearman, a small publisher specializing in occult books. But while the advance for *Sky Crash: A Cosmic Conspiracy* was small, the investigation was costly. Since Spearman's publicity budget was hardly adequate, Randles held her own press conference in October 1984. No national media turned up. And when she later issued a two-page summary of the conference, no one responded.

Efforts to sell the book in the United States met with even less success. According to Randles, 21 American publishers have turned down the manuscript, including Putnam-Hall, the most likely choice.

Meanwhile, Street's telephone has been disconnected after bills went unpaid. Butler has retired from the field, and Randles has had to sell her home.—DEANNA STACY



SAN FRANCISCO BAY HUM

Twenty years ago, pop singers Joli and Eddie evoked the sounds of the Golden Gate with their hit June "San Francisco Bay Blues Well, contemporary San Franciscans—particularly those who live in lakeside houseboats—are hearing a new and far more bothersome sound, a mysterious underwater hum that, according to one houseboater, sounds like "the buzzing of an electric razor, only ten times louder."

Tales of the San Francisco Bay hum, which have been circulating for years among the houseboat community, eventually reached the ears of houseboat owner and acoustical engineer Frank Hubach. Curious about the origin of the strange buzz, Hubach sent a group of his associates paddling around the bay in a plastic dinghy, making tape recordings with an underwater microphone. When these surveys eventually turned up an acoustic "hot spot" some 30 feet offshore from Sausalito, houseboat moorings, the

engineers thought they were closing in on an explanation. But a detailed acoustic "profile" of the sound showed that it had nothing in common with the typical frequencies emitted by such suspect machinery as sewage pumps or electric vibrators attached to sailboat hulls as a form of barnacle prevention. That, says Hubach, engineer Jim Cole, "really had us scratching our heads."

Enter a San Francisco State University ichthyologist with a new theory: The hum might be the mating call of a small fish known as the plainfin moonfish. Following up, officials at nearby Steinhart Aquarium have captured a few moonfishmen and are now hoping to get them comfortable enough in holding tanks so they'll mate and emit their cry—which could then be compared with Hubach's recordings.

Houseboat owners are skeptical. The sound, they think, is much too loud to be attributed to a biological source. In the meantime, they're lightening the mystery hum with everything from earplugs to white-noise

machines. Chalk it up, says one Steinhart official, to one of the charms of being by the bay. —Bill Luerer

KEY WEST COMET

The last time Halley's Comet came by, people thought the sky was falling. This time, Florida businessmen hope it will rain money.

A recent article in *Sky and Telescope* picked the Florida Keys as one of the nation's best places from which to view the comet. So Key West's mayor has named the sight "Official Halley's Comet Capital." USA and scheduled a Halley's Comet Festival between March 13 and April 13.

The Gordo probe will pass within three hundred miles of the comet on March thirteenth, an ideal time for viewing in North America, says freelance writer and promoter Townsend Kieffer, who thought of the festival. By coincidence, the Island Club International, the most popular club in the area, throws a party on the 13th of every month. This is a big party town.

Key West, Kieffer adds, is going all out to make this one of the biggest parties ever. There will be masked balls, Mr. and Mrs. Halley Physique contests, and nationally sponsored tennis and golf tournaments. Special interest groups are getting special attention. There will be "cometcades" for owners of motor homes, a yacht flotilla with water taxis for bowlers, and a Halley fly-in for private pilots.

There is a serious side

too. Kieffer says Jack Horkheimer, head of the Miami Space and Transit Planetarium, is bringing down some professional quality telescopes for people who want a close-up view of the comet. And the city has agreed to set up blackout areas along the southern beaches so that street lights will not interfere with viewing and photography.

If the weather cooperates, Kieffer says it almost always does, the town expects to take in \$70 million to \$30 million—perhaps more—during the 32-day event.

For more information, call (305) 296-7144 or 294-9922, or send a self-addressed, stamped envelope to CIB Productions, Inc., 1010 Truman Avenue, Key West, FL 33040.

—Owen Davies

"Perhaps if we threatened the rats with unemployment they might press the lever for benevolence instead."

Dr. Roger Brown



EAR ROACHES

Last fall, a middle-aged woman came into the emergency room at Charity Hospital in New Orleans, complaining of ear discomfort. "They hurt, like something is moving and scratching around in there," she told doctors.

No wonder. When resident physician Kevin O'Toole poked inside with a lighted instrument, he discovered two roaches—one living in each ear. "They were regular-size roaches, the kind you might see scurrying around the kitchen," O'Toole recalls.

He killed one bug by squirting it with mineral oil until it suffocated, then he dug it out of the ear. But to get rid of the second vermin, he tried something new—squirting it with the anesthetic lidocaine.

"The roach exited the ear canal at a cumulative rate of speed and attempted to escape across the floor," O'Toole reports. A few-eating intern, however, made sure the creature would never again make its home in a human. He squashed it under his shoe.

According to O'Toole, who is chief resident in emergency medicine at the University of Pittsburgh, roach-infested ears are nothing new. "At Charity Hospital where I was participating in a trauma training program, we found that problem almost every day, particularly in people from lower socioeconomic groups."

At night, he explains, roaches and other insects



crawl into people's ears as they sleep. "A lot of people don't know they are in there. But ear canals are pretty sensitive, and the bugs can cause painful sensations as they buzz and flip their wings," Sherry Baker

"From this world to the next
from utility to creation."
—Emile Durkheim

CURIOUS ENCOUNTERS

America is a lot more than spacious skies and amber waves of grain. According to Loren Coleman's recent books, *Mysterious America* and *Curious Encounters* (Faber & Faber), the country is teeming with the weird and unexplained—the giant panthers that wander through towns and then disappear; gigantic birds capable of carrying children off in their claws; dinosaurs; monsters lurking in lakes; phantom sister cities; and more.

For the past 25 years, Coleman, who is a child welfare researcher at the University of Southern Maine by day, has used his weekends

and vacations to travel across the United States in his "investigative mobile unit" (a pickup truck), tracking down such mysterious reports. Director of the first tale of *Forbidden Studies*, Coleman insists, "What I study is scientific, although it is beyond what science accepts."

One of his favorite cases involves a creature spotted in Dover, Massachusetts, in the late Seventies. In three separate incidents during a 25-hour period, four teenagers claimed to have seen a small, gnomelike figure with a watermelon-shaped head, glowing red eyes, and long, spindly limbs. Coleman, who dubbed the thing the Dover Demon, quickly arrived at the scene to interview the youths. His conclusion? The witnesses were telling the truth. And as Coleman continued to research the report, he discovered that One Indians had legends describing similar creatures—

"little people with round heads, no noses, long spidery legs," Coleman labels the Dover Demon case "disturbing and bizarre."

When an area of the country begins to report strange incidents, Coleman says, he usually finds that investigation points to a history of strange phenomena. For example, a sighting of a Bigfoot will often accompany sightings of UFOs.

"I take a holistic approach, unlike a lot of UFO investigators, cryptozoologists, or even geomagnetic specialists, who tend to have narrow perspectives when they look into mysterious phenomena," Coleman says. "I've

gone into an area asking about UFOs and been told there weren't any—but that there was a giant turtle in a pond nearby. Now that kind of information might be ignored by other investigators, but not by me."

Could there be logical scientific solutions to the mysteries Coleman delves into? According to John W. Coe, executive director of CSICOP (Committee for the Scientific Investigation of Claims of the Paranormal), "Just because there are reports of things that people don't understand doesn't mean that they can't be understood within the realms of science and must be given paranormal explanations. People who make those claims in such profusion" says Coe, "who let such a hodgepodge of the explained, pre-udged the case against those isolated reports that really do need serious investigation."

Undaunted by such criticism, Coleman continues to pursue the weird and mysterious. One current interest, for example, is the gill man, who he says looks curiously like the title character in *The Creature from the Black Lagoon*.

—Sherry Baker

"The theory of reincarnation is a turning point in the history of man."

—Friedrich Nietzsche

"Life after death, when experienced properly from the outset, is so challenging that life on Earth is nothing in comparison."

Susy Smith

YAMAMOTO RETURNS

Dennis Dallison's troubles began during childhood when his parents and teachers viewed him as retarded. Because he had trouble absorbing things, he tended to agree with them.

But all that changed, Dallison says, when the Army sent him to Japan. "Something about Japan woke me up," Dallison explains. "I taught myself Japanese in a few months and spoke it constantly."

After his discharge, the once slow Dallison breezed through college and picked up two master's degrees. Yet his malaise deepened, and only one escape seemed to offer relief. Without knowing quite why, he says, "I studied everything I could find about life on other planets, reincarnation, and the human spirit."

Dallison's studies primed him for what he now views as the turning point of his life: watching a David Suzuki interview with Ruli Norman of the Ureus Foundation in El Cajon, California. Known to her followers as the Archangel Uriel, Norman claims to be in contact with aliens promoting universal peace. At one point Norman told Suzuki she had lived as Socrates.

"When she said that, Dallison reports, "I saw her change into Socrates, Greek robes and all. I almost fell out of my chair," started studying her books and later moved to El Cajon to study at the center.

There, Dallison began to see a past-life regression

therapist. He also met the biographer of Japanese samurai Isoroku Yamamoto. "Every time he talked about Yamamoto," Dallison proclaims, "my stomach flipped and my past-life teacher encouraged me to learn more." One day I looked at a photo of Yamamoto speaking to a class of naval officers and suddenly I was seeing through his eyes, talking to them myself. Since then memories of that life have come back constantly. I have learned to face the guilt I earned as Yamamoto, leading men to kill and be killed. And for the first time, I am in control.

It is a strange tale, but nothing new for parapsychologist Emily Wilkins Cook, of the University of Virginia, who has studied reincarnation for seven years. She believes that some people do recall lives they may once have lived. But she doubts that Dallison is one of them. "We get a lot of cases like this," she says. "It is hard to be sure the memories are not just things people have read or heard but do not consciously recall."

"We look at past-life therapy with great skepticism," Cook adds. "These groups tend to promote fantasy in gullible people. I can't think of a case that's come out of them that's been valuable or convincing." —Owen Davies

MULTIPLE MIX-UPS

Multiple personality is a mysterious syndrome that splinters the mind. The person is left with several parallel personalities that vie for con-

trol of the body. While it is well-known that each of these egos will be psychologically distinct, it now looks as though they might be biologically separate as well.

Dr. Bennett Braun, of the International Society for the Study of Multiple Personality in Chicago, for instance, has documented cases in which the patient's alternating personalities presented different brain waves, pain thresholds, rates of healing, and epileptic histories. But one of his most amazing cases concerns a patient whose several personalities—with one exception—were allergic to citrus juice.

If this personality ate an orange and remained in control of the body for a sufficient period of time to digest and metabolize the orange, no ill effects would be experienced by the system, "he explains. Conversely, if he switched control too soon a rash would often result.

Other psychiatrists studying multiple-personality cases report similar findings. For instance, the Multiple Personality Study Group

which meets monthly at the University of California at Irvine, reports a female patient who had to undergo surgery. "The anesthetic worked on a few—but not on the majority of—personalities," according to Dr. Donald Schacter, the founder of the group. These problematic personalities later offered the surgeon a totally accurate description of the operation and complained of the pain. Several other patients studied by the group needed different eyeglass prescriptions for their various alternating personalities.

Since multiple personality is considered a rare disorder, some experts remain skeptical. There have been more cases of the disorder reported in the last ten years than in the history of the world, "asserts Dr. Martin Orme, a prominent expert on hypnosis. Since hypnosis is used to diagnose and treat suspect cases of multiple personality, Orme believes that therapists might be creating bogus cases through suggestion during their probing. —D. Scott Rogo



COMPETITION

By Scot Morris

Last December we called for entries in *The Omni Etiquette Book*. No matter how wondrous life in the future might be, we said, you will still be expected to mind your manners. Even at a gala dance on Mars, you still won't wear a formal space suit with brown shoes. Some things just aren't done—ever. We gave examples of proper wording for a space birth announcement and of what not to say at a lunar eclipse. And acting on an idea suggested by Charles Atford, we asked readers to supply more good manners for the next millennium.

We promised a grand prize of a one-week cruise for two to the Caribbean and \$1,000 cash, and a one-year *Omni* subscription and \$50 cash to each of ten runners-up. In addition, 200 special prizes were awarded: copies of *The Omni Future Almanac* (an \$8.95 paperback published by World Almanac). We can print only a few of these 200 special-mention winners here, but all prizes have been awarded.

And now, with your kind permission, our most proper winners:

GRAND PRIZE: CRUISE AND \$1,000

It is bad manners to awaken someone by abruptly turning the gravity back on.

—John Hussain, Zimmerman, MN

RUNNERS-UP: \$50 AND SUBSCRIPTION

Never be fashionably late to a solar eclipse.

—Kay Rice and Mary Roberts
Fort Collins, CO

Never shout "Vacuum!" in a crowded lunar movie dome.

—Lochlan H. Johnston, Menasha, WI

What not to say at an artificial-heart convention: "Check your beltcase, sir?"

—Robert Anderson, Champaign, IL

Zero-g Wedding Reception: It is the bride's responsibility to provide the protective headgear for the bouquet toss.

—Gerald C. Greenwood, Chicago

During space travel it will be improper to use a salad straw to drink the main course on live-star shuttles.

—Bill Burns, Wellsboro, PA

For the discriminating Morlock: Elbowsteaks should never be eaten with the fingers. The fingers may be eaten separately.

—Patricia J. Weber, Mount Pleasant, SC

The polite science-fiction writer will never say "I told you so."

—Carol Svec, Fair Hills, NJ

When you're at a genetic-mutations laboratory, never casually refer to someone as being "all thumbs."

—Ernie Peters, Rockledge, CA

Invitation to superhero explosion: "BYO bottle of sunglasses (Number 15 recommended)."

—Denise DeWolfe, Oak Park, MI

What not to say at a publication party for Isaac Asimov's thousandth book: "Congratulations. I really enjoyed *The Illustrated Man*. It's one of my favorites."

—Richard Nauden, Cleveland

SPECIAL MENTION

1. It is bad manners to say "Goodnight!" when an alien visitor tells you his name.

2. It is bad etiquette to bring tarantulae along on a hunt for the Loch Ness monster.

3. When touring cave paintings, it is a serious breach of etiquette to render any of them anatomically correct.

—John Hussain, Zimmerman, MN

Event: Time-Travelers' Convention. Out: "How old are you?"

In: "When are you from?"

—Marshall T. Baker, Corona, CA

What not to say to a recent brain-transplant patient: "I miss you."

—Larry Tusick, Westlake, OH

When dancing in an intimacy ballroom, it doesn't matter who leads.

—Christine Gilinsky, San Jose, CA

What not to say to your spouse (who stayed on Earth), when returning from a near light-speed trip to Alpha Centauri: "Your hair looks nice with that touch of gray."

—F. R. Folkard, Dallas

An appropriate pickup line at an extraterrestrial bar: "What's your constellation?"

—Shirley E. Fornicola, Alsip, IL

Never sleep with your own clone. The results, whether good, bad, or otherwise, will discourage you from sleeping with anyone else.

—Edwin R. Gasparini, South Plainfield, NJ

What not to say at a solar eclipse: "I can't see a thing. The moon is in the way."

—Steven Storms, Las Cruces, NM

What not to say to Gerard O'Neill at the christening party for Island One: "Great party, Gerry. By the way, what's that hissing sound?"

—Delmar Smith Stone, Jr.
Fort Walton Beach, FL

What not to say to your lunar tour guide: "When are they ever going to fix those potholes?"

—Marcus DeMille, Virginia Beach, VA

In case of emergency, beam up women and children first.

—Wyman Adcock, Vacaville, CA

You shouldn't ask Uri Geller to repair the dents in your car bumper or fender.

—Richard V. Wagner, Irving, TX

It is considered tacky to send a hologram of yourself on your blind date.

—Barbara Radwan, Denver

Do not suggest to Frank Herbert that *Dune* should be subtitled "A Space Odyssey."

—Len Elliott, Auburn, WA

A magnifying glass is an appropriate gift to bring to a space-shuttle launch party.

—Terry L. Stawar, DeLand, FL

Never inquire of a woman's weight while on Jupiter.

—Dick Steinman, Sarasota, FL

Reptilian guests at *Omni's* Intergalactic Ball are not required to wear tails.

—Ben Gottlieb, McLean, VA

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SNOW

CONTINUED FROM PAGE 54

often see caretaking little-visited places. He wore a brown smock like a monk's robe and was making coffee in a corner of his small office, out of which little business seemed to be done. He looked up startled, caught out, when I entered.

"Sorry," I said, "but I don't think I understand this system right."

A problem? he said. "Shouldn't be a problem." He looked at me a little wide-eyed and shy, hoping not to be called on for anything difficult. "Equipment's all working?"

"I don't know," I said. "It doesn't seem that it could be." I described what I thought I had learned about The Park's access concept. "That can be right, can it?" I said. "That access is totally random."

He was nodding, still wide-eyed, paying close attention.

"Is it?" I asked.

"Is it what?"

"Random."

"Oh, yes, Yes, sure. If everything's in working order."

I could think of nothing to say for a moment, watching him nod reassuringly. Then "Why?" I asked. "I mean why is there no way at all to, to organize, to have some kind of organized access to the material?" I had been gun to feel that sense of grotesque boldness in the presence of death, as though I

were haggling over George's effects. "That seems stupid, if you'll pardon me."

"Oh no, oh no," he said. "You've read your literature? You've read all your literature?"

"Well, to tell the truth."

"It's all just as described," the director said, "I can promise you that. If there's any problem at all."

"Do you mind?" I said, "if I sit down?" I smiled. He seemed so afraid of me and my complaint, of me as someone possibly grief-crazed and unable to grasp the simple limits of his responsibilities to me, that he needed soothing himself. "I'm sure everything's fine," I said. "I just don't think I understand. I'm kind of dumb about these things."

"Sure, Sure, Sure." He regretfully put away his coffee makings and sat behind his desk, leaning his fingers together like a consultant. "People get a lot of satisfaction out of the access here," he said, a lot of comfort if they take it in the right spirit. "He said a smile. I wondered what qualifications he had had to show to get this job. "The random part. Now it's all in the literature. There's the legal aspect—you're not a lawyer are you, no, no, sure, no offense. You see, the material here isn't for anything, except, well, except for communing. But suppose the stuff were programmed, searchable. Suppose there was a problem about taxes or inheritance or so on. There could be subpoenas, lawyers all over the place, destroying the material concept completely."

I really hadn't thought of that. Built-in ran-

domness saved past lives from being searched in any systematic way. And no doubt saved The Park from being in the records business and at the wrong end of a lot of suits. "You'd have to watch the whole eight thousand hours," I said, "and even if you found what you were looking for, there'd be no way to replay it. It would have gone by." It would slide into the random past even as you watched it, like that afternoon in Ibiza, that party in Paris, Lost. He smiled and nodded, lamely and nodded.

"I'll tell you something," he said. "They didn't predict that. The randomness. It was a side effect, an effect of the storage process. Just luck." His grin turned down, his brows knitted seriously. "See, we're doing here at the molecular level. We have to go that small, for space problems. I mean your eight-thousand-hour guarantee. If we had gone tape or conventional, how much room would it take up? If the access concept caught on. A lot of room. So we went vapor trap and endless tracking. Size of my thumbnail it's all in the literature." He looked at me strangely. I had a sudden intense sensation that I was being looked, ticked, that the man before me in his smock was no expert, no technician, he was a charlatan, or maybe a madman impersonating a director and not belonging here at all. It seared the hair on my neck and passed. "So the randomness," he was saying, "it was an effect of going molecular. Brownian movement. All you do is hit the endless tracking for a microsecond and you get a rearrangement of the molecular level. We don't randomize. The molecules do it for us."

I remembered Brownian movement, just barely from physics class. The random movement of molecules, the teacher said, it has a mathematical description. It's like the movement of dust motes you see swimming in a shaft of sunlight, like the swirl of snowflakes in a glass paperweight that shows a cottage being snowed on. "I see," I said. "I guess I see."

"Is there," he said, "any other problem?" He said it as though there might be some other problem and that he knew what it might be and that he hoped I didn't have it. "You understand the system. Key lock, two bars, ACCESS RESET."

"I understand," I said. "I understand now." "Communism," he said, standing, relieved, sure I would be gone soon. "I understand. It takes a while to relax into the communing concept."

"Yes," I said. "I do."

I wouldn't learn what I had come to learn whatever that was. The Wasp had not been good at storage after all, no, no better than my young soul had been. Days and weeks had been missed by its tiny eye. It hadn't seen well, and in what it had seen it had been no more able to distinguish the just-remembered from the unforgettable than my own eye had been. No better and no worse—the same.

And yet, and yet—the stood up in Ibiza and dressed her breasts with lotion and spoke to me. Oh, look, hummingbirds. I had



"Never mind that. Can you bend the spoon?"

logaters, and the Weasp had not, and I owned once again what I hadn't known I had lost. hadn't known was precious to me.

The sun was setting when I left the Park, the calm sea foaming softly randomly around the rocks.

I had spent my life waiting for something, not knowing what, not even knowing I waited. Killing time. I was still waiting. But what I had been waiting for had already occurred and was past.

It was two years, nearly, since George had died, two years until for the first and last time I wept for her—for her and for myself.

Of course I went back. After a lot of work and correctly placed dollars, I netted a HAPPY card of my own. I had time to spend, like a lot of people then, and often on empty afternoons (never on Sunday) I would get out onto the unpaved and weed-grown freeway and glide up the coast. The Park was always open. I relaxed into the communing concept.

Now, after some hundreds of hours spent there underground, now, when I have long ceased to go through those doors (I have lost my key, I think, anyway I don't know where to look for it), I know that the solitude I felt myself to be in was real. The watchers around me, the listeners I sensed in other chambers, were mostly my imagination. There was rarely anyone there.

These tombs were as neglected as any tombs anywhere usually are. Either the living did not care to attend much on the dead—when have they ever?—or the hopeful buyers of the contracts had come to discover the flaw in the access concept—as I discovered it, in this end.

Access, and she takes dresses one by one from her closet, and holds them against her body, and studies the effect in a tall mirror and puts them back again. She had a funny face, which she never made except when looking at herself in the mirror, a face made for no one but herself, that was actually quite unlike her. The mirror George.

RESET

Access. By a bizarre coincidence here she is looking in another mirror. I think the Weasp could be confused by mirrors. She turns away, the Weasp adjusts, there is someone asleep, tangled in bedclothes on a big hotel bed, morning, a room-service cart. Oh, the Algonquin myself. Winter Snow is falling outside the tall window. She searches her handbag, takes out a small vial, swallows a pill with coffee, holding the cup by its body and not its handle. I stir show a tumbled head of hair. Conversation—unintelligible. Gray room, which snow light, color degraded. Would I know (I thought, watching us) reach out for her? Would I in the next hour take her, or she me, push aside the bedclothes, open her pale pajamas? She goes into the john, shuts the door. The Weasp watches stupidly, excluded, transmitting the door.

RESET. Finally.

But what (I would wonder) if I had been patient, what if I had watched and waited?

Time, it turns out, takes an unconscious

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ble time. The waste, the foolcass waste—it's no spectator sport. Whatever fun there is in sitting idly looking at nothing and tasting your own being for a whole afternoon, there is no fun in replaying it. The waiting is excruciating. How often, in five years, in eight thousand hours of daylight or lamplight, might we have coupled, how much time expended in lovemaking? A hundred hours, two hundred? Odds were not high of my coming on such a scene, darkness swallowed most of them, and the others were lost in the interstices of endless hours spent shopping, reading, on planes and in cars, asleep, apart. Hopeless.

ACCESS She has turned on a bedside lamp. Alone. She hunts amid the Kleenex and magazines on the bedside table. Finds a watch, looks at it dully, turns it right side up, looks again, and puts it down. Cold. She burrows in the blankets, yearning, staring, then puts out a hand for the phone but only rests her hand on it, thinking. Thinking at four a.m. She withdraws her hand, shivers a child's deep, sleepy shiver and shuts off the light. A bad dream. In an instant it's morning dawn, the Wasp slept, too. She sleeps soundly, unmoving, only the top of her blond head showing out of the quilt—and will no doubt sleep so for hours, watched over more attentively, more leechily than any peeping Tom could ever have watched over her.

RESET

ACCESS

"I can't hear as well as I did at first," I told

the director. And the definition is getting softer."

"Oh sure," the director said. "That's really in the literature. We have to explain that carefully. That his might be a problem."

"It isn't just my monitor?" I asked. "I thought it was probably only the monitor."

"No, no, not really no," he said. He gave me coffee. We'd gotten to be friendly over the months. I think, as well as being afraid of me, he was glad I came around now and then. At least one of the living came back, one at least was using the services. "There's a slight degeneration that does occur."

"Everything seems to be getting gray."

His face had shifted into intense concern, no belittling this problem. "Mm-hm, mm-hm, see, at the molecular level where we're at, there is degeneration. It's just in the physics. It randomizes a little over time. So you lose—you don't lose a minute of what you've got but you lose a little definition. A little color. But it levels off."

"It does?"

"We think it does. Sure it does, we promise it does. We predict that it will."

"But you don't know."

"Well, well, you see we've only been in this business a short while. This concept is new. There were things we couldn't know." He still looked at me, but seemed at the same time to have forgotten me. Tired. He seemed to have grown colorless himself lately, old, losing definition. "You might start getting some kleson," he said softly.

ACCESS RESET ACCESS

A gray plane of horribone-laid stones, gray clicking palms. She turns up the collar of her sweater, removing her eyes in a storm wind. Buys magazines at a kiosk. Vogue, Harpers, La Mode. Cold, she says to the kiosk girl. *Fro*. The young man I was taking her arm, they walk back along the beach, which is deserted and strung with cast seaweed, washed by a dirty sea. Winter in Ibiza. We talk, but the Wasp can't hear the sea's sound confuses it, it seems bored by its clothes and legs behind us.

RESET

ACCESS The Algonquin, familiar, morning, winter. She turns away from the snowy window. I am in bed, and for a moment watching this I feel suspended between two minutes, collected endlessly. I had seen this before, I had lived it once and remembered it once, and remembered the memory and here it was again, or could it be nothing but another morning, a similar morning. There were far more than one like this, in this place. But no, she turns from the window, she gets out her veil of pills, picks up the coffee cup by its body. I had seen this moment before, not months before, weeks before, here in the chamber. I had come upon the same scene twice.

What are the odds of it? I wondered: what are the odds of coming upon the same minutes again, these minutes.

I sit within the bedclothes.

I leaned forward to hear, this time, what I would say. It was something like but for any way, or something.

Fun, she says, laughing, hawrowed, the degraded sound a ghost's twittering. Charles, someday I'm going to die of fun.

She takes her pill. The Wasp follows her to the pills, and is shut out.

Why am I here? I thought, and my heart was beating hard and slow. What am I here for? What?

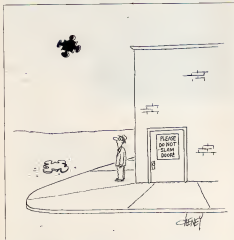
RESET

ACCESS

Sweated icy streets. New York, Fifth Avenue. She is climbing, shouting from a cab's dark interior. Just don't shout at me, she shouts at someone, her mother. I never met, a dragon. She is out and hurrying away down the sleety street with her bundles, the Wasp at her shoulder. I could reach out and touch her shoulder and make her turn and follow me out. Walking away, lost in the colorless press of traffic and people, impossible to discern within the scanned snowy image.

Something was very wrong.

George hated winter, she escaped it most of the time we were together, about the first of the year beginning to long for the sun that had gone elsewhere. Austria was all right for a few weeks, the toy villages and sugar snow and bright, sleek skiers were not really the winter she feared, though even in fire-warmed chalets it was hard to get her naked without gooseflesh and shudders from some draft only she could feel. We were chased in winter. So George escaped it. Antigua and Bali and two months in Ibiza when the air



monds blossomed! It was continual false fireworks spring all winter long.

How often could snow have fallen when the Wasp was watching her?

Not often, countable times, times I could count up myself if I could remember as the Wasp could. Not often. Not always.

"There's a problem," I said to the director. "He peeked out, has it?" he said. "That definition problem?"

Actually, I said, it's gotten worse.

He was sitting behind his desk, arms spread wide across his chair's back and a false pinkish flush to his cheeks like under-taker's makeup. Drinking.

"Hasn't peeked out, huh?" he said.

"That's not the problem," I said. "The problem is the access. It's not random like you said."

"Molecular level," he said. "It's in the physics."

"You don't understand. It's not getting more random. It's getting less random. It's getting selective. It's freezing up."

"No, no, no," he said dreamily. "Access is random. Life isn't all summer and fun, you know. Into each life some rain must fall."

I spluttered, trying to explain. But but.

"You know," he said. "I've been thinking of getting out of access." He pulled open a drawer in the desk before him, it made an empty sound. He stared within it, dully for a moment and shut it. "The Park's been good for me, but I'm just not used to this. Used to be you thought I could render a service, you know? Well, hell, you know, you've had fun, what do you care?"

He was mad. For an instant I heard the dead around me. I tasted on my tongue the stale air of underground.

"I remember," he said, sitting back in his chair and looking elsewhere. "many years ago I got into access. Only we didn't call it that then. What I did was, I worked for a stock-footage house. It was going out of business, like they all did, like this place here is going to do, shouldn't say that, but you didn't hear it. Anyway it was a big warehouse with steel shelves for miles, filled with film cans. film cans filled with old plastic film you know? Film of every kind. And movie people, if they wanted old scenes of past time in their movies, would call up and ask for what they wanted. find me this find me that. And we had everything, every kind of scene, but you know what the hardest thing to find was? Just ordinary scenes of daily life. I mean people just doing things and living their lives. You know what we did have? Speeches. People giving speeches. Like presidents. You could have hours of speeches, but not just people, whatcha-call-it, cash washing clothes, sitting in a park."

"It might just be the reception," I said. "Someone."

He looked at me for a long moment as though I had just atoned. "Anyway," he said at last, turning away again. "I was there awhile learning the ropes. And producers called and said, 'Get me this, get me that.' And one producer was making a film, some film of the past, and he wanted old scenes,

old, of people long ago, in the summer having fun, eating ice cream, swimming in bathing suits, riding in convertibles. Fifty years ago. Eighty years ago."

He opened his empty drawer again, found a bathpick, and began to use it.

"So I accessed the earliest stuff. Speeches. More speeches. But I found a scene here and there—people in the street, fur coats, window-shopping traffic. Old people, I mean they were young then, but people of the past; they have these pinched kind of faces, you get to know them. Sad, a little. On city streets, hurrying, holding their hats. Cars were sort of black then, in film, black cars in the streets, black derby hats. Stone. Well, it wasn't what they wanted. I found summer for them, color summer, but new. They wanted old. I kept looking back, I kept looking I did. The further back I went, the more I saw these pinched faces, black cars, black streets of stone. Snow. There isn't any summer there."

With slow gravity he rose and found a brown bottle and two coffee cups. He poured sloppily. "So it's not your reception," he said. "Film takes longer. I guess, but it's in the physics. All in the physics. A word to the wise is sufficient."

The liquor was harsh, a cold distillate of past sunlight. I wanted to go get out, not look back. I would not stay watching until there was only snow.

"So I'm getting out of access," the director said. "Let the dead bury the dead, right? Let the dead bury the dead."

I didn't go back. I never went back, though the highways opened again, and The Park isn't far from the town I've settled in. Settled the right word. It restores your balance, in the end, even in a funny way your cheerful nose, when you come to know, without regrets, that the best thing that's going to happen in your life has already happened. And I still have some summer left to me.

I think there are two different kinds of memory and only one kind gets worse as I get older: the kind where, by an effort of will, you can reconstruct your first car or your serial number or the name and figure of your high school physics teacher—a Mr. Helm, in a gray suit, a bearded guy, skinny, about thirty. The other kind doesn't waver, if anything it grows more intense. The disappearing kind, the kind you stumble into as you come with secret doors and suddenly find yourself sitting not on your front porch but in a classroom. You can't tell just where or when, and a bearded smiling man is turning in his hand a glass paperweight, inside which a little collage stands in a swirl of snow.

There is no access to Geopropolis except that now and then, unpredictably, when I'm sitting on the porch or pushing a grocery cart or standing at the sink, a memory of that kind will visit me vivid and startling, like a hypnotist's snap of fingers.

Or like that funny disappearance you sometimes have, on the point of sleep, of hearing your name called acutely and distinctly by someone who is not there. DO

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I don't believe it!
That must take forever to do

Not really

Once you find the right models
the rest is easy



That I believe



STONE SENTRY

CONTINUED FROM PAGE 38

marker. Such a monument would have to include massive, hard-to-remove components made of such low-value materials as earth or stone—more of them than appear needed at the outset—and written records

Kaplan found many of these elements in England's Stonehenge. Stonehenge is obvious from both the air and ground. Its design features a circle within a circle. Moats of dirt surround concentric rings of monoliths, which are built around a central altar. While it has survived as long as the pyramids, its form is far more efficient for delineating an area than a pyramid is. Kaplan explains: "Because of the multiple components, you can still afford to lose some of the markers. About a third of the stones are missing, yet there is no debate about its plan." Kaplan also observed that many of the monoliths are too big—up to 24 feet high—to be attractive for hauling away. One weak point in the site's chances for perpetual survival: Because records contemporary with its construction do not exist, no one knows who built Stonehenge or why.

Working from these ancient guides, Kaplan and colleagues, under contract from the DOE, composed what might be dubbed the Nuclear Stonehenge plan for marking geological repositories. In a presumably semicircular, or, as useless a piece of real estate as possible," as Kaplan puts it, the perimeter of the 2,000-acre underground repository would be marked with up to 30 monoliths, each looming about two stories high. The markers, fashioned of one piece for durability, would be carved from some of the toughest wind- and water-resistant materials known—probably granite or basalt, if large enough slabs can be found. Or they could be molded from durable, man-made industrial ceramics. They might narrow slightly to a rounded top to form a shape that reduces wind resistance and sheds rain to resist weathering. The unusual shape would also be impractical for a would-be recycler to build with. Warning and danger symbols would be inscribed on them as part of the effort to make up for the original Stonehenge's major failing.

While this circle of oversize debris would be unmistakable from the ground, they would resemble little more than pinpoints from the air. So inside their bounds, engineers might construct an earthenwork from the backfill after digging the repository. The earthenwork, shaped like a colossal hazardous-waste symbol 300 feet wide, would be at least as fast high as top paved with crushed stone or asphalt. Like the Great Wall, it could be viewed from airplane and satellite. Infrared sensors and even certain types of radar detectors would perceive its surface texture. Monument constructors might pack it with magnetized sand so that other types of anthropic sensors likewise would spot it from the air.

Near the middle of the earthwork would stand the central monument, another ring of

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three or four monoliths, 25 feet high and weighing 200 tons each. They would surround several stone vaults containing detailed information about the site but whose location kids would inhibit casual investigation. Kaplan proposed placing a central vault beneath a tunnel, a hollow simulating an ancient burial mound, where it would be protected from the freeze-thaw cycle.

The first site-specific plan for nuclear deep-time communication is now on the drawing boards at the Hanford Nuclear Reservation. The task at Hanford is to design possible markers not for waste lodged half a mile underground, but for extremely long-lived contamination just 13 to 18 feet below the surface. Scattered about a 32-square-mile area in the interior of Hanford are 70 acres where earth or gravel "crabs" stole some of the long-lived waste, or where it has leaked or been drained into the soil.

Mid Adams, group manager for environmental technology at Rockwell International, presents some of the options for cleanup of those lethal areas. "We can either entomb the radiation from the site and place it in a deep geological repository or we can leave it in place. The way it looks now, we expect the risk to workers, as well as the cost, to be lower if we leave it in place." A final decision may be years away. If the contamination is allowed to stay where it is, engineers would cap it with an 18-foot-high barrier of earth and stone.

Before the barrier is built, though, the radioactive soil that's close to the surface must be dealt with. Under one plan the contaminated earth would be literally melted and turned into dark, obsidianlike glass. High-voltage electrodes placed in the ground would vibrate up to 500 metric tons of earth at a time by elevating the soil's temperature to as high as 2000°C. Since the contamination would then be locked in the structure of a glass block, engineers say that the radiation would be highly resistant to leaching but remain hazardous nonetheless.

If this form of shallow burial becomes a reality, future generations could easily dig through the barrier and find themselves in direct contact with radiation. "While proposing to ring the whole thirty-two-square-mile area containing these areas with an early warning system of monoliths," Adams explains, "They would say essentially no risk moving." Inside the boundary might be dozens of banner mounds, each overshadowed by four obelisks inscribed with more explicit warnings and information.

As an added warning method, Hanford's atomic memorial would offer surprises underground. Archaeologist Kaplan has recommended scattering small discs, much like potsherds at an archaeological dig, throughout the earthen barriers. Anyone who dug into the mounds would chance upon some of these yellow and magenta plaques with markings matching those on the monoliths. One side of each disc would feature a warning symbol and the words DO NOT DIG HERE: HAZARDOUS WASTE BELOW. The other side would display a pictograph, yet to be

perfected, admiring leaders not to grow deep-rooted crops. The reason: Long roots could reach into the contaminated area and draw radiation up into the edible portions of the plant, anyone who then ate the plant would be ingesting radioactivity, too, and risk illness or death.

Made of stoneware or porcelain, the markers portraying this danger are expected to outlive clay pottery, which lasts 7,000 to 8,000 years. Their perspective size—five to six inches in diameter—was also inspired by archaeology. Larger potsherds generally break.

But what will prevent the markers from becoming a popular collector's item for future amateur archaeologists or perhaps ending up on the shelves of local entrepreneurs? "It's true they can become interesting sou'wears," Adams says. "When a shipment was brought here for testing, everybody wanted one. But I think we will have dis-charged our responsibility if we've warned people."

The trick to a successful atomic memorial, of course, is to find a way for inanimate objects to communicate a clear and urgent caution, rather than simply to exist and possibly inspire twentieth-century archaeologists to poke around. Making sure that future peoples get the right message takes a special sort of communication.

A principle of monumental architecture that must also be used for deep time communication is redundancy: sending the same signal numerous ways. "The more redundancy in the system," says Indiana University's Saback, "the less margin for error and the safer it is." The basic warning of danger and the command not to dig in the area can be conveyed by a warning symbol, a written message, and pictures, each engraved on the monoliths. The written message can also be repeated in a number of languages.

The DoE panel recommended that the warning emblem carved into the obelisks repeat those on the vaults and the shape of the earthwork. It would best be a common, internationally accepted emblem, such as the cloveleaf symbol that currently signals the presence of radiation, or a new symbol designed to be used wherever biochemical waste may be located.

A symbol's explanatory powers are limited, so experts agree that an integral part of nuclear memorial design would be more descriptive messages. But languages change rapidly. "Linguistics studies show that nineteen percent of a language's 'basic' words change every thousand years and that more unusual terms change even faster," says research anthropologist David B. Givens, of the American Anthropological Association in Washington, D.C. At that rate, readers 5,000 years hence would understand just better than half our common vocabulary and English speakers in 10,000 years would recognize only about 32 percent of our everyday words. "If anything," Givens continues, "we can expect more

to know the code. Our alphabet, for instance, consists solely of symbols. To create a tongue that resists time erosion, we need to reverse the historical trend and build iconic principles back into the message. "You can see examples of icons in the signs at airports and hospitals today, but warning messages would be more narrative, more complex," Givens says.

For a demonstration of the power of pictographs, Givens suggests a trip to a comic-book archive. "Take an early Henry Carter—the first with no words. It's quite clear. Any child can follow the story—maybe even kids from different cultures."

A warning cartoon prepared by the DoE's panel of experts is a sequence of frames

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indicating that when containers buried in the ground are punctured, their substance could leak into the water taken up into the roots of crops and eaten by people. The last frame shows several people, one of them collapsed on the ground and holding his or her abdomen. "There is no doubt," Givens adds, "that we can make a message that will work."

The key to such pictographic narration is to make it as clear and as free of culture-related detail as possible. Another challenge, one that Givens is currently researching, is how to guide the viewer's eye in the appropriate direction. If someone reads the cartoon backward, obviously the message will be garbled. Although our own left-to-right, top-down reading order has historically been the most common, future peoples will not

necessarily read in that order. Ancient Egyptians wrote their hieroglyphics in a zigzag right to left then left to right, then right to left.

Pre-Columbian Mexicans wrote from the bottom up, Crow Indian messages read in a spiral from the inside out. Even today many languages read right to left. Givens suggests using footprints or tally dots—one dot in the first frame, two in the second, and so forth—to indicate the sequence of action in a Nuclear Stonehenge picture-text.

There comes a limit, though, to the detail that cartoons can transmit, so despite their mortality, verbal messages are planned to supplement the warning emblem and pictures emblazoned on the obelisks. For a deep geologic memorial, caution—*caution*



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ARABIC WRITING BURNED HERE would be etched high up on three sides of each monolith, in the six official languages of the United Nations. Clearer to eye level more information would be noted, including the depth that radioactive wastes are buried and the area they cover underground. The few central obelisks would bear extended multilingual inscriptions identifying the waste and explaining why contact with it should be avoided. The inscriptions at Hanford's interior monolith would be similar.

In an effort to defy the metamorphosis of language markers would also transmit a final request that future spectators "relay" the stone's messages or reread them every few hundred years into current tongues.

At a deep geologic repository, engravings on the giant central stones would also direct the curious to the central vault. There they would find hundreds of pages of technical data about radiation and the radioactive waste, aged underground text and mathematical calculations, maps, and diagrams. Since these volumes will probably disappear, Francis Stonehenge planners envision widely distributing such information to libraries and data banks around the world.

But the interplay of stone and message site and archive still leaves a vital gap, according to Seaback. "What we need," he says, "is a self-selected, self-perpetuating group of men and women who would be in charge of the monuments and the information." Scientists and social scientists, they would pass on their custodianship through each generation, independent of whatever government there may be. Seaback has dubbed such a group an atomic priesthood but says the term has been misunderstood, adding that atomic communion would convey the meaning equally well.

These specialists would repair the monuments in case of vandalism or natural disaster and would also see to it that future librarians maintain information about the nuclear grave sites. Information retrieval systems may change radically. People may someday get the data they need from "Dick Tracy-type watches," as Seaback puts it, which could give out a message in response to a code the wearer would punch in, or perhaps from microprocessors that might be implanted directly into the human brain. Whatever form future libraries or computers take, "this information would have to be updated and incorporated into futuristic library technology by the committee," Seaback says.

But the site that Seaback envisions would also have a more controversial objective: steering people away from the memorials. They might circulate legends of danger, encourage performance of rituals near the site, and possibly threaten supernatural retribution for ignoring the obelisks' warnings. Seaback does not advocate such techniques for an educated audience but, rather, for people who can't read. There's always the possibility, he says, that there will be illiterate segments of the population, especially if civilization as we know it is wiped out. "Suppose an underground river changes course,"

Seaback says, "and leaches some of the radiation out of the cavern and up toward the surface. Then nobody will need sophisticated technology to get at it. You have to worry about a peasant with a shovel."

While Seaback's system of taboos nourished by myths and rituals verges on an "atomic religion," other specialists argue for a purely rational approach. They maintain that although local folklore may spring up, public education coupled with straightforward on-site information would be a more credible deterrent to interference.

"Trying to inculturate fear is nonsense. The first time that a boy scout troop camps out there and nothing happens, the myth is destroyed," says Abraham Wertheim, senior executive consultant at NUS Corporation, in Gaithersburg, Maryland, and member of the DoE task force. "You need to teach people about these issues in high school. And then whenever folklore develops will start off in the right direction." Adds Givens: "Humans are more willing to go along with what's true than what's frightening. Using fear might even be counterproductive because people might dare one another to violate the taboo."

But given the sheer physical grandeur of the Nuclear Stonehenge scheme, the monuments seem certain to inspire awe, religious or otherwise. And although some human interference researchers say the monuments should not receive much publicity, others imagine their becoming tourist attractions.

"To bill it as a modern-day Stonehenge, as the world's longest-lasting monument, to encourage people to visit," Givens says, "you could even carve other kinds of information there—about the history of our species—and make it an open-air museum." Attracting people to the monument would remind them that what lies beneath is dangerous.

The cost of warning the future will not be cheap: if approved by the DoE, the Hanford memorial alone will probably cost taxpayers tens of millions of dollars. According to Adams, the price tag of each monolith could amount to \$100,000, and several hundred are contemplated. Yet the total comes to a fraction of the projected several billion-dollar expense of actually interring the waste permanently in the ground.

Human interference experts advocate the Nuclear Stonehenge project on moral rather than economic grounds. The gravity of radioactive wastes (threat to health is such that after our grandest buildings tumble, our literature turns into lessons in a "dead" language, and the very name of our country is lost to all but scholars, nuclear waste will still have the power to cause genetic mutations and to kill. Perhaps our age will be immortalized by aesthetics of stone guarding a subterranean legacy of poison.

And yet, say some in the field, those very shroudes may prove a hopeful sign for humanity. "No earlier culture ever bothered to warn the future about dangers," Kaplan says. "I would like to think that when this generation takes responsibility for the waste and for altering future generations, it will mark the coming of age of human responsibility." □

BODY

CONTINUED FROM PAGE 24

Now it is being proposed that those with very low amounts in the urine may be the most severely poisoned, says toxicologist Alvin Bronstein, of the Rocky Mountain Poison Center, in Denver.

"They may not get it out of their systems. It defines measurement," he adds.

Results from a recent test conducted by David Eggleston, of the University of Southern California, suggest that a link may exist between amalgams and suppression of the immune system.

Frequency of T cells, the white blood cells that regulate the type and intensity of all immune responses, rarely varies by more than 4 percent in an eight-week period. Yet when flings were removed, Eggleston found that the percentage of T lymphocytes rose dramatically. Eggleston believes his findings warrant further investigation.

At a July 1984 conference sponsored by the federal National Institute of Dental Research, the official summary of the proceedings concluded that there was no documented evidence for discontinuing the use of dental amalgams.

But participants recommended that further research be conducted in several areas. Among these were studies on the effects of mercury on T lymphocytes and research to see whether a relationship exists between birth defects and maternal exposure to amalgams. The report also called for research to determine the number of U.S. citizens with an allergy to mercury.

The ADA maintains that "silver" fillings are safe. "There is no documentation that proves amalgams are really harmful," says P.L. Fan, of the ADA's Council on Dental Materials. "That's the same as saying they are safe."

But critics of the ADA's stand argue that while more research is needed, amalgams have not been proved harmful.

I have over three hundred scientific references on mercury toxicity,' says Atlanta dentist Ron Drusler. 'And I can no longer in good conscience put those things [mercury fillings] in people's mouths.' □

CREDITS

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COMPETITION

CONTRIBUTOR: HOWARD K. GIL

What not to say at the publication party for Isaac Asimov's thousandth book: How many of them can you get in *Cliff's Notes*?
—Gregory Nicol, Atlanta

What not to say at a Halley's Comet watch: "This is spectacular. I hope they do it more often."
—Gregory Nicol, Atlanta, GA

Never smile when you ask Carl Sagan how many hamburgers McDonald's will sell by the year 2100.
—John E. Bluth, Colorado Springs

Time travelers should leave a forwarding (or recording) date with the postmaster.

Be sure to wear clean underwear prior to cryogenic suspended animation.
—Lois Rustbekkie, Louisville, KY

What to serve at a computer hardware exhibition: *foie and chips*.
—Carol A. Paszko, Medford, PA

What not to do before buying a used space cruiser: Kick the thrusters and slam the hatches.
—Douglas Fisker, Guilford, NH

Congratulation wishes on the arrival of a new clone in the family: "Happy birthday two you."
—George Taylor, Montgomery, AL

What not to say on your Mars vacation: "Which way to the canals?"
—Kim Alan Pedersen, Iowa City, IA

It is considered rude to rest one's Waldo on the table.
—John Gordos and Geoff Beshell, Atlanta, OH

Amy VanAllenbelt, adviser to *The Ozer* Etiquette Book, recommends: The chef at an intergalactic banquet welcoming Earth should not say to our delegation: "May I serve you?"
—Charles Underhill, Burlington, VT

Never ask your Mercurial girlfriend how old she is or remind her parents that the drinking age on Jupiter is two.
—Pat Portale, Huntington Beach, CA

Introductions to aliens: Shake only the proffered appendage. Never take the initiative by shaking just any appendage.
—Dana Calk, Salem, NH

A time traveler should never yell: "Duck!" at Ford's Theater.
—Christopher Krajci, Park Ridge, IL

You are not expected to take a gift when invited to a meteor shower.
—Gary Tutt, Duncanville, TX

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INTERVIEW

CONTINUED FROM PAGE 32

field-Jakob disease. Those tests show it to be not so toxic that it kills people. In Crautzfeldt-Jakob disease the subjective impression of the clinicians was that patients were improved after HPA-23. Because of these impressions, they decided to try HPA-23 in AIDS patients. A thirteen-year-old boy had the virus before being given HPA-23, but after treatment the virus couldn't be isolated. So it was felt that the drug was promising, and it was tested in other patients. In some of these the virus seemed to have gone away. When they discontinued the treatment, however, the virus reappeared within a few weeks. So now HPA-23 is being tested in a longer course of treatment.

Omni: Doesn't interferon show some promise in treating early AIDS?

Kimm: It's entirely logical to think so, because interferon is active against retroviruses. In fact, it's been shown in the test tube to inhibit the HTLV-3 virus. We should have extensive trials of interferon in people with early infection to measure the extent to which it can control viral multiplication. I doubt it will cure people with early AIDS, because even though it may suppress the expression of the virus, once the interferon is withdrawn, the virus will be expressed again. But interferon could possibly delay the emergence of full-blown AIDS or make it less severe.

Omni: Could the government do more to promote AIDS research?

Kimm: The federal government under President Reagan has not used all the money appropriated by Congress for research on AIDS. They have funded only certain areas, mostly concerned with the causes of AIDS. Other ways of controlling the disease have not been encouraged, primarily public education—the only means we now have—and treatment. It is terrible to see people inevitably dying, while we are not trying hard enough to treat them. It's also appalling to hear our Secretary of Health and Human Services, Margaret Heckler, address an international meeting last April and say, in effect, that we must find an answer to this disease before it reaches the heterosexual community. Never mind the people who already have it. What an embarrassment.

Omni: Will Rock Hudson's tragic illness ultimately have a positive impact on the campaign against AIDS?

Kimm: Yes. It should send a message to the public that this is not a disease that strikes sleazy people. The public may finally realize that AIDS hits people who are beloved and who make great contributions to society.

Omni: What information should the public know about AIDS?

Kimm: The public ought to get the message that there is no need to panic at the thought of having AIDS patients around us—in our clubs, buses, theaters, and restaurants. This is first, because of the lack of evidence for contagion by casual contact, and second, because AIDS patients are actually less

contagious than people having an early infection before clinical symptoms appear. Because so many T cells of AIDS patients are already largely destroyed, they're actually carrying less of the HTLV-3 virus. Nothing is solved by discriminating against AIDS patients or throwing them out of apartments or jobs. Quite the contrary, this would give the public an entirely false sense of reassurance. The public should also know that under certain conditions, mainly sexual intercourse, the infection is transmissible, and that women can get it. In women, of course, the health of the offspring is also jeopardized. Newborn babies come down with AIDS even if the mother does not have the full-blown disease but only HTLV-3 infection. Infants lack a mature immune system, so they can't fight off the virus. The way to prevent this disease is to avoid the transmission of HTLV-3 between people. This can be accomplished by having sex without the exchange of bodily fluid from person to person. Last year I was invited on the Phil Donahue show and tried to get the message across. I was determined to tell people to wear condoms. At the last minute in front of the TV camera, I got embarrassed and started mumbling. So Donahue said to me, "You want to say that people have to wear rubbers." And I shouted, "Yes, yes, yes!" Safety can also be increased through the use, during sexual intercourse, of certain preparations containing a germicidal substance specifically nonoxonyl-B, which rapidly kills HTLV-3. Avoiding casual sexual encounters and limiting the number of one's sexual partners may be effective protection too. [Nonoxonyl-B is a component of some female contraceptive gels that are available at drugstores.]

Omni: Do you subscribe to the surveillance theory, namely that the immune system polices the body and routinely shoots down cancer cells as they are forming?

Kimm: I think one must, even though we don't have clear evidence for it. We know that the body has systems that eliminate abnormal cells, not only cancer cells, but also virus-infected and old cells that have outlived their usefulness. Experimental evidence shows that natural killer cells and macrophages [cells that surround, engulf and digest cellular debris] can recognize and kill cancer cells. We don't know whether they survey all cancer cells or just search for specific cellular defects. But it would be really extraordinary if we can show that they can recognize tumor cells in the test tube and not in the organism.

Omni: Has the connection between viruses and cancer been clearly established?

Kimm: In my mind it was established long ago. Certain viruses are capable of inducing tumors in humans. Not always necessary, they can be a vehicle by which precancerous chromosomal changes can occur.

Omni: Can life-style, as well as viruses, be seen as a cause of cancer?

Kimm: No, no. The emphasis on life-style and nutrition is exaggerated. Of course we should have a balanced diet—we should eat fiber

and not too much fat—and of course we should exercise and breathe clean air. But the belief that any one conventional food either causes or eliminates cancer is ridiculous. Cancer is due to a fundamental biological reality. We have chromosomes and genes that need to undergo chemical changes; genetic expression must be regulated; and occasionally something goes wrong. We will always have cancer; prevention will never be complete. So we must work at treatments.

Omni: Suppose people could be trained to visualize very specific cells?

Krim: You mean by using the mind as a sort of shooting range to hit a particular target? This idea is ridiculous and actually belittling to people who die of cancer. It's like telling them: "Well, you're not able to control your own body, and this is why you're dying." Those people want to live. I assure you.

Omni: Is it naive to think that there might be a single cure for cancer?

Krim: Of course. Cancer is not one disease; it is a hundred diseases. Even cancer cells from the same kind of tissue have different properties from individual to individual. Almost every cancer patient has his own individual variety of the disease. Even growth, which is supposed to be the common denominator in cancer, is controlled by different mechanisms. The breakdown in any one of these mechanisms can lead to the uncontrolled growth that we call cancer.

Omni: How will cancer be treated?

Krim: In the future a cancer patient will come in and we will take cells from his tumor and study them in vitro. When we've determined the properties of these particular cancer cells from a patient, we'll be able to custom-design a cocktail of natural substances that will put things back on the right track—change the surface properties of the cancer cells, stop them from growing, or kill them.

Omni: Is the pie for cancer research being sliced properly?

Krim: No. I would put more emphasis on basic biological research. We appear to spend lots of money on toxicities and superciliousness, on things of little fundamental importance. A few years ago, an enormous amount of money was spent to get people to spit on slides to detect early signs of lung cancer. But what was the result? When you detected something, you operated. But did you really prolong lives by doing earlier operations? No. You worried the people sick, gave them years of misery, and in the end you couldn't prolong their lives. A major defect of the national cancer program is that those in charge of any program find it very difficult to cut off funding for things not proven useful. Each of these programs generates a constituency of people who develop expertise and become advocates for the program because they make a living at it. And it's very difficult to cut them out.

Omni: Should society—particularly the federal government—contribute more to science than it does?

Krim: As a society we have not yet decided the importance of science and the price we're willing to pay for it. We're not performing like a company, where it would be established policy that some definite percentage of profit is reinvested in research. Because our support is appropriated by Congress each year, we never know how much we'll have to work with next year. It has become so difficult to survive as a scientist that some people have even become dishonest. A few years ago a researcher applied to my foundation for a grant to investigate a new approach in the reversal of a certain immunological abnormality. A very original idea. We gave him a grant, but he needed more money. So he went to the NIH for support, and his application was peer-reviewed by other scientists. They turned him down. Just a few days ago I attended a meeting on a report from the lab of one of these scientists on exactly the same approach. This person sat on the committee that reviewed and rejected the original application. Because the idea was very original it's hard to believe that it was a coincidence.

Omni: What about the status of women in science? How has it changed since you started out?

Krim: When I was starting in Switzerland, society generally thought women going into science were forsaking their normal way of life, that they were rare exceptions, a little bizarre. People used to think female scientists were either destined to become spinsters or that they were amiable, spoiled girls wasting our time. We were given a very hard time. Today it's quite different. Many women going into science believe that they can make a career and still have a family life. Back then I had serious doubts that I could do both. Those doubts still persist. I often think that I am not good at anything I do that neither my work nor the care of my family is being done properly. I have an almost constant feeling of guilt. Male colleagues don't understand it. Even my husband doesn't. He has been very good about letting me work, but he thinks that because he doesn't complain, there's no problem. "You see?" But there is. The problem is that I feel guilty. I have not come across many overtly discriminatory attitudes in male scientists. The wrong attitude is in me. I suffer from insecurity, and I think most women do.

Omni: Do you think there are advantages to being a female scientist?

Krim: In a way, yes. There are certain things that women are (or were) taught by tradition—knitting, embroidering, cooking, taking care of babies—that are very good training for science. We have nimble fingers, we are good at delicate work. We are attentive, conscientious, pay attention to detail. Our aesthetic sense is better developed. All this helps. I'm convinced. In today's system of science, I think, at the top there is less difference between men and women because those of both sexes who are different have already been eliminated. At the top all have learned to play the same game. And it is a bit of a con game. **OO**

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SPACE

CONTINUED FROM PAGE 30

taking just one person into space on the shuttle is going to be about one million dollars," Swartz believes. "Even at that, we expect that three hundred people per year will want to make the trip. But we want to take thousands of people into space each year. For that, eventually we will have to get the price down to fifty thousand dollars."

The other obstacle to space tourism is NASA. According to Peter Eaton, NASA's director of policy and plans for commercial development, a firm called Orbital Adventures of Bellevue, Washington, has already applied to carry tourists in a passenger module. The firm was rejected and appears to have abandoned the project.

"They wanted to fly large numbers of people on many shuttle missions each year," Eaton explains. "The numbers have to be high to hold the price down. Unfortunately if you have four orbiters and project your traffic rate into the next decade, you cannot make that long-term commitment and still meet other responsibilities."

Those other responsibilities would include devising escape procedures for emergency situations. It's feasible to remove a small crew safely, but plans for evacuating a number of untrained passengers have not been worked out.

"What it boils down to is that tourism would not be our top priority," Eaton concludes. "We have to meet the needs of national security, science, and commercial projects that are leveraging jobs and high-technology industries of the future. All these things have higher priorities than such public affairs-type activities as tourism."

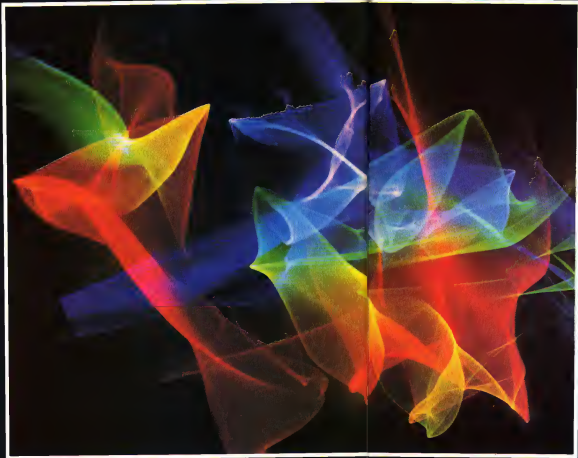
Yet the folks at Society Expeditions are undaunted. "In the long run, we would like to buy two shuttles of our own," Swartz says. "We might even have our own launch pad. We hope for one launch per week."

And this shuttle need not be NASA's. "We have already talked to several people who have designed space vehicles," Swartz adds. "We believe that we will be able to raise the seed capital necessary for a private passenger vehicle." Although he can give no details, a cleverly designed launcher, he believes, could be less costly than the Rockwell passenger module.

Despite the protests and reservations of the people at NASA, the agency will probably find a way to take large groups to space. At least Spacecom's Steve Dunt believes it will.

I have a missionary's conviction that the shuttle should and will be used for passengers as a prime function," he says. "That's the one area that nobody can compete with Ariane competes with it for putting satellites out, and so do expendable launch vehicles. The Russians and the Chinese are in this market now, but nobody can take people up the way we can."

"There are one hundred million Americans who know that it's our shuttle," he adds, "and they want to go." **DD**



PHENOMENA

A fantasia of rainbowed veils dances capriciously against the darkness in this image rendered by artist Eric J. Pittman, of Victoria, British Columbia. "Color is among the most important stimuli we have," Pittman says. "The stained-glass windows of medieval cathedrals were created so that sunlight would pour down in bands of color on the congregation, promoting feelings of awe and wonder." Pittman's desire to use the purest possible color in his work has led him to the light source itself: the sun. In a candleless technique he calls light painting, Pittman uses crystals to liberate and then manipulate the spectral colors in sunshine, refracting them directly onto photographic plates. This light painting is part of a series Pittman made in the rarified atmosphere atop Hawaii's 13,796-foot-high Mauna Kea volcano, the site of four astronomical observatories. There, far from any smog, he used the sun's palette to "communicate an experience of energy." DD

GAMES

By Scot Morris

Hanging is too good for a man who makes puns, he should be drawn and quartered
—Fred Allen

When someone asked Henry Einskane if the pun is the lowest form of wit, he replied "It is, and therefore the foundation of all wit." Samuel Taylor Coleridge, in a lecture on Shakespeare, said that punning "may be the lowest, but at all events is the most harmless kind of wit, because it never escapes envy."

The cliché is that puns are an inferior form of wit because they rely merely on an accident of language rather than on a creative play with ideas. Puns depend on sound. They capitalize on the fact that two distinct words have identical or similar pronunciations. The punster notices this and draws the two meanings together in one utterance. Puns remind you that words are one thing, and things are another. "The fact that people and trees and elephants and cats all have trunks just proves that there are more things than there are words."

But there are champions of punning. Edgar Allan Poe said, "Of puns it has been said that those who most dislike them are those who are least able to utter them." The sentiment is shared by Oscar Levant. A pun is the lowest form of humor...when you don't think of it first."

When James Boswell suggested that Samuel Johnson disliked puns because he couldn't make them, Johnson replied, "If I were punished for every pun I shed, there would not be left a puny shed of my punnish head." Oliver Wendell Holmes was a "heretofore rapscallion" according to Walter Reardon in *Runs*. On the one hand Holmes made puns (as a physician he once said that he was grateful for small favors), and on the other hand he was outspoken in criticizing them. People that make puns are like wicker boys that put coppers on the railroad tracks. They amuse themselves and other children, but their little trick may upset a freight train of conversation for the sake of a battered witicism."

Newspaper headline writers are notorious punsters. The need for a quick, catchy summary of a story and for collapsing



Clearness Is Next to Godliness? by Doug Webb. Enter Competition #38 for the perfect pun

multiple meanings into few words can bring out classic examples. The *New York Times* ran an article on the people who use stopwatches to record performance times of track-and-field athletes and gave it this headline: THERE ARE THE SOULS THAT HAVE MOVIE TRICKS. The *New York Daily News* ran a picture of pedestrians basting winter in the city and appended this caption: MANY ARE COLD BUT FEW ARE FROZEN. The same paper once ran a classic headline over a photo of Mayor Ed Koch and Governor Hugh Carey, who had spent the weekend in meetings discussing how to raise funds for the New York City transit system. Early Monday morning they held a news conference to announce the rejuvenation of the transit system. The *News* writer must have thought the situation was too good to be true. The headline over the photo, sick, THWARTED A GLORIOUS MONDAY.

FINE POINTS

A pun: A play on words. A double entendre: A personification. The terms are

often used interchangeably, but some pundits make distinctions. Patrick Hughes and Paul Hammond, in *Upon the Pun*, take great pains to draw the line. A pun, they say, rests on two different words or phrases that have the same sound. A few examples: Follow the Leader. Cadmus Weeds. The excitement at the circus is in tents. To wit: "Here's champagne to our dear friends and real pun to our sham friends." Marina Navratilova's request on defecting to the United States: "Do you catch Cadmus?"

According to Hughes and Hammond the pun is two sentences, built on two words that happen to sound alike. When it appears in print the writer must decide which of the two to spell out and which to leave implied. When the two pronunciations in question aren't exactly alike but just similar, some authors call it a personification. Mexican weather report: Chili today hot (male). Birth of a Nation: There is a vast difference between children and no children. A bar in the basement of the DuPont Plaza

Hotel, in Miami, was reportedly called Chee When. "Armageddon sick of it," said Robert A. Hearian.

In contrast, Hughes and Hammond rested the term play on words to wordplay based on one word with two distinct senses. As for Stevenson: "He who slings mud loses ground." At a flea circus a dog came by and stole the show: "What's worse than killing cats and dogs? Having them." An architect in prison complained that the walls were not built to scale. The play on words works equally well in speech or in print; the pun depends on sound.

Finally, the double entendre is said to be a play on words, one meaning of which is lewd. Did you hear about the sheepy bride who couldn't stay awake for a second? You need leather heels to play rugby.

One aspect of the distinction is that a play on words is often translatable from one language to another, whereas a pun usually is not. A Frenchman boasted he could come up with an instant pun on any subject. Someone proposed the king. He replied: "The king is not a subject." The wit comes through as well in translation to English. Cicero said of a farmer who had plowed up the field where his father was buried: "He is truly to outlive a father's memory." Here the translation from Latin to English works quite well.

These fine distinctions are not widely used. For most purposes—ours included—the term pun is used in the wider sense and is meant to include Hughes and Hammond's play on words.

In spite of its critics the pun has a distinguished history. The Catholic Church is founded on a pun: Jesus promised in Matthew 16:18, when he said, "Thou art Peter, and upon this rock I will build my church." In Greek, *petros* is the name for Peter and also for rock (it's the root of *petrify*—to turn to stone). When General Sir Charles Napier defeated the Indian province of Sind in 1843, he sent to London a message of one Latin word—*Paccina*. The members of the foreign office—classically educated all—understood exactly what he meant: "I have sin'd."

Some puns have entered the language. The upper arm bone is called the humerus,

a Latin name. At the elbow end of this bone is the ulnar nerve, which, when bumped sends a peculiar twinge of tickling pain up the whole arm. Some unknown medical man called this elbow joint the "funny bone," a deliberate pun on *humerus*. A term that is little known to Americans, wide-awake hat, applies to a broad-brimmed felt hat. It was so named, according to the *Shonsie Oxford English Dictionary*, because it has no nap.

CRITICS' CHOICES

What is the best pun ever? As you might expect, authorities don't agree. Art Moger, author of *The Complete Pun Book*, says his own favorite pun is a Burma Shave sign he saw along a roadside in about 1963:

PICNIC: WALKED—BACK HOME BY GULLY—HIS BRISTLY CHAIR—WAS HOT TO MOLLY.

Walter Eppie, author of *An Almanac of Words at Play* and many other books on wordplay, told us that his favorite pun was one Richard Hughes slipped into a novel. He described a cat that was so smart it first ate cheese and then breathed down mouse holes—with baited breath.

John Crosbie, editor of *The Purditt*, a monthly newsletter devoted to the use of puns in the media (30 Sandesh Avenue, Toronto, Ont. M4W 3B1), says his favorite is the story of the first Queen Elizabeth on a state visit to London. Greeted by the Lord Mayor with "Hail to the Queen," she glanced at him and supposedly said, "How dare you hail while I am reigning."

William Safire, author of the "On Language" column in the *New York Times Magazine*, reported a story of people who were trying to remove spilled oil from seawalls. The conservationists claimed that they left no harm unstated. Frankly, we don't get it, but Safire thought this was among the best of recent puns. This only goes to show how subjective a punner's opinion is. For our money, we prefer the reported by Tom Wolfe in *The Electric Kool-Aid Acid Test*, an account of the drugged-out commune headed by Ken Kesey. At the end of the drive leading from the commune to the main road, attached to a fixed sign at the intersection there was this sign: NO LEFT TURN UNLESS YOU WANT TO HAVE TO.

call that one of the best puns ever—a clean triple! with three different words.

Along these lines, there is the story of the celebrated wit S. J. Perelman, who was visiting Taipei and found himself surrounded by attractive professional ladies who kept soliciting him for more than his autograph. According to a *Time* magazine account, Perelman later told a friend that it was a case of the tail clogging the wag.

But for the best pun ever we would have to cite the story of Focus Ranch. Three brothers started a cattle ranch in Texas but couldn't decide what to call it. They cabled their father for an idea and he suggested Focus, because that's where the sun's rays meet. Both Isaac Asimov and the editor of *World Ways*, A. Ross Eckler, called this their favorite pun of all time. Asked to pick a second favorite, Asimov chose this: In a conversation about the inhabitants of ancient Media in Persia, George S. Kaufman reportedly opined: "One man's Media is another man's Persia." When someone asked, "Are you stork?" Kaufman replied: "Subtly!"

COMPETITION #36: PUN FUN

Can anyone beat Focus Ranch? We're betting that *Omni* readers have some original ideas for puns, plays on words, or any other forms of wordplay discussed earlier. We're looking for the perfect pun and we'll award an Emerson VocabularySetter Recorder (VHS format) to the grand prize-winner and \$25 each to nine runners up. All we will get one-year *Omni* subscriptions. We're not looking for joke punch lines (Rudolph the Red knows rain, dear Perelman me. Roy is that the cat that chewed your new shoes?). And we're not looking for new entries in *Omni's* Fractured Dictionary (alimony, bounty on the mutiny, drive in theater, wall to wall ice pelting). These are competitions for another time. What we want is more brilliant wordplay of the type exemplified above. Send one entry only please, on a postcard for a card in an envelope, to *Omni* Competition #36, 1995 Broadway, New York, NY 10023 5065, postmarked by December 15, 1986. All entries become the property of *Omni*; none will be returned. **DO**



LAST WORD

By John Ficariz

“The object of this experiment was simple, to determine the exact sound that a Tupperware container makes when burped in an atmosphere-free environment.”

Now that the space shuttle *Columbia* and *Challenger* are blinding off and returning to Earth with some regularity, the public awareness of, and interest in, the space program has once again begun to dwindle. One page-one headline, *First Steps on Efforts and Research* are now usually buried in the newspaper somewhere between *Dear Abby* and the obituaries.

For those of us whose interest in the space-shuttle program has waned, I've compiled the following catch-up guide to some of the lesser-known and sometimes experiments that have been conducted by our astronauts.

EXPERIMENT PAB-1200: Medical researchers have long theorized that existing drugs could be made more easily and with greater purity in the zero-gravity environment of space. The object of experiment PAB-1200 was to test this theory by attempting to manufacture one kilo of the painkiller Percocet.

The experiment began on schedule one Friday night at 11:08 a.m. EST. Ground *Columbia* first indication that something was amiss came at 3:48 A.M. When monitoring devices showed one of the astronauts had gone outside the shuttle for an unauthorized spacewalk. When asked to explain his actions, he replied: “I... groves... beer...” He then passed out.

Repeated attempts to contact the remaining crew aboard the shuttle proved unsuccessful as all Earth-to-shuttle communications were jammed by a recording of the Beatles' song “Helter Skelter,” emanating at incredible decibels from somewhere onboard the spacecraft.

At 4:00 A.M. EST, the flight director at NASA ordered the experiment halted and the space shuttle returned to Earth under remote guidance from ground control.

Although the Percocet experiment was deemed as “incomplete,” PAB-1200 was not without its merits. Once again the shuttle demonstrated its versatility. Scientists were able to recalculate a flight plan for it and instead of touching down at Edwards Air Force Base, the shuttle landed directly at the Betty Ford Rehabilitation Center in Palm Springs, California.

EXPERIMENT GOWKTY: The object of this experiment, one of the first to be undertaken commercially, was simple: to determine the exact sound that a Tupperware container makes when it's burped in an atmosphere-free environment.

Although the procedure was meticulously rehearsed at hundreds of Tupperware parties on Earth, NASA admits human error in space caused this experiment to go awry. When the astronaut trained to do the burping opened the cargo-bay doors, the Tupperware container slipped out of his hands and drifted off into space. Eventually it settled into a new orbit around Earth.

While the burping aspect of the exper-

iment was a complete bust, this story has an interesting footnote: NASA estimates that at its current speed the Tupperware container should remain in orbit until the year 2016. Tupperware has gone on record to assure NASA and the country that the bologna sandwich put in the container by one of the astronauts will still be fresh when it is buried to orders on eBay.

EXPERIMENT LOVE II: NASA. Not all space experimentation is hard work. Operation Love II, NASA's a prime example. The object of the experiment was to illustrate various aspects of weightlessness by filming astronauts “action-testing,” or playing with a number of different toys.

The earlier part of the experiment was off without a hitch. Film of the astronauts “wailing the dog” and “going around the world” with their yo-yo appeared on all the TV networks. It was after the cameras were shut off that the problems started.

Two astronauts were playing chess while the other two began playing *Monopoly*. According to the chips log, an argument began between the two *Monopoly* players when one player's piece landed on Marvin Gardens and the other player attempted to charge hotel rent for the black king's rook, which had floated over and settled on the board.

Meanwhile, at the chess game an argument began between the other two astronauts about whether white could use a knight out of and race card to move the queen out of check. Black threatened to counter with the move “Knight takes Little Scottie Dog, Checkmate!”

Finally, Mission Control had to intervene and order the astronauts to put away their toys. Houston declared the games a draw although hard feelings lingered for the remaining orbits.

EXPERIMENT MTV: Hailed by NASA as “what this program is all about,” Mission MTV marked the first servicing of a broken television satellite in outer space.

Two astronauts trained in TV satellite repair put on their jet packs and coasted out to the malfunctioning unit. There they labored a total of ten hours to find the problem. But no luck. They prepared to follow standard NASA procedure and bring the broken satellite “back to the shop.”

But the commander of the mission had another idea. Ordering the two astronauts to “stand” back, he activated the shuttle's remote-control arm and—using its precise controls, raised what NASA spokesmen described as a “slap-in-hand” to the side of the malfunctioning satellite. It began to tremble, immediately and hasn't had a single problem since. Once again, science triumphs. **CO**

John Ficariz's first book, *The MAD Book of Fears and Phobias*, was published by Warner Books this month. It may never be seen in space.