OMNI

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NEW FRONTIERS: SPACE • EARTH NIGHT • SPIRIT

PLUS: THE LOST ART OF WERNHER VON BRAUN AND THE WINNERS OF THE MOON BUGGY CONTEST

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Artist Attila Hejja's majestic space station travels through the cosmos. The inhabitants of such a craft will one day plot the course for off-planet life. This month we explore the new frontiers being plumbed by earthbound pioneers

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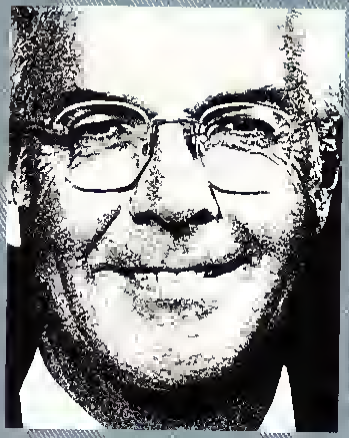


FIRST WORD

By Sanford N. McDonnell

"The Soviets have established a firm foothold in space. Unless the United States builds its own space station, it will be a second-class space power in the twenty-first century."

You never know until you try.

That little bit of wisdom has been proved by people with vision throughout history. For instance, just three decades ago many thought that journeying into space was an impossible dream. "Space travel is utter bilge," declared Sir Richard van der Riet Woolley, royal astronomer for Great Britain, in 1956.

We've come a long way since then. Not only have we traveled to space, we've taken the first steps to explore it. We've sent men to the moon and launched successful probes to Mercury, Venus, Mars, Jupiter, Saturn and Uranus. In addition, we've launched spacecraft to study the sun, as well as satellites that allow us to send messages around the world in the blink of an eye. We even built a temporary orbiting workshop called *Skylab*, which proved that humans could live in the weightlessness of space.

But our exploration of space has just begun. We've traveled through space for short visits and caught glimpses of the universe that lies beyond. We've gathered bits and pieces—just enough to leave us wanting to know more. The time has come to take the next logical step in space: to build a space station—a permanent base where men and women can live and work in space.

In January 1984 President Reagan directed NASA to build that permanently manned space station and to do it within a decade. The station NASA envisions will be a multipurpose facility: a national science and technology center that will allow us to study the earth's resources, to explore the far reaches of the universe, to repair and refuel satellites in orbit, and to develop new manufacturing techniques for products that will be used on Earth. In addition, an infrared telescope assembled and launched on the station will allow astronomers to see farther than ever before. And a planned X-ray observatory may give us clues about the massive black holes that appear at the center of many galaxies.

The station will also enable us to send astronauts or robots to retrieve broken satellites and bring them back to the station's "spacecraft garage," where they can be fixed and put back into orbit. By giving astronauts more time and more room to conduct experiments in orbit than ever before, the station will stimulate the development of new products. One especially promising area is materials processing, which would take advantage of microgravity to produce new pharmaceuticals and metal alloys and purer crystals for computer chips.

By serving as an assembly base for new spacecraft, the station will also help further space exploration. It may serve as a launchpad for spaceships going to the moon and as a stepping-stone for mankind's first trip to the planet Mars.

A manned space station is vital if this nation is to remain a world leader in space exploration. The Soviets have been putting space stations into orbit for more than 15 years. During that time they have established a firm foothold in space and seem determined to harvest its rich potential. Unless the United States builds its own space station, it will be a second-class space power in the twenty-first century. If that happens, we'll probably fall behind in technological expertise on Earth as well. Only with a manned research base in space will we be able to sustain and advance our scientific and technological leadership on Earth.

Even with all of these compelling reasons for our nation to build a space station—and build it soon—there are still those who believe that launching a space station is, well, "utter bilge."

What these people don't realize is that scientific research is the discovery of the new and unexpected. Robots can be programmed only to respond to what we already know. We can build artificial eyes and hands and even artificial intelligence, but they remain just that—artificial. There's no substitute for the presence of a thinking human being.

But that doesn't mean that unmanned missions aren't important. On the contrary, unmanned probes are an essential complement to manned missions. They are the first step to exploring unknown regions and gathering basic information on what's out there. Unmanned spacecraft can survive the harsh environments and prolonged trips necessary to reach some of the far-flung regions of our solar system. But once we've studied an area with unmanned spacecraft, the next step is to launch manned missions to further explore the region.

Some believe we don't need people in space. Others are against all space exploration. It's too much money, they say. It's not clear how we'll benefit from it, others say. They don't think that the long-standing dream of colonizing space, of establishing a base on the moon, or of sending an expedition to Mars is possible. But there are those of us who dare to dream differently. Just as there were people who believed in the idea of space travel and made that idea a reality, there are those of us who believe that building the space station is an idea essential to this nation's future. What scientific discoveries and technological breakthroughs will result from this next step in our exploration of the universe?

We'll never know until we try. ∞

Sanford N. McDonnell is chairman and chief executive officer of McDonnell Douglas Corporation and the chairman of the 1987 National Spaceweek.

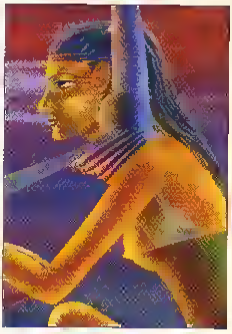
CONTRIBUTORS

OMNIBUS


LAWREN


STARMAN


INTERVIEW


WALK LIKE AN EGYPTIAN


PRIX DE LUNE


FOREVER YOURS ANNA

The world is full of places few people have experienced frontiers ripe for exploration Going there requires only an adventurous spirit a curiosity about the unknown a determination to break new ground

In "Pioneering Middle Earth" (page 44) *Bill Lawren* reports on those geological adventurers who are attempting to plumb our underworld Using new sophisticated tools and techniques they are drilling mapping, measuring and in some cases actually looking into the earth s interior As a result terra firma is beginning to reveal some of its most important secrets In the future we ll more accurately prospect for fuel and minerals discover new miracle metals and predict or even prevent disasters caused by earthquakes and volcanoes Last summer, as a result of his article "The Cities of Neptune (July 1986) Lawren began pursuing sea diving and underwater construction Now he wants to invest in land—if he can get the rights to what lies beneath it

There are still Gardens of Eden on Earth like Indonesia s Tanjung Puting Reserve an enclave protected since Dutch colonial times There primatologist Birute Galdikas the subject of this month s Interview (page 76) has documented the solitary life-style of the orangutan "She s not an easy person to get to know says journalist *Don Lessem* a former primatology student at Harvard who encountered Galdikas during one of her rare visits to the United States "Like the orangutans she is shy and suspicious of strangers I m not sure if that s a product of so many years in the jungle or if it s what made her suited to the environment in the first place" Galdikas of course has since returned to Indonesia and Lessem is off to MIT on a Kidder Fellowship to study macrotechnology a subject that caught his imagination after interviewing Frank Davidson (May 1987)

Reincarnation is a spiritual frontier that many people believe warrants closer scrutiny "Walk Like an Egyptian" (page 66) a love story that spans 3 000 years is excerpted from *Jonathan Cott s* book *The Search for Omm Sety* (Doubleday) An Englishwoman who spent her lifetime reaching back to what she believed to be her ancient roots Dorothy Eady (Omm Sety) contributed a great deal to the subject of Egyptology and discoveries made among the pyramids

In his article "Into the Night" (page 36) former *Omni* editor *Gurney Williams III* presents the daring colonizers of the nocturnal frontier—that time beyond midnight when most of us are asleep resting up for the next day Increasing activity during those sunless hours however may mold future societies providing full 24-hour services

To explore this new frontier Williams became a night owl himself working until dawn and experiencing short periods of sleep during the day "Those naps were surprisingly restful as good as a full night s sleep" he says At night he wandered through sparsely populated streets and bustling businesses in cities like Detroit and Houston exploring the incipient culture

Williams also wrote the text for "Starman" (page 86) part three in our pictorial series on the Fifties view of the space frontier "I remember seeing these artists works when they first appeared in *Collier s,*" says Williams whose father was the magazine s humor editor at the time "They had a galvanizing effect on a boy of eleven and spawned my interest in science"

Last October we challenged readers to design a vehicle capable of racing across the barren lunar frontier Some 2 000 entries were subsequently submitted for the moon buggy contest all from contestants vying for a trip to low Earth orbit Now in "Prix de Lune" (page 52) artist *Ron Embleton* gives his interpretation of the top ideas and SF writer *Dean Ing* describes the event as it might be run by these strange contraptions

In "Forever Yours Anna" (page 58) science-fiction writer *Kate Wilhelm* offers a story involving the frontier of time travel Wilhelm recently received a Nebula award from the Science Fiction Writers of America for her novelette "The Girl Who Fell Into the Sky" *(Isaac Asimov s Science Fiction Magazine)*

And we also congratulate *Greg Bear* who won a Nebula for "Tangents" (January 1986) a short story that explores another frontier—the fourth dimension ∞

OMNI

THE CORPORATION

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Future Options

Thank you for publishing "The Ghost Lemurs of Madagascar" [April 1987] William Burroughs's tale emphasizes the critical need to protect the nearly extinct primates in Madagascar and the importance of preserving our environment If habitat destruction continues at the present rate we may become the final endangered species Drastic action needs to be taken if we are to survive

Alan Koslowski
Silverdale, WA

Gardens of Stone

Your article "Let's Hear It for Acid Rain" [Continuum April 1987] presents the phenomenon of acid rain in a positive light without referring to its devastating effects on the environment, our natural resource base, and human health Your simplistic presentation at a time of serious congressional debate over how to control this global problem seems in bad taste if not altogether misleading

Adding small amounts of nitric acid to soil does stimulate plant growth, as the article notes There is far more to the story however than increased crop yields and reduced fertilizer costs Acid rain has killed the fish populations in 14 000 lakes in Canada and 200 lakes in the Adirondacks caused wholesale forest death and created excessive amounts of low altitude ozone

Legislation has been proposed in Congress that could cut U.S sulfur dioxide emissions by 50 percent reduce nitrogen oxide emissions and establish trilateral emission control among the United States, Canada and Mexico The public has an opportunity to support this legislation and turn back the tide of acid rain destruction It's time to disarm the polluters

Karen L Coulter
Acid Rain Campaign Coordinator
Greenpeace
Seattle

Waking Up

Three cheers for "Power Trips Controlling Your Dreams" ["The Omni Experience" April 1987] It's amazing how long it takes for science to realize that dreams do indeed form a link between the sleeping and waking states Will scientists ever understand that certain phenomena exist for which there is no empirical evidence?

Jeffrey Brooker
San Francisco

Pride and Prejudice

Gunter Dörner's endocrinologically based theory of homosexuality ["Sexual Destinies," April 1987] is just that—a theory Dorner's studies are flawed by a small sample size, skewed selection of subjects from patient populations, and obvious prejudice In addition to the homophobic taint to Dorner's conclusions, there is a deeper pervasive sexist bigotry the notion that all homosexual men are more "feminine" and thus like women who are presumed to be weaker and undeserving of the rights of manhood

Dorner's suggestion to decrease the incidence of homosexuality by abortion or by biologic or chemical manipulation of the fetus is a very dangerous social instrument This century has already witnessed xenophobic theories in practice during the Holocaust

Michael Mauk, M.D.
Secretary to the Board
National Gay and Lesbian Task Force
Washington, DC

Here we go again—another theory on the origins of homosexuality with the predictable objective of eliminating it I am damn tired of researchers like Dörner who want to make us over in their own image I have been gay for more than 30 years and—in spite of prejudice, AIDS, fundamentalist doublethink and straight oppression—my life has been rewarding, exciting and creative Heterosexuality is no guarantee of happiness

Charles Alexander
Detroit

Correction

In the May 1987 article "Perfect Crime" Harlan Ellison's identification of Alfred Bester's book *The Demolished Man* was omitted We regret the error.

COURTROOM PSYCHICS

FORUM

Editors Note. *The judicial system in this country has been using the abilities of psychics with increasing regularity. The Honorable Howard E. Goldfluss, acting justice of the Supreme Court, State of New York, comments on what appears to be a growing trend. Justice Goldfluss is a member of the New York State Task Force on Child Abuse and author of* The Judgment.

The highest priority of our judicial system should always be the quest for truth. Although it seems reasonable to assume that judges and juries will be skeptical of the claims of the paranormal—ESP, clairvoyance, psychokinesis, and the like—to everyone's surprise, no one is laughing. Law enforcement agencies, juries, and judges are finally acknowledging that we don't have answers to the unexplainable. It really shouldn't shock people that psychic phenomena have found a forum in the courts, requiring us to deal with novel and fascinating ideas.

If I've learned anything as a sitting judge for 15 years and as a practicing lawyer for 24, it is that the law must have an open mind. Concepts not considered a generation ago are accepted today. Trial lawyers, for instance, have psychics sit at counsel tables during the jury selection process in an effort to determine if prospective jurors are telling the truth. Psychics claim that they can weed out undisclosed bias or prejudice. Sometime in the future the courts may have to decide the propriety of that procedure.

Acceptance of psychics in the American courtroom has been gradual. The first major publicized case occurred in 1975 when ESP was used in a trial. Joan Little, an inmate in a Raleigh, North Carolina, jail, fatally stabbed a prison guard. She claimed he had tried to rape her. Jerry Paul, her chief defense counsel, wanted to know at the outset where a potential juror's sympathy would lie. He employed psychic Richard Wolf to consult with him in jury selection. After Little's acquittal, Paul said, "Wolf wasn't one hundred percent correct, but he was more often right than wrong." Paul saw Wolf's role as essential to the reaching of the verdict.

There are other examples of psychic successes that even the most jaded and skeptical would find difficult—if not impossible—to ignore. Greta Alexander of Delavon, Illinois, calls herself a parapsychologist. She claims she acquired her psychic powers 26 years ago, after being struck by lightning. I know the normal reaction to such a claim: a wink and a finger moving counterclockwise around the ear, signifying that the woman is playing with less than a full deck.

But in 1977 she pinpointed the missing bodies of a three-year-old boy and a twenty one-year-old man who drowned in separate incidents in Iowa. Those discoveries were documented as authentic. In 1983 she again gave the police information that led a team of 22 police and civilians volunteers to a wooded area near Peoria, Illinois. At the designated site they found the skeletal remains of a woman who had been missing for a month. Alexander had given the police a number of specific details about the missing woman. The head would be detached from the body (confirmed); the remains would be near a bridge (confirmed); a salt or rock pile would be close by (confirmed). Police agencies throughout the country now routinely consult Alexander. No one doubts her sanity or believes she is a charlatan.

There is strong evidence that the public is growing more tolerant of psychic phenomena. Noreen Reiner, a self-proclaimed psychic in Medford, Oregon, is a case in point. She took umbrage at an assertion by John D. Merrill, cofounder of Northwest Skeptics, that she was a fraud. She sued for libel. At the trial she testified that she instructed police trainees throughout the nation on the value of psychic intervention in crime investigation. That fact was not lost on the jury, which awarded $25,000 to Reiner and in so doing gave fair warning to all defamers similarly inclined that they had better be prepared with the facts.

Intervention by psychics will raise vexing but intriguing legal problems, including issues of coercion and the right to privacy. Assume, says Ronald J. Allen, professor at Northwestern University School of Law, that a suspect is given his Miranda rights and consents to waive the presence of a lawyer. He answers questions put to him by the police. Assume further that the police arrange to have a psychic present during the questioning. Could his statement be stricken because it was coerced? Allen believes this is a strong possibility. "If the police have reason to believe the suspect is susceptible to that interrogation method and use it to break down his will, there could be a Fifth Amendment claim," Allen says.

California criminal lawyer Harold Weitzman is concerned with the consequences of the mind-probing abilities of psychics. A person in custody has the constitutional right to remain silent. But if his thoughts are "read" and transmitted to the police, has he then been deprived of a reasonable expectation of privacy? "I just don't believe it's possible," says Weitzman, "but if psychics can do what they say, it would be the height of a Fourth Amendment violation. If there's any place you have a reasonable expectation of privacy, it's in your mind."

For the present these questions are debatable. Acceptance of psychic phenomena has not reached the point where facing such legal problems is imminent. But we will have to deal with them in the future. Evidence is always a matter of degree. Loose ends prevail in the courtroom. Certainty is a rare commodity. Psychics do not solve crimes, nor do they resolve lawsuits. But if they contribute in any way to the discovery of the truth, then they can't be ignored.

Those of us who participate in the judicial system must be concerned with the discovery of truth as our prime objective. The value of psychic assistance in finding the truth has yet to be determined. Some psychics will turn out to be frauds; some will be legitimate. We will not be able to judge them until we listen to what they have to say. If justice is to be served, we should not be deterred by our inability to explain how such a noble purpose is accomplished.

BRAIN PICS

MIND

By Linda Marsa

The defendant had been convicted of shooting his wife and children to death. He claimed he had acted on command from a voice on television. Now it was up to a jury in Santa Barbara, California, to decide if he was insane or mentally competent when he murdered his family. If he was sane when he committed the crime, he could be sentenced to death.

Psychiatrists testifying that the defendant was schizophrenic conceded that the man could have fooled them. Undaunted, the defense attorney called on Monte S. Buchsbaum, a professor of psychiatry at the University of California at Irvine (UCI). He presented an unusual piece of evidence that the convicted killer was mentally ill: A picture of the man's brain taken by a positron emission tomography (PET) scanner machine, revealed the same abnormal patterns seen in the brains of many schizophrenics.

The jury recommended that the man not be sent to the gas chamber. Their verdict set a legal precedent. The admission of a PET scan as evidence for the insanity defense in a murder trial is just one of the practical applications of Buchsbaum's research into the biological underpinnings of mental illness.

Buchsbaum has performed close to 200 scans since the PET machine became the centerpiece of the UCI Department of Psychiatry's Brain Imaging Center in September 1984. A single scan costs about $2,500 and takes two hours to complete. The $1 million computerized "camera" is the only PET scanner installed in an academic psychiatry department and used exclusively for studying mental disorders. Buchsbaum contends that PET scanners will transform the practice of psychiatry from a largely subjective science into an objective one.

The process starts before dawn on just about every Wednesday—PET scan day at UCI. Physicists at the Davis campus of the University of California, located almost 400 miles to the north, throw a series of switches to ignite their 100-million-electron-volt cyclotron. Inside the cyclotron, a container filled with neon gas is bombarded with subatomic particles to produce radioactive fluorine, which is then carefully combined with glucose.

If all goes well, the radioactive fluorine isotope—it decays so rapidly that it loses half its potency within 110 minutes—is ready by noon and placed in a specially designed lead-lined container about a foot long and six inches in diameter. Rushed to a waiting twin-engine Beechcraft plane, the package arrives at John Wayne Airport, near Irvine, a little more than two hours later.

The phone rings. "Fifteen minutes," Buchsbaum announces to his expectant staff as he hangs up the phone. The isotope has arrived and is being inspected at the airport to ensure there's no leakage. The courier finally arrives with the precious cargo at three o'clock. Buchsbaum patiently tests the potency of the isotope for a few minutes before he informs his waiting troops that there is enough for three complete scans.

Buchsbaum's strategy is to watch the brain as it metabolizes and transforms its source of energy, glucose, into the electrical and chemical impulses we know as thoughts and emotions. After the radioactive glucose has been injected into the bloodstream of a patient and absorbed by the brain, the patient is given a PET scan. The result, a color-enhanced blueprint of the brain that, says the forty-six-year-old scientist, "provides the muddy-shoed footprints that lead gumshoe neuroscientists through intricate mazes of neural activity."

Already, the UCI team is finding some answers to questions that have baffled psychiatrists for years. What goes awry in the brain when, say, a schizophrenic hallucinates? Is autism a childhood form of schizophrenia, or is it an entirely different disorder? Is there a significant and consistently reproducible difference between brain patterns of normal subjects and of those suffering from Parkinson's disease, schizophrenia, or autism?

James, a teenager who has recovered from autism, sits in an overstuffed chair in a darkened room, taking a Continuous Performance Test (CPT). Designed to evaluate schizophrenics, it assesses how

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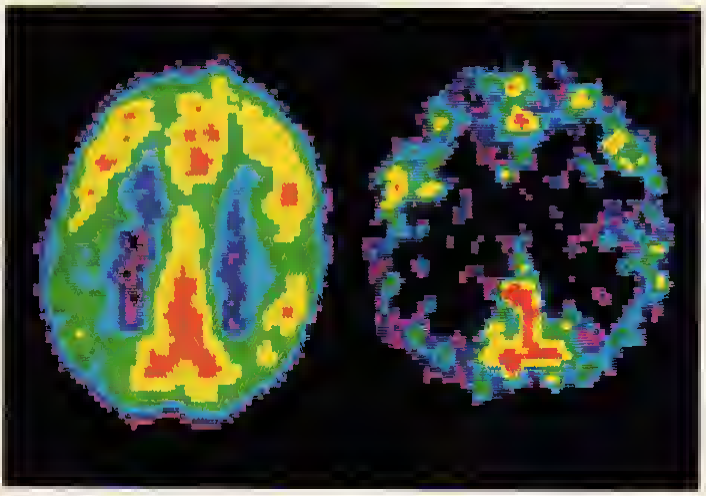

PET scan showing metabolic activity in a normal brain (left) and a schizophrenic brain (right)

ASTROCROPS

SPACE

By Richard Wolkomir

The two huge canisters, tethered together like a child's can-and-string telephone, spin slowly in space next to NASA's gleaming new space station. Inside the canisters are sweet potatoes and iceberg lettuce, the crops of the first space garden.

This is the Variable G Research Facility due to be launched sometime near the turn of the century. It will be a centrifuge that will spin at various speeds to simulate different gravities. Since so little is known about producing artificial gravity in orbit or about the effects such conditions might have on living organisms, the facility will offer an unprecedented opportunity to find out how little—or how much—gravity is needed for everything from plants to people. Particularly interested in the facility is a group of NASA biologists. They hope to use it to grow earthly crops under unearthly conditions and to lay the groundwork for future astrofarms on the moon or even Mars.

"It all comes down to cost," explains biochemist Robert MacElroy, science and technology manager in charge of pioneering astro-agriculture for NASA's Controlled Ecology Life Support System (CELSS) program. "It's the cost of sending up packaged food versus growing food in space." For now, it appears cheaper to grow it in space.

MacElroy and others expect that the first stages of astro-agricultural research will come around 1995, with our next major step into space—the space station. The Variable G Facility will offer them the chance to test out the astrofarm idea.

It won't be agriculture as we know it—no amber waves of grain, no beefsteak tomatoes ripening in the August sun. Early space farms will look like jumbo thermos bottles. Inside, the crops will never touch dirt. The "field hands" will be robots.

First, however, scientists will have to learn much more about how plant physiology will be affected by strange surroundings. "Nobody has really studied how plants behave in small, enclosed systems because nobody has needed to know," says MacElroy. "We also know little about the effects of the space environment—the low gravity and high levels of radiation—on plants."

At the Ames Research Center in California, NASA scientists are growing plants in sealed Lucite cylinders—about five feet across and 30 feet long—developed by the University of New Hampshire's Complex Systems Research Center. Inside, plants like wheat sprout from porous platforms positioned about two feet up from the bottom of each cylinder. Their roots dangle into the dark lower chamber and their stems reach into the brightly lit upper part of the cylinder.

Every minute or so, the unit automatically sprays the plant roots with a nutrient mist. Meanwhile the plants' stems bask in artificial light equal to about half the sunshine on a midsummer noon. An artificial breeze rustles the growing grain—agronomists have found that plants need wind to exchange gases as their leaves inhale carbon dioxide and exhale oxygen and water vapor. Sensors monitor everything: the plants' temperature, the light, wind speed, as well as the levels of carbon dioxide and oxygen, and a computer adjusts the mix of these variables to achieve optimal growing conditions.

Steven Schwartzkopf, a University of California ecologist working for NASA, has already grown small crops of tomatoes, soybeans, and corn in the cylinders. He has also grown 5,000 rice plants per square meter, ten times the density possible in the natural world. Now he is cultivating plants in a low oxygen atmosphere—5 percent of normal. He has found that as oxygen levels drop, photosynthesis and growth accelerate.

Astrocrops already grow fast. While wheat in the field matures in 105 to 135 days, in the cylinders it ripens in just 60 days. "And if we play around, we can get it to grow even faster," says MacElroy.

It's not all fertilizer and zephyrs, however. "Disease is a big worry, especially viruses," MacElroy says. Astrofarms will be compartmentalized, and the air filtered to prevent epidemics. Meanwhile, Utah State University researchers are seeking breeds genetically resistant to diseases that might circulate in space capsules.

Low gravity is another unknown. On

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Veggies in space. Someday moon colonists may be preparing for an extraterrestrial harvest.

SUPERVACCINES

BODY

By Jeanne Toal

You could call it the vaccine revolution. Intractable diseases like cholera, malaria, leprosy, herpes, hepatitis, cancer, even AIDS, may be destined for extinction if imaginative new immunization techniques are implemented. In addition to wiping out disease, a simple shot in the arm could soon protect against everything from tooth decay and traveler's diarrhea to unwanted pregnancies and birth defects.

Advances in recombinant DNA technology and an improved understanding of the immune response have brought about the vaccine research explosion. But skeptics say that the new vaccines could do more harm than good. Indeed, a few studies suggest that some vaccines may wreak havoc with the immune system, making us more susceptible to the AIDS virus and other infections.

Immunization techniques have always carried a risk simply by the nature of the way they prevent infection. Traditionally, a vaccine has consisted of a live or dead bacterium injected to stimulate the production of antibodies, substances formed by the body to destroy invading infections. Once created, these antibodies stick with you, making you immune to a particular infection. Doctors soon learned, however, that this process could backfire. They found that a small percentage of those injected with the bacterium became infected with the very disease from which they sought protection.

Side effects—sometimes dangerous—have also made many vaccines unpopular. For example, the DPT vaccine, administered to children to protect against diphtheria, tetanus, and whooping cough, frequently provokes such side effects as fever and acute pain at the injection site. And in rare instances, the shot has been known to cause irreversible brain damage and even death. In fact, in 1984, 73 lawsuits were brought against the makers of the DPT vaccine. Of the 28 suits asking a specific amount in damages, the average was more than $45 million.

And these are only the immediate and easily detected effects of immunization. There is a growing suspicion that past immunization against relatively harmless childhood diseases, such as measles and diphtheria, may be responsible for the dramatic increase in autoimmune diseases like rheumatoid arthritis, multiple sclerosis, and AIDS," says Dr. Robert S. Mendelsohn, former associate professor of preventive medicine at the University of Illinois and a longtime vaccination critic. Recently, researchers at Roswell Park Memorial Institute in Buffalo, New York, discovered that repeatedly immunized animals are more susceptible to attack by the AIDS virus.

In an unusual experiment, Roswell researchers Sybille Muller, H. C. Chang, and Heinz Kohler injected one breed of mice with cells from a different strain of mice. This forced the injected mice to constantly mount an immune response to the foreign cells. Next, the researchers injected the mice with a test antigen—a molecule on the outside of a disease-carrying organism that signals the body's defense system to produce antibodies—and then measured their immune response. The treated mice not only produced fewer protective antibodies than did a control group, but also exhibited a lower ratio of helper T cells (which encourage immune system activity) to suppressor T cells (which suppress the immune response). Both responses—suppressed immunity and the changed T-cell ratio—are characteristic of AIDS.

A shot in the arm for immunization

"It's possible," suggests Muller, "that you can create an AIDS-like response by manipulating the immune system with an overload of antigens. Because such an overload is what you get from repeated immunizations, Muller speculates that there may be a link between the U.S. policy of mass inoculation and the recent rise in autoimmune diseases. "I'm cautious myself about getting inoculations," admits Muller. "There's always been a risk with vaccines."

But Muller asserts that a new breed of vaccines she and colleagues are currently developing—called anti-ideotype vaccines—will sidestep many of the hazards posed by traditional immunization. Unlike conventional vaccines, the anti-ideotype doesn't use a live virus or bacterium to stimulate immunity. Instead, antibodies are manufactured in the laboratory and then injected to stimulate a second group of antibodies to combat a specific disease. The result: You become immune to that disease without risking any exposure to it.

This new technique relies on the "network theory" of immunology, which states that once the immune system begins producing an antibody, it eventually "notices" that antibody and starts pumping out other antibodies directed against the first. The fact that this second group of antibodies may prod the immune system into attacking things it normally ignores makes anti-ideotypes ideal candidates for fighting cancer.

Roswell's Heinz Kohler, along with Muller and Chang, has created an anti-ideotype vaccine to do just that. Because cancer cells arise from normal cells, the immune system often doesn't detect anything foreign about malignancies—and thus doesn't create antibodies to fight them. The goal of a cancer vaccine is to trick the

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ARTIFICIAL INTELLIGENCE

By Grant Fjermedal

Artificial intelligence guru Marvin Minsky recently wasted three CO_2 cartridges before taking apart the seltzer bottle he was trying to recharge and finding that the culprit was a faulty O-ring, a discovery that turned his thoughts toward the space shuttle.

I know this because Minsky told me about it one night, though he was probably already asleep at the time. Minsky's thoughts about O-rings, as well as his detailed message about the design of space telescopes, were carried across the continent to my home computer terminal courtesy of the Department of Defense (DoD).

Conceptualized at MIT in the late Sixties and put online in the early Seventies, DoD's computer network ARPAnet (for Advanced Research Projects Agency) was created to provide electronic mail service between the universities and research centers that received department funding for computer science, robotics, and other high-technology projects. But over the years it has been linked with a series of other online services and is now, according to many of its users, almost as addictive as it is informative.

DoD could hardly have imagined what would happen when some of the finest minds in the country's most prestigious universities and research labs began conversing with one another on ARPAnet. When a technical question is raised on one of its bulletin boards, you can sit back and watch the responses pour in from the science departments of schools like MIT, Carnegie-Mellon, Stanford, Cornell, Yale, and Caltech and from research centers such as NASA's Ames Research Center, the Jet Propulsion Laboratory, Fermi National Accelerator Laboratory, and Bell Labs.

Almost always intriguing, the postings are exceedingly well researched and carefully presented. In part this is because the jury of peers reading the boards is highly critical and well-informed. A posting about a new theory of technology might bring a correction or rebuttal from the scientist who actually did the work under discussion. "You can't just gush blood all over the network," says one user. "It will come back to haunt you."

But there is room for irreverence. Take this posting about NASA's proposed Astrometric Telescope Facility (ATF), which is designed to detect the presence of planets by measuring the motions of stars. "They plan to mount ATF on the space station. This seems to be an incredibly stupid idea. Do they really expect microarcsecond pointing accuracy with astronauts banging around inside, shuttles docking, spacewalking astronauts firing nitrogen gas all over the place? Once again, valid scientific projects are being perverted to help support needless human activity in space."

Some postings provide vivid images for possible future scenarios. "I think any honest environmentalist or person concerned with wilderness preservation also has to be an advocate for space industrialization," writes one user of the Space Digest bulletin board. "With the industrialization of space, the earth can be excluded from all polluting commercial activity. I think the earth should be a world of parks, farms, and small cities. The bulk of the human population, with all of its environmentally destructive (though productive) activities, should be moved off planet. The main commercial activity of the earth should be as a tourist resort for the rest of the human race, which is living in space."

The demand for intellectual rigor extends even to the world of science fiction. The SF Lovers Digest bulletin board can have excruciatingly detailed postings tearing apart authors who make the slightest error in extrapolating about the future. After a point-by-point dissection of one book's generally workable ship-propulsion system, one message concluded, "Why do authors have to make up stupid stardrives when you can get any number of working ones from the *Journal of the British Interplanetary Society*?"

Saul Jaffe, a systems programmer at Rutgers University, has become a celebrity at science fiction conventions because

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A silent and growing addiction: when you can't say no to your computer

PLUTO THE PLANETOID

STARS

By Doug Garr

Pity the poor planet Pluto. In the world of astronomy it has never commanded much respect. Its very existence remained a secret until 1930, its single moon remained undiscovered until 1978. Of all the planets, Pluto stirs the least amount of curiosity. The *Voyager II* spacecraft, which will swing by its neighbor Neptune in 1989, won't pause long enough even to take a picture.

Now a small group of astronomers has offered the ultimate insult. They are trying to take away Pluto's status as a planet and reclassify it as some sort of asteroid because its diameter seems to be smaller than originally estimated.

Pluto (the heavenly body, not the god of the underworld) is already our smallest planet. "And every time it gets studied, it seems to get smaller," says Frank Cooper, director of Houston's Burke Baker Planetarium. Because astronomers now have better telescopes and more accurate measuring techniques, Cooper says, the latest measurement of Pluto's diameter, shrinking it from 1,800 to about 1,500 miles, means that the planet is "smaller than our own moon. And that puts it in the category of a large asteroid."

Cooper is not alone in his assessment. Dr. Brian Marsden, associate director for planetary sciences at the Harvard–Smithsonian Center for Astrophysics in Cambridge, Massachusetts, is another leading proponent of Pluto's demotion. "I've always thought it wasn't the massive object it was supposed to be," he says. "Even in the Fifties it was questionable to call it a planet."

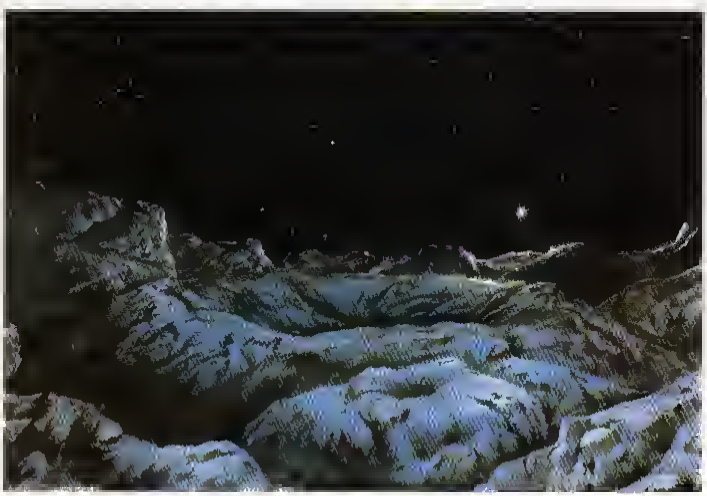
There is no universally accepted definition of a planet beyond a large body orbiting the sun. And there is certainly no official minimum size. For the time being, Pluto could be considered an in-between object. If it can be considered too small to be a bona fide planet, it is also a little too large to qualify as a typical asteroid. Because large asteroids can sometimes be considered minor planets, they are occasionally called planetoids. By this argument, Pluto is, at the very least, our greatest planetoid.

Pluto's history has never been very tidy. It had a hard time being discovered at all. In the early 1900's two American astronomers, Percival Lowell and William Pickering, suspected there was another planet beyond Neptune. Both had made independent observations that suggested such a conclusion. Neither man was able to prove anything was out there.

It wasn't until 1930 that Clyde Tombaugh, an amateur astronomer in his early twenties, photographed Pluto and thus confirmed its existence. Tombaugh, now eighty-one and a professor emeritus at the University of New Mexico, is understandably peeved at astronomers' revisionist attitudes toward his discovery. "I think it's a little ridiculous that they want to call it an asteroid," he says. "Pluto is still two thirds the size of Mercury and three times larger than any asteroid." Furthermore, the discovery of its moon Charon adds credence to its original designation, says Tombaugh. Asteroids are generally too small to have moons. (Most are too small even to have names. They're usually numbered.)

William Gutsch, chairman of New York's American Museum–Hayden Planetarium, agrees with Tombaugh. With all the wonderful discoveries being made in the universe, he feels debating Pluto's status is a waste of breath. "Instead of Pluto's diameter being the width of the United States, we found out that it's only from New York to Denver." As for the name change, "This isn't science, it's semantics." Gutsch says there are no plans to alter the planetarium's famous solar system show.

Still, there is some unofficial acceptance of the downgrading of Pluto's size. Richard Berry, the editor in chief of *Astronomy* magazine, sympathizes with the experts who have uncovered new information about a heavenly body so far from the earth. In December 1978 his magazine began acknowledging the suggestion that Pluto wasn't all it was cracked up to be with an article entitled "Pluto: Planet or Imposter?" Even if Pluto is demoted, however, he still thinks that it's special. Says Berry, "If it were up to me, I wouldn't take away its name. There are hundreds of asteroids out there, but there's only one Pluto."



The "real" Pluto, asteroid, planetoid, or the amazing shrinking planet? Take your pick.

CONTINUUM

HOUSE CALLS 2000

Half a century ago when I was new to the profession of medicine one of my teachers had already been practicing for 50 years During those years Dr Evan Evans told me, the practice of medicine changed completely but the patients stayed exactly the same In the 50 years since our conversation medical practice has changed even more drastically The X ray was our first miracle of technology Now scanning and imaging make the inner man visible Laboratories are disclosing the secrets of body chemistry Advances in mechanics and immunology will make it possible to replace body parts Some damage to nerves will be repairable Drugs will balance unstable emotions But medicine the most personal of arts is now often practiced within impersonal organizations What is the future for the family doctor?

The old-fashioned family doctor gave his patients time That was before anyone in medicine realized that time was money Now as economist Joseph Newhouse of the Rand Corporation says ' Illness has been quantified It is no longer human suffering but economics that matters

Where have the general practitioners gone? Some have died others have aged and retired Many have moved into specialty medicine always more prestigious and remunerative Others have given up private practice for group or hospital practice What has affected the private practitioner most is the loss of patients to large medical organizations, the stricture of Medicare payments the bookkeeping and form filling necessary to collect from private and public insurance companies the need to pay for the fabulous technology and the rapid, inexorable rise in the cost of insurance against malpractice suits

All this is irrelevant to the relationship between doctor and patient, to the eliciting of information and the careful review of the patient s history and pattern of behavior, to the physician s knowledge of the patient s family and its dynamics and to a painstaking physical examination The irrelevant interferes with the doctor's ability to care for the patient It is also increasingly difficult for the sole practitioner to earn a living

When a doctor seeks refuge the most obvious place to find it is within some established or newly forming group perhaps a so-called health maintenance organization or a group associated with a hospital There the physician s insurance will be paid and an office and auxiliary services will be provided at little or no cost The doctor surrenders his independence and works by the clock His patients are assigned to him He is obliged to use the specialists of his group If he can save his group money, so much the better He will share in the savings

Because of personality, knowledge, and care, the doctor may build a practice within the organization But he has no reason to exert himself Someone else will take care of emergencies The doctor will not work late He will make no house calls Above all, he will make no night calls Recently an eighty nine-year-old man with pneumonia was instructed to come to his group s office because none of the doctors would go to him What family doctor does not remember sitting up all night to help a patient!

Doctors still want to treat the whole person Some teaching hospitals have instituted residencies in a specialty called family practice But what awaits these young doctors when they go forth to practice? In the short run, the same fate that pursued the family doctor of the generation before In organized medicine they will be at the bottom of the barrel in payment and respect After all what doctor *can t* practice general medicine?

But even now economic pressure is altering the situation, forcing corporations to cancel employees health insurance or to trim contributions Some health insurance companies will inevitably fail Many medical groups will dissolve Many specialists will abandon their expensive specialties as happened in the Thirties The government is already paying less per service for medical care than it once did and the government is the biggest medical customer New technology such as the conduction of electricity with virtually no resistance will reduce the cost of today s high tech diagnostic machines When that happens, the individual practitioner will have the same buying power as the medical organizations

I predict the family doctor will survive The pendulum of economics makes me think so Human nature too makes me think so People will always want to be treated as individuals particularly in times of illness The family doctor is endangered but he is not extinct —*MILTON JONATHAN SLOCUM, M D*

Dr Slocum is the author of Manhattan Country Doctor, *a memoir of his practice in the Hell s Kitchen section of New York City*

CONTINUUM

THE WAITING ROOM FROM HELL

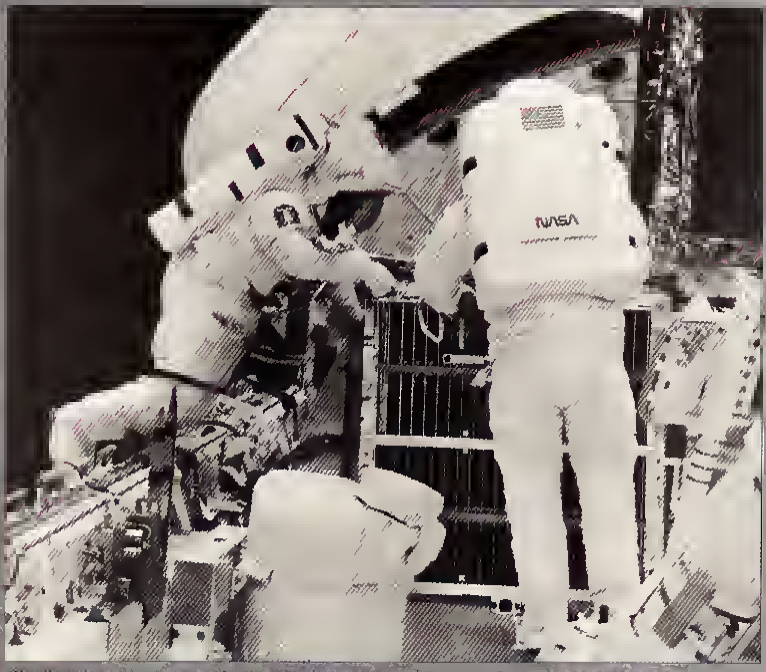
Do you sit on a cheap orange vinyl couch in your doctor's waiting room thumbing morosely through a two year old travel and leisure magazine? Is the philodendron dying?

If so you probably won't follow your doctor's advice, says Dr Marvin Stone a psychiatrist at the University of Texas Health Science Center in Houston If people have a negative vibration toward someone who s giving them advice he says they won't accept the advice "

Stone has been cataloging common decorating faux pas among physicians tattered, out of date periodicals dying plants and an ambience suggestive of a Greyhound bus terminal "Mismatched furniture he observes "is almost universal And that furniture is as critical as what the doctor says "

Stone suggests enhancing waiting rooms with plants fish tanks, and art —G Bear

What should a waiting room resemble a bus terminal?



Shuttle astronauts replace a faulty attitude control module on the Solar Maximum Mission satellite An example cited by NASA that illustrates the need for a combination of man and machine in space

SPACE QUANDARY: MAN OR MACHINE?

What s the most efficient way lo open the solar panels on an orbiting space platform—by hand or by machine? The solution It deoends on whether you want to save money or get the job done fast

Having an astronaut do the job could save you hundreds of thousands of dollars You wouldn t have to spend money developing and installing a small motor to open each panel

On the other hand if you had to open the solar panels as soon as the space platform reached orbit—to run equipment on the platform say—it would pay to let a machine do the job

What s the point of this exercise? According to a NASA study conducted by McDonnell Douglas humans will always have some sort of place in space—it s just a matter of what place The study looked at all the possible tasks that can be done in space and came up with a formula for determining whether an astronaut a machine or a combination of both would be most efficient

For any specific job, says Stephen Hall NASAs technical manager for the study you can settle the man-versus-machine question by looking at the amount of time needed for the task the cost and whether the technology is available

Example a space mission in the next five years that calls for tasks to be done in geosynchronous orbit A by-hand approach would automatically be ruled out

right from the start because the technology is not available. The shuttle does not go up to geosynchronous orbit, so the mission would have to be done by machine.

Most problems, though, will best be solved by a combination of man and machine. Hall cites the *Solar Max* rescue mission, where astronauts relied on power tools to fix the satellite.

—Devera Pine

BORING RESEARCH

Psychologist Mark Leary of Wake Forest University in Winston-Salem, North Carolina, is studying why boring people are so, well, boring.

To find out who is boring, what ways they are boring and just how boring boring can be, Leary conducted surveys and laboratory research to identify the most boring behaviors. He also had research subjects use a "boringness index" to rate recorded conversations. In another experiment, participants listened to both boring and interesting conversations and then listed the perceived personality traits of the people talking.

The results? "The most boring behaviors," says Leary, "involve talking about superficial things, complaining about oneself, and showing little interest in others."

Leary notes that bores frequently ask questions. "But they tend to be things like, 'Do you like the color of the walls?'—not questions that make a good conversation."

Boring people are also perceived as less emotional and less sensitive than interesting people, but they are perceived as *more* intelligent. "That may be because critical people, which boring people tend to be, are frequently thought of as intelligent," says Leary.

Is there hope for the chronically boring? Leary thinks the answer is yes, once their problem is identified. "A lot of people may be depressed and lonely because they are socially unskilled and their main problem may be that they are boring. I hope this research will sensitize psychologists to that fact."—Sherry Baker

"I see nothing in space as promising as the view from a Ferris wheel."

—E. B. White

"A superstition is a premature explanation that overstays its time."

—George Iles

"What is the use of a house if you haven't got a tolerable planet to put it on?"

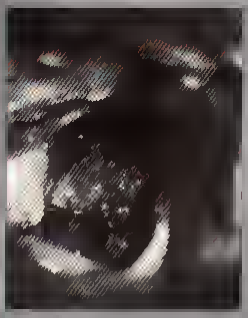
—Henry David Thoreau

What is it that makes some people as boring as the Stepford Wives? Perhaps questions like "Do you like the color of the walls?"

GENETIC MARKERS FOR HEART DISEASE

A test for susceptibility to atherosclerosis (hardening of the arteries) could soon become a routine part of blood-sample analyses. Atherosclerosis, which can cause heart attacks, results from the buildup of cholesterol deposits on blood vessel walls. It's a multifactor disease. Environmental and behavioral factors such as diet and smoking play a part, but some bodies are genetically less able to cope with these stresses than others. Their mechanisms for clearing away cholesterol don't work well.

Dr. Philippe Frossard and colleagues at California Biotechnology Inc. have taken the first steps toward developing a test that will determine who is at risk for heart disease. Locating those at risk for a disease of this kind is particularly valuable because the people who are vulnerable can protect themselves by changing their life style or taking drugs.



Obstructed artery. Soon, a test for tendency to heart disease

Because arteries are clogged by fatty material, Frossard was interested in naturally occurring mutations of 15 genes that produce proteins involved in the metabolism, transportation, and clearance of fats. He used enzymes to break apart genes taken from 700 German patients with atherosclerosis and 300 controls. He then compared the length of the subjects' gene fragments with the length of fragments cloned from normal genes.

So far, the researchers have found 11 significant variants in the DNA sequences. Five of the variants, or "markers," are linked to increased susceptibility to heart disease. Six are protective. People with these markers are less likely to develop hardening of the arteries.

A good genetic test would require six or seven markers whose physiological effects don't overlap with the effects of other DNA sequences. Frossard expects such a test to be ready in about two years.—Leah Wallach

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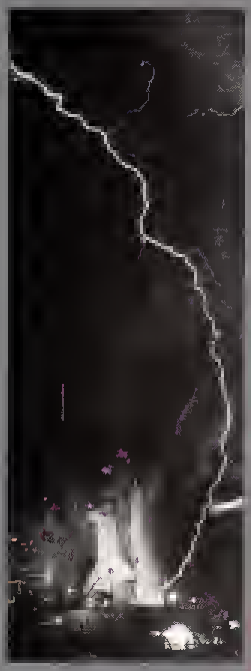


Lightning does its thing to the Canaveral launchpad

LIGHTNING AND ROCKETS

A research physicist has developed a theoretical model—based on a set of intricate measurements of a thunderstorm over Cape Canaveral—that could eventually be used to predict when lightning will strike.

According to Robert D. Hill of the University of California at Santa Barbara, existing methods can give no more than 30 minutes' warning of impending lightning. That margin doesn't begin to meet the needs of commercial aviation, much less the problem encountered last March by a NASA Atlas–Centaur rocket that was struck and destroyed by lightning.

Three scientific teams at Canaveral, Coral Gables, Florida, and Socorro, New Mexico, made the measurements that led to their theoretical model.

They went over their storm's characteristics from top to bottom, literally. There were Doppler radar measurements of its wind field versus its height, along with VHF readings and calculations of changes in its electrical fields. All of those data and more went into the model that the scientists hope will one day help them avoid such mishaps as the one at Kennedy Space Center.

—George Nobbe

GUESS WHAT: CIRCUMCISION HURTS

The conventional medical view that infants don't feel pain during circumcision may be wrong. At least, that's the conclusion reached by Fran Porter after studying 50 newborn boys as physicians cut the foreskin from the babies' penises.

Porter, a research psychologist at the Washington University Medical Center's Children's Hospital in St. Louis, points out that about 1 million infants in the United States are circumcised each year—without any anesthesia. "Doctors have assumed that a baby's nervous system is so immature that he doesn't feel the pain. But my study shows that clearly may not be the case."

Porter tape-recorded the baby boys' cries as they underwent the procedure. She found that when a baby was taken from his crib and strapped to a plastic board, his cries began to change. They became rapid and high-pitched as clamps were placed on the penis to secure the foreskin, and they intensified when adhesions connecting the foreskin to the penis were removed. "The cries resembled those of babies born with something severely wrong with them," Porter notes.

Could this trauma have lasting effects on boys? The babies' cries returned to a preoperative state very quickly, so there doesn't appear to be any long-term impact, she answers.

Porter's research has changed her own attitude. "If my three sons were being circumcised today, I'd consider asking the physician to give them very small doses of an anesthetic."

—Sherry Baker

HITLER'S REAL PROBLEM

In 1938 a visiting Swedish diplomat noticed a suspicious hesitancy in Hitler's speech and advised him to put off the invasion of Poland. This advice was ignored, and the rest is, as they say, history. In 1983 Dr. Abraham Lieberman presented evidence that Hitler may have suffered from Parkinson's disease for much of his reign over the Reich. Clinical signs of the disease—tremors, problems with speech and gait, facial rigidity—were noted by Hitler's personal physician.

Now Dr. Ernest Friedman, comparing Hitler's signatures from 1932 and 1944, believes that the Führer's change in handwriting was due to a condition called motor impersistence, a defect in sustained manual activity that can affect fine motor activity. This sign has been associated with Parkinson's disease, particularly when the right hemisphere of the

How would you like someone to strap you down and hack off your foreskin? Newborn infants, it turns out, don't like it much, either.

Der Fuhrer *Damage to the right side of the brain may have impa[illegible]ension of information a skill important in such activities as say invading*

brain is involved The right hemisphere moreover is the side most responsible for spatial analysis and holistic comprehension of information, cognitive skills that may be important in such activities as planning and carrying out military strategy

Was the Fuhrer's ill-conceived two-front campaign the product of a failing brain? According to Friedman, it's possible Lieberman points out however that Hitler was also receiving a wide variety of drugs' to treat his condition Some of these scopolaminelike medications are known to induce or exacerbate paranoia and other such mental symptoms 'But' Lieberman adds Hitler was probably crazy with out them

—Laurence Miller

'If we could hear all the sounds existing we'd soon be mad'

—Charlie Parker

'It's not that I'm afraid to die It's just that I don't want to be there when it happens'

—Woody Allen

THE SECRET TO GOOD GRADES

Attention students Want better grades? Sit on the right side of the classroom Teachers pay more attention to the right side and that results in higher marks

Dr John Kershner of the Ontario Institute for Studies in Education observed 19 teachers noting the direction of their stares every 30 seconds for 15 minutes

"They were really ignoring the kids on the left side of the classroom facing the teacher Kershner says In fact the students on the left side of the class received half as many glances as those in the middle or on the right The teacher looked straight ahead 44 percent of the time to the students' right 39 percent but to the students left only 17 percent of the time

Kershner confirmed that the level of teacher attention influenced grades In eight fourth-grade classes the kids on the right-hand side of the class (the teacher's left) scored significantly higher on spelling tests than did those on the left

Why do teachers look left? It could be simple Perhaps it's easier to look that way while writing on the chalkboard But Kershner speculates that while someone's thinking eyes naturally turn left The left hemisphere of the brain may be the one says Kershner 'that is most actively involved in processing the logic of the argument during lecturing

—Vincent Bozzi

Want to be a grade grubbing goody two shoes? Sit on the right

CONTINUUM

amos ph as adapted equations g to a com at provides portraits of mobs

THE PHYSICS OF UNRULY MOBS

What happens when someone yells 'Fire!' in a crowded movie theater? When a dangerous demagogue harangues a crowd?

You'd expect such topics in the psychology department, but Frank Harlow of the Los Alamos National Laboratory in New Mexico is a theoretical physicist. And his computer simulates the behavior of human mobs.

'I've spent many years studying complicated fluid systems—tu ent eddies raindrops going through the air' he says. So it naturally occurred to me to wonder what other systems I could apply these things to.'

In the past these models have been applied to such diverse phenomena as automobile traffic, predator/prey populations, and military maneuvers. But in this study, Harlow and undergraduate engineering student Donald Sandoval programmed in emotional factors—fear, excitement, anger.

Take a bunch of people on a football field. Plot the position, velocity, and excitability of each. Figure their state of excitement, anger, or fear. Then let someone start yelling. What happens? Harlow's computer will provide an intricate portrait of the mob. Or instead of a football field, place the crowd on a battlefield, in the midst of an inner-city riot, or in an auditorium where someone yells "Fire!"

A more benign example, adds Harlow, 'would be a bunch of people in an auditorium conversing together, waiting for a comedian. Then the comedian comes out and tells a few jokes. He 'warms up' the audience; he is converting them into what we call a mob.'

Next, with military funding, Harlow intends to work out equations for a 'double mob'—that is, a mob of rioters versus a SWAT team, or two armies in battle.

—Judith Hooper

ELECTRIFIED COWS

For several years Ronald C. Gorewit of Cornell University has been shocking milk cows to answer the question: Do electrified cows give less milk?

It was a question first raised by dairymen in Wisconsin, Michigan, and Minnesota. Somehow, explains Gorewit, a lactation physiologist, "they got wind of studies in Europe and New Zealand, and they all went out and got meters from Radio Shack and started checking for voltage leaks."

Wiring systems on farms are diverse and often jury

Eight volts right to the teats can't stop old Bossie

rigged according to Gorewit Suspecting that stray voltages were shocking their cows and affecting milk production farmers sued utility companies milking machine manufacturers and dairy co-ops The parties being sued, in turn, set up something called the Stray Voltage Research Council to investigate the matter and Gorewit found himself shocking cows for science

For three years he sent electrical currents into udders, spines, and milking machines, shocked cows just before milking and throughout the day, and measured milk flow, heart rate and levels of oxytocin, one of the hormones responsible for lactation The result? It seemed that even being shocked directly on the teats with levels up to eight volts didn't noticeably faze cows ("Cows aren't people" says Gorewit "They acclimate to it") That seemed to refute the farmers claims

Recently however, Gorewit tried another tack A lactating cow requires 20 gallons of water a day he reasoned If the cow gets shocked every time she drinks would she stop drinking and cease producing milk? Testing is currently under way

—Luna C Grant

'Put three grains of sand inside a vast cathedral and the cathedral will be more closely packed with sand than space with stars'

—Sir James Jeans

"Science commits suicide when it adopts a creed'

—Thomas Henry Huxley

SHUTTLE II TAKES SHAPE

The shuttle program may not be back on track yet, but at least some NASA people are already thinking ahead to what the *next*-generation orbiter—or shuttle II—should look like

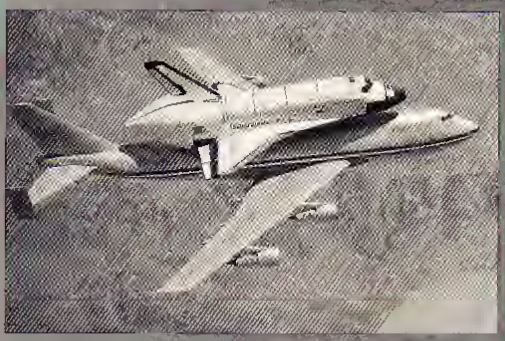
According to Ivan Bekey, former director of advanced programs in the office of spaceflight at NASA, shuttle II will be NASAs primary manned carrier—cruising between the space station and Earth—and it will be fully reusable

Though there are no specific plans yet Bekey envisions either a single stage-to-orbit craft or a winged booster coupled with an orbiter that's smaller than the current one NASA is also studying the possibility of having shuttle II take off *and* land vertically The advantage to this design You can test out the vehicle slowly launching it only 100 feet into the air the first time, 1 000 feet the next and so on "With a winged vehicle you're committed to going to a very high velocity so you can glide back to land if some thing goes wrong" says Bekey

The size of shuttle II isn't definite yet either If the vehicle doesn't have to carry much cargo it could be small But the real problem says Bekey, is determining exactly what sorts of things shuttle II will be toting back from space For instance he says will it eventually have to bring back an entire space telescope—or just parts of it?—Devera Pine

AIDS AND NEEDLES

A few years ago doctors and nurses would enter an AIDS patient's room only if they shrouded themselves in masks and gowns causing the patient to feel like a leper Now a task force from the University of California at San Francisco (UCSF) reports that such extreme—and alienating—precautions are unnecessary



A vertical landing shuttle II will have an advantage over the present orbiter (above), which had to be tested at high velocity

The need for extreme AIDS precautions has been disputed

"At first," notes Dr Julie Gerberding of UCSF, a member of the study, "everybody thought AIDS was like hepatitis B People who stick themselves with needles have a ten to twenty-five percent chance of getting hepatitis It turns out the risk is much smaller for AIDS."

Those caring for AIDS patients are advised to avoid needle sticks, of course which is routine procedure for *any* infectious disease

Of 2,500 health care workers studied only one has been proved to have contracted the AIDS virus in the line of duty, according to Gerberding That was a nurse who during an emergency procedure accidentally stabbed herself in the arm with a syringe containing blood from an AIDS patient and several months later tested positive for the virus Some 1 000 other hospital workers ministering to AIDS patients have pricked themselves with needles so far without ill effects

—Judith Hooper

For good Chinese cooking you need an authen[illegible]inese restaurant—unless you have CHEF *the moo shu[illegible]' soft[illegible]*

STIR-FRIED SOFTWARE

When *CHEF*, a computer program at the University of Chicago tried 'cooking' up some stir-fried broccoli and beef in its simulated kitchen, things turned out badly. The broccoli was soggy. But *CHEF* was no stupid automaton.

Realizing that juice from the stir fried beef had dampened the veggies, the program modified its approach. The next time it stir-fried the broccoli first and removed it before stir frying the meat. Then the digital Chinese cook generalized from its experience. Asked for a recipe for chicken with snow peas, it wisely decided to stir fry the chicken and snow peas separately. The vegetables remained crisp.

CHEF is the brainchild of computer scientist Kristian Hammond. Hammond chose Chinese cooking as his domain "because most of the domains in artificial intelligence [AI] are so esoteric that people can't understand them, but people can understand cooking."

Frivolous though it may sound, the digital Chinese chef represents a big break through in the effort to make computers intelligent. While most AI creations "think" by following sets of rules, *CHEF* employs "case based reasoning." "There are some programs that are set up that learn from their successes," says Hammond. "I had *CHEF* learn from its failures because I think that's how people learn something new."

CHEF begins with a small set of recipes and a set of rules for modifying them based on the physics of cooking. It does its "cooking" in *Simulator*, an auxiliary software program where it can theoretically chop, steam, stir fry, and add spices and where ingredients behave as they do in a real kitchen. Then, in essence, it gets to taste the food, touch it, look at it, and compare it to its goal," says Hammond. "It finds out that certain spices dissolve, that heat makes meat sweat, and so on. If it sees that the vegetables are soggy, it says, 'Oh, we've got a problem here.'"

—Judith Hooper

There is no fate that cannot be surmounted by scorn.
—Albert Camus

"The future is hidden even from the men who made it."
—Anatole France

THE GENERATION SHIP

One of the hoary cliches of science fiction is the "generation ship," a space ark that takes thousands of years to travel to the nearest stars. Space scientists Aden and Marjorie Meinel, of NASA's Jet Propulsion Laboratory, are already designing a different kind of generation ship. It would keep generations of earthbound scientists happily employed measuring the size of the galaxy.

The ship is called TAU, for thousand astronomical units, after the distance (93 million miles, the distance from the sun to the earth.) The 11,000-pound space probe—with its 60-inch telescope, other space-science instruments, and megawatt class nuclear reactor—would be boosted out of the solar system by an ion propulsion system.

TAU's mission will be to measure the size of the Milky Way galaxy using the parallax technique. TAU images will show a star against a slightly different stellar background than is seen in images of the same star taken on Earth. Comparisons of the two sets of images will easily give a direct measurement of stellar distances.

A few years after launch, TAU would be giving astronomers accurate measurements to stars as distant as the galactic center, some 30,000 light-years away. At the end of its 50-year mission, as it entered the solar system's Oort cloud of protocomets, it would be measuring the distances to some of the nearer galaxies.

Though a project for the twenty-first century, TAU is already arousing enthusiasm. Says Aden Meinel: "Astronomers are asking: Why can't we do it sooner? Do we have to wait?"

—Joel Davis

All truths are easy to understand once they are discovered; the point is to discover them."
—Galileo

"I'm just trying to make a smudge on the collective unconscious."
—David Letterman

ARTICLE

INTO THE NIGHT

BY GURNEY WILLIAMS III

Artificial slumber, electronic malls, and 24-hour hair salons are helping us pierce the boundaries of night

TS LADY met VECTOR on a computer network at about 11 PM. They talked until three, tapping out messages that appeared on glowing CRT screens in their homes 1,000 miles apart. For their first electronic date a few evenings later, they listened to a funny National Public Radio show—she in Connecticut, he in Florida—occasionally typing HAHAHA to each other over the CompuServe network. By then they had revealed their real names, *Susan C. T. Mahoney* and *Todd N. Tolhurst*, replacing their CompuServe "handles," nicknames used to maintain anonymity in the system.

The relationship warmed. Initially they talked at 300 baud (information bits per second flowing over phone lines), the leisurely pace of most beginners who chat on computer channels. Then the nocturnal baud rate increased to 1,200. She met his mother one night online. The couple traded pictures by mail only after they knew each other well.

Today—or rather *tonight*—the two no longer commune by computer because VECTOR has moved in with TS LADY. They plan to be married within a year and to transmit their wedding ceremony line by line, at a bell-ringing 2,400 baud, out over CompuServe to any of the more than 350,000 subscribers who want to offer the honor of their electronic presence. And there's a good chance, according to LADY, that the ceremony will take place in the same milieu as their courtship: in the middle of the night.

Night is a frontier. The germ of the idea came to Boston University sociologist Murray Melbin as he was walking out of a hos-

Painting by René Magritte. The Empire of Light II. 1950. Oil on canvas. 31 x 39 inches. Collection The Museum of Modern Art, New York. Gift of D. and J. de Menil.

pital where he had been studying shift work among nurses. *There are a lot of other things happening after dark besides this,* he thought. *I wonder what they are.* As he began to look beyond the shifts and to chart the night as if it were a new territory, he entered a world of work and play remarkably like the Old Western frontier of more than 100 years ago. But Melbin believes that the pioneers on the frontier of night—the hours between midnight and 7:30 A.M.—will lead us into the next millennium.

The future according to Melbin, author of *Night as Frontier*, may strike nine-to-fivers as the work ethic gone mad. We are moving into the age of *incessance*, he says, when human life will break its night–day cyclic bonds, and business as usual will mean business 24 hours a day. Melbin predicts that in the future some of us will never sleep, resforing our bodies instead by artificial slumber (in which the benefits of sleep are provided by hormone and neurotransmitter supplements as well as by electrical stimulation of the brain). And on that frontier of unfading light, Melbin says, social relationships will change. The territories of the future will be settled by people adept at quickly forming friendships—and quickly adjusting when bonds break.

Melbin reports that many of the details of this startling picture of tomorrow have already been filled in. Census figures released in 1980 showed that even seven years ago, about 29 million Americans, on average, were out of bed during the first hour after midnight. Few of them matched the image of the lonely night sentry. In fact, there were more people at private parties at that hour than military people awake at their posts to defend the country. Most of the late crowd were out spending money; almost 16 million were eating in restaurants, shopping, or traveling. But 6.8 million were earning wages on their regular jobs, and only 97,000 of the total were moonlighters. Even between three and four in the morning, the quiet hour before the dawn, 10.6 million people were awake, with some 3.7 million at work.

Nowhere is the murky outback of night more apparent than on Neil Myers's new radio talk show, *Talknet*. When he first took the NBC network job in mid-April, Myers says, he wasn't sure who would be listening or calling in—if anyone. "Would it be old people with sleep problems, or students cramming for an exam, or would it be just Neil and the Grand Canyon?" Prior to his arrival, NBC shut down each night at 1 A.M. When he began talking, it was virginal air and no demographics.

But Myers discovered that night America is a boomtown. The 1-to-4 A.M. show is picked up by some 4.5 million people in 297 cities, and the New York switchboard is clogged with calls (to 1-800-223-4141). He takes eight to ten callers an hour, he says, as their genders and subjects flip up one after another on the computer connected to the control room.

These nocturnal talkers don't fit any stereotypes, Myers says. "They have all kinds of different jobs, and they phone in as they're about to go to work or just after they get home—at all hours. Nobody sounds sleepy. They're not vague. About ten percent of the callers are children. I think ought to be in bed. Compared with day people, they're more willing to talk about offbeat personal experiences.

"Someone sighted a UFO and called me," Myers says, "and then we had a spate of calls from people who said, 'I saw this,' and 'My father saw that.' And from that we got all sorts of people who had had a strange or psychic experience and felt free to express themselves."

Are Myers's callers typical night birds? What kind of person would *want* to live on the frontier? Bostonians probably asked the same questions a century ago when they began to hear Western yarns of gunfights and varmints, saloons and snake-oil salesmen. "The class of pioneers cannot live in regular society," sniffed the president of Yale College early in the nineteenth century. "They are too idle, too talkative, too passionate, too prodigal, and too shiftless to acquire either property or character."

> *"On the night frontier, sleep is the villain in the black hat. It prowls close to the perimeters of wakefulness, awaiting the sounds of ambuscade and surrender."*

But for the pioneers themselves, the Old West provided rich compensation for the hardships. Far from the stuffiness of the president of Yale, they found bountiful new markets, surprising hospitality and openness, serenity, splendid vistas, escape, and freedom to be quirky. Melbin says. Any visitor to the night frontier soon discovers the same secret attractions. It isn't hard to get there. Just wait until after midnight. Then, by moonlight and the glow of a CRT, you take on the handle of NIGHT WATCHER and hop through CompuServe channels to meet TS LADY and VECTOR PICKLE and BLACKHEART, BIG BYTE and SILENT KNIGHT.

ENTERING ADULT CHANNEL, the green letters warn at a little after 2:30 A.M. Silently you fall into the middle of a party. Fragments of crowded, single-spaced conversation stack up and disappear at the top of the screen. Your mind supplies the clink of glasses, the laughter, and the music.

"—I JUST WANT TO SEE IF WE'RE COMPATIBLE," says PICKLE.

"ANY WOMEN WANNA TALK?" asks VELVET TONGUE.

"BYE ALL," says RECKLESS.

"RECKLESS I WANT TO APOLOGIZE TO U!!!!!" says PICKLE. "RECKLESS???"

"YOU DON'T SEEM TO RECOGNIZE THAT RECKLESS IS A *LADY*," says INNKEEPER, somehow putting a John Wayne swagger into the words while the cursor blinks with the speed of a racing heart. NIGHT WATCHER splits to another channel.

"HI NIGHT WHAT'S UP?" asks BLACKHEART.

"FULL MOON BLACK AND THE LIGHT OF A MICROWAVE OVEN," says NIGHT WATCHER. "IT'S WEIRD HERE. A LOT OF LIGHT."

"KINDA MAKES ME WANT TO PICK UP AN AX AND STALK THE NEIGHBORHOOD [GRINS]," BLACKHEART says, writing his own stage direction.

While a new friendship begins on Channel 5, business never stops on CompuServe's Electronic Mall, an incessant market where each customer feels like the only customer never a wait. Moving through the shops, browsers can buy a full-size keyboard synthesizer at $699, Trivialaska, 'Alaska's leading game,' at $22.50, and flower bouquets at $19.95. WHICH IS THE SELECTION? asks the no-nonsense salesman.

Discerning a slight German accent, NIGHT decides to get out but can't remember how. He pushes the RETURN key over and over, like Dorothy clicking her heels to escape the land of Oz. But it doesn't work. The Teutonic flower salesman can't be stopped. "PLEASE ENTER THE TOTAL $ AMOUNT FOR SELECTION."

RETURN. *I'm really just browsing.*

"RECIPIENT INFORMATION. NAME OF RECIPIENT. . ."

RETURN

"ENTER ADDRESS."

RETURN!

"DO YOU WISH TO PLACE ANOTHER SPECIAL ORDER/REQUEST? (Y OR N)"

RETURN. *Damn you, emerald slippers.*

RETURN!

"INVALID ANSWER. ENTER (Y OR N). PLEASE TRY AGAIN. . ."

Outside on the streets, away from the occasional nightmares of electronic shopping malls—the major cities—the *day* places—are aglow with night haunts, too. At 12:30 in the morning, the Days Inn motel on Michigan Avenue in Detroit is mostly dark. So are the parking lots and the Salvation Army building and Louie's hock shop, which closes at 5 PM. But in the same neighborhood, Vantinus Hair Design never shuts down. (Call 313-961-HAIR. Anytime.) And hard at work in the middle of the night, its twenty-seven-year-old proprietor, Vantinus Johnson, sees himself as the businessman of the future.

Friends laughed when he took over a bank building at 350 Michigan about a year and a half ago, tore out the bulletproof glass, and put in hairdresser stations where tellers used to count money. They laughed even harder a few months later when he hired a night manager and two stylists and left the doors open all night, walk in, no

appointment necessary—the start of the era of perpetual perms

At first it appeared the skeptics were right. For the first two months of night operations, almost no one came. Then Johnson discovered that his manager had been sending people away. 'People would call and she'd say, 'No, no, we're not here.' She was just lazy.' Johnson fired her and installed himself at night in the former bank manager's office. Almost immediately he had to hire two more stylists to handle the demand from the largely black clientele.

Now Johnson owns half a dozen salons in a Detroit chain, most of them open all night, and he can't remember exactly how many people work for him. At 1:30 in the morning, despite a discreet sign marking the PRIVATE OFFICE OF MR. VAN JOHNSON, stylists barge in to get change or to rummage through paper bags of real hair, searching for the right color to add fullness to a client's coiffure. Seated at a desk next to a large, broken toy robot, Johnson keeps a close eye on the cash flow, just like his predecessor in the room ('About three thousand tonight, gross, from all the studios,' he estimates). But out in the large main room—still painted in the conservative burnt orange, raspberry and brown hues of the bank—all the former teller slots are filled with Johnson's night crew, working nonstop on trims, jheri curls, and blow dries while he rides the tuning knob of an FM radio broadcasting rap, jazz, and disco to keep the customers moving.

"They're daring at night," says stylist Donna Stubbs, who has worked in other salons by day. 'Here the customers say, 'Take it *all* off, and take me up to blond, and from blond to burgundy, somethin' *loud*.' Shaves and tapers are in, and asymmetrical. *Anything* is in. *Taking it all off* is code for short hair and punky cuts, not baldness. But in the future, if current night preferences continue, 'they're really gonna want it all off and paint their heads to match their clothes,' Stubbs predicts.

Johnson himself doesn't track hair-design fads as closely as he tracks trends in business. Based on his success, he's got predictions of his own about where to look for gold in the Nineties. And he readily admits he's out of step with most urban developers, who are still planning malls for mere daytimers. To make the point, Johnson waves his arm at an imaginary Detroit developer in his office. 'Youre gonna spend fifty million, and you're gonna *half* do it?'

Johnson's mind is on a vision of a future night conglomerate. 'I'd like to take everyones business,' he says, "and say, 'Fine. You want to go home at five? I'll pay you rent, and I'll run your business for you and give it back in the morning.' '

Does this man never sleep? Johnson warms to the question, ignoring a bleating phone, one of two on his desk. "I love life. Why end my day? When I sleep, I don't know where I'm at. I don't know where the hell I am! No! I love every moment of being awake. And I like to have people around me, so I make them stay up, too.'

On the night frontier, sleep is the villain in the black hat. It prowls close to the perimeters of wakefulness, waiting for an ambuscade and surrender. Eyeballs tremble at its approach. Often it wins without a fight but still causes a massacre. It shut down a nuclear reactor this spring, for example, after the Nuclear Regulatory Commission (NRC) got a tip that operators at the 2 000-megawatt Peach Bottom facility in York, Pennsylvania, were napping. A source told the NRC that at one point all of the five- or six-member crew on the 11 PM-to-7 AM shift appeared to be asleep at once.

"It's extremely difficult to change the hardwiring controlling sleep, according to physiologist Ralph Lydic of the Penn State University College of Medicine. Even when people force their eyes open to fight the onset of night sleep, their physiological tides begin to ebb. Body temperature drops. Breathing slows. And sometimes in sleep labs, Lydic says, 'they go right into rapid-eye-movement [REM] sleep without knowing it. For no more than a fraction of a second, researchers see a little burst of REM and a loss of muscle tone. But when they ask the people if they were sleeping, they'll say, 'No, not at all.'

Nevertheless, in general we appear to be getting by on less. One study in 1972 showed that Americans got 7:83 hours of sleep a night, on average. By 1984 the average had dropped to about seven.

Melbin thinks that in the future, despite the hardwiring, we may dispense with sleep altogether and replace it with artificial sleep. "The feat is within the capability of a culture that learned how to improve fertility in humans, how to prolong their length of life, and that now creates new organisms by genetic transfer,' he argues. 'A society that can accomplish those things will undo sleep if it wishes.'

Melbin doesn't know how science will invent pseudosleep. But the answer may lie hidden in some eye-opening animal studies. No other species on Earth sleeps the way most humans do, according to psychologist Scott S. Campbell of the University of California at San Diego. He and colleague Irene Tobler discovered research on napping behavior in 160 different species of animals, from insects to primates. The studies show that all creatures except humans break up sleep into several discrete phases per day or doze lightly while doing something else. Porpoises and some species of whales, for example, swim slowly in circles while sleeping. Gulls and albatrosses float, half asleep, on thermals. "We go against nature when we sleep just once in twenty-four hours,' Campbell says.

In one key experiment with human subjects, Campbell revealed that night pioneers who get by on naps may actually be obeying some natural physiological laws that the rest of us flout. He sent nine subjects to live in a windowless, underground room for 72 hours. To eliminate all external cues that might interfere with the body's natural sleep-control system, he prohibited reading, writing, listening to music, strenuous exercise or watching TV.

In this lab cocoon, sleep patterns changed. Instead of a single long slumber during the night followed by long wakefulness during the day, subjects alternated naps—averaging about four hours—with waking periods averaging about five hours. Seldom did anyone stay awake for more than eight and a half hours at a time. Seldom did any of them sleep long, either.

Campbell did discover a natural rhythm in his subjects' slumber patterns. But in the lab, without even knowing what time it was, his subjects quickly moved out of step with the marching beat of the typical American daytime drone. Subjects tended to break up their sleep with longer episodes in the middle of the night and shorter naps roughly halfway toward the next night. Longer sleep periods, he found, came when the body's temperature was lowest. Midday 'siestas' overlook subjects when their temperatures were relatively high.

People have long believed that naps disrupt night sleep. But Campbell says it may be the other way around. Enforced night sleep disrupts our natural tendency toward nodding off during the height of the day. "I'm an advocate of naps," Campbell says. "Andy Rooney once said that naps got a bad reputation somewhere along the line, and he resented it. I feel the same way."

Campbell is hopeful that in the future humans will begin to sleep more like animals, spreading short periods of slumber over the day. Shift workers and night settlers, he adds, will lead the way.

Already night pioneers are setting the frontier on the eighth floor of the Dallas office of Fidelity Investments, the country's largest privately held mutual fund and discount brokerage company. A year and a half ago, this office would have been empty at 12:30 A.M.—the night shift started in January 1986. But now there are 32 people wearing lightweight headsets, tubular microphones arcing in front of their faces. Each of the young, conservatively dressed representatives faces an IBM terminal linked to an unflagging memory of 4.7 million mutual fund accounts and 1 million brokerage accounts. This office and another like it in Salt Lake City will field more than 4 000 calls during the late shift, many of them from people who want to buy or sell mutual funds or other investments in the middle of the night. And part of the definition of success for the Fidelity night peo-

ple is picking up the customer's call within 18 seconds, answering market questions or taking orders, and hanging up courteously in something less than 300 seconds, on average.

"Your big responsibility is to handle the shareholders professionally and get them off the phone," says Wendell Weaver, who specializes in retirement funds. "While they're on, someone else is on hold." Weaver's average is about 266 seconds per call, tracked by computer. Someone "cross-trained" in all the company's offerings would average about 220 seconds. Representatives—like rodeo cowboys racing a clock as they wrestle a steer—have to come close to these averages to get maximum income for themselves.

"Hold on just a second," Weaver tells a shareholder as he calls up a screenful of information including the man's Social Security number, his share history, and a full record of investment activity with Fidelity. In a few seconds Weaver knows more about the caller's financial position than most of the customer's friends and family. In less than a minute a red CALL WAITING button begins flashing, and Weaver, unfailingly polite, is off to make another connection to give fast-finance help.

Sociologist Melbin says that while night people can shift gears quickly, many are nonetheless friendlier than day people—just the way settlers on the frontier a century ago were famed for opening their homestead doors to strangers.

Fidelity representative Jackie Roach, like Weaver, takes dozens of calls a night, forgetting the previous shareholder as a new set of numbers appears on her screen. But she well recalls the elderly woman she met on the line recently when the stock market began to decline. "I gave her the balance on her account. She was concerned, and I tried to reassure her that this was a long-term investment, and I talked to her about the past record of her mutual fund.

"Then she started to tell me about the day she'd had, and I mentioned something about Texas. And then she told me her daughter had been living in Texas when she died of cancer the week before." A day-shift worker might have been hard pressed to stay on the line with the woman, but Roach talked with her for an hour and a quarter and then gave the woman her name. "I told her there would always be someone here," Roach says.

Melbin discovered that the willingness to be intimate, to help, is typical of night pioneers. He sent three teams of male and female researchers out on two-hour field visits to Boston streets, day and night, in all seasons and all weather. In one experiment, researchers secretly gave points to people willing to give directions to strangers. Then Melbin and his colleagues totted points, compared results, and found differences as sharp as night and day.

"Nighttime scores were consistently highest," the researchers found. The conclusion: "The atmosphere of sociability and cooperation has a rhythm to it that peaks at night," Melbin says.

The results are surprising in the face of enduring fears of nocturnal crime, but researchers found that night people in general weren't nearly as daunted by strangers as the nine-to-fivers were. In fact, darkness sometimes produced shining examples of chivalry. At 4:30 A.M. on a rainy December morning, researchers encountered the one passerby they saw during their entire two-hour shift. The subject was leaping puddles when one of the researchers asked for directions. "Follow me!" the stranger yelled, and sprinted away. The researcher chased his subject through the rain, pursuing him into a subway station, where he got courteous directions and silently gave a point to the night people.

The climate of helpfulness on the frontier arises partly from recognition that night crises are often more crippling than disasters by day. "Suppose someone's using his computer late at night, and all of a sudden it stops working," says author and computer guru Russ Walter (*Secret Guide to Computers*). "There's a sense of panic." Walter himself owns about 40 computers, so he sympathizes deeply with people facing a system crash at midnight. That's one reason why Walter broadcasts his home phone number to the world (617-666-2666); answers the number himself; and welcomes callers with any questions or problems about computers any time of the day—or night. He often gets several calls per night and sometimes picks up the phone by the light of a Leading Edge, a Radio Shack, and an Apple, often on at the same time, cursors winking.

"One poor guy was typing his wife's term paper all night," says Walter. "At five in the morning, he tried to get it to come out of the printer, and the computer just stopped working. It was an Adam. All I could give him was sympathy."

The death of an Adam, followed by grief and sympathy, carries more emotional moment at night. Melbin agrees. "In a well-established society there is less adversity—and less goodwill—than at the precarious edge of human settlement."

By the end of the century, Melbin predicts, the "precarious edge" will seize our imaginations as strongly as the Old West excited the settled world at the end of the nineteenth century. It's easy to imagine some of the news from 1999:

Polls are open a full 24 hours, a symbol of the growing political clout of night people. Giant mirrors on the moon reflect the light of the sun, casting a dim, perpetual glow on designated cities throughout the night. Children don't know how to change a light bulb. An inventor working in a night lab in the late Eighties retired after patenting perpetual illuminators. A medical debate rages over the safety of a low-frequency personal pseudosleep machine that induces sleep waves in the brain

CONTINUED ON PAGE 56

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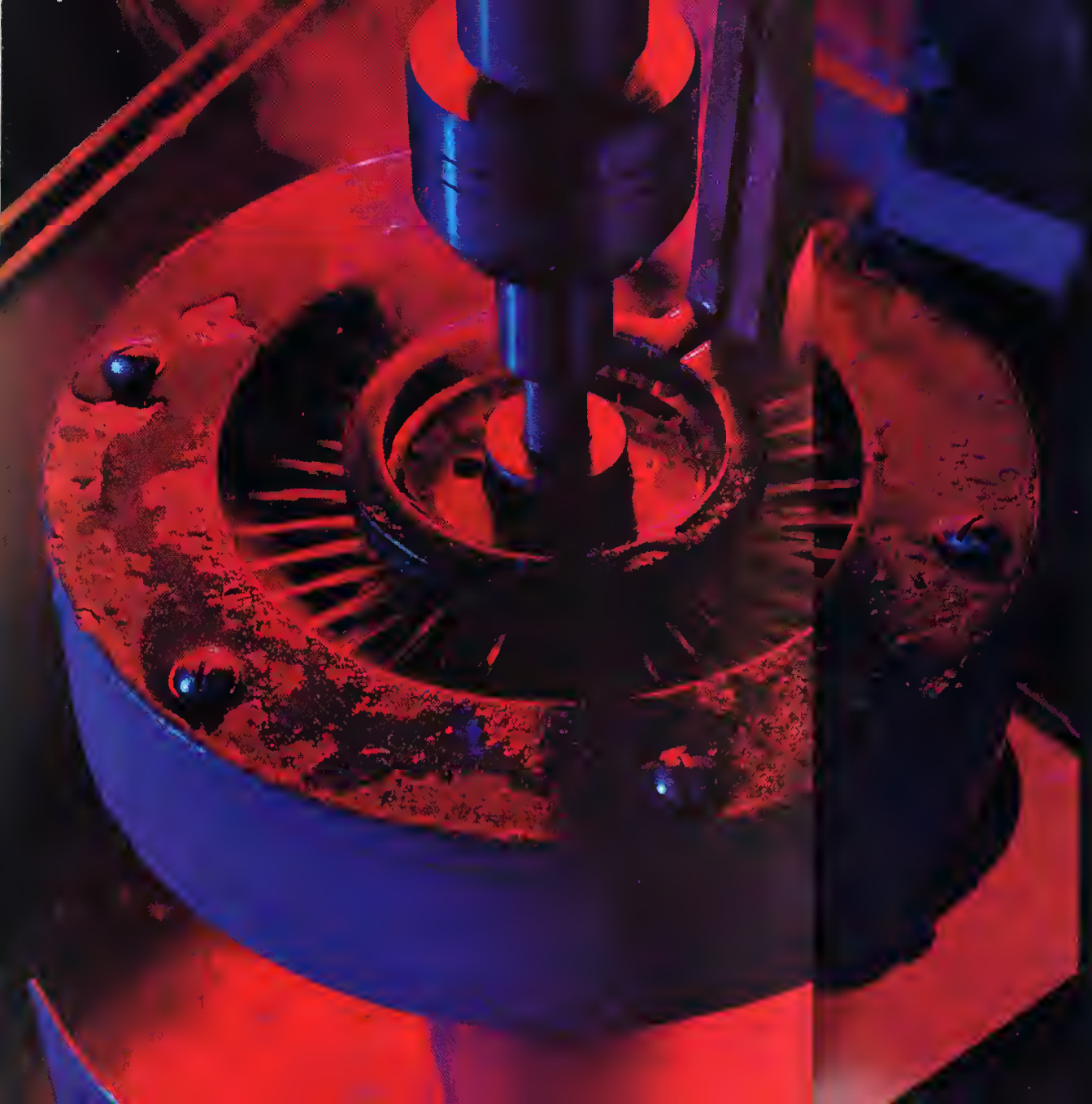


ARTICLE

Plumbing the depths of the earth is no longer the domain of poets. Scientists, too, are beginning to explore the dark, forbidding interior

PIONEERING MIDDLE EARTH

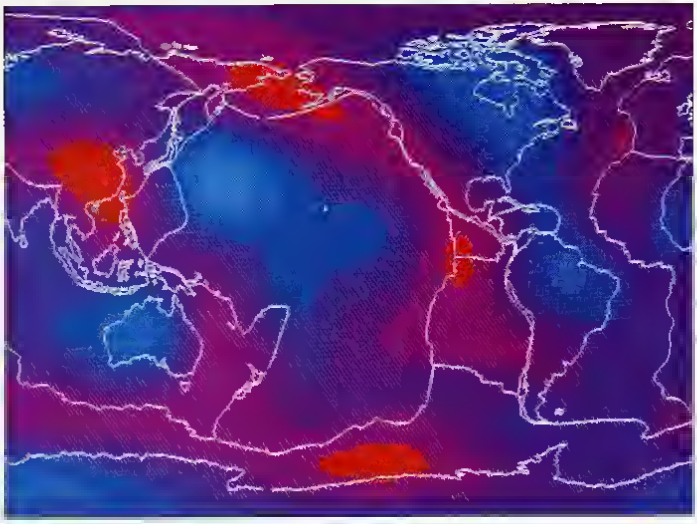
BY BILL LAWREN

PHOTOGRAPH BY GREGORY EDWARDS

The voyage began in the center of a dormant volcano. Plunging down through the "wild and savage staircase" of the crater, the travelers descended until they reached the very core of the planet, where they discovered another world: a huge, dark ocean whose shores percolated with life. Giant reptiles. Furry mastodons. A race of pale Neanderthals. Eventually, thrust back to the surface by a violent volcanic eruption, the voyagers returned to find their faculties and perception intact, with one curious exception: No matter what direction they faced, the needle on their compass pointed north.

This adventure, the product of the extraordinary mind of Jules Verne, echoes the mythic imagination of the human race. Ever since the first *Homo sapiens* fled the eruptions of Kilimanjaro and the earthquakes of the Great Rift Valley, we have been fascinated by the world "down under." The mythological tales of Hades and Vulcan, of Sinai and Pele, even of Dante's icy Inferno can in some ways be read as our attempt to shed light on the nature of the dark underground. But until this century, even the

By using CAT scans, researchers are discovering that the earth's interior is lumpy, bumpy, and asymmetrical.



most scientific attempts to describe the earth's interior have been only a step removed from the fanfasies of the poets The eighteenth-century scientist John Cleve Symmes, for example, saw the whole earth as an immense doughnut with large holes at or near both the North and South poles In the nineteenth century the "doughnut" theory gave way to the "egg," in which the earth is seen as a huge undifferentiated ball of molten liquid surrounded by a relatively thin (50-mile) solid "shell"

In the beginning of our own era, when the study of earthquake-generated seismic waves began to give a somewhat sharper picture of middle Earth, the "egg" was replaced by a "golf ball." In this picture, the 8,000-mile inner earth is seen as a descending series of spherical zones First comes the crust, with its variegated rocks and sediments and its pockets of oil, gas, and volcanic magma The crust stretches downward to a depth of about 20 to 35 miles Next comes the mantle, almost 2,200 miles of compressed rock forged by increasing heat and pressure into hard and stable crystal After the mantle, the next 1,000 miles belong to the outer core, a roiling inferno composed entirely of molten iron compounds At the center of everything is the heart of the earth, about 800 miles of iron that, despite its stellar temperature, has been squeezed by unimaginable pressures into a superhot, solid ball

But even the golf-ball picture was accurate only in outline It gave the impression, first of all, that the zones were relatively uniform features, with smooth, precise boundaries dividing one zone from another It yielded what turned out to be a massively mistaken estimate of temperatures in the core It only partially answered important questions about the behavior of the earth's magnetic field, which is generated along the boundary between the core and the mantle And it failed to resolve one of the hottest of the many controversies that have enlivened the modern study of the ancient earth To what degree do forces generated deep in the guts of the earth drive the majestic movements—from the grand and gradual waltz of the continents to the explosive tremors of earthquakes and volcanoes—that in turn determine the nature and distribution of life itself?

Obviously, a clearer picture was needed For the past decade a new group of scientific adventurers has been attempting to plumb the depths of inner Earth as never before, using sophisticated new tools and techniques to travel—in a figurative sense, at least—all the way down to the planet's core They are drilling, mapping, and measuring the interior with such skill that the deep underworld is finally beginning to reveal some of its most important secrets In at least one case, a group of explorers has begun a literal descent, looking deeper with their own eyes into the planet's heart than anyone since Orpheus

One of these scientists is Harmon Craig of the Scripps Institute of Oceanography in La Jolla, California The proper scientific name for what Craig does is geochemistry, but it may be just as accurate to call him a helium prospector Craig, a big, graying man whose avuncular smile masks a hard-nosed scientist with a reputation for almost always getting what he wants, discovered helium-3 20 years ago Most of what remains of the earth's stores of this rare isotope, which was formed during the birth of the solar system, is locked miles deep in the interior, most of it inaccessible But at certain places along the seams of the earth—places where the boundaries of the great continental plates crack the crust or where volcanic pipes known as hot spots punch their way up through the ocean floor—the gaseous stew that bubbles up contains much larger proportions of helium-3 than are found elsewhere At those places, says Craig's colleague David Hilton, "you know you're looking at material that has come up from the mantle itself"

Craig has spent 15 years "chasing helium" at such places, a chase that has taken him from his home base in La Jolla to Kenya's Great Rift Valley, to New Zealand, and to the crater of the Kilauea volcano on the island of Hawaii In the late Seventies and early Eighties, Craig rode the *Alvin* (the same high-tech submersible sphere that was used to find the *Titanic*) on a series of dives along the East Pacific Rise, the enormous trench that divides the two great plates on which the Pacific rests Here, where the two plates are in a continuous process of being formed and then pushed apart, Craig found abnormally high quantities of helium-3, a sure marker of a pipeline to inner Earth

Encouraged, Craig went searching for hot spots and found one at Loihi, a volcanic crack in the ocean floor about 30 miles off Hawaii Preliminary sampling of the water around Loihi indicated that it contained the highest helium-3 levels found anywhere on Earth Theoretically, Craig knew what this meant The Loihi vent plunged deeper into the earth than any oceanic site yet examined

A 3,000-foot descent to Loihi in the *Alvin* revealed a glowing crack in the ocean floor, surrounded by bright red, rust-covered terraces of basalt rock Shimmering, champagnelike water bubbled out of the vent—water hot enough to rise but "so stuffed with carbon dioxide," according to Hilton, that it actually flowed *down*. "Clinging to the sides of the vent were billowing white plumes of exotic, gas-eating bacteria All in all, says Craig, "it was like coming

Above Temperatures inside the earth seem to vary greatly, ranging from cold (shown here as blue) through mild (purple) to hot (red)

upon a fairy castle or a beautiful abstract painting by Miró."

How did Craig feel when he realized that he was gazing deep into the earth's glowing heart? "It was funny," he says. "At Loihi you don't get the feeling of tremendous power that you do on the East Pacific Rise, where you have four-hundred-degree smokers roaring out like freight trains. At Loihi the vent is just sitting there with this shimmering water rolling down it like a waterfall. It's so peaceful you have to remind yourself that you're sitting on a hot spot that leads all the way down to the mantle."

To Craig, Hilton, and colleagues the depth of this window holds great significance. Helium-3 levels at Loihi and other hot spots have indeed proved to be much higher than they are along such mid-ocean ridges as the East Pacific Rise, indicating that vents like Loihi do indeed plunge much deeper into the mantle than do the rises. In fact, Craig estimates that the Loihi vent may penetrate as far as eight miles into the lower mantle. The differences in helium-3 levels at the two kinds of sites also form part of the evidence that has led some geologists to revise the older golf-ball picture of inner Earth. The mantle, they now believe, is not an isolated and uniform zone but in fact is layered into a number of subregions, each of them having bumpy, asymmetrical boundaries, but all of them in "communication" with and fed by the core below. Despite its peaceful, almost ethereal appearance, then, the Loihi vent makes a strong argument for the idea of an earth even more integrated and dynamic than anyone supposed.

For all its drama, though, and for all the unworldly beauty of its vista, Craig's trip to Loihi was still primarily a surface excursion, a look into the earth's interior from the top down. To actually reach down and touch the depths, scientists rely on an updated, high-tech version of one of the most primitive enterprises in the history of human engineering: the hole.

Miners, of course, have been digging holes into the earth's crust for thousands of years, and petroleum companies for the last hundred. But drilling for scientific purposes did not really begin until the late Sixties, when the International Project JOIDES (Joint Oceanographic Institutions for Deep Earth Sampling) began a systematic series of drillings into the ocean floor. Drillings that continue to this day and that have been instrumental in validating plate tectonics, the modern theory about how the earth's landmasses shift and move.

To find the Big Bertha of contemporary drill holes, one must travel to the Soviet Union. There, beneath the ancient rock of the Kola Peninsula, which lies near the Finnish border about 250 miles north of the Arctic Circle, Russian scientists have been drilling since 1970. By 1984 the hole had reached a depth of almost seven miles, passing through deposits of iron, copper, zinc, titanium, and nickel. American geologist Robert Andrews, who visited the Kola Superdeep hole in 1984, calls it a "major breakthrough in terms of drilling to great depths and bringing back samples. They've achieved what no one else in the world has done."

Although the Russian discovery of deep deposits of valuable ores was interesting, what really grabbed the attention of geologists was the finding, at a depth of about 15,000 feet, of what Soviet geologist Y. A. Kozlovsky called "surprising, copious flows of hot, highly mineralized water."

The find was unexpected because standard geological wisdom holds that water cannot reach such depths because the tremendous prevailing pressures (more pressure than that of 1,100 atmospheres) should crush the resident rocks together so tightly that no "pores" could exist to allow water to penetrate.

Proof that pores did indeed exist set geologists buzzing. Since 1979 a maverick Cornell University astrophysicist named Thomas Gold had been claiming that there was enough natural gas (specifically methane) locked deep in the earth's interior to solve the world's energy problems *ad infinitum*. The claim brought forth a chorus of scoffing from the world's geologists, who immediately wanted to know how this methane could possibly penetrate the tightly packed rock of the upper mantle and lower crust. "Pores," Gold replied bluntly. He then went on to describe in great theoretical detail how upwelling fluids and gases could create just the kind of porous layers that the Soviets subsequently found in the Kola hole.

> *"At the center of everything is the heart of the earth, about 800 miles of iron that has been squeezed by unimaginable pressures into a superhot, solid ball."*

The Russian discovery caught the eye of other researchers, and in 1986 the Swedish government decided to drill at a site in the Siljan Ring, where the impact of a huge meteorite that hit 360 million years ago was thought to have caused deep fractures in the ancient granite rocks. Such fracturing, Gold thought, might create pores that would trap and hold upwelling methane gas.

In March 1987, as the drill bit through the Siljan rock to almost 20,000 feet, technicians at the site noticed something startling. The "mud" piped down to lubricate the drill bit suddenly began to disappear at a very fast rate. According to Paul Wescot, a geologist with the Gas Research Institute (GRI), the best explanation for the fluid's disappearance was that it had escaped into a zone of porous rock, just the sort of porous rock that Gold had envisioned. At this writing, it remains unclear whether those pores hold a commercially viable amount of methane. Even if the Siljan hole doesn't rescue the world from its energy problems, there is little doubt that findings at both Kola and Siljan have given deep hole drilling a tremendous boost. In West Germany geologists are planning to sink an ultradeep hole in northern Bavaria, a hole that may eventually reach as deep as ten miles. In the United States, a three-year-old consortium of universities known as DOSECC (Deep Observation and Sampling of the Earth's Continental Crust) is drilling a 16,000-foot hole in Southern California's Cajon Pass, near the line of the San Andreas Fault. The prime objective, says DOSECC's Robert Andrews, is to get an accurate model of the fault, to aid in earthquake prediction. In the next few years DOSECC will begin to sink a series of deep and ultradeep holes, one of which, on the island of Hawaii, could become the first in history to penetrate all the way through the crust and actually reach the upper mantle.

With present technology, researchers should be able to reach depths of more than ten miles. "Nobody's talking about going any deeper except Jules Verne," says Andrews, "and he's already done it."

While the hole drillers may be limited for some years to those ten miles, other scientists are reaching, by proxy, at least much farther—in some cases as far down as 2,000 miles, all the way down to the boundary between the mantle and the core itself. As one way of plumbing these hitherto unreachable depths, researchers have borrowed a high-tech tool from modern medicine: the computerized axial tomography (CAT) scan. By using CAT scans it's possible to peer into the heart of the earth in much the same way that neurologists examine the human brain.

To stretch the analogy a bit, the geologists' version of CAT scanning, called seismic tomography, is a bit like analyzing a human brain caught in the act of suffering a series of violent seizures. In the geologic case, though, the "seizures" are earthquakes. Every earthquake sends out its own shock waves, waves that can literally travel all the way through portions of the inner earth. As they move, the waves tend to slow down or speed up depending on the temperature and density of the interior regions through which they pass. The changing paths of the waves are registered by a worldwide network of seismic detectors. By collating large numbers of these wave paths and subjecting them to computer analysis, geoscientists can now paint a portrait of inner Earth in sharper relief than has ever been possible.

The emerging picture is one of an inte-

nor that is almost as lumpy bumpy and generally asymmetrical as the surface on which we live At MIT, Thomas Jordan and Stuart Sipkin (now with the U S Geological Survey) used seismic tomography to show that ancient cores of continents (called cratons) actually have their beginnings deep in the mantle Massive "roots" that extend as far down as 250 miles connect the continents to the deep interior At Caltech, Robert Clayton a former oil prospector who still has a wiry cowboy look scanned all the way down to the core–mantle boundary 2,000 miles below the Gulf of Alaska, where he found what appears to be a peak of interior elevation Because scanning techniques are crude at best Clayton can say only that the peak appears to rise as high as 180,000 feet If this peak actually represents a subsurface mountain (Clayton's techniques do not reveal the extent and angle of the slopes) it would be some six times higher than Mount Everest Meanwhile MIT's Jordan has found enormous features some of them thousands of miles across at the core–mantle boundary These huge anomalies he thinks, may represent massive interior "continents" of floating slag

While all this undoubtedly spells death for the golf-ball model of inner Earth, with its pat but inaccurate smoothness and uniformity the map is still incomplete During the next few years as a consortium of universities called IRIS (Incorporated Research Institutions for Seismology) replaces outdated earthquake detectors and extends the existing international network by installing new ones the resulting increase in data should help fill in a good deal of the missing detail In the meantime Harvard's Jeremy Bloxham is busy drawing and interpreting a map of a different kind one that reaches deep into the heart of the planet to trace the very source of the earth's magnetic field

Geoscientists have long believed that the magnetic field is generated by the rolling motions of the molten iron in the earth's outer core Over time as the motion eddies and shifts the direction of the field shifts with it and every million years or so (on average) it suddenly reverses entirely Magnetic north suddenly becomes magnetic south During the past several years Bloxham and his colleague David Gubbins have been combining eighteenth-century sailors' measurements of the magnetic field with the much more detailed data gathered by modern-day satellites "We're beginning," Bloxham says "to get a picture of what the field really looks like"

To the researchers' surprise that picture has turned out to include several pairs of huge "core spots" at the core–mantle boundary some 2,000 miles below the surface (Bloxham estimates that one such pair of spots located under South Africa, may be up to 1,200 miles across) These magnetic anomalies they say are "terrestrial analogs to sunspots" Significantly Bloxham's calculations show that the spots in which the direction of the normal surrounding magnetic field is reversed appear to have grown by more than 10 percent during the last 150 years

"If the process continues" he says "in about fifteen hundred to two thousand years we'll be in the middle of a planetary reversal of the magnetic field"

Such a reversal would be very disruptive if not downright hazardous, to say the least to life on Earth In the first place, Bloxham says there would be a period of what he calls "navigational chaos a few hundred years, and possibly quite a bit longer, when compass needles would be pointing all over the place." Of course alternative methods of navigation would allow business to go on as usual, but hikers and recreational sailors who rely on compasses would find them useless In addition other scientists have pointed out that the magnetic field is one of the important forces that act to shield us from incoming radiation especially cosmic rays A reversal of the field they warn could lead to a "dangerous disruption" of that shielding effect, with consequences that could include great increases in mutations as well as a skyrocketing cancer rate

> *"At Lohi the vent is quiet, with shimmering water rolling down it like a waterfall You have to remind yourself that this peaceful spot leads all the way to the earth's center"*

Bloxham's uncomfortable forecast is the product of a figurative journey that took him to the outer boundaries of the core of the earth Other researchers have gone still farther using advanced machinery and techniques to simulate in their laboratories the fire and force of the core itself The tool of this unique trade might have excited the admiration of Thor It combines an infrared laser beam with a vise made of gem quality diamonds Using this "diamond anvil," geophysicists can for the first time re-create the stellar temperatures and incredible pressures of the heart of the earth

At the University of California Berkeley geophysicist Raymond Jeanloz and his colleagues have used the new technology hundreds of times Their basic technique called "cook and look," is to place certain materials in the anvil clamp them down between the diamond points turn up the pressure to the desired level (amazingly this is done by the simple turning of a screw) then heat the pressurized matter with the laser beam

The "guinea pig" material for many of Jeanloz's baking sessions has been magnesium silicate which is known to transform under great pressure to a crystalline structure called perovskite Earlier experiments had shown that perovskites in general are the preferred form that minerals take under the pressures found in the upper mantle but until very recently, no one could re-create the even greater pressures necessary to show that the same was true farther down But in the last few years improvements in the alignment of the diamond clamps allowed Jeanloz and his colleagues to reach the pressures of the lower mantle pressures equivalent to those produced by 240,000 to as many as 1 3 million atmospheres. At those pressures they found, magnesium silicate did indeed transform to stable perovskite crystals Estimating that this magnesium silicate perovskite makes up 70 to 90 percent of the composition of the lower mantle "we concluded," Jeanloz says "that it is the most abundant mineral on Earth"

From there, Jeanloz and other researchers went on to turn the pressure up to what he calls "the hairy edge of believability," all the way to 3 million atmospheres—just a half million short of those that prevail at the edge of the inner core (that's where the solid iron center meets the outer core's molten iron) With corelike iron oxides between the diamond clamps the researchers then turned the laser heat up until the iron began to melt At that point Jeanloz says the temperature—about 6300° Kelvin—was equivalent to that at the boundary between the inner and outer cores By extrapolation he arrived at the temperature at the very center of the core about 12000°F—more than 4000° hotter than anyone had ever thought and hotter, incredibly enough, than the surface of the sun

The body of Jeanloz's work has applications and implications that go far beyond mere temperature taking The perovskites created in the anvil are similar in structure and composition to the recently discovered class of superconducting materials that promise to revolutionize everything from data processing to mass transportation Jeanloz suggests that the anvil process may help to stabilize such materials In the course of his experiments Jeanloz has found that inner-Earth levels of temperature and pressure change the way materials bond which could give rise to what he calls "a new kind of chemistry" including "miracle materials" that might be harder than diamonds

If Jeanloz's study of inner Earth promises to lead the way to a remodeled future that remodeling will be aided even further by other new applications of today's geoscience Tomorrow's prospectors for example may read seismic tomographs the way yesterday's read treasure maps "Things that happen in the interior" explains Caltech's Donald Anderson, "are ul-

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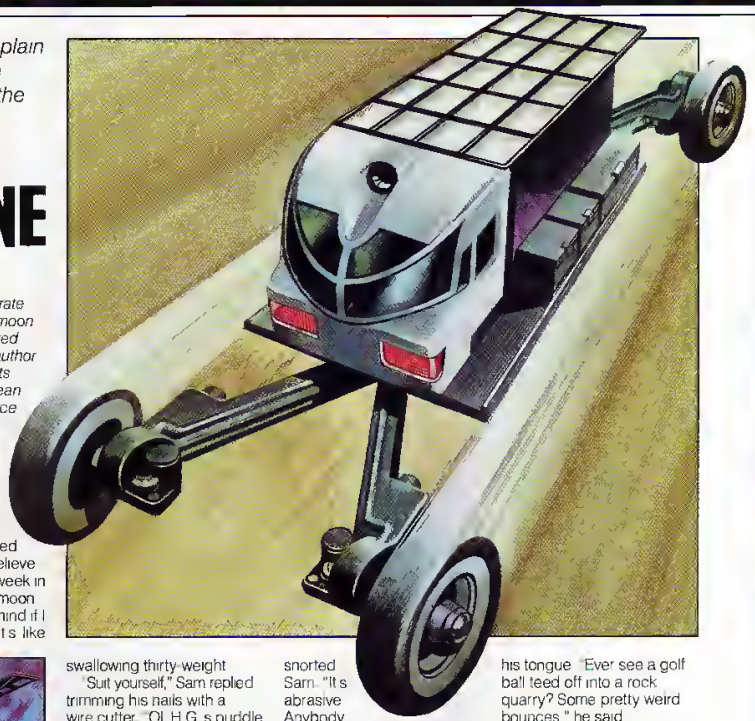
Across the lunar plain a strange vehicle roars in to claim the

PRIX DE LUNE

BY DEAN ING

Editors Note: *To celebrate the finish of the* Omni *moon buggy contest, we asked noted science fiction author and experienced sports racing car designer Dean Ing to portray how a race over our lunar course might run with the ten contest finalists. The real winner of the* Omni *contest is announced at the end of this story, on page 100.*



Okay, Sam," I smirked, "so I'm supposed to believe you've spent the past week in the year 2086. On the moon. *Watching a race.* You mind if I doubt a few details? It's like swallowing thirty-weight."

"Suit yourself," Sam replied, trimming his nails with a wire cutter. "Ol' H.G.'s puddle jumper took me most of the way, and the rest was mere laserboost." He paused and grinned up into the eaves of his shop reflectively. "You wouldn't believe how many ways a moon-race vehicle can get messed up. pull a real fumdudder."

"Try me," I said.

"The dust, for one thing."

I snorted. "It's abrasive. Anybody running too close behind a rooster tail of moon dust will be sorry. You build up static charges even on the moon, and dust on your solar panels can shut you down. But the worst part was the guys leaping obstacles on rocket boost, because they tried to take the bounce to save fuel." He clucked his tongue. "Ever see a golf ball teed off into a rock quarry? Some pretty weird bounces," he said.

Then they didn't use any wheels at all?"

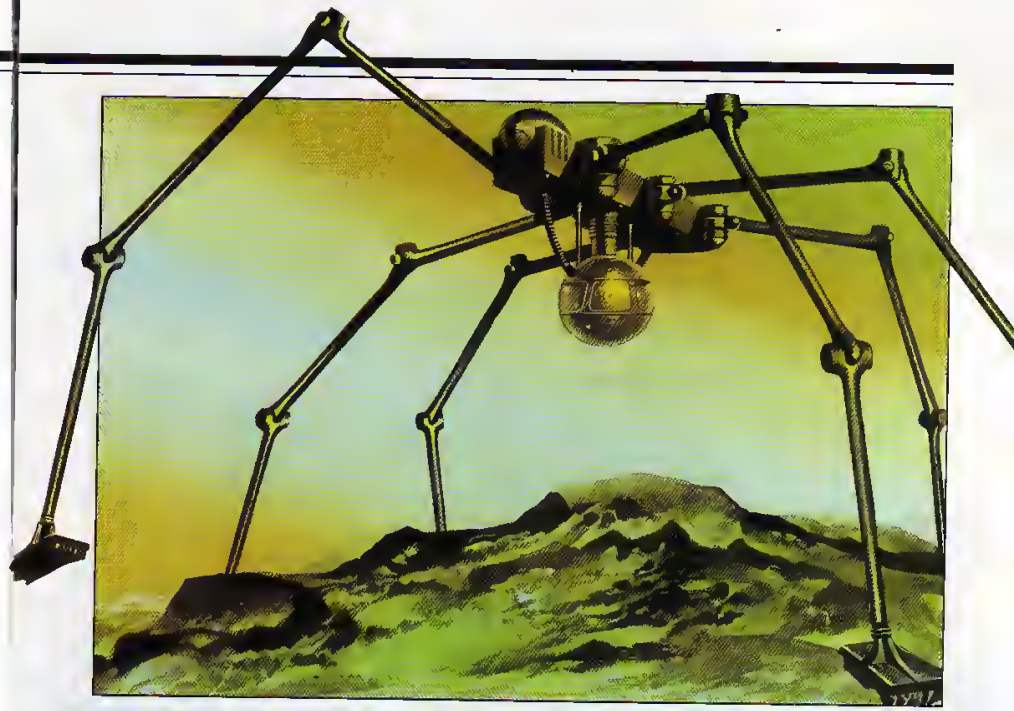
"They were *supposed* to be wheeled, according to the original specs. Tech inspector was the meanest curmudgeon in racing history, disqualified three of the ten entrants because they didn't use wheels."

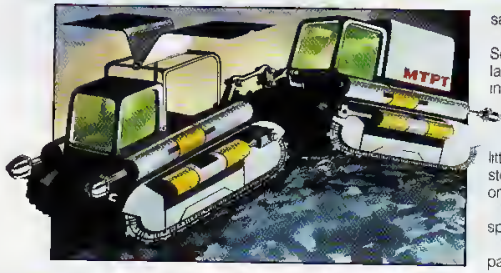
"Oh, well, that's racing," I said with a shrug.

"Didn't stop 'em. The Schartz Big Rig had caterpillar treads, so the driver insisted his bogies were wheels. He passed. The Kirpes Spyder had jointed legs, but the driver cut a little bitty wheel out of shim stock and epoxied it right onto the cab."

"Aw, Sam, that's not in the spirit—" I began.

"But it's racing, buddy. He passed. So did the Bower POGO, with a paper wheel glued to its pogo stick. The only protest that was upheld was the Froehlich Trike 'cause its crew snuck a lot of supply dumps out on the course ahead of time. Too bad. A two-man tricycle was a great idea, even if the low seating did give poor





Clockwise from upper left: Froehlich Trike, Rubin Moonvan, Kirpes LRV, Schartz Big Rig, and Stratford Rover.

PAINTINGS BY
RONALD EMBLETON

inspector tried to disallow its finish cause it was almost fifty feet high as it bounced past the finish line.'

But that's—' I began

'—racing. Sam finished. "Seventh place the Stratford Rover, had a solar heat collector on a boom. The boom got clogged with dust on full extension and the front wheels came up. But with steerable rear wheels they managed to finish. It roved all right—jerky little zigzags all the way home. The Kirpes Spyder was great on rough stretches clearing boulders and crevasses with all those legs until dust fouled the joints in the front pair of legs. It staggered to sixth place with its front legs folded like a schoolmarm's.'

Now, this Spyder, it was a, uh *spider*?'

Sam smiled and made a scuttling movement with one hand. 'Yep but with just six legs. Passed the Metcalfe New Yorker for a time. Metcalfe's brute had a spherical cab and a pyramid of tanks looked like the 1939 World's Fair on wheels. But it had rockets and took a bad bounce in the Apennines and rolled. Stuck that pyramid point solid for hours, but they got it loose in time to finish fifth. The Schartz Big Rig wasn't fast, but those double-tandem caterpillars bridged just about every crevasse visibility. When dust wore their chain sprocket out, they picked the whole vehicle up and toted it all the way from the crater Hipparchus to the finish line. They woulda been seventh, blame it on the tech inspector.

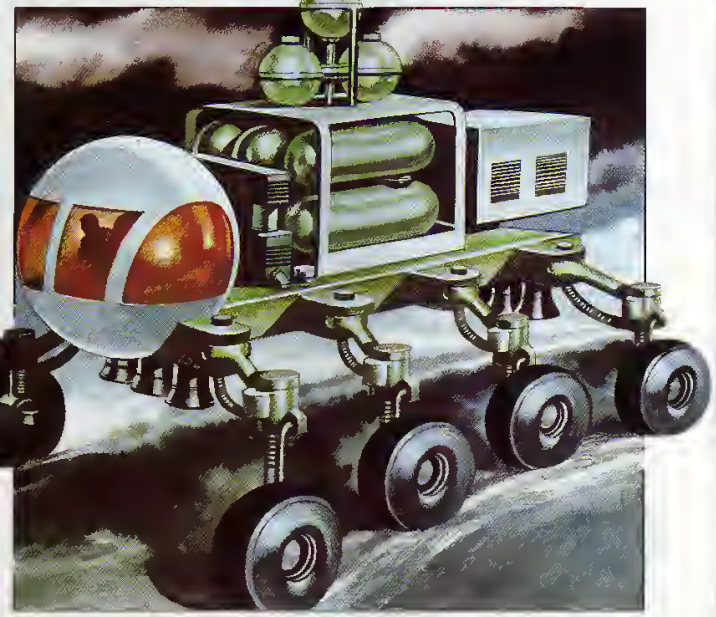
"They weren't disqualified?"

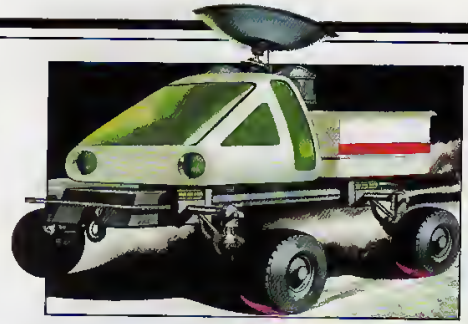
Naw, they just got penalized. People with fresh approaches always get penalized. But that's—

'That's racing,' I said quickly. 'What was ninth?'

Dead heat between the Edwards Pickup and the Bower POGO. The Pickup took an early lead across Armstrong Flats, but it had overhangs just like Granny's coupe de ville. Got stuck about a dozen times climbing the Apennines and it had a sprocket drive too. When it started eating other people's dust, the sprockets suffered.

'The POGO was doing great until it went through a piece of thin crust. Ended up bouncing around in some Russian dome for close to an hour before it got out. Tech

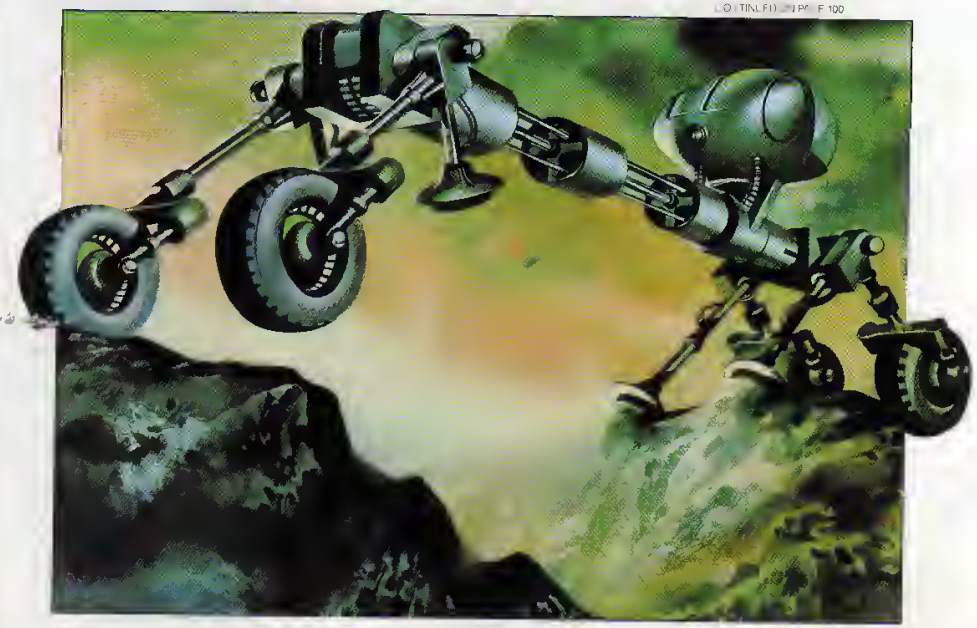




and didn't take many detours. It finished fourth. I liked the Strand Mantis, and it was one of the early leaders, cause it bridged crevasses like the Schartz. But the bridging was slow, and when the dust fouled its chassis boom, the crew had to change tactics and detour wide cracks. Went like stink on long straights with that nuke engine and managed third.'

Somehow I expected somebody to have a big wheel like your sudden-blizzard machine.' I sighed.

Somebody did. The Kuhfeld Cage was a humongous clear ball with the crew inside, rockets on the axle, solar cells on the surface. I mean, until they ran out of propellant, this sucker *ran*! Then static buildup and plain



Clockwise from upper left: Kuhfeld Cage, Edwards Pickup, Strand Mantis, Metcalfe New Yorker. Not shown: Bower POGO.

INTO THE NIGHT

CONTINUED FROM PAGE 42

and partial muscle relaxation with little drowsiness. A three-night symposium in Houston draws together researchers from around the world to discuss how findings about the frontier of night apply to new NASA plans for a colony on Mars. The night people grow so numerous they have their own quirky forms of music, cooking, literature, art. Jobs once thought of as day endeavors—lawyering, boutique managing, book editing—are carried out in lit-up offices and shops throughout the night. The computer, a workhorse for the bulk of day people, provides nighthawks with social contacts, intellectual stimulation, intimate friends.

A future social commentator will remark on the irony that *color* flourishes in the enclaves of the night society. Just as Vanlinus Johnson orchestrates the incessant beat in his salon, his successors will ride laser videos in all-night malls for the pleasure of shoppers and the productivity of workers. A new branch of fashion will grow out of studies on the way different hues dampen or elate the human spirit after dark. But at the same time nocturnal rainbows of artificial color begin arching through the sky; darkness itself will lose some of its mystery. Parties will start and end at all hours. Revelers going or coming will meet commuters to and from work. And references to the "graveyard shift" will become anachronistic as the first night-shift CEO begins running the giant Corporation Unlimited, tied to the workings of an international stock exchange where closing bells never sound. Day and night workers alike will be offered the chance to nap on the job after researchers confirm that carefully scheduled and staggered snoozing improves efficiency and lessens the chance of human error. Things won't go bump or worse in the night, at least not as often, when it's no longer a wild frontier but the nearly settled territory of 1999.

But for now it's still a wilderness stalked by crisis. Messages about an impending breakdown begin to appear on NIGHT WATCHER's computer screen at about 4 A.M. It's his first night online at CompuServe, and he is in the middle of an interview with BLACKHEART about science, monsters, UFOs, space and night as a frontier.

"IF THE LOCH NESS MONSTER AND BIGFOOT ARE FOUND OUT," BLACKHEART says, "AND TURN OUT JUST TO BE ELUSIVE ANIMALS, ALL THE MYSTERY AND MAGIC WILL BE TAKEN OUT OF THEIR MYTHS. DO YOU BELIEVE IN UFOS AS SHIPS OF OTHER RACES?"

"I DON'T THINK THERE'S MUCH EVIDENCE," NIGHT responds. "BUT I BET THERE ARE LIVING CREATURES SOMEWHERE OUT THERE. IF NOT, WHAT DOES THAT TELL US ABOUT THE FUTURE OF A TECHNOLOGICAL SOCIETY?"

"I HEARD MARS' ATMOSPHERE IS ALL CARBON DIOXIDE. SO WHAT'S TO STOP US FROM PUTTING PLANTS THERE?"

"YEAH, OR EVEN REPLACING THE ATMOSPHERE WITH OXYGEN—JUST PLANT A LOT OF TREES," NIGHT says. "LOT OF TALK THESE DAYS ABOUT GOING TO MARS."

"AFTER ENOUGH PLANTS, THEY WILL REPRODUCE WILDLY," BLACKHEART interrupts. "WITH THE SOVIETS."

The dialogue on the screen looks like pseudopoetry, the result of crossing and blending words somewhere in one of the 34 DEC mainframes at the heart of CompuServe in Columbus, Ohio.

The warning breaks into BLACKHEART's dreams about space.

"SYSTEM. SYSTEM GOING DOWN IN ONE HALF HOUR. AT 04:30 EDT."

"IF MAN SPREADS OUT AMONG THE PLANETS, THEN NUCLEAR DESTRUCTION MAY BECOME LESS OF A REALITY."

The alarming words—and the fragment of BLACKHEART's beliefs about the value of space colonization—seem unreal, and NIGHT struggles to ask questions about sleep and the role of night in horror movies.

"ONE TIME I LET MYSELF STAY UP SO LATE THAT I CAME BACK TO GETTING UP IN THE MORNING," BLACKHEART says. "BUT I'VE DRIFTED ROUND."

It's about 4:10, and BLACKHEART is speculating on why most horror movies have night settings. Monsters can see you at night, he theorizes, but you can't see them.

Outside, the full moon has set. A traffic light blinks. The conversation drifts to night-vision glasses to ease the fear of the dark. You can already buy them through *Soldier of Fortune*, BLACKHEART says, and then abruptly begins talking about death.

"I'VE LOST MY FEAR OF DEATH BUT I STILL FEAR THE WAY I'LL DIE. I FEAR HAVING A DEATH THAT TAKES A LONG, LONG, AGONIZING TIME."

And NIGHT responds, "ME, TOO."

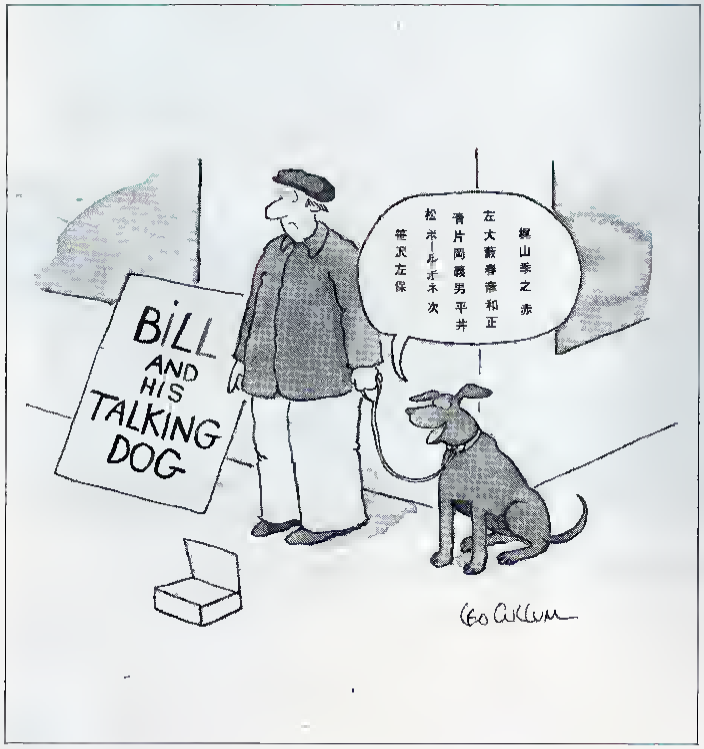
BLACKHEART goes on. "SUCH AS STARVING TO DEATH AND DEA—"

"SYSTEM. SYSTEM GOING DOWN IN 15 MINUTES AT 04:30 EDT."

After almost two hours of deep conversation between strangers who had become friends, NIGHT WATCHER lost contact with BLACKHEART on CompuServe's CB Band A at exactly 4:30 in the morning. Steve Noland, manager of operations at CompuServe, declined in a later interview to explain specifically why the band had gone down. But he did say that CompuServe operators routinely do maintenance work on some of the mainframes each night. In one operation, the crew extracts all of the memory of a mainframe, condenses it on a separate magnetic tape, then restores it before dawn in a neater package in the mainframe's disk.

He acknowledges that the process parallels what some scientists believe happens during human slumber when the memory fragments of the day migrate from short-term to lifetime storage in the brain.

So it appears that the breakdown may have been just one of the adversities of the frontier. The horses that take you farther down the trail also have to sleep.



FICTION

He's obsessed by a woman who's letter-perfect The problem She might exist only on paper

FOREVER YOURS, ANNA

BY KATE WILHELM

Anna entered his life on a spring afternoon, not invited, not even wanted Gordon opened his office door that day to a client who was expected and found a second man also in the hallway The second man brought him Anna, although Gordon did not yet know this At the moment, he simply said, "Yes?"

PAINTING BY DI MACCIO

"Gordon Sills? I don't have an appointment, but ... may I wait?"

"Afraid I don't have a waiting room."

"Out here's fine."

He was about fifty, and he was prosperous. It showed in his charcoal-colored suit, a discreet blue-gray silk tie, a silk shirt. Gordon assumed the stone on his finger was a real emerald of at least three carats. Ostentatious touch, that.

"Sure," Gordon said, and ushered his client inside. They passed through a foyer into his office workroom. The office section was partitioned from the rest of the room by three rice-paper screens with beautiful Chinese calligraphy. In the office area was his desk and two chairs for visitors, his chair, and an overwhelmed bookcase with books on the floor in front of it.

When his client left, the hall was empty. Gordon shrugged and returned to his office. He pulled his telephone across the desk and dialed his former wife's apartment number, let it ring a dozen times, hung up. He leaned back in his chair and rubbed his eyes absently. Late-afternoon sunlight streamed through the slats in the venetian blinds, zebra light. *I should go away for a few weeks,* he thought. Just close shop and walk away from it all, until he started getting overdraft notices. Three weeks, he told himself, that was about as long as it would take. *Too bad about the other guy,* he thought without too much regret. He had a month's worth of work lined up already, and he knew more would trickle in when that was done.

Gordon Sills was thirty-five, a foremost expert in graphology, and could have been rich. His former wife had reminded him quite often. If you don't make it before forty, she had also said—too often—you simply won't make it, and he did not care, simply did not care about money, security, the future, the children's future.

Abruptly he pushed himself away from the desk and left the office, going into his living room. Like the office, it was messy, with several days' worth of newspapers, half a dozen books, magazines scattered haphazardly. To his eyes it was comfortable-looking, comfort-giving, he distrusted neatness in homes. Two fine Japanese landscapes were on the walls.

The buzzer sounded. When he opened the door, the prosperous, uninvited client was there again. He was carrying a brushed-suede briefcase.

Gordon opened the door wider and motioned him on through the foyer into the office. The sunlight was gone, eclipsed by the building across Amsterdam Avenue. He indicated a chair and took his own seat behind the desk.

"I apologize for not making an appointment," his visitor said. He withdrew a wallet from his breast pocket, took out a card, and slid it across the desk. "I'm Avery Roda. On behalf of my company I should like to consult with you regarding some correspondence that we have in our possession."

"That's my business," Gordon said. "And what is your company, Mr. Roda?"

"Draper Fawcett."

Gordon nodded slowly. "And your position there?"

Roda looked unhappy. "I am vice president in charge of research and development, but right now I am in charge of an investigation we have undertaken. My first duty in connection with this was to find someone with your expertise. You come very highly recommended, Mr. Sills."

"Before we go on any further," Gordon said, "I should tell you that there are a number of areas where I'm not interested in working. I don't do paternity suits, for example. Or employer–employee pilferage cases."

Roda flushed.

"Or blackmail." Gordon finished equably. "That's why I'm not rich, but that's how it is."

"The matter I want to discuss is none of the above," Roda snapped. "Did you read about the explosion we had at our plant on Long Island two months ago?" He did not wait for Gordon's response. "We lost a very good scientist, one of the best in the country. And we cannot locate some of his paperwork, his notes. He was involved with a woman who may have them in her possession. We want to find her, recover them."

Gordon shook his head. "You need the police, then, private detectives, your own security force."

"Mr. Sills, don't underestimate our resolve or our resources. We have set all that in operation, and no one has been able to locate the woman. Last week we had a conference during which we decided to try this route. What we want from you is as complete an analysis of the woman as you can give us, based on her handwriting. That may prove fruitful." His tone said he doubted it very much.

"I assume the text has not helped."

"You assume correctly." Roda said with some bitterness. He opened his briefcase and withdrew a sheaf of papers and laid it on the desk.

From the other side Gordon could see that they were not the originals but photocopies. He let his gaze roam over the upside down letters and then shook his head. "I have to have the actual letters to work with."

"That's impossible. They are being kept under lock and key."

"Would you offer a wine taster colored water?" Gordon's voice was bland, but he could not stop his gaze. He reached across the desk and turned the top letter right side up to study the signature. ANNA. Beautifully written. Even in the heavy black copy it was delicate as artful as any of the Chinese calligraphy on his screens. He looked up to find Roda watching him intently. "I can tell you a few things from just this, but I have to have the originals. Let me show you my security system."

He led the way to the other side of the room. Here he had a long worktable, an oversize light table, a copy camera, an enlarger, files. There was a computer and printer on a second desk. It was all fastidiously neat and clean.

"The files are fireproof," he said dryly, "and the safe is also. Mr. Roda, if you've investigated me, you know I've handled some priceless documents. And I've kept them right here in the shop. Leave the copies. I can start with them, but tomorrow I'll want the originals."

"Where's the safe?"

Gordon shrugged and went to the computer, keyed in his code, and then moved to the wall behind the worktable and pushed aside a panel to reveal a safe front. "I don't intend to open it for you. You can see enough without that."

"Computer security?"

"Yes."

"Very well. Tomorrow I'll send you the originals. You said you can already tell us something."

They returned to the office space. "First you," Gordon said, pointing to the top letter. "Who censored them?"

The letters had been cut off just above the greeting, and there were rectangles of white throughout.

"That's how they were when we found them," Roda said heavily. "Mercer must have done it himself. One of the detectives said the holes were cut with a razor blade."

Gordon nodded. "Curiouser and curiouser. Well, for what it's worth at this point, she's an artist more than likely. Painter would be my first guess."

"Are you sure?"

"Don't be a bloody fool. Of course I'm not sure—not with copies to work with. It's a guess. Everything I report will be a guess. Educated guesswork, Mr. Roda, that's all I can guarantee."

Roda sank down into his chair and expelled a long breath. "How long will it take?"

"How many letters?"

"Nine."

"Two, three weeks."

Very slowly Roda shook his head. "We are desperate, Mr. Sills. We will double your usual fee if you can give this your undivided attention."

"Gordon's voice was bland, but he could not stop his gaze. He reached across the desk and turned the top letter right side up to study the signature. He looked up to find Roda watching him."

'And how about your cooperation?

"What do you mean?"

"His handwriting also. I want to see at least four pages of his writing."

Roda looked blank.

"It will help to know her if I know her correspondent."

"Very well."

"How old was he?

"Thirty."

"Okay. Anything else you can tell me?

Roda seemed deep in thought, his eyes narrowed, a stillness about him that suggested concentration. With a visible start he looked up, nodded. "What you said about her could be important already. She mentions a show in one of the letters. We assumed a showgirl, a dancer, something like that. I'll put someone on it immediately. An artist. That could be right."

'Mr. Roda, can you tell me anything else? How important are those papers? Are they salable? Would anyone outside your company have an idea of their value?

'They are quite valuable," he said with such a lack of tone that Gordon's ears almost pricked to attention. "If we don't recover them in a relatively short time, we will have to bring in the FBI. National security may be at stake. We want to handle it ourselves, obviously."

He finished in the same monotone. "The Russians would pay millions for them. I'm certain. And we will pay whatever we have to. She has them. She says so in one of her letters. We have to find that woman."

For a moment Gordon considered turning down the job.

Trouble, he thought. *Real trouble*. He glanced at the topmost letter again, the signature, 'Anna,' and he said, 'Okay. I have a contract. I use routinely—"

After Roda left, he studied the one letter for several minutes, not reading it, in fact, examining it upside down again, and he said softly, 'Hello, Anna.'

Then he gathered up all the letters, put them in a file, and put it in his safe. He had no intention of starting until he had the originals. But it would comfort Roda to believe he was already at work.

Roda sent the originals and a few samples of Mercer's writing before noon the next day, and for three hours Gordon studied them all. He arranged hers on the worktable under the gooseneck lamp and turned them this way and that, not yet reading them, making notes now and then. As he had suspected, her script was fine, delicate, with beautiful shading. She used a real pen with real ink, not a felt-tip or a ballpoint. Each stroke was visually satisfying, artistic in itself. One letter was three pages long, four were two pages, the others were single sheets. None of them had a date, an address, a complete name. He cursed the person who had mutilated them. One by one he turned them over to examine the backs and jotted: PRESSURE—LIGHT TO MEDIUM. His other notes were equally brief: FLUID. RAPID. NOT CONVENTIONAL PROPORTIONS. ONE TO FIVE. That was European, and he did not think she was, but it would bear close examination. Each note was simply a direction marker, a first impression. He was whistling tunelessly as he worked and was startled when the telephone rang.

It was Karen, finally returning his many calls. The children would arrive by six, and he must return them by seven Sunday night. Her voice was cool, as if she were giving orders about laundry. He said okay and hung up, surprised at how little he felt about the matter. Before it had given him a wrench each time they talked; he had asked questions. How was she? Was she working? Was the house all right? She had the house on Long Island, and that was fine with him; he had spent more and more time in town anyway over the past few years. But still, they had bought it together; he had repaired this and that, put up screens, taken them down, struggled with the plumbing.

That night he took the two children to a Greek restaurant. Buster, eight years old, said it was yucky. Dana, ten, called him a baby, and Gordon headed off the fight by saying he had bought a new Monopoly game. Dana said Buster was into winning. Dana looked very much like her mother, but Buster was her true genetic heir. Karen was into winning, too.

They went to The Cloisters and fantasized medieval scenarios; they played Monopoly, and on Sunday he took them to a puppet show at the Met and then drove them home. He was exhausted. When he got back he looked about, deeply depressed. There were dirty dishes in the sink and on the table in the living room. Buster had slept on the couch, and his bedclothes and covers were draped over it. Karen said they were getting too old to share a room any longer. Dana's bedroom was also a mess. She had left her pajamas and slippers.

Swiftly he gathered up the bedding from the living room and tossed it all onto the bed in Dana's room and closed the door. He overfilled the dishwasher and turned it on and finally went into his workroom and opened the safe.

"Hello, Anna," he said softly, and tension seeped from him, the ache that had settled in behind his eyes vanished, he forgot the traffic jams coming home from Long Island, forgot the bickering, his children seemed unable to stop.

He took the letters to the living room and sat down to read them through for the first time. Love letters, passionate letters, humorous in places, perceptive, intelligent. Without dates it was hard to put them in chronological order, but the story emerged. She had met Mercer in the city, they had walked and talked, and he had left. He had come back, and this time they were together for a weekend and became lovers. She sent her letters to a post office box; he

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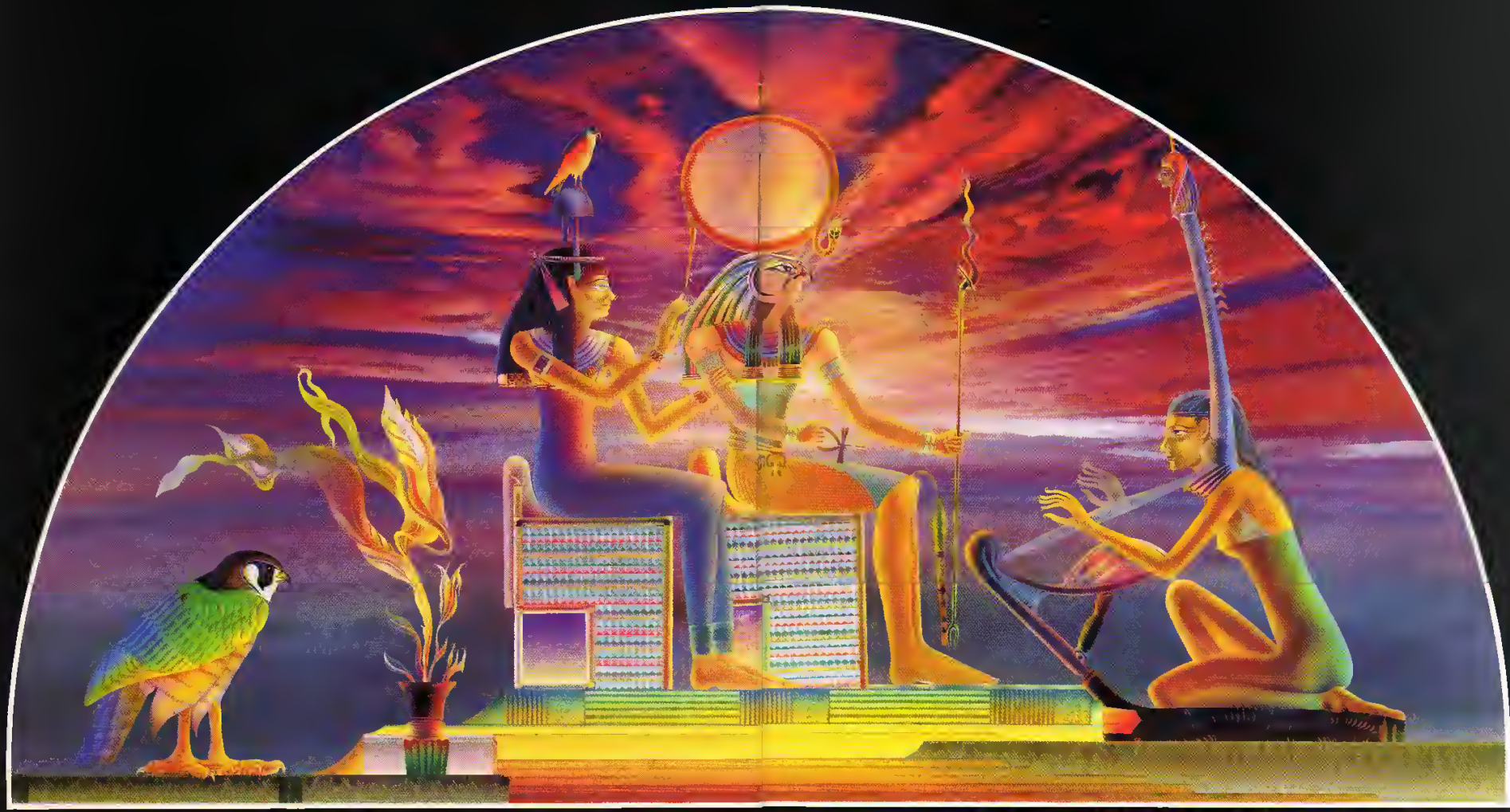

ARTICLE

The road to wisdom is often long and arduous

WALK LIKE AN EGYPTIAN

BY JONATHAN COTT

Editors' Note: Dorothy Eady, born at the turn of the century into a middle-class English family, had a passion for Egypt. Her devotion to the country and desire to contribute to the study of Egyptology began early and never wavered. She journeyed to Cairo in 1933 and spent the rest of her long life there, earning the accolade—in the words of one colleague—of "patron saint of Egyptology."

PAINTING BY THOMAS AKAWIE

The first woman ever hired by the Egyptian Antiquities Department she contributed to some of the most important archaeological discoveries of the century She worked with the world-famous Egyptologist Selim Hassan on the excavations at the pyramids of Giza and assisted renowned archaeologist Ahmed Fakhry on the Pyramid Research Project at Dahshur Her greatest achievement however was her work to restore the Temple of Sety the First in Abydos A master at deciphering hieroglyphics Eady—who became known as Omm Sety—translated thousands of inscriptions found in and around the temple She also discovered the existence of a secret garden which had flourished near the temple more than 3,000 years ago

But Eady's story is also one of reincarnation and eternal love She fervently believed that in an earlier life she had served in the temple of Sety and was the lover of the Egyptian king Sety the First Jonathan Cott explores Eady's lifelong search for the truth about her past in his new book *The Search for Omm Sety* In this excerpt based in part on Eady's diaries and on interviews with her close friends and colleagues Cott describes the journey of this odd and fascinating Englishwoman to the ancient place she called home

In the holy city of ancient Abydos where the celestial green valley of the Nile gives way to the bleached coppery sands of the Western Desert, there has long stood a beautiful white-limestone temple adjoined on its southern perimeter by a luxuriant garden At the center of this garden was a rectangular lotus pool, bordered by beds of jasmine and oleander It was here one morning about 3,000 years ago that a golden haired, blue eyed fourteen-year-old girl named Bentreshyt ('Harp of Joy') was picking flowers and singing to herself

On that same day the man responsible for the building of this temple—Pharaoh Sety the First—was paying a visit to Abydos Passing by the garden the Pharaoh, a man then in his fifties, was struck by the sound of a melodious voice then caught sight of the young girl who glanced up to see him through blossoms and leaves "Who are your parents little one?" he asked

I am an orphan

"And what are you doing now?

"I am a priestess to our lady Isis

Sety scrutinized this young blue eyed blond girl who looked so different from the rest of the people standing reverently at his side. For her part, Bentreshyt found it hard to meet His Majesty's eyes directly though she soon became aware that he was quite handsome After their first meeting she occasionally caught a glimpse of him as she made her way to or from the garden

One night the Pharaoh was sitting alone by the lotus pool when Bentreshyt happened to walk by He smiled at her and said "Come little one and sit beside me' When she did he took hold of her hand and kissed her The girl was scared, and His Majesty told her to run and not come back So she ran but not far enough At the end of the park she turned around and saw him sitting with his head in his hands Slowly she went back to him

Sety found one excuse after another to delay his departure from Abydos, and all the while Bentreshyt would meet him in the garden after dark This was forbidden because Bentreshyt was vowed as temple property, and nobody was allowed to touch her Since the girl was a virgin priestess of Isis, the affair was regarded as a horrific breach of the religious laws of the time

Bentreshyt was constantly under the close scrutiny of the high priest Antef When he was informed that Bentreshyt was in a family way the priest made her go down to the tomb of Osiris under the island of Osirion and tried to force her to confess to her crime. The girl refused to answer his questions at first When he compelled her to place her hand on the statue of Osiris, however she was unable to lie, and she finally shouted out "Yes, I have a lover! but she refused to mention the name of the king as her fellow culprit

> *"Sety smiled at her and took hold of her hand and kissed her The girl was scared She ran, but at the end of the park she turned around and saw him sitting with his head in his hands"*

It was at this time that Sety was finally obliged to leave Abydos He told Bentreshyt that he would come back soon and stay for a longer period A few days later events began to move very quickly As the last ship of the king's cortege disappeared Bentreshyt was coerced into admitting that the king was her lover The priest, with Spartan bluntness told her that her crime was punishable by death By law there could be no death sentence without a trial And if the legal procedure were followed the secret would not be kept So Bentreshyt decided to save the name of the only man she had ever loved and committed suicide When Sety returned to Abydos and asked about her he was shocked and heartbroken 'I will never forget her' he vowed to himself

For 3,000 years, he never did

In 1907 when she was three years old Dorothy Louise Eady fell down a flight of stairs While her mother Mrs Caroline Eady looked on in shock from the upper landing of the family's flat in the London suburb of Blackheath, the little girl careened down the steps, ending up motionless on the floor below The frantic mother immediately sent for the doctor, who examined the girl with a stethoscope, held a mirror then a feather up to her mouth and pronounced her dead The doctor then carried the dead little girl to her bedroom and informed the grieving family that he would shortly return with a death certificate declaring that the girl had died of a brain concussion

But when he came back instead of finding a corpse he saw a fair-haired chocolate smeared child sitting up and playing on her bed Dumbfounded the doctor examined the girl observed no obvious injuries tore up the death certificate swearing to Mr Eady that the girl *had* been dead

Soon after her accident Dorothy began to have recurring dreams about a huge building with columns a garden filled with fruits and flowers and tall trees nearby During the day her parents—to whom she had spoken about these visions—would often find their daughter weeping for no apparent reason "Why are you always crying?" Dorothy's mother would ask. The little girl would answer, "I want to go home"

One day when Dorothy was four her parents took her to the British Museum Upon entering the Egyptian galleries Dorothy suddenly let go of her parents' hands and went running crazily through the rooms kissing the feet of all the statues she could reach The little girl walked up to a mummy in a glass case sat down on the floor beside it and refused to budge

"Dorothy we must be leaving!" Mrs Eady insisted But Dorothy wasn't moving In an unrecognizable voice that sounded to her mother eerily like that of a strange old woman she announced "Leave me These are my people!"

When Dorothy was seven she first began to understand (or remember) what her recurring dream image of the huge building with its columns and garden and trees was all about One evening her father had come home after work with some magazines While lying on the floor idly going through their pages Dorothy suddenly became transfixed by a photograph whose caption read "The Temple of Sety the First at Abydos Upper Egypt" It was as if she couldn't breathe Clutching the magazine she shouted "This is my home! This is where I used to live!"

Dorothy's parents undoubtedly realized that their daughter's accident had affected her in some unknown and peculiar way Of course Dorothy was an unconventional child Her obsession with Egypt was bizarre to say the least When the Eadys sent their daughter to Sunday school, Dorothy told her teacher that since Egyptian religion was thousands of years older than Christianity it must be the true religion and Christianity merely its copy The Sunday school teacher's response was immediately to request that Mrs Eady keep her "heathenish" daughter away from class

Dorothy Eady finally found someone who accepted and encouraged her devotion to ancient Egypt. When she was ten, she would often play hooky from school and wander over to the British Museum to moon about the Egyptian galleries. One day, while examining some hieroglyphs on a relief, a short, stout, white-haired older gentleman who had noticed this little girl in the museum many times before went up to her and asked her why she wasn't at school. Dorothy replied that school didn't teach her what she *really* wanted to know. And what might that be?' the gentleman inquired. 'Hieroglyphs!' she fervently exclaimed. He smiled at the intense-looking young girl and said, 'Well, in that case I'll teach you what you want to know.'

This guardian angel who befriended Dorothy Eady and offered to act as her unofficial tutor was Sir E. A. Wallis Budge, the keeper of Egyptian and Assyrian antiquities at the British Museum and an extraordinarily prolific and controversial Egyptologist. To his amazement, his young pupil quickly learned how to write the hundreds of basic hieroglyphic characters that he taught her. Soon, at her mentor's suggestion, she began to try her hand at deciphering certain texts of the so-called *Egyptian Book of the Dead* (magical funerary prayers and spells intended to guide the dead of ancient Egypt on their journeys through the netherworld, originally inscribed on the walls of tombs and preserved on papyri—the finest collection of which is in the British Museum).

When she was fourteen, Dorothy came home from school one evening feeling unusually tired. She ate a light dinner—saying only a few words to her parents—then excused herself and went to bed. What happened next was so startling that when she recalled it some 50 years afterward, it seemed to her as if it had taken place only the night before. "I was asleep, and I half woke up, feeling a weight on my chest. I saw this face bending over me with both hands on the neck of my nightdress. I recognized the face from the photo I had seen years before of the mummy of Sety. I was astonished, and I cried out; yet I was overjoyed. And then he tore open my nightdress from neck to rim. The hands moved, and the arms moved, but he didn't talk. He didn't say a single word. And I will never forget the terrible look in the eyes. I don't know how to describe it. You can only say that the eyes had the look of somebody in hell who had suddenly found a way out."

Shortly after this first night of Sety's visitation, she began to have a recurring dream. A young Egyptian girl encountered a tall, severe-looking man dressed as a high priest, and a number of other men and women who stared at her disapprovingly. When she refused to answer his incessant questions, the man would begin beating her with a stick—at which point Dorothy would wake up screaming.

Dorothy didn't understand what any of this meant. She would consult with spiritualists about her perplexing feelings. They suggested that at the moment of her "death," when she fell down the stairs, an ancient spirit had possibly entered her body and possessed her. Uncertain of the "true" explanation of her condition, Dorothy gave up asking why and simply focused her energy on her Egyptological reading and collecting.

When she was twenty-seven, Dorothy went to London, where—in spite of her family's disapproval—she got a job with an Egyptian public relations magazine for which she wrote articles and drew political cartoons promoting the cause of Egyptian independence. There she met a young man from an upper-middle-class family named Imam Abdel Meguid, who was studying British educational methods in preparation for becoming a teacher back in Cairo.

He soon returned to Egypt, and after a year of exchanging letters, he asked Dorothy to marry him. She agreed, and in 1933, after packing a few of her belongings, she booked passage on a boat to Egypt.

> *"Instead of finding a corpse, the doctor saw a fair-haired, chocolate-smeared child, sitting up and playing. Dumbfounded, he tore up the death certificate, swearing she had been dead."*

Almost immediately upon arriving in Cairo, Dorothy and Imam Abdel Meguid married; she quickly became pregnant and gave birth to a boy, whom she named Sety. It didn't take long for Imam Abdel Meguid to realize that his wife was an extremely peculiar person around whom the strangest things were likely to occur.

Imam's father—whose sanity his son had no reason to doubt—happened to walk into his daughter-in-law's bedroom one day when she was recuperating from an illness, and suddenly people in the house observed him running from the room, yelling that "there was a Pharaoh sitting on [Dorothy's] bed!"

Unlike Dorothy's father-in-law, Imam Abdel Meguid had never caught a glimpse of this "apparition." But after the birth of his son he grew increasingly distant from his wife, whose interests were far removed from his own and whose ever more bizarre behavior both amazed and frightened him. During the second year of their marriage, he would wake up in the middle of certain nights—usually when the moon was full—and would watch his spouse rise up out of the bed in a kind of half-conscious, half-trance state and seemingly float over to a desk next to the window where, by the light of the moon, she would begin to write—as if being dictated to—some kind of fragmentary hieroglyphic messages.

Dorothy Eady would later say: "I *was* being dictated to. The [apparition] who was narrating my story—his name was Hor-Ra—really took his time. He would just tell me a few words, then be absent for a fortnight or so, then come again." Dorothy pieced together the bits of information Hor-Ra gave to her, and in this way she says she learned about her previous life as the young Egyptian girl Bentreshyt.

For three years Imam Abdel Meguid remained married to his wife of many lives. But when, in 1935, he was invited to work in Iraq as a secondary school teacher for a year, he readily accepted the offer. His wife did not accompany him. And not long after his return to Egypt in 1936, he divorced her and married his cousin. As the ex-Mrs. Abdel Meguid, who legally kept her married name and Egyptian citizenship, would later describe their amicable parting: "His cousin was a good cook [Dorothy wasn't] and didn't like monuments. I married the Egyptian Antiquities Department. So everybody was happy."

We've all known people who have dreamed about the pyramids or had visions of a previous life in Egypt," an Egyptologist friend of Dorothy Eady's once stated. "But those kinds of obsessions last three months or a year, and then they're over and the people are on or off to something else. Dorothy Eady really lived the whole thing. She also was an endless source of fascinating information, suggestions, and theories about ancient Egypt because she really stayed put and learned her subject step by step the hard way."

Her husband having departed for Iraq, Dorothy immediately left with her little son Sety and took up residence in Nazlet el Simman—a tiny hamlet consisting of not more than 20 houses, located at the foot of the Giza plateau, looking out onto the pyramids and the Great Sphinx. She soon got a job as a draftsman with the Egyptian Department of Antiquities—Dorothy Eady was the first woman ever to be hired by the department—and began working for Dr. Selim Hassan. A world-famous Egyptologist, Hassan (1886 to 1961) was responsible for the discovery of the fourth pyramid, and his excavations in the Giza area were among the most important archaeological undertakings of this century. (His magnum opus, the ten-volume *Excavations at Giza*, gives "special mention, with sincere gratitude," to Eady for her drawings and for her editing, proofreading, and indexing contributions to three of the volumes.)

When she wasn't working in Giza, Eady spent many of her days in the libraries at the Cairo Museum and at the home of Hassan, where she read voraciously, continued her hieroglyphic studies, deciphered

the magical spells of the Fifth Dynasty Pyramid Texts and wrote out in longhand the hundreds of pages of hieroglyphic transliterations and meanings contained in the great German/Ancient Egyptian dictionary *Worterbuch der Aegyptischen Sprache*. She also found time to collaborate with Mrs. Selim Hassan on ten enormous tapestries that depicted ancient Egyptian maps, lists of kings, and battle scenes. Nine of these tapestries are now displayed in the Wilbour Library of the Brooklyn Museum. The tenth tapestry—which depicts scenes from the famous Battle of Kadesh, in which Ramses the Second (the son of Sety the First) defeated the Hittite army—was given to Mrs. Anwar Sadat, who donated it to the Foreign Office in Cairo, where it now hangs.

In 1939 Imam Abdel Meguid—who, though a patient and tolerant person, did after all come from a conservative Muslim Egyptian family—decided that his son was not being brought up in an "appropriate manner." Too much playing around with mummies and such things, he told his ex-wife, and he took custody of the five-year-old boy. Dorothy realized that the kind of life she had pledged for herself was not suitable for a child. "I suppose I've always preferred cats to children, anyway," she said. She now began to devote most of her affectional life to an ever-increasing menagerie of cats, dogs, geese, donkeys, birds, and snakes.

After Hassan retired, Eady began work as a research assistant to another renowned archaeologist, Dr. Ahmed Fakhry (1905 to 1973), who was in charge of the Pyramid Research Project at Dahshur (the site of the Red and Bent pyramids). Here she displayed remarkable ability to fill in the lacunae of different texts and inscriptions and helped catalog the sculpture fragments from a number of tombs and temples in the area.

Dr. Klaus Baer, professor of Egyptology at the Oriental Institute and professor in the department of Near Eastern languages and civilization at the University of Chicago, met and became friends with Eady in the early Fifties when, as a recipient of a Fulbright fellowship, he was assigned to Ahmed Fakhry's Pyramid Research Project. He said of Eady, "When I first knew her, she was a large, vigorous woman, bubbling over with enthusiasm—very English, despite everything. Her Arabic was fluent, colloquial, and bad—she didn't have a very good ear for it—but she was quick with her tongue. She was an Egyptian patriot, and she lived in Egypt when the political agitation against England was at its height. She was once walking down a street in Cairo, in a lower-class area, when some women started shouting, 'Go home, English whore!' She promptly answered back, 'And leave all the customers to you?'"

But one of the many surprising things about Eady was the easy way she had of temporarily adjusting and adapting herself to whatever social world she happened to be frequenting. One evening she would be having dinner at an aristocratic gathering, whose guests included members of the Egyptian royal family; the next day she would be at an excavation site, sitting on the ground with the workmen eating a simple, dusty meal with her hands.

With the revolution of July 23, 1952, Egypt had begun to renew its independent destiny. It was then that Eady decided it was time to fulfill hers.

"I had only one aim in life," she had often said, "and that was to go to Abydos, to live in Abydos, and to be buried in Abydos." She had spent 19 years in Egypt, but "something outside my power had stopped me from even visiting Abydos."

It should also be remembered that for the first 19 years that Eady had spent in Egypt, she had patiently set out to study and train with the leading archaeologists and scholars of the day in order to master the complicated and multifaceted discipline of Egyptology. She desired not only to "immerse" herself in her favorite subject,

"Imam would wake up in the middle of the night and watch his spouse rise up out of bed in a half trance. She'd float over to a desk and begin to write as if being dictated to."

but also to contribute something to it.

But her chief reason for delaying her ultimate and inevitable "return" to Abydos had to do with her "passionate" involvement with her secret paramour, Sety the First. It is a story of astral travel ("the experience of leaving one's physical body and traveling freely abroad") and of an uncanny relationship with the "ghostly" lover. It is a story strange beyond telling.

"I can't describe to you the marvelous feeling of freedom and lightness when one's rid of one's body," Dorothy said. "I traveled many times in my astral body to visit His Majesty, and I had lovely evenings with him.

"One evening His Majesty asked me if I would, from then on, agree to his materializing himself as a man and visiting me. I asked him why he had been allowed to visit me as a [mummy] when I was fourteen years old. He said that he had been given permission to do so only in the form in which he had last seen his own body on Earth. Since he had known me first as Bentreshyt, he hoped to see me in exactly the same way as when we had first met—he as a man in his early fifties and I as a teenage girl. But he had completely forgotten that he had last seen himself as a mummy. He told me that we are allowed to choose the age at which we prefer to appear, but we cannot be older than we were at the time of our death. So a child, for example, cannot choose to appear as an adult. Most people choose to appear at the age at which they were happiest.

"When he first came to me in solidified form, there was no need to ask him whether it was possible to have a relationship with him like a normal man and woman—because he demonstrated his sexual powers. There was no chance of having children since nothing of him was allowed to remain behind when he left me early in the morning, always before dawn."

Whenever Dorothy began to think seriously of moving permanently to Abydos, she herself realized that at that point she would once again become "temple property" and be subject to the religious laws that would make it impossible for her to continue her passionate affair with the man she loved. Because of this, she found any number of reasons to miss her train. But she also knew that it would be only a matter of time before she would have to make that predestined journey. She applied numerous times to the Antiquities Department for a transfer to Abydos—but to no avail. None of the officials would dream of sending her to that "godforsaken" village. In the mid-Fifties Abydos had no electricity, no plumbing, no running water. Not one person in this hamlet of mud-brick houses and mud-dust lanes spoke a word of English. It was not, in the opinion of the Antiquities Department, a place to send a person from London or Cairo—much less a single woman—to live.

Eady was not to be dissuaded. Finally, in early 1956, she got her wish. Fakhry offered her a job as a draftsman in Abydos. Although overjoyed at the prospect of leaving, Dorothy had a deep and secret regret. Years later, in an extraordinary diary entry, she would write:

"Sety appeared to me at the Pyramids a few days after I had received news that the Antiquities Department had at last consented to transfer me to Abydos, to work in the Temple. He stayed with me all night and made love to me in a surpassing way. That was the last night that we ever made love together, and it was the sweetest. He has slept beside me many times since then, and we have embraced and kissed, but nothing more because now the Temple lies between us like a drawn sword. [Sety told me] From now until the end of your earthly life you belong again to the Temple, and you are forbidden to me or to any man.' I started to cry and asked him if I should refuse to go to Abydos after all. Then he explained to me that this was the period in which we were both to be tested. If we resisted temptation for the rest of my life in Abydos, our original crime would be forgiven, and I would belong to him for eternity. I asked if I would ever see him again,

and he replied that he would certainly come to me at Abydos. I said: Will you come as an intangible spirit as you used to do? He said, No, Beloved. I shall come to you as a living man. I cannot forgo your kisses and the clasp of your arms." A few days after this, I left for Abydos."

Having never wavered from the certitude of her heart and having spent many years preparing herself intellectually for her journey, Eady finally returned "home" to the small village of Arabet Abydos, situated at the point where the alluvial Nile plain in the east meets the desert and a limestone mountain to the west. Here stands the Temple of Sety, dominating the village. Generally considered the most beautiful and best-preserved structure of its kind in Egypt, the Temple of Sety was the greatest artistic achievement of the former army officer who, on becoming Pharaoh in his early thirties, proclaimed himself "Bringer of Renaissance" and attempted to reform the corrupt and inefficient government and to regain the empire Egypt had lost since the reign of the Eighteenth Dynasty heretic king, Akhen-Aton.

The Sety temple differs from all other Egyptian religious shrines in two important aspects. First, instead of being designed according to the customary rectangular plan, the temple is L-shaped, thereby allowing the Osirion, which served as a cenotaph for both Osiris and Sety himself, to remain uncovered and intact; and second, instead of being dedicated to just one principal god (and that god's consort and son), the temple contains seven vaulted chapels—three for the holy family of Abydos (Osiris, Isis and Horus), one each for the gods Amon-Ra of Thebes, Ra-Horakhty of Heliopolis and Ptah of Memphis, and a seventh for the dead, deified Sety. In its attempt to represent and reconcile the demands and hopes of this world, the netherworld, and the empire, the Temple of Sety the First truly became a "national" as well as a "cosmological" shrine.

To Eady, the temple was also a "personal" shrine. On one of her first visits to the building—sometime during her two brief pilgrimages to Abydos in the early Fifties—she remembered feeling "as if I'd walked into a place where I'd lived before." Being both postulant and scholar, Eady—like few others—had the ability to experience and explain the marvels and mysteries of this holy place.

In Egyptian villages, the local people have always considered it impolite to call a married woman by her real name, choosing instead to designate her as the mother of her eldest child. So in Abydos, Eady now became known as Omm Sety (Arabic for *mother of Sety*)—a name that she would use and by which she would be known for the rest of her life.

In 1956, the Temple of Sety was in the process of undergoing restoration under the supervision of Edouard B. Ghazouli, the late chief inspector of Middle Egypt. The houses in front of the temple facade had been pulled down, and when the southern part of the first pylon and its terrace were cleared away, Ghazouli and his workers discovered a small temple palace with its reception hall. The original stone doorways, columns and window grills were all in fragments. Omm Sety, upon her arrival in Abydos, was given about 3,000 of the inscribed pieces to catalog and fit together and was then asked to translate the inscriptions. This was exactly the kind of task she had undertaken for Fakhry in Dahshur, and her earlier training was now to serve her well.

"You see," she would say on hindsight, "I really couldn't have come to Abydos until I'd learned properly the job I was intended to accomplish there. In other words, I was meant to do something good for the temple, not just merely flap about it."

It was during this period that Omm Sety finally got her chance to prove her contention that the gardens she had always sworn once flourished near the temple—and

> *"They found the garden exactly where I said it was: to the southwest of the temple—tree and vine roots, little channels for water, even the well. And it still had water in it."*

about which Eady had told her disbelieving and scornful father when she was a little girl—had in fact existed. "The foremen found it exactly where I said it was—to the southwest of the temple—tree roots, vine roots, little channels for watering, even the well—and it still had water in it."

In the temple, Omm Sety turned one of the rooms near the Corridor of the Bulls into a personal office. Here she worked on a drafting table lit by a gas lamp. Spending as much time as she did in the Sety temple, Omm Sety was bound to experience some extraordinary things there. Perhaps the most unusual of these took place in 1958, when she was working in the Hall of the Sacred Boats.

At that time, she explained, "work on roofing the temple was in progress, and although I had the keys to all the doors, it was easier to get in and out of the building by going up the stairs to the roof, walking along the top of the southern wall of the unroofed western corridor and down the scaffolding at the west of the temple. We then had an epidemic of Asiatic flu, and one morning I was feeling rather bad. As a couple of aspirins and a short rest had no effect, I decided to call it a day and go home. I went up the stairs and started walking along the top of the wall when I suddenly became very dizzy and fell, twisting my right ankle and hurting my left shoulder. I remember hearing a loud grating sound, like that of a grindstone at work, and I rolled down a fairly steep slope, the grating sound was renewed, and I found myself in darkness.

"After a while the dizziness passed off enough to allow me to stand up and grope for a wall. I touched some smooth limestone blocks. I sensed very faint threads of light filtering down from above as though through cracks in the roof, and as my eyes became accustomed to the gloom, I found that I was standing in a narrow passage less than ten feet wide. A narrow path, perhaps about twenty inches wide, ran along the base of the wall, but the remainder of the width of the passage appeared to be completely filled with boxes, offering tables, cases, bales of linen—and everything had the gleam of gold. Feeling my way along the wall, I limped along. The passage seemed to be endless, and to my left crowded with objects.

"I stumbled and fell, and on trying to rise saw what I took to be the god Horus himself bending over me, his hands raised as though in astonishment. Then I suddenly realized that Horus was only a painted wooden statue, life-size, originally standing upright, with the arms bent at the elbows and the hands raised. Insects had eaten away part of the front of the body, causing the upper part to lean over. Scrambling to my feet, I noticed similar life-size statues of Osiris and Isis leaning against the far wall, apparently uninjured.

"Near where I stood was a golden vase about ten inches high. It had an oval body, a long neck, and a trumpet-shaped mouth, and stood in a wooden ring stand. By the faint light I could see a cartouche engraved on its body, but it was too dark to read it. But by the length of the frame I knew that it was not the cartouche of Sety but of one of the later kings, perhaps from the Twenty-sixth Dynasty. I picked it up. It was very heavy, and at first I thought I would take it as evidence of what I had discovered by accident, but I finally decided against it and put it down in its place.

"Two days later the chief inspector of the Antiquities Department for this area came here, and I told him about this experience. He was very astonished and interested, but neither of us could decide if it had really happened. One thing I am certain of: The Temple of Sety still holds some secrets."

Omm Sety later confided to her closest friend, Dr. Hanny El Zeini, that in the temple treasury waiting to be discovered was the diary of Sety the First—written on papyri. Omm Sety's belief in the existence of this diary and of the treasury itself cannot be doubted because on the temple walls themselves inscriptions say that both are hidden somewhere inside it.

Excavations have now become much

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Relinquishing a family and civilization for the rain forests of Borneo, the youngest of "Leakey's Angels" tracks the mysterious animals that "never left the Garden of Eden"

INTERVIEW

BIRUTÉ GALDIKAS

Orangutan. The word is Indonesian, and spoken in that tongue it has a gentle lilt: *orong-oo-tahn*. That is just the way Biruté Galdikas says the word—with reverence, never with a finishing *g* or abbreviated to *orang*. Human beings' third closest relative and the world's largest tree-dwelling animal, the orangutan, say the primatologists, is the most elusive and enigmatic of the great apes. The word itself conveys that sense of mystery. It means "person of the forest."

Lithuanian by heritage, German by birth, Canadian by upbringing and citizenship, Galdikas has spent most of the last 15 years deep within the rain forests of Borneo, documenting the solitary life style of the orangutan. She now lives with her second husband—a Dayak tribesman—and their two children in a cabin beside a river, six hours from the nearest settlement.

Galdikas's research has yielded startling new insights into orangutan behavior. Geographically isolated from press attention and too busy to publish many of her findings, Galdikas remains the least known of "Leakey's Angels." Like chimpanzee researcher Jane Goodall and the late gorilla observer Dian Fossey, Galdikas was selected by anthropologist *extraordinaire* Louis B. Leakey to perform pioneering long-term studies of great apes in the wild. Galdikas, now forty, was chosen almost 20 years ago, not only for her zeal but for her academic qualifications. While Goodall was a secretary with a high school education, and Fossey a physical therapist, Galdikas received her master's degree in primatology at UCLA in 1969. She returned there in 1976 to earn her doctorate in anthropology. Her findings have not been so widely disputed as those of Goodall and Fossey. "Galdikas's methodology is the best of the three," says Washington University primatologist Robert Sussman. His sentiments are echoed

PHOTOGRAPH BY CHRISTOPHER SPRINGMANN

by former Brandeis University primatologist David Horr Agee the only person to conduct long-term research on orangutans before Galdikas Agee, who spent three years studying orangutans in Indonesia, says "Galdikas has provided us with the most detailed description of the orang way of life we have"

Galdikas's interest in orangutans long predates her academic work in primatology "I don't believe in predestiny," she says "You make your own fate yet I was born to study orangutans and their forest I believe my affinity for forests comes from my Lithuanian heritage We are a forest people" The Galdikases, however, were an urban and urbane family Brought by her physicist father and mother to Toronto as a child, she grew up knowing only the trees of Hyde Park as forest and orangutans only from books As a serious and scholarly UCLA undergraduate, Galdikas met and married Rod Brindamour, a Canadian country boy and summer lumberjack who was very much her opposite

Galdikas, twenty-two and Brindamour had only each other for company when they left Canada for a remote stretch of forest in southern Borneo that was then called Tanjung Puting Reserve, now an Indonesian national park From their hut the two would go off on daylong treks through the waist-deep mud of the swampy forests struggling to keep pace with the orangutans overhead In 1971 the National Geographic Society joined the Wilkie and Leakey foundations as supporters of Galdikas's research Camp facilities were expanded, and native Dayaks hired to track orangutans Brindamour however wanted to be a helicopter pilot and computer expert not a primatologist After seven and a half years with Galdikas at Tanjung Puting, he left in 1979 Forced to choose between Rod and the orangutans, Galdikas remained in Borneo A year later their young son, Binti, who had been raised with orangutans as playmates, followed Brindamour back to Canada

Galdikas's life at Tanjung Puting has dramatically changed since her early years there A compound of buildings including a dormitory and eating hall, has transformed the dockside camp, which now swarms with up to 25 Dayak assistants, plus American helpers Thirty ex-captive orangutans which Indonesian authorities have confiscated from illegal pet trade and remanded to Galdikas have free run of the camp, picking pockets for candy, doors and suitcase locks for soap and playthings Galdikas treats the ex-captives for illness and for injury from mistreatment and to date 25 have been successfully reintroduced to life in the wild At the same time she tends to her own children Filomena Jane, two, and Frederick, four, by her Dayak husband Pak Bohap

For four months every year Galdikas returns to Canada to lecture at Simon Fraser University and visit her elder son Even when in North America, however, she still spends considerable time with orangutans Writer Don Lessem conducted part of this interview at the Rio Grande Zoo in Albuquerque, New Mexico, where Galdikas made daily visits to an adolescent female orangutan Memela is a subordinate female here so she has never had much attention' Galdikas explained as she fed the young ape yogurt and after-dinner mints Demonstrating that she would give the shirt off her back to help orangutans, Galdikas presented her new knit sweater to Memela, who promptly grabbed it and admired its bright threads

Much like the animals she studies notes Lessem, Galdikas was initially evasive, even hostile responding to inquiries with "You are nosy aren't you?" 'Use your head when you ask a question," and to a query on how it was she came to Canada from Germany, "By plane" But she soon overcame her icy mistrust and revealed the warm, generous nature known to friends, family, co-workers, and orangutans Her facial expressions remained masked by smoky glasses but there was no hiding her excitement when she spoke of her impending return to Borneo "My family and my life's work are there I love the Indonesian people and think I am becoming, slowly, one of them Above all, I feel this special kinship with orangutans'

> *"The silence is ominous in the rain forest. There is an expectant air, like in a movie when the soundtrack stops and you know something will happen imminently."*

Omni How did you originally connect with Louis Leakey?

Galdikas The professor of a course at UCLA on archaeological dating techniques asked Leakey to speak During the question-and-answer session he really caught fire when asked about the relevance of studying great apes for understanding evolution Then patting his pocket he took out a telegram from Dian Fossey saying that she had finally habituated some wild mountain gorillas He was really proud like a doting daddy After the lecture I told him I wanted to study orangutans He said he was going back to Africa the next day but would keep in touch I walked out of that hall convinced I was going to study orangutans It took nearly two and a half years to get funding Leakey didn't care about formal education He wanted enthusiasm, belief in what you were doing Always support someone who knows what he or she wants to do" he said

Omni Was it coincidence he chose women for all his great ape projects?

Galdikas No He steadfastly believed women were more patient and saw details better Scientists who have shown films to male and female undergraduates have found that the females remember the seemingly irrelevant details better In science initially irrelevant details can prove highly relevant later on Leakey gave me some little tests to gauge my powers of observation He turned over some cards and asked me which were the reds and which were the blacks I immediately noticed that half of them were slightly bent He claimed men didn't notice He also claimed men will excite aggressive behavior in male pongids whereas women excite protective tendencies in them Wild orangutans can't distinguish men from women, but generally I think Leakey was right

Omni Why didn't Leakey's imprimatur guarantee you the money you needed to begin your study?

Galdikas Leakey never had any money until the end of his life Even famous field researchers have to struggle all their lives That is not the image you get from the glossy pages of magazines But Leakey did have good contacts He wrote to the head of the nature protection agency in the Indonesian government who decided Tanjung Puting Reserve was where we should go Nobody had been there—no researchers, no tourists If had been a preserve since Dutch colonial times It is fifty kilometers by boat from the nearest town Some illegal hand loggers had abandoned a bark-walled hut near the river We lived there for three years We brought only two large green knapsacks Mine had a typewriter in it

Omni What did the Indonesians think of you there?

Galdikas The only Indonesians we saw the first few years were Malayu—small, slender Moslems who were after the sweet latex that goes into chewing gum These wild-rubber collectors probably thought we planned to do something other than study orangutans—like logging, searching for oil, or collecting antiquities The only other Westerners they'd seen were missionaries the idea that we were at the reserve to proselytize orangutans made no sense to them

Omni What was your strategy when you first began searching for orangutans?

Galdikas I would go one way, and Rod the other I'd search and Rod would make trails I'd just take a jar full of cold coffee and go from early morning to late in the afternoon, up to my armpits in water At first we thought we had to stay in the swamp because that's where George Schaller the noted naturalist and early orangutan researcher had seen them On our initial trip down the river with local foresters we saw

what I thought were two females. As soon as we got close they took off. I wanted to get out and follow but was told it was no use in the swamp. Even so I was jubilant. A week or two later I saw a subadult male in a tree eating bark. He hiss-squeaked his annoyance, then went right back to eating. I watched him for five hours and was thrilled. Later I learned it was quite anomalous for a subadult to do a double take display and vocalize and not just run away. Animals usually went berserk the first time we saw them.

Omni: Describe the Bornean rain forest.

Galdikas: Tanjung Puting is not the cathedral forest of [nineteenth-century naturalist] Alfred Russel Wallace's description. The canopy is more open, although it's still "twilight at noon," as the phrase goes. The understory is poor, and so lots of seedlings and saplings crowd the earth. Overhead the trees are tall but not giants. Lianas and other vines aren't so predominant either, but you walk with difficulty through the mass of saplings and barely see a few meters ahead. It is hot, muggy, and the silence is ominous. You think of the rain forest as a cacophony of sounds, but unless you come in the early morning, when the female gibbons and birds are calling, it is virtually silent. You attend to every sound and the snapping of a twig is amplified in your mind. There is an expectant air, like in a movie when the soundtrack stops and you know something will happen imminently. You don't see the full life of the forest until you sit for an hour or two. Gradually you begin to notice birds, rodents, the occasional big mammal leaping by, or an orangutan crashing in the branches.

Omni: How do you find them?

Galdikas: With difficulty, especially if you don't know where they've made their nests the night before. I get up at three-thirty A.M. You want to be there before the orangutans leave their nests at dawn. I used to go alone. Now I go with my husband, Pak Bohap. I've become pretty good at reading the signs of new nests and recent orangutan activity. I see things Westerners can't, but my skills are nothing compared to my husband's. He's hunted for food in these forests all his life. He moves barefoot soundlessly. I need sneakers for the nettles, spines, and leeches. I snap twigs, which annoys him. I walk slowly on my own, looking for signs of orangutans. He walks quickly, then stops when he sees something, even a bent twig. He'll point out wood owls, and I'll see none until I train my binoculars and see two birds perched twenty meters up in a clump of leaves. His hearing, too, is just as remarkable. There's lots of white noise in the forest when it's windy—branches crashing, leaves dropping. But he'll hear an orangutan's long call or a slight crunch and go right to the point where the branch snapped and stop, using an unconscious trigonometry.

After I've spotted an orangutan, I follow it from food source to food source. About sixty percent of their active hours are spent at a food source, and they consume an enormous range of foods. They cover five hundred meters to two kilometers a day. When you are waist-deep in the swamp trying to keep up, that seems like quite a lot. Usually they are about thirty meters up in the trees—a ball of orange hair to the naked eye.

Orangutans are quite agile, but I've seen them take terrible falls. Once I heard a crash and saw a female holding her infant fall about sixty feet through branches to the ground. Both were fine, and they moved back up into the canopy. I also saw a male fall about sixty feet straight down from a breaking branch, and he hit the ground so hard he bounced! He sat there a moment, dazed, then climbed back up.

Omni: How do you record your observations in the forest?

Galdikas: I note what the individual is doing in one-minute intervals: foraging, moving, resting, vocalizing, mating, and so on; where the animal is; what tree, how high,

> *"I once saw a male fall sixty feet from a breaking branch, and he hit the ground so hard he bounced. He sat there a moment and then climbed back up."*

whether there are gibbons or maroon leaf monkeys calling, and so on. If I can afford the time, I follow them until it is too dark to see them, then return to the nest site at dawn. I don't follow infants and juveniles. You can't do everything.

Omni: How do you tell the sex and age when they are high in the trees?

Galdikas: There is no misfaking the males. The females weigh seventy to eighty pounds, and the males one hundred and fifty to two hundred pounds. When mature they develop these enormous cheek pads. Males are built like sumo wrestlers, but it is all muscle. They are incredibly strong. Orangutans *are* hard to sex as infants. The clitoris is huge, and from thirty meters below it looks like a penis. Zoos make the mistake of calling little females males all the time.

You can recognize individuals by the size and shape of the face, missing fingers, scars, but you never know when you are going to see him or her again. Females don't go far, but males often range over thirty-five square kilometers. Their appearance as adults is completely different from their appearance as juveniles. One ex-captive male walked right into camp, and I didn't recognize him—until I looked closely and saw that he had one white eye. I'd known him as an adolescent eleven years before and hadn't seen him since. It's possible to differentiate individual orangutans by smell, but I'm not that good. Wild ones have a powerful odor. There was one ex-captive female that had a very pungent smell. Rod Brindamour, my former spouse, has a nose like a bloodhound's. He'd come back to the cabin one half hour after this orangutan had left, and he'd know she'd been there.

Omni: How do you acclimatize the wild orangutans to your presence?

Galdikas: By encountering them repeatedly, you walk a fine line between not bothering them and acclimatizing them to the human observer. Most females in the thirty-five-square-kilometer study area are habituated. But one female took twelve years to habituate. Some males take a year or two. Others will never be habituated. Once they are accustomed to you, they are oblivious. They have no more interest in you than in a bump on a log. But when you first encounter them, their displays can be aggressive—vocalizing, throwing branches. And even with females who have been habituated, if you don't see them for a year, they may become unhabituated. Think of it this way: You don't like it when someone follows you. It makes you nervous. You might get used to it, but after a year off you'll get belligerent all over again.

Omni: Have you ever been physically threatened by an orangutan?

Galdikas: Yes. The closest I ever came to death was when I was trapped between two logs in a windfall and couldn't move. A female orangutan was throwing branches and trying to topple a snag, a branchless dead tree, onto me. Females don't normally manipulate snags, so she lacked experience and didn't get me. Had it been an adult male that was trying to push the snag, I'd have been killed.

An adult male, Ralph, was sexually pursuing an ex-captive female in camp. Males can be very dangerous then. He stood right in front of me on a bridge. I'd had experience in assessing adult male nerve, and like the orangutans, I am slow to react. Had I jumped or winced, he would have attacked me. Male orangutans are like karate champions. They have staring bouts to assess will, with occasional grappling. Finally, he backed off. I tell all my assistants to sit still if an orangutan approaches. But once one of our local workers was surprised by a male orangutan and ran as the orangutan started to charge. After that, the orangutan would attack humans whenever he saw them. Rod said, "We can't have that." He was made of stainless steel. He went after the orangutan and charged him back. After that, things were all right again.

It's mostly bluff with orangutans. Other animals in those forests are much more dangerous. The most frightening are the Malayan sun bears, very belligerent little

honey eaters. I avoid going near wild pigs, but I am positively apprehensive in the presence of bears. You'll sit down under a tree, hoping you are not sitting on a poisonous snake, and a bear will come tearing straight down the tree. I was quite surprised when a bear came charging down like a cartoon character. They don't always run off, though. The local Malayu forest people say never turn your back on a bear—it will leap, do a backflip onto your front, and rip your chest open. Rod scared one, but after it came down from the tree it circled and charged him. Rod hit it on the back with his machete, but these bears have such loose skin folds that it wasn't even cut. It just ran off.

Omni: Does combat establish a sort of dominance hierarchy among males?

Galdikas: Sometimes, but dominance is usually mediated through the long call, so named because it lasts up to four minutes. A distinctive vocalization of the adult male, it starts with a series of grumbles that function much like an opera singer clearing his or her throat. Then the adult male makes a sound like the trumpeting of an elephant. These bellows subside into sighs lasting a minute or two. The patterns are so individual, you can actually chart who it is.

Omni: Do the long calls serve only to establish dominance?

Galdikas: No, although individual calling rates correlate so clearly with dominance that at first I couldn't believe it. One male can easily find another by the call. The male cheek pads may act as an acoustic filtering device to enhance their sending and receiving responses. But it also is a way of telling females they are in the vicinity. It is very hard for one orangutan to find another in the forest—if the first one doesn't want to be found. The long call is a way the dominant males crash along saying, 'Here I am, if you want me.'

Omni: The females do the selecting?

Galdikas: Yes, they form consortships during receptivity that last three to ten days. Their mating is protracted, acrobatic, and vocal, lasting up to half an hour. Sometimes there are two, three, or four matings in the ventral–ventral position. The male may long call before copulating. The female is rarely audible, unless it is a hiss-squeak directed at us if she is not used to humans. This low hiss sound, a mark of annoyance, is completely different from her response to 'rape.' Then, she screams or gives a loud grunt. This rape grunt is the female's loudest vocalization.

Rape among orangutans is relatively infrequent, a reproductive tactic of subadult males. Most matings come during consortships with big adult males. The throat pouches or cheek pads don't fully develop on males until they are seventeen or eighteen, but they are already bigger than the females. Subadult males try to form consortships, but it's difficult for them. If a big male approaches, he'll drive them away. To overcome this problem, they copulate forcibly. Rape is a low-risk tactic. The orangutans struggle, but it is very focused. When he wins, she acquiesces, and the aggression is over. There isn't any coyness or teasing in these fights. In one resisted-mating sequence, the pair ended up on the ground with the female screaming before copulating. Subadults aren't about to confront the adult males, who play for keeps. When an adult male establishes a consort relationship, he invests a lot in guarding his mate. A subadult rapist could get badly hurt.

Omni: Aren't females much more sociable than males?

Galdikas: Yes, they form friendships, and although they do have enemies, they are mostly friendly or neutral toward other females. A female will nurse her offspring for eight years, so they are seldom alone then. By comparison, chimpanzees have six years on average, gorillas four to five, between successive live births. Because orangutans are solitary or semisolitary, they might need a longer time with their mothers to learn foraging techniques and, perhaps, to grow to maturity because of the low-protein content of their diet. Orangutans live at least into their fifties or sixties. I saw a fully mature female orangutan when I began my work and have seen her again fifteen years later—and she hasn't gotten much older looking. She must be at least thirty-five and still looks to be in the prime of her life.

Omni: Is there an orangutan personality?

Galdikas: There are many. They are incredibly gentle beneath their bluster and very easy to get along with. They aren't devious or deceitful like chimpanzees, which are so much like us in aggressiveness, tool use, and the beginnings of culture. You won't see much politics among orangutans, but you will find an incredible strength of character. Put a chimpanzee in a zoo, and it changes very quickly. But you can never take the orangutan out of an orangutan. That has to do with their semi-solitary nature.

Omni: Are they as smart as chimpanzees and gorillas?

Galdikas: Wild orangutans don't use tools, say, in the way a chimp works a stick to get termites, but they have incredible cognitive abilities that they use in locomoting and in processing food, abilities that are equivalent to those required for tool use. They have astounding memories. Put a gorilla or a chimp in a cage, they will try to get out, get frustrated, and quit. One zookeeper told me she had an orangutan try to pick at a weak spot in its cage for a week. She brought the orangutan back to the same cage years later, and it immediately went back to picking at the same spot. They are great at picking locks. Theirs is a different mind from those of chimpanzees or gorillas, but it is certainly of equal intelligence. They aren't so excitable as chimps. There is a reserve, a detachment about them. They don't allow you too close to them. That serenity has always appealed to me.

Omni: Is that what first attracted you to studying orangutans?

Galdikas: Yes, and their eyes. Orangutans have such humanness. Perhaps it's because they have white around their eyes like we do. I was always drawn to their eyes. I told Rod Brindamour when we met that I wanted to go to Sumatra or Borneo to study orangutans. He didn't even know what color they were. He'd never seen one.

Omni: Were you ever so frustrated that you thought of quitting?

Galdikas: No, we had come prepared to slog through the swamps the rest of our lives. It was very rough the first year or two before we set up the study-area trails. What we missed most were books, but we had each other. And Rod had all sorts of forest skills. He managed camp, bought supplies, did photography, mapping, recorded the long calls. He's an incredibly courageous, talented person. After three years I went to a conference in Austria and spent a few days in North America. He didn't leave camp for four years. It was his home as much as mine.

Omni: How was raising a child in such isolated conditions?

Galdikas: Very difficult. People see those *National Geographic* pictures of Binti as a baby playing with orangutans and think we just let him run around with the ex-captives. We were terribly afraid he might pick up some disease, so we'd grab the orangutans and give them a bath before we let any of them near him. We were constantly worried he might get eaten by Bornean bearded pigs.

Omni: What does Binti think of orangutans now that he's back in Canada?

Galdikas: He likes them, yet when he was a toddler he resented the attention they received. I took him to see the Clint Eastwood movie with the orangutan [*Every Which Way but Loose*] when he was four, and he said angrily, 'Orangutan is not people.' That pretty well summed up his attitude at the time. Now he thinks orangutans are interesting and enjoys them.

Omni: What did you think of the Eastwood movie at the time?

Galdikas: It was fun. I thought Clint Eastwood and the orangutan had a good re-

> *"Gorillas were all that mattered to Dian Fossey. She was like a gorilla in many ways: majestic, intelligent, sensitive, and gentle beneath a ferocious, blustering temper."*

lationship. I'm a lot happier with that situation than with the lack of attention orangutans get in many zoos.

Omni: How many ex-captive orangutans have you cared for?

Galdikas: About eighty. There are thirty in camp now, and another thirty have been returned to the wild. Many have died—they came to us very sick and died quickly. And several have been born to ex-captives. They all have free run of the camp, but we try and keep doors closed to keep them out. When we started working with them, I was the only woman in camp, so the infants would adopt me. I remember carrying one frail little infant all swaddled in blankets with me to a doctor, and people at the clinic glancing over at me, wondering to themselves, I'm sure, *Just where did this woman get such a hairy baby?*

Now that I have children of my own, I can't go through that all over again. But it is essential they form a relationship with another animal, preferably another orangutan. Many orangutans are very nurturing; we've even had males that allowed infants to suckle from their breasts. When an ex-captive is ready for release, we let it go on the other side of the river from camp, so it won't interfere with our wild study population. We allowed one wild female to feed at our station because our camp is in the core area of her home range. But you can't let wild adult males in. They can be very dangerous. Ex-captives are safe to be around, and generally we've never had a serious injury in camp. We have had problems, however, depending upon how they've been treated before they came. They love to wrestle and don't know their own strength when they're young. One ex-captive would attack blonds. Once he attacked me when I was nine months pregnant. I was wrestling with another orangutan and fell over. He saw me down, vulnerable, and rushed in and took a big bite out of my arm.

Omni: Do you yourself feed the ex-captive orangutans?

Galdikas: No, I couldn't spend the necessary time twice a day. Years ago it was a problem because the ex-captive males are real sexists—they attack men. They didn't feel competitive with females, so for a short while we used women to feed them. But one woman was menstruating, and she was physically attacked. That stopped that. Until Pak Bohap came. He has a presence. The orangutans are scared of him.

One day Rod and I drove to a Dayak village. A man in his twenties—quite short, about five feet two inches, and big shouldered—came out to the jeep, opened the door, and threw his stuff in. He didn't say a word, but I knew from first sight that this Bohap was someone. He was so supremely self-confident. We eventually became friends, but it was years before we became engaged and married. That all happened after Rod left.

Omni: Why did your first husband leave?

Galdikas: Rod had been there a long time for someone who did not consider orangutans his lifework. He had wanted to be a helicopter pilot, but he had health problems. He still wanted to work with computers. When he finally left in 1979, he had such a huge tropical ulcer on his leg he could barely walk to the plane. Years of wounds festering in that dampness had made purple holes in his legs. He had been very healthy, and he resented his loss of health. The ulcers cleared up in two weeks, once he got back.

Omni: Has your own health been compromised by life there?

Galdikas: I'm sure. The climate does sap your energy. I brought some of it on myself by not eating or resting sufficiently. I'm much more careful about my diet now, and Pak Bohap makes sure I eat. I used to smoke clove cigarettes, which are popular there. They are highly carcinogenic and can burn holes in your lungs. Many Westerners take up smoking in Indonesia. It sounds curious, as if you wanted to bring your own bit of pollution into this pristine

"Rod left saying I loved orangutans more than him. I still loved him, but he said his wife had to love him more than anything else on Earth. I've given up a lot for orangutans."

world. It is slow when you are watching orangutans all day, and you can't read a book. So you smoke.

Omni: Describe your relationship with your husband, Pak Bohap.

Galdikas: He's not like Western men—Rod, for instance, who just let you go your own way even if you were doing something he disagreed with. He doesn't agree with my devotion to the orangutans, but he respects it. Dayaks are only superficially Westernized—wearing jeans, digital watches, and T-shirts. They are literate, but they still live within traditions thousands of years old. My husband admires American technology but has no wish to go there or to be anywhere else. Dayaks look upon Westerners as somewhat less civilized, too confrontational, too aggressive.

Omni: Are you becoming "Dayakized"?

Galdikas: In some ways. I'm a very different person than I was fifteen years ago. I never smiled in those *National Geographic* pictures and films. Now I smile all day long. If I don't know what to do, I smile. I'm less rushed, more patient—I've acquired an Indonesian sense of time. They are happy because they are deeply rooted, and I think that has rubbed off on me and made me a better person.

Bohap and I don't necessarily agree on a lot of things, culture, priorities. He is Keharingen Hindu, and his worldview comes from that. Mine is that of a scientist with a Judeo-Christian background. I see the overwhelming importance of evolution in nature. For a long time he refused to acknowledge that humans could be descended from apes, though he jokes that Europeans could be related to proboscis monkeys because both have such big noses. In my twenties I couldn't have been married to someone who didn't share my worldview, my sense of the importance of orangutans in the universe. Now I'm more broad-minded. Orangutans don't occupy a big place in Bohap's mind, like trees or the forces of nature do. But he knows them very well, as all Dayaks do. They have about ten different words for *orangutan*—with cheek pads, small pads, large—like the Eskimos' thirty words for *snow*.

Omni: Was your husband a hunter before he came to work in camp?

Galdikas: Yes, and a slash-and-burn horticulturist. It is a system we don't understand very well. Agronomists used to think it was destructive to the rain forest, but slash-and-burn cultivation is the agricultural system most in equilibrium with nature of any human life-style in the tropical rain forest. Farmers don't use draft animals. They cut a field in the primary forest, just big enough for one or two families to work, never larger than seventy-five by forty meters. It mimics the kind of clearing that occurs naturally. Birds and animals disperse seed quickly in the fields, and the primary forest comes back quickly. Twenty years later a monkey can't tell a Dayak field was ever there. The normal secondary-growth succession is not deflected. The problems come only when the shifting cultivators get chain saws and stop leaving the fields fallow.

Omni: Do orangutans ever eat the Dayak-cultivated fruit?

Galdikas: Yes. One man was growing durian fruits, which are so highly prized in Indonesia they bring one dollar or more for just one. An orangutan was eating up this farmer's durians, and he got so angry he climbed into the tree to scare the orangutan off. The Dayaks are expert tree climbers and fearless, but that is complete madness. It's like going into the water with a spear to fight a crocodile. Even Mark Spitz shouldn't try that!

So the orangutan knocked him out of the tree, and he died before his family got him to a doctor. The man's neighbors went after the orangutan and killed it with their machetes. After the police investigated, they gave me the bones. You can see the machete marks on the skull.

Omni: Do you use only Dayak assistants in your camp?

Galdikas: We do for tracking and tree climbing, because they are much better than the Malayu, who are probably better

than most Westerners. With so many assistants, we can gather an incredible volume of data on orangutans that I could not generate myself. But it is not an arithmetic progression because we need two assistants in camp for every one in the field. You have to keep the river open and the trails clean. Once a decade ago, when we just had Rod, myself, a Malayu assistant and two Indonesian students, we each followed an orangutan for five days. We didn't match that kind of productivity with twenty-plus people in camp until December 1985. In those days the motivation was so intense. We lived, slept and stayed in the forest constantly. I'm still trying to get the first ten years of data written up. So far I've published only the first four.

Omni: What are the basic directions of your ongoing research?

Galdikas: We're looking at birth intervals and at copulation, hoping to relate them to the individual orangutan's overall reproductive fitness. We look at mother–offspring relations. Are first- and second-generation or male and female offspring treated differently? We assess how efficiently orangutans are utilizing the forest. Orangutans, by what they eat, defecate or discard, are seed-dispersal agents for seventy percent of the species they eat in Tanjung Puting. How much of the way the forest looks—what fruit trees there are and how many—has to do with orangutans' feeding patterns?

The answers to these difficult questions might well tell us something important about the development of early hominids. The forest is the only home for orangutans and ninety percent of all primate species. To measure the orangutans' foraging impact, we need an independent measurement of what's in the forest—how it is distributed in space and time. That's why we have set up eight botanical plots that we monitor monthly. The plots contain five thousand trees in five different microhabitat zones. We check each tree to see if it is fruiting, flowering, or leafless. The patterns seem somewhat irregular. Flowering and fruiting seem to be triggered by microclimatic changes. We can't predict when individual species will flower, but generally we've discovered that many flower and fruit after the end of a dry season. You need a little rain for the fruits to develop.

Omni: How do you chart the movements of the orangutans in the preserve?

Galdikas: We have covered the whole study area with grids of transects [lines of measurement crossing at right angles, used for mapping] five hundred meters apart along the cardinal directions. The transects are staked every twenty-five meters so we can note the precise position of an orangutan as we follow it across a transect.

Omni: What is to be gained for all these days, months, years of observation?

Galdikas: In the end I hope to flesh out something about how orangutans live in the wild, how they adapt to their environment, how many offspring they have and at what intervals, at what age the female first gives birth and the male gets cheek pads, and how long they live. With such long-lived animals it takes a lifetime to document such basic facts. If you don't see them for a long time, you get just a window of insight and often a skewed impression. Once you understand orangutan reproductive and foraging strategies, you can compare them to our own and to those of other great apes to see what similarities exist. That is the beauty of sociobiology.

Omni: What do you think your major contribution to the understanding of orangutans has been?

Galdikas: It is hard to single out any one discovery as most important. I have observed orangutans for hours on end on the forest floor. My main contribution is staying in one place, following one population longer than anyone. Right now I can tell you pretty much what these orangutans are doing over the short term in this area. I have yet to follow individuals from birth to death. That will take most, if not all, of my lifetime. And I am happy to do it.

Omni: How much awareness of the need for orangutan and forest preservation in Indonesia is because of your efforts?

Galdikas: We have tried to counter illegal trade in orangutans. I'm not Indonesian, but I can set an example by the way I live in the forest. As a guest here, public criticism and activism is not my place. If I do express my opinions on conservation policy, it is done privately, in governmental offices. Tanjung Puting was a game preserve when Rod and I came, an artifact of Dutch law. Hunting wasn't permitted, but you could clear-cut all the trees. Our goal was to make it into an inviolate habitat. We worked hard to persuade agencies to upgrade it to national park status. This happened in 1982. Indonesians who come here say, 'We know who started it all.'

I feel good about the future of Tanjung Puting and our role in it. I am not so optimistic about the rest of Borneo and Sumatra. The prospects for the survival of any rain forest not in reserves beyond the end of the century, anywhere on Earth, are pretty dismal.

Omni: Are the forests being logged heavily in Indonesia?

Galdikas: There is logging, and I used to get all hot and bothered about it. Now I realize that it, per se, is not what destroys the forest. I've seen the logging, and there isn't clear-cutting. It is selective and doesn't totally destroy the forest. People do. Population pressure—people clearing it to farm, not the Dayak shifting cultivation tradition—is what threatens the forest. A botanist told me the soils of Tanjung Puting can grow pineapples. But what is the market for that? Hawaii is giving it up. Or you can keep an area as forest. Done right, logging may be the answer.

Omni: What are the consequences of rain forest destruction?

Galdikas: With the possible exception of certain coral reefs, the tropical rain forest

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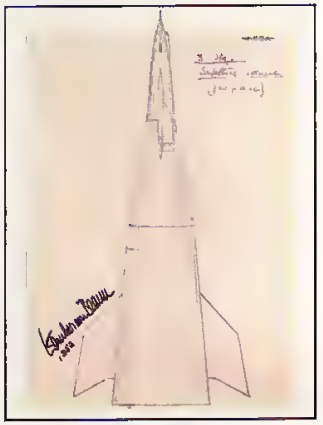
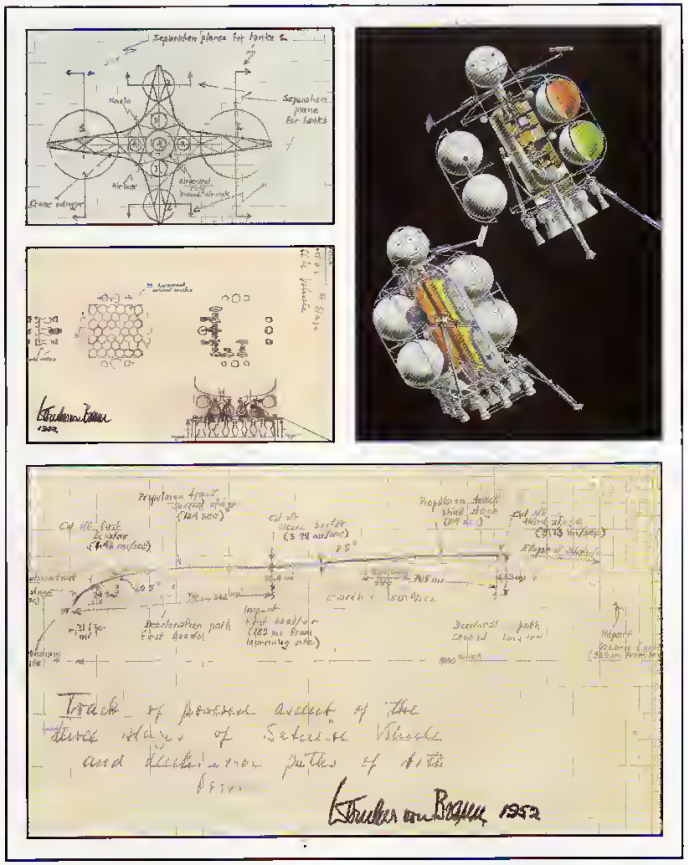
An exclusive glimpse into the lost sketchbook of this century's premier

STARMAN



BY GURNEY WILLIAMS III

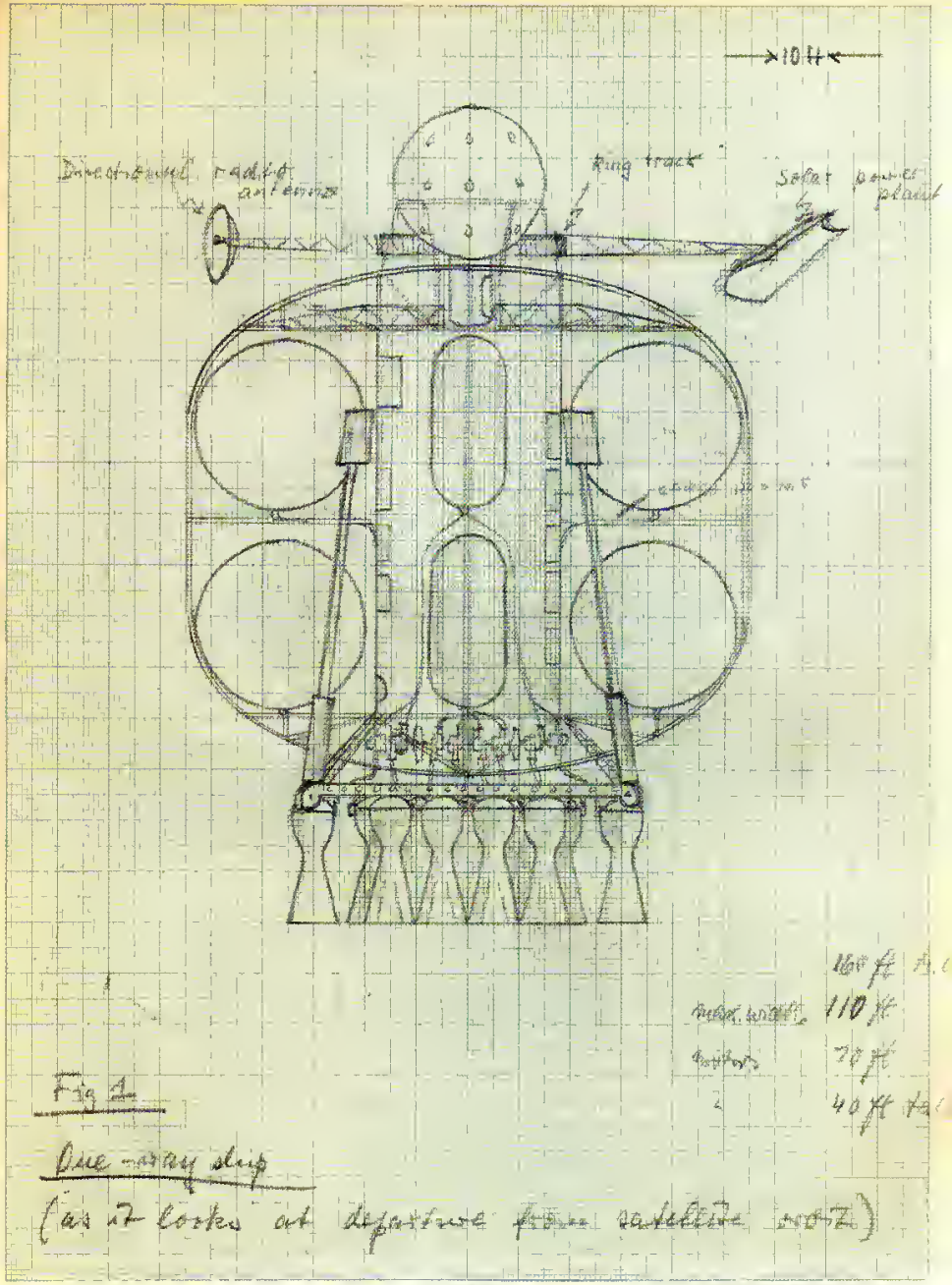
Like the spires of Gothic cathedrals, the gracefully pointed spaceships on these pages directed the hopes of an entire society toward the heavens. The creator of these images was the rocket genius Wernher von Braun. He conceived them in the Fifties while collaborating with this country's top space artists, like Chesley Bonestell (whose moonscape is at left), in an attempt to forecast the future of spaceflight. The project was

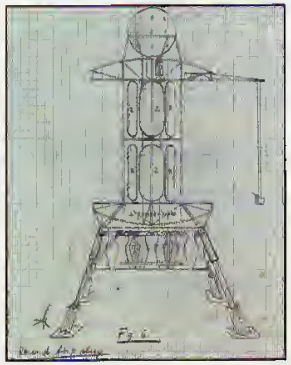


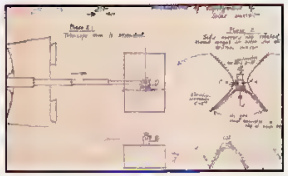
suggested by the editors of *Collier's* magazine and was meant to portray realistic scenarios of how we Earthlings might one day explore near space, the moon, and, ultimately, Mars.

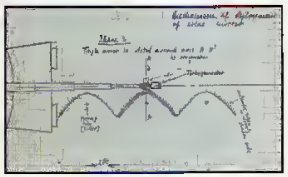
Von Braun's original sketches for this project were once thought to be lost, but *Omni* recently acquired them and is publishing them here for the first time. The sketchbook includes Von Braun's designs for the first space rocket (previous page and center sketch, above), its expected path of ascent (above), and the 160-foot-long moonships (facing page and top left) that served as models for the Rolf Klep painting (top right).

Few details of the space program escaped Von







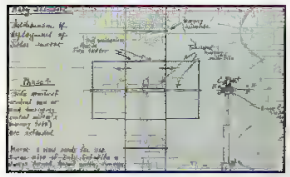


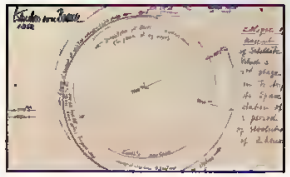
Braun's eye and pen. He sketched how an orbiting lunar reconnaissance craft would look (far right) and showed how a moonship would sprout a crane to unload cargo (far left). He made a series of drawings of a solar-powered generator (top and bottom at near left, facing page; top at near right). These showed how a trio of concave mirrors would unfold from the end of a boom in his 'Baby Satellite.' The three mirrors would focus the sun's rays on mercury-filled tubes, and the boiling mercury would drive a generator capable of producing 12 kilowatts.

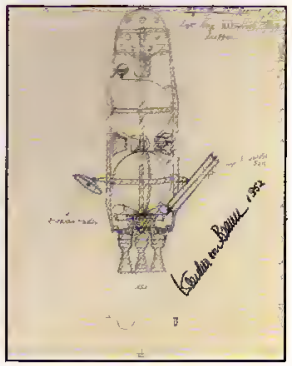
Von Braun even worked out on paper how to boost the satellite vehicle's third stage into orbit (near right). This meticulous attention to minutiae gave the artists and editors at *Collier's* sufficient background material to produce what was to be the most authoritative forecast of its time.

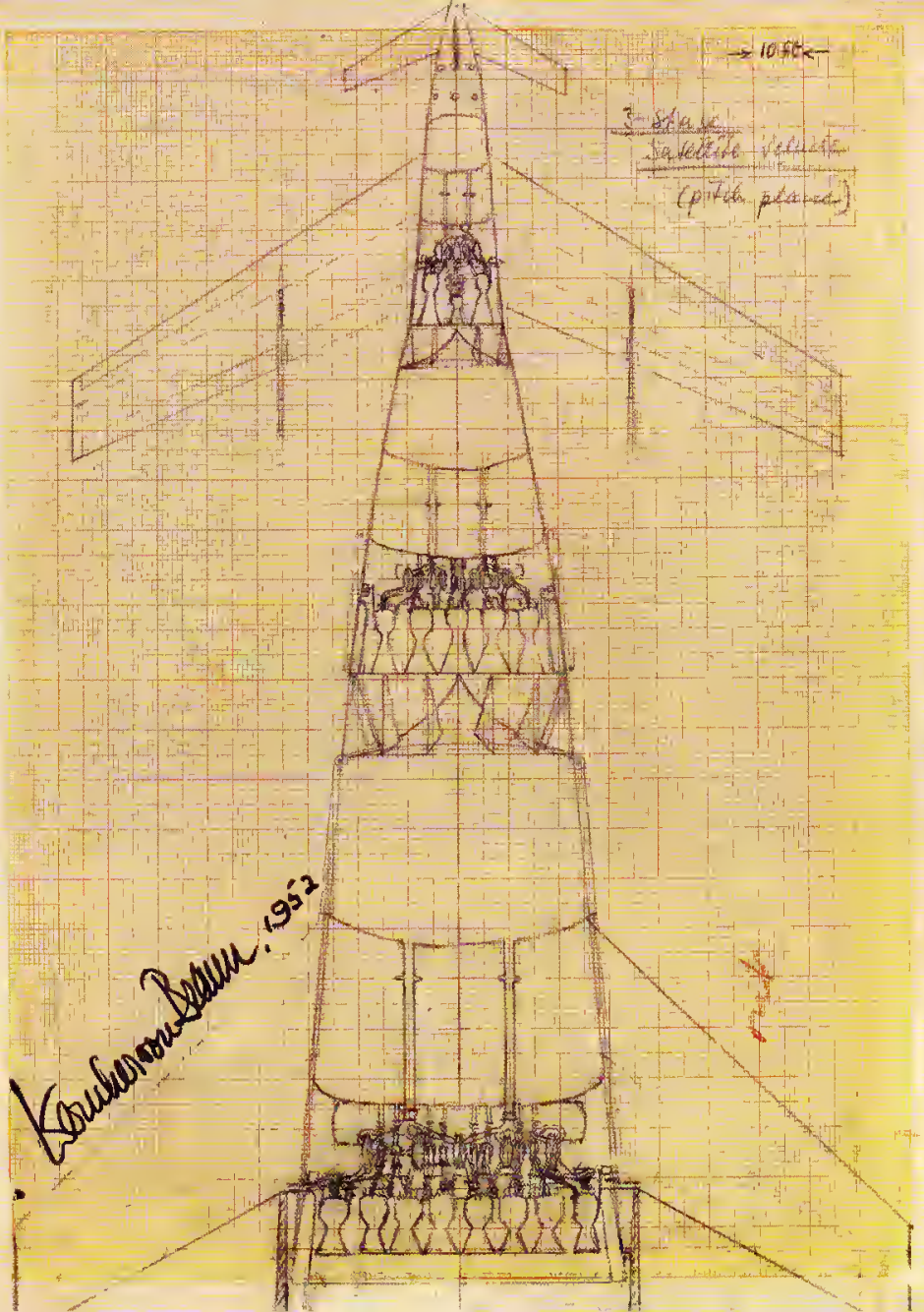
After publishing a series of articles on satellite launches and lunar exploration, *Collier's* went on to do an issue in 1954 on a more ambitious plan—sending a ten-ship, two-and-a-half-year mission to Mars. In one article Von Braun and *Collier's* editor Cornelius Ryan suggested that sometime before the middle of the next century, we could launch such a fleet to the red planet.

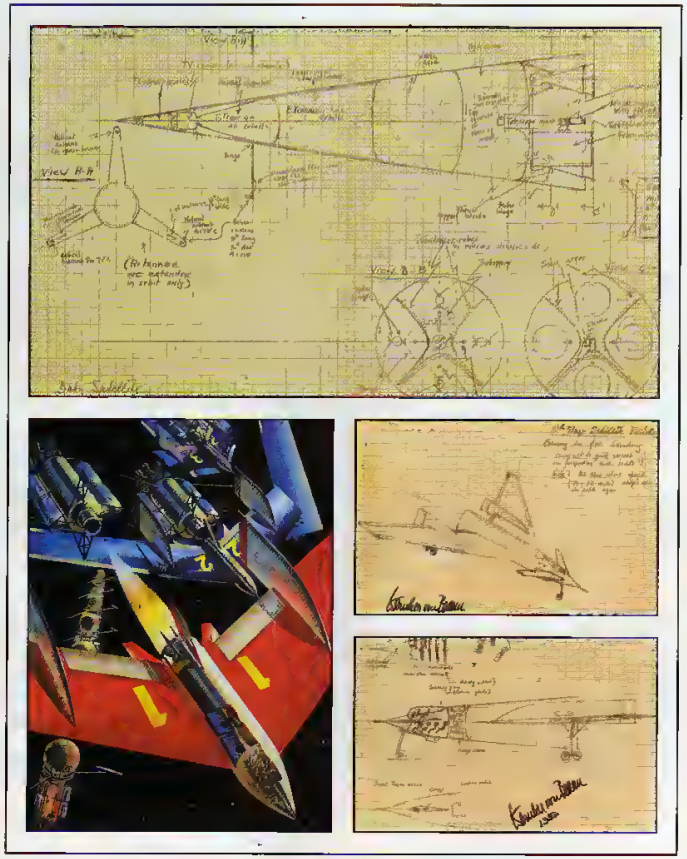
The Mars fleet would be constructed in Earth orbit and would consist of seven 4,000-ton cargo ships and three sleek, needle-nosed landing craft. Once the cargo ships reached Mars orbit approximately 600 miles above the planet, the first Mars lander would fire its rockets and begin its descent (as shown in the large Bonestell painting above). After the first crew had established a base camp, the other two landers would ferry down the remaining colonists for their 15-month stays.











Each of the *Collier's* artists captured beautifully the childlike sense of wonder and the joy of invention that Von Braun's hand brought to this project For example Fred Freeman's painting of a Mars ship (above) neatly portrays the spirit of adventure that pervaded the entire project

The sketchbook shows the breadth of Von Braun's vision the early satellites carrying experimental animals (top) the satellite-vehicle concept (facing page) that would mature into the Apollo moon rocket and the space shuttle prefigured in his satellite-vehicle sketches (the two drawings at lower right) Even now there is still much of the dream waiting to be fulfilled

"The mystery metal disappeared from his shirt pocket just as he was about to show it to the scientist"

ANTI-MATTER

UFO UPDATE

It was back in the Seventies when a one-armed Swiss farmer named Eduard "Billy" Meier declared he'd met extraterrestrials from the star system Pleiades. To prove his vivid claims, he produced strange alien instruments, along with photos of the Pleiadean starships and the ETs, including the blond, voluptuous female leader Semjase. Although Semjase looked about twenty-five or thirty, she was actually three hundred years of age, Meier said. What's more, she had taken him on flying-saucer rides and introduced him to Jesus Christ.

It's no surprise that Meier's claims were quickly debunked by a host of experts, who said the photos were put together with double exposures and models held by strings. The mystery instruments they added were made of cheap and decidedly earthbound junk-shop alloys. The controversy, however, has refused to die. Its most recent incarnation is a book called *Light Years*, in which journalist Gary Kinder concludes that the Meier case should at least be left open.

Kinder bases his argument on an investigation led by retired Air Force Lieutenant Colonel Wendelle C. Stevens and private detectives Lee and Brit Elders. During the past ten years, Stevens and friends have conducted interviews with Meier and have produced dozens of witnesses who say that they have seen evidence of the Pleiadean spacecraft.

What really piqued Kinder's interest, though, were reports by respectable scientists who had conducted laboratory analyses of Meier's photos and mystery metals. Robert Post, head of the photography lab at NASA's Jet Propulsion Laboratory in Pasadena, California, for example, told Kinder that he couldn't see anything that was fake about the Meier photos. They looked legitimate. The sentiment was echoed by Michael Malin, a professor of planetary sciences at Arizona State University, who said the photos appear to represent a real phenomenon, and by special effects expert Wally Gentleman (*2001*), who found it incredible that a one-armed farmer with only a sixth-grade education could have had the money or the craftsmanship to contrive photos that ill.

Even so, problems remain. The photographs were several generations removed from the originals, so that none of the experts could say anything really conclusive. Worse yet, the metal sample mysteriously disappeared from Vogel's shirt pocket just as he was about to show it to another scientist.

Kinder acknowledges the problems. The Meier case, he concludes, is "either a fascinating reality or a fascinating hoax." Experienced UFOlogists remain convinced it's the latter. "Skilled fakery," says Jerry Clark, a director of the Center for UFO Studies in Illinois. Equally adamant is Walt Andrus, head of the International Mutual UFO Network. In a letter to Kinder's publisher, he called the ad for Kinder's book "hyped-up, unadulterated hogwash." —*BILL LAWREN*

ANCIENT EGYPT IN CALIFORNIA

Amateur archaeologists have found the remains of a lost city believed to include four towering statues of Ramses II and 14 ten foot high sphinxes The discovery wasn't made in Egypt, however but in a sand hill near Guadalupe, California located about 170 miles north of Los Angeles

The artifacts are apparently the remains of a massive set for Cecil B De Mille's 192 epic *The Ten Commandments* More than 1 000 workers helped build the replica of an Egyptian temple out of 30 tons of plaster and 500 000 feet of lumber but the set mysteriously disappeared after the completion of the film

De Mille left a cryptic reference to its fate in his autobiography II 1 000 years from now archaeologists happen to dig beneath the sands of Guadalupe I hope that they will not rush into print that Egyptian Civilization extended all the way to North America.' Intrigued by this clue, Los Angeles independent filmmaker Peter Brosnan and associates searched dunes near Guadalupe The result? A carved horse's head and other artifacts have Brosnan convinced he's found the long missing set.

Brosnan is currently seeking funds to finance an archaeological dig at the site and a documentary film on the project University of California at Santa Barbara archaeologist Brian Fagan is serving as consultant, and

volunteers from the Santa Maria Archaeological Society plan to work with Brosnan on the excavation

Until the dig begins, Brosnan is keeping mum on the exact location of the *Ten Commandments* set, in hopes of keeping souvenir hunters away "We have guards and county sheriffs watching it The stuff is extremely fragile and just walking around there can cause damage he notes

Why did De Mille bury his Egyptian city in the first place? "He had a grand sense of his own importance. It's not unimaginable that he may have left this as a monument to himself ' Brosnan concludes Besides burying the set cost him a lot less than dismantling it

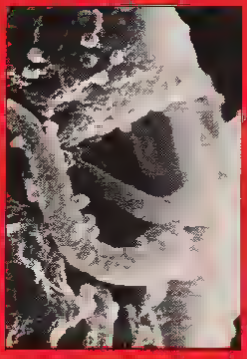
—Sherry Baker

'I am not real to my civilization, I am not real to the culture that has spawned me and made use of me I am only a collection of myths I am an existential stand in

—Vivian Gornick

AIDS WARFARE

In September 1986 the Soviet magazine *New Times* reported that AIDS had been created by American germ warfare labs. Citing work by French scientists, the article claimed that AIDS had been created in 1977 in a Pentagon lab and that convicts infected with the virus had been promised freedom if they survived. In 1979 the first American AIDS cases were reported, and the article noted, this would



approximate the time that the virus's incubation period would have ended, precipitating the disease itself.

Since the article appeared there has been a flurry of speculation concerning the claim, but little science to support or refute it. Now, however, researchers at the Emory School of Medicine in Atlanta have proof that the charge is false. There is now clear evidence, they say, that the virus existed at least 20 years prior to its appearance in the United States.

"We studied a collection of plasma taken from Africans in 1959 and found evidence of the AIDS antibody in one sample," says Emory immunologist Andre Nahmias. These results were confirmed by the Centers for Disease Control in Atlanta and by investigators at Duke and Harvard.

That the virus dates back to the late Fifties is now understood, but could a germ warfare lab have created it then? According to Nahmias and other AIDS researchers, our knowledge of genetics in 1959 was in its infancy, and the techniques necessary to engineer a retrovirus (the family of viruses to which the AIDS virus belongs) were yet to be developed.

"We knew about retroviruses in animals in the late Fifties," says Nahmias, "and a lot of effort was being expended trying to find evidence of them in humans. The fact that the AIDS retrovirus existed at this time strongly suggests that it could not have been purposely engineered." —Rick Boling

NIGHTMARE VISION

It was an ordinary Wednesday afternoon in 1980 when Etta Louise Smith, a Lockheed shipping clerk, heard a radio broadcast about a house to house search for a missing nurse. "I immediately thought, *She's not in a house*," Smith recalls. "Then I had a visual picture, as if there was a photograph in front of me. The woman was dead."

Spurred by her vision, the thirty-nine year old Smith, a mother of three, stopped by the police station to talk with investigators. Then she went out to the remote canyon site she'd visualized hours earlier. It wasn't long before she found the beaten and raped body of thirty-one-year old Melanie Uribe.

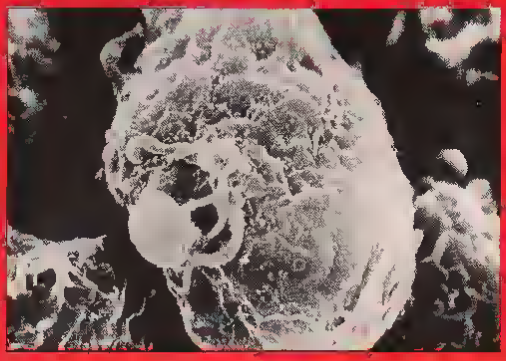
Twelve hours later, to her horror, Smith was booked on suspicion of murder. During her four-day stint in jail, one of the killers told a local resident about the murder and was arrested. He confessed and implicated two accomplices, who were

also arrested, charged, and later convicted of the crime. Vindicated, Smith filed suit against the city of Los Angeles for false arrest.

Last March, Superior Court Judge Joel Rudof ruled that the police had lacked probable cause and sufficient evidence to tie Smith to the killing. The jury (the majority, according to the foreman, believed that Smith *did* have a psychic experience) awarded her $26,184.

The assistant city attorney, Michael K. Fox, who defended the city, remains skeptical. "Whether or not Smith had a psychic experience I don't know," Fox says. "It's been the belief of the police, and I agree, that she had knowledge *somehow*, perhaps through talk in the neighborhood."

As for Smith, she says, "Maybe in the future I'll call anonymously." —A.J.S. Rayl



But I know I live half alive in the world/Half my life belongs to the wild darkness.
Galway Kinnell

BERMUDA TRIANGLE MYSTERY PLANE

Five Navy TBM 3 Avengers left Fort Lauderdale on December 5 1945, for a routine training mission—and disappeared without a trace A Martin Amphibian plane sent to search for the aircraft soon vanished as well The incident helped spawn a whole mythology about that area of the Atlantic Ocean known as the Bermuda Triangle complete with theories that aliens plucked the planes from the sky

Recently, however treasure hunter Mel Fisher announced that his crew may have discovered one of the missing planes partially buried in mud on the ocean bottom about 20 miles west of Key West Not only did the wreckage of the Grumman Avenger show no signs of other worldly contact but as one member of the salvage crew K T Budde noted it simply looked like it had gotten lost and run out of fuel

Does that mean at least part of the Bermuda Triangle mystery has a logical explanation? Not exactly According to Fisher s attorney, David Paul Horan a check of Navy records has revealed that the recently uncovered Avenger was *not* among the infamous five planes "Instead Horan explains "it was lost from Key West nearly three months prior to those planes disappearing One survivor who bailed out has been able to identify this plane absolutely

Horan, who is also a pilot, admits he s disappointed in the way things have turned

out "I was hoping we had solved the mystery when the wreckage of that Avenger was discovered Horan says But we didn t In fact, nothing that has been found down there looks like it might be related to that whole incident Sherry Baker

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If you are ready to leave father & mother & brother & sister & wife & child & friends & never see them again—if you have paid all your debts and made your will, and settled all your affairs and are a free man—then you are ready for a walk

Henry David Thoreau

I do not know what I may appear to the world But to myself I seem to have been only like a boy playing on the seashore and diverting myself and now and then finding a smoother pebble or a prettier shell than usual whilst the great ocean of truth lay all undiscovered before me

—Sir Isaac Newton

COSMIC CONTACT

Everyone needs a good agent right? Members of the psychic community do too And now that need is being filled by Cosmic Con tact Psychic Services, a Big Apple-based referral agency for psychics

The agency was born after New York City's Michael Goodrich began a marathon personal odyssey visiting more than 500 psychic readers around the country "I found such a wide variety—everything from complete fakes to extremely talented people ' he says 'The fakes were often good performers telling wild tales of the lost continent of Atlantis, but when it came down to nuts and bolts—the truth—forget it Other psychics who weren t very well known and didn t charge that much were dead on target Cosmic Contact was the result

Today Goodrich represents 22 psychics ranging from Rolla Nordic a world tarot authority and the person who brought the Rune stones to America to Rock Kenyon who teaches psychic development and past life regressions and makes rock star and celebrity predictions for *Spin* magazine The service caters not only to individuals but also to nightclubs fund-raisers and corporations

A PR agency will call up and ask for forty readings to give out to clients, or we ll do a giant party for two hundred people at a company says Goodrich 'We also have a whole business package I'll have an astrologer do a workup on the business and then I'll have a psychic go in We do predictions on products—which ones we think will do better that kind of thing '

According to Goodrich psychics have been flocking to his agency, seeking a stall in the stable I m doing this because people use wackos and then end up being totally disillusioned " he says "My people hold up Joanna Torrey

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If it s an unfriendly ghost, dogs will growl or seem to cower at nothing at all If a friendly ghost appears the dog will start wagging its tail and sit there like someone is petting it '

—Nancy Stallings

'One step away from rationality the air is balmy with possibility

—Deborah Mason

'What is characteristic of illusions is that they are derived from human wishes

—Sigmund Freud

PRIX DE LUNE

CONTINUED FROM PAGE 55

friction gof lunar dust sticking to the ball Poor devils couldn t see anything got off course and couldn t clean the dusf off so they dismounfed and ran

'You mean they just left their cage and hotfooted it?'

No they ran *inside* the ball like two gerbils on uppers They placed second got overtaken on the last turn by the winner

Let me guess, I said He did and I did, for two hours, and finally had to give up

The Rubin Moonvan was heavy and just slow enough to win Crew had shirt sleeve comfort While they got passed a lot at first, they stayed fresh and they could suit up to clean dust off their solar array, so they went ahead when most of the others were detouring Everybody protested the winner, as usual and some even tried to bribe the tech inspector'

With what?

With these, he said bringing out a handful of rough diamonds from a pocket "Turns out they re pretty common up here'

'The tech inspector *you*?'

"Who else?"

Who else indeed I hadn t believed that Sam would go to any race merely to win But if they wanted history s smartest, meanest rule bender for a tech inspector Sam was their only rational choice So I guess I can swallow it especially since I saw his sketches for a racing version of 'ol H G 's puddle jumper' But that's a whole other story

OMNI CONTEST RESULTS

The checkered flag has fallen on the great *Omni* moon buggy contest The last entries for the *Omni* 2000 Moon Rally have crossed the finish line Our all-star judges have rendered their verdicts and the contest is over

But not for one talented amateur engineer For the winner of our grand prize one giant sfep remains—into a rocket for a day of orbital sightseeing on Project Space Voyage now set to launch in 1992 We'll tell you whose entry earned that fabulous reward in a moment

First, though look at what it took to beat out the competition You remember the assignment Design a moon buggy to race in the year 2086 from Tranquillity Base around the Apollo landing sites, and back to where man took his first steps on another world Mere speed wasn't enough The vehicle would face dust and searing heaf mountains crevasses and not one pit stop along the 2 600-mile route It had to be tough to survive all that

To help us decide on which were the best and the brightest among our finalists we enlisted a panel of judges James Irwin, the *Apollo 15* commander who drove the, first moon buggy in 1971 James M Sisson, fhe NASA engineer in charge of designing the original Lunar Rover Vehicle Mr Right Stuff himself Chuck Yeager Gerard K O Neill professor of physics at Princeton University author Isaac Asimov Richard Pefty seven time winner of the Daytona 500 Mario Andretti, Indianapolis 500 champ Tom Brokaw anchorman of the *NBC Nightly News*, Edsel Ford scion of the Ford motor company family Neil McAleer author of *The Omni Space Almanac* and T C Swartz, director of Project Space Voyage and founder of Society Expeditions Travel Company and American Space Corporation

More than 2 000 people answered our challenge Some were schoolchildren others had years of professional experience—one, for instance was an engineer at Boeing But training made little difference in the quality of the entries and the amateurs clearly had enough engineering savvy to match the pros

Entries had to run a gauntlet of judging criferia nearly as difficult as the racecourse itself Creativity and originality were no problem for *Omni* readers, but some designs lost points for infeasibility or for not being suitable to the lunar terrain With all that to consider our judges had to put a great deal of thought into selecting a winner from among our ten finalists

> *"Uniquely imaginative in design were the human-powered buggy, the bouncing POGO, the six-legged LRV (Lunar Race Vehicle), and an inflated sphere with a control cabin inside"*

Uniquely imaginative in their designs were the human-powered buggy a two-passenger tricycle offered by David B Froehlich of Chevy Chase Maryland the bouncing POGO (for Personnel Operated Gas-assisted *Omni* pod) suggested by James M Bower the six-legged, two-passenger LRV (for Lunar Race Vehicle) concocted by geophysicist Joseph Kirpes of Dallas, and Albert W Kuhfeld s inflated sphere with a control cabin inside

Following more conventional design formulas were the Mantis a four-wheel-drive vehicle with a telescoping body to bridge crevasses designed by Norman Strand of Midland Michigan a two-passenger moon truck called the Lunar Pickup from Paul Edwards of Derry New Hampshire the Rover a glass bubble of a vehicle with eight-foot wheels by Chris Sfratford of Provo Utah a truck that travels on tractor treads and has retractable arms the brainchild of Jeff Schartz of Mission, Kansas, the Lunar Recreational Vehicle powered by a thermonuclear generator from Joseph B Metcalfe of Westminster California, and finally from Tim Rubin of Bend Oregon a machine we call the Moonvan—a four-passenger electric vehicle

Each judge used his own method for selecting the winning entry By far the most elaborate was that of Daytona 500 champ Richard Petty "I brought together my top mechanics explained the request and proceeded as follows." he explained "We looked at each of the four categories—creativity originality, suitability for the lunar terrain and environment and feasibility—and scored each description on a point system from one to ten

The Petty team picked Kuhfeld s entry The two-person vehicle is a 15-meter plastic sphere driven like a gerbil cage with the control cab suspended inside Its power source is a layer of doped silicon that turns the sphere s surface into a solar battery

Froehlich's design also stirred up some interesf A tandem recumbent tricycle it offers two features that caught the eye of T C Swartz director of Project Space Voyage Weight is critical" he explains 'It takes a lot of power just to gef into Earth orbit And simple machinery is better than complicated technology since repairs will not be easy on the moon'

Nether of these made the winners circle, however The prizewinners

- Norman S Strand takes our third prize, a telescope from Halley Optical A two person buggy his Mantis inchworms across small canyons by bracing itself wifh jacks and extending its front wheels on a telescoping graphite tube chassis
- Second prize, a trip to the U S Space Academy af fhe Alabama Space and Rocket Center in Hunfsville, goes to Joseph Metcalfe His Lunar Recreational Vehicle carries two passengers and is powered by a nuclear generator For small obstacles it can raise its wheels Major obstructions—canyons or mountains—it leapfrogs with onboard rockets
- And finally the winner of the grand prize an all-expenses-paid trip to space is Tim Rubin His Moonvan easily took first place It's the ultimate off-road recreational vehicle with a climate-controlled cab for a crew of four Power from the tour independently driven wheels comes from batteries recharged by a solar array and backed up by a thermoelectric generator

NASA's Sisson picked the Moonvan over the competition because Rubin dealt with fhe widest array of design details power, suspension, steering and tires

Auto magnate Edsel Ford noted simply that 'Rubin seemed to have best described the type of vehicle I would want to cross the surface of the moon in" And *Apollo 15* commander James Irwin liked the Moonvan s large shirt-sleeve crew compartment "Good luck!" he offered our winner Wish I could be with you!'

So do we ∞

SPACE

CONTINUED FROM PAGE 16

Earth plants produce a natural polymer lignin that binds cells together stiffening them so stems can grow upward During one shuttle experiment University of Houston biologist Joseph Cowles found that lignin production waned in some plants such as mung beans but not in pine seedlings for instance NASA experts want to know the reason for the difference in lignin production

Another restriction is the amount of square footage needed "To grow enough food on Earth to support a space-station crew you'd need a closed ecosystem the size of the Houston Astrodome We want to do it in two hundred square feet says Maurice Averner a University of New Hampshire biologist and manager of NASA's Biospherics Research Program

As one solution Boeing, in Seattle has just designed a space station farm module that squeezes a large number of plants into a small space Wheat plants are grown on an accordion tray As they grow requiring more space robots gradually pull out the accordion tray moving the plants to new positions and adjusting light nutrients and airflow to accommodate the plants growth stages When the wheat ripens the robots will harvest thresh and grind it into flour

At various sites NASA is evaluating other astrocrop candidates—potatoes at the University of Wisconsin, soybeans at North Carolina State lettuce at Purdue and sweet potatoes at Tuskegee Institute And "at Kennedy [Space Center] we're beginning to test this technology on a real-life scale says MacElroy There engineers have begun to increase the scale of research by converting a spacecraft testing vacuum chamber into an astrofarming chamber 100 times the size of Ames's small cylinders

So far NASA has no program for doing the same with animals The experimental program that comes closest to a space ranch—complete with animal herds and a fish farm—is a closed environment, called Biosphere II now being built in the Arizona desert (See Bioshelters" March 1987) Unlike the CELSS program Biosphere II is not designed specifically for a zero- or low-gravity environment For now the logistics of raising and maintaining meat-producing animals in space remains too daunting Unlike plants they consume rather than produce oxygen and would compete with humans for life-support systems Even the fish farms of Biosphere II could present a problem because they would require hauling up heavy supplies of water from Earth for the farm tanks

That may change Ultimately says Averner the day will come when space stations and planetary expeditions are supplied with crops grown on the moon rather than with food rocketed up from Earth "The moon," he says, "may become an agricultural colony" ∞

CONTINUED FROM PAGE 14

they use the frontal lobe, a region of the brain where they appear deficient. James is identifying out-of-focus numbers flashed by a rear slide projector onto a screen. When he has completed the test, James undergoes a scan. It will be more than an hour before an entire survey of the brain, composed of nine separate slices or photographs, is completed.

The data from the scan will be used for a $20,000 study funded by the Stallone Foundation, founded in 1983 by Sylvester Stallone and his former wife, Sasha, after their son Seargeoh was diagnosed as autistic. Autism has stymied scientists for years. They still don't know why some autistic children recover as they mature, while others spend their entire lives locked inside their own silent worlds.

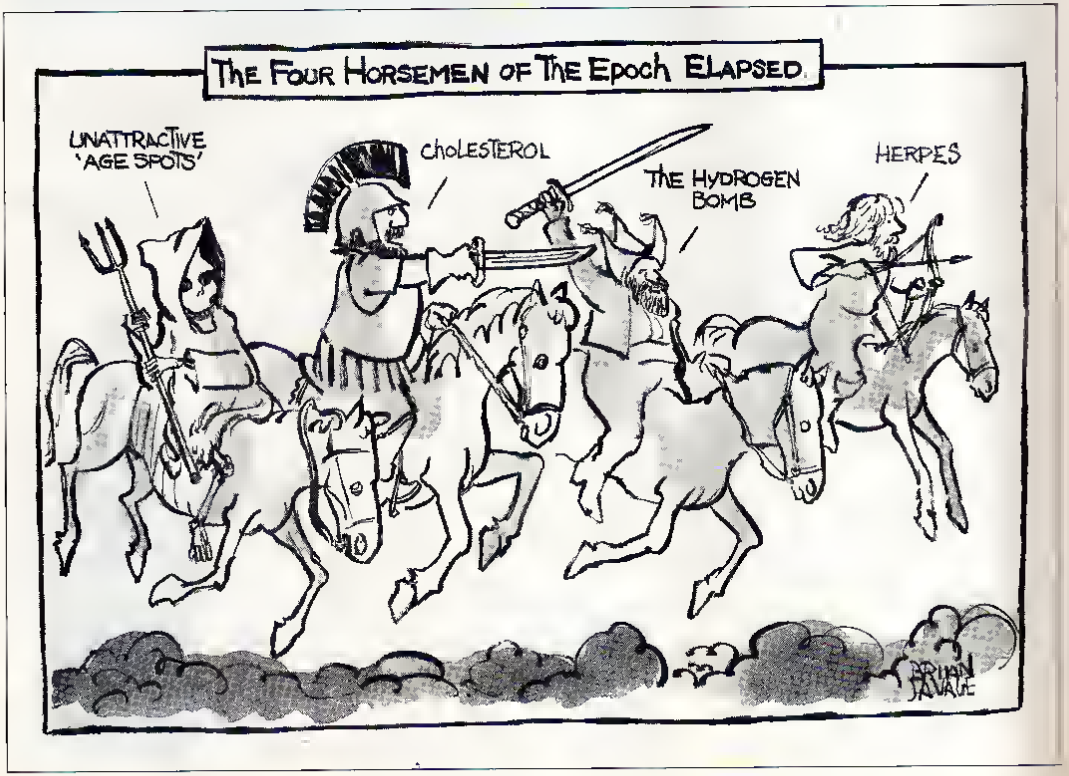
Finally the first complete scan of James's brain appears on the screen. Pay dirt! Parts of the left frontal lobe are bright yellow, indicating intense metabolic activity. The UCI team has consistently found a high level of metabolic activity in the left frontal lobes of recovered autistics. The pattern is exactly the opposite of that found in schizophrenics, who exhibit low metabolic rates in their frontal lobes. Also, schizophrenics and their children do poorly on the CPT, while the comparison group of recovered autistics does very well. The results challenge the long-held notion that autism is a childhood form of schizophrenia.

Buchsbaum and his colleagues at UCI have uncovered other important findings. They have located the anatomical sites in the brain that malfunction in such illnesses as depression, schizophrenia, and anxiety. Buchsbaum found these sites by examining the brain areas affected by the drugs used to control these illnesses. Scans revealed that antidepressants work on the frontal lobe, the planner and organizer of behavior. This may indicate that antidepressants are effective because they help people concentrate and organize their thoughts—and not because the drugs alter mood states. Anxiolytics, the class of drugs that treat anxiety, affect the occipital lobe at the base of the brain, which also controls vision. Buchsbaum hopes that further PET scans will determine the role vision plays in anxiety. On the other hand, neuroleptic drugs, used to treat schizophrenia, go to the basal ganglia, a cluster of nerves that form the connective link between the brain and the spine. These drugs also block the action of dopamine, a chemical substance produced in that area of the brain.

Researchers have suspected that schizophrenia and Parkinson's disease are somehow linked because schizophrenics suffer from an excess of dopamine, and victims of Parkinson's disease suffer from a dopamine deficiency. Buchsbaum has found the first concrete proof of such a link. In some simple way, the two ailments appear to be the exact opposite of each other, caused by a malfunction in the same region of the brain.

Many scientists believe the excess dopamine in schizophrenics may cause them to hallucinate. Their bizarre behavior can be explained, Buchsbaum speculates, because their frontal lobes, which organize behavior, are not working. And because the drugs used to treat both manic-depressive psychosis and schizophrenia affect the same section of the brain, Buchsbaum thinks that these two diseases could be related like distant cousins.

The fact that schizophrenia and manic-depressive psychosis are linked has led Buchsbaum to speculate that "there could be one inherited genetic defect common to some patients now diagnosed as having both disorders." As the afflicted individual matures, however, the defect expresses itself in different ways, depending on home life, childhood experiences, and personality traits. One person gets depressed, another psychotic. "Of course, there's a great debate about all of this within the field," Buchsbaum says. "That's why brain imaging is so important. It's an entirely new way of looking at this puzzle." ∞



FOREVER YOURS

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did not write to her although he left pages of incomprehensible notes in her care. She was married or lived with someone whose name had been cut out with a razor blade every time she referred to him. Mercer knew him visited him apparently. They were even friends and had long serious talks. She was afraid. Mercer was involved in work that was dangerous and no one told her what it was. She called Mercer her mystery man and speculated about his secret life: his family, his insane wife or tyrannical father, or his own lapses into lycanthropy.

Gordon smiled. Anna was not a whiner or a weeper but she was hopelessly in love with Mercer and did not know where he lived, where he worked, what danger threatened him, anything about him except that when he was with her, she was alive and happy. And that was enough. Her husband understood and wanted only her happiness, and it was destroying her, knowing she was hurting him so much, but she was helpless.

He pursed his lips and reread one. "My darling. I can't stand it. I really can't stand it any longer. I dream of you, see you in every stranger on the street, hear your voice every time I answer the phone. My palms become wet and I tingle all over thinking it's your footsteps I hear. You are my dreams. So I told myself today, this is how it is? No way! Am I a silly schoolgirl mooning over a television star? At twenty six! I gathered up all your papers and put them in a box and addressed it, and as I wrote the number of the box, I found myself giggling. You can't send a Dear John to a post office box number. What if you failed to pick it up and an inspector opened it finally? I should entertain such a person? They're all gray and dessicated, you know, those inspectors. Let them find their own entertainment! What if they deciphered your mysterious squiggles and discovered the secret of the universe? Do any of them deserve such enlightenment? No! I put everything back in [excised] safe—"

Mercer was not the mystery man, Gordon thought then; the mystery was the other man, the nameless one whose safe hid Mercer's papers. Who was he? He shook his head over the arrangement of two men and a woman and continued to read. "—and [excised] came in and let me cry on his shoulder. Then we went to dinner. I was starved."

Gordon laughed and put the letters down on the coffee table, leaned back with his hands behind his head, and contemplated the ceiling. It needed paint.

For the next two weeks he worked on the letters and the few pages of Mercer's handwriting. He photographed everything, made enlargements, and searched for signs of weakness, illness. He keystroked the letters into his computer and ran the program he had developed looking for usages, foreign or regional combinations, anything unusual or revealing. Mercer, he decided, had been born in a test tube and never left school and the laboratory until the day he met Anna. She was from the Midwest, not a big city somewhere around one of the Great Lakes. The name that had been consistently cut out had six letters. She had gone to an opening, and the artist's name had been cut out also. It had nine letters. Even without her testimony about the artist, it was apparent that she had been excited by his work. It showed in the writing. He measured the spaces between the words, the size of individual letters, the angle of her slant, the proportions of everything. Every movement she made was graceful, rhythmic. Her connections were garlands, open and trusting, that meant she was honest herself. Her threadlike connections that strung her words together indicated her speed in writing, her intuition, which she trusted.

> *"As the work went on, he was making more complete notes, drawing conclusions more and more often. The picture of Anna was becoming real. He paid less attention to Mercer's writing."*

As the work went on, he was making more complete notes, drawing conclusions more and more often. The picture of Anna was becoming real.

He paid less attention to Mercer's writing after making his initial assessment of him. A scientist, technologist, precise, angular, a genius, inhibited, excessively secretive, a loner. He was a familiar type.

When Roda returned, Gordon felt he could tell him more about those two people than their own mothers knew about them.

What he could not tell was what they looked like, or where Anna was now, or where the papers were that she had put in her husband's safe.

He watched Roda skim through his report on Anna. Today rain was falling in gray curtains of water, the air felt thick and clammy.

"That's all?" Roda demanded when he finished.

"That's it."

"We checked every art show in the state," Roda said, scowling at him. "We didn't find her. And we have proof that Mercer couldn't have spent as much time with her as she claimed in the letters. We've been set up. You've been set up. You say here that she's honest, ethical, and we say she's an agent or worse. She got her hooks in him and got those papers, and these letters are fakes, every one of them is a fake!"

Gordon shook his head. "There's not a lie in those letters."

"Then why didn't she come forward when he died? There was enough publicity. We made sure of that. I tell you, he wasn't with her. We found him in a talent hunt when he was a graduate student, and he stayed in that damn lab ever since, seven days a week for four years. He never had time to have a relationship of the sort she's talking about. It's a lie through and through. A fantasy." He slumped in his chair. His face was almost as gray as his very good suit. He looked years older than he had the last time he had been in the office. "They're going to win," he said in a low voice. "The woman and her partner. They're probably out of the country already. Probably left the day after the accident, with the papers, the job done. Well done. That stupid besotted fool!" He stared at the floor for several more seconds, then straightened.

His voice was hard, clipped, when he spoke again. "I was against consulting you from the start. A waste of time and money. Voodoo crap, that's all this is. Well, we've done what we can. Send in your bill. Where are her letters?"

Silently Gordon slid a folder across the desk. Roda went through it carefully, then put it in his briefcase and stood up. "If I were you, I would not give our firm as reference in the future, Sills." He pushed Gordon's report away from him. "We can do without that. Good day."

It should have ended there. Gordon knew, but it did not end. *Where are you, Anna?* he thought at the world being swamped in cold rain. Why hadn't she come forward, attended the funeral, turned in the papers? He had no answers. He just knew that she was out there, painting, living with a man who loved her very much, enough to give her her freedom to fall in love with someone else. *Take good care of her,* he thought at that other man. *Be gentle with her, be patient while she heals. She's very precious, you know.*

He leaned his head against the window, let the coolness soothe him. He said aloud, "She's very precious."

"Gordon, are you all right?" Karen asked on the phone. It was his weekend for the children again.

"Sure. Why?"

"I just wondered. You sound strange. Do you have a girlfriend?"

"What do you want, Karen?"

The ice returned to her voice, and they made arrangements for the children's arrival, when he was to return them. *Library books,* he thought distantly. *Just like library books.*

When he hung up he looked at the apartment and was dismayed by the dis-

gruesome the disregard for the barest amenities. *Another lamp,* he thought. He needed a second lamp, at the very least. Maybe even two. Anna loved light. A girlfriend? He wanted to laugh, and to cry also. He had a signature, some love letters written to another man, a woman who came to his dreams and spoke to him in the phrases from her letters. A girlfriend! He closed his eyes and saw the name. Anna. The capital *A* was a flaring volcano, high up into the stratosphere, then the even, graceful *n*'s, the funny little final *a* that had trouble staying on the base line, that wanted to fly away. And a beautiful, sweeping line that flew out from it, circled above the entire name, came down to cross the first letter, turn it into an *A*, and in doing so formed a perfect palette. A graphic representation of Anna, soaring into the heavens, painting, creating art with every breath, every motion. Forever yours, Anna. Forever yours.

He took a deep breath and tried to make plans for the children's weekend, for the rest of the month, the summer, the rest of his life.

The next day he bought a lamp and on his way home stopped in a florist's shop and bought half a dozen flowering plants. She had written that the sunlight turned the flowers on the sill into jewels. He put them on the sill and raised the blind, and the sunlight turned the blooms into jewels. His hands were clenched; abruptly he turned away from the window.

He went back to work; spring became summer, hot and humid as only New York could be, and he found himself going from one art show to another. He mocked himself and cursed himself for it, but he attended openings, examined new artists' work, signatures, again and again and again. If the investigators trained in this couldn't find her, he told himself firmly, and the FBI couldn't find her, he was a fool to think he had even a remote chance. But he went to the shows. He was lonely, he told himself, and tried to become interested in other women; any other woman, and continued to attend openings.

In the fall he went to the opening of yet another new artist, out of an art school, a teacher. And he cursed himself for not thinking of that before. She could be an art teacher. He made a list of schools and started down the list, perfecting a story as he worked down it, one by one. He was collecting signatures of artists for an article he planned to write. It was a passable story. It got him nothing.

She might be ugly, he told himself. What kind of woman would have fallen in love with Mercer? He had been inhibited, constricted, without grace, brilliant, eccentric, and full of wonder. It was the wonder that she had sensed; he knew. She had been attracted to that in Mercer, and had got through his many defenses, had found a boy-man who was truly appealing. And he had adored her. That was apparent from her letters; it had been mutual. Why had he lied to her? Why hadn't he simply told her who he was, what he was doing? The other man in her life had not been an obstacle, that had been made clear also. The two men had liked each other, and both loved her. Gordon brooded about her, about Mercer, the other man, and he haunted openings, became a recognized figure at the various studios and schools where he collected signatures. It was an obsession; he told himself unhealthy, maybe even a sign of neurosis, or worse. It was insane to fall in love with someone's signature, love letters to another man.

And he could be wrong, he told himself. Maybe Roda had been right after all. The doubts were always short-lived.

The cold October rains had come. Karen was engaged to a wealthy man.

The children's visits had become easier because he no longer was trying to entertain them every minute; he had given in and bought a television and video games for them. He dropped by the Art Academy to meet Rick Henderson, who had become

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a friend over the past few months. Rick taught watercolors.

Gordon was in Rick's office waiting for him to finish with a class critique session when he saw the *A*. Anna's capital *A*.

He felt his arms prickle and sweat form on his hands and a tightening in the pit of his stomach as he stared at an envelope on Rick's desk.

Almost fearfully he turned it around to study the handwriting. The *A*s in *Art Academy* were like volcanoes reaching up into the stratosphere crossed with a quirky, insouciant line, like a sombrero at a rakish angle. Anna's *A*. It did not soar and make a palette, but it wouldn't; not in an address. That was her personal sign.

He let himself sink into Rick's chair and drew in a deep breath. He did not touch the envelope again. When Rick finally joined him, he nodded toward it.

"Would you mind telling me who wrote that?" His voice sounded hoarse, but Rick seemed not to notice. He opened the envelope and scanned a note, then handed it over. Her handwriting. Not exactly the same, but it was hers. He was certain it was hers, even with the changes. The way the writing was positioned on the page, the sweep of the letters, the fluid grace. But it was not the same. The *A* in her name, Anna, was different. He felt bewildered by the differences and knew it was hers in spite of them. Finally he actually read the words. She would be out of class for a few days. It was dated four days ago.

"Just a kid," Rick said. "Fresh in from Ohio, thinks she has to be excused from class. I'm surprised it's not signed by her mother."

"Can I meet her?"

Now Rick looked interested. "Why?"

"I want her signature."

Rick laughed. "You're a real nut, you know. Sure. She's in the studio, making up for time off. Come on."

He stopped at the doorway and gazed at the young woman painting. She was no more than twenty, almost painfully thin, hungry looking. She wore scruffy sneakers, very old faded blue jeans, a man's plaid shirt. Not the Anna of the letters. Not yet.

Gordon felt dizzy and held onto the doorframe for a moment, and he knew what it was that Mercer had worked on, what he had discovered. He felt as if he had slipped out of time himself as his thoughts raced, explanations formed, his next few years shaped themselves in his mind. Understanding came the way a memory comes, a gestalt of the entire event or series of events, all accessible at once.

Mercer's notes had shown him to be brilliant, obsessional, obsessed with time, secretive. Roda had assumed Mercer failed, because he had blown himself up. Everyone must have assumed that. But he had not failed. He had gone forward five years, six at the most, to the time when Anna would be twenty-six. He had slipped out of time to the future. Gordon knew with certainty that it was his own name that had been excised from Anna's letters. Phrases from her letters tumbled through his mind. She had mentioned a Japanese bridge from his painting, the flowers on the sill, even the way the sun failed when it sank behind the building across the street.

He thought of Roda and the hordes of agents searching for the papers that were to be hidden, had been hidden in the safest place in the world—the future. The safe Anna would put the papers in would be his, Gordon's, safe. He closed his eyes hard, already feeling the pain he knew would come when Mercer realized that he was to die, that he had died. For Mercer there could not be a love strong enough to make him abandon his work.

Gordon knew he would be with Anna, watch her mature, become the Anna of the letters, watch her soar into the stratosphere, and when Mercer walked through his time door, Gordon would still love her and wait for her, help her heal afterward.

Rick cleared his throat, and Gordon released his grasp of the doorframe, took the next step into the studio. Anna's concentration was broken; she looked up at him. Her eyes were dark blue.

Hello, Anna.

The Artist

CONTINUED FROM PAGE 22

of his role as moderator of the SF-Lovers Digest bulletin board. Each day he sifts through the reams of potential postings that pour into his office and selects the best to be packaged for SF Lovers Digest. "The last time someone sat down and tried to figure out how many people were reading SF-Lovers," he says, "it came out to be a subscription base of something like twenty thousand people and growing."

Part of this growth is related to the additional computer networks (such as the National Science Foundation's CSnet) that have been linked to ARPAnet and that, together, form the Internet. The online equivalent of a cable-television service.

Unfortunately, though, only authorized personnel can access the Internet. University students, especially those in mathematics, computer science, engineering and other technical disciplines, can often get permission to use the service. So too can employees of computer companies, particularly those performing work of interest to DoD. But the average online junkie can only drool over the prospect of gaining access and tapping into discussions on tachyon drives, negative mass, the Fermi paradox, self-replicating robots, and the care and feeding of Bussard ramjets.

On the other hand, not everyone who has access can handle the stimulation. "It's as if you got twenty newspapers at your house every day," says ARPAnet user Charles McGrew. "Many are the people I've seen who've had work just dwindle to nothing as they sat and read and posted to bulletin boards on all sorts of different topics. I've seen people almost waste away." DO

CREDITS

Page 6 clockwise from left, Randy Mayor, Fred Freeman, Christopher Springmann/Photo Researchers, Thomas Akawie, Di Maccio, Ron Embleton **page 12,** Monte S. Buchsbaum **page 14,** Daniel Ribeiro **page 16,** Joanne Schwartz **page 20,** Henner Preiß **page 22,** Michel Tcherevkoff **page 25,** Toshuj Iwasaki/Space Art International **page 28 left,** Barbara Pfeiffer/Peter Arnold, Inc. **page 28 right,** NASA **page 29 left,** Movie Still Archives **page 29 right,** Boehringer Ingelheim **page 30 left,** NASA **page 30 right,** Bill Aron Photography/Photo Researchers **page 31 left,** Eugene Gordon/Photo Researchers **page 31 right,** Bruce Roberts Photo/Photo Researchers **page 32 left,** Gerard Rancinan/Sygma **page 32 right,** Z. Leszczynski/Animals, Animals **page 33 left,** NASA **page 33 right,** Frankin/Sygma **page 34,** J.P. Laffont/Sygma **pages 36–37,** René Magritte *The Empire of Light II* 1950 Oil on canvas 31 x 39" Collection The Museum of Modern Art New York Gift of D. and J. de Menil **page 46,** Photo Seismo/Caltech **page 86,** Chesley Bonestell/Space Art International **page 87,** Wernher von Braun collection of Bob Guccione and Kathy Keeton **page 88 top left, center left, bottom,** Wernher von Braun collection of Bob Guccione and Kathy Keeton **page 88 top right,** Rolf Klep/Space Art International **page 89,** Wernher von Braun collection of Bob Guccione and Kathy Keeton **pages 90–91 top,** Chesley Bonestell/Space Art International **page 90 bottom left,** Wernher von Braun collection of Bob Guccione and Kathy Keeton **page 91 bottom right,** Wernher von Braun collection of Bob Guccione and Kathy Keeton **page 92,** Wernher von Braun/collection of Bob Guccione and Kathy Keeton **page 93 top, center right, bottom right,** Wernher von Braun/collection of Bob Guccione and Kathy Keeton **page 93 bottom left** Fred Freeman/Space Art International **page 95** John Pound **page 96,** Movie Still Archives **page 97 left,** CDC Science Source/Photo Researchers **page 97 center,** CDC Science Source/Photo Researchers **page 97 right,** AP Wide World **page 98** Tim White **page 113** Michael Simpson **page 114 top,** Scott Weiner/Retina Ltd. **page 114 bottom,** Quantum **page 115 top,** Saito **page 115 bottom left** Richard Kriegler **page 115 bottom right** Michael Dafoli **page 124** Stanislaw Fernandes **Addendum, June 1987 issue page 74 bottom right**—copyright © 1982 by Paramount Pictures Corporation all rights reserved

INTERVIEW

CONTINUED FROM PAGE 85

is the most complex ecosystem ever to evolve on this planet Only about ten percent of the land is covered by rain forest, but at least sixty percent of all species live there It is our Garden of Eden and a vast loss of genetic material will occur if it goes Evolution could come to a stop It is awesome ' as my ten-year-old says to contemplate all we get from these forests

Omni: Your late colleague Dian Fossey was much criticized, both for her disinterest in conservation and for not publishing much of her data Yet you praise her work in memorial lectures

Galdikas: She couldn't worry about long-term projects when the short-term prospects for the survival of the gorillas were so dire People were killing the gorillas left and right in front of her If that happened to orangutans my attitude would change As for criticisms about her lack of published data that's typical of the snotty attitude of academia She was looked down upon and had tremendous trouble getting money She wouldn t come down from that mountain in Rwanda because she didn't have the money for gas She didn't have an academic background or a lof of publications but don t overlook the tremendous contribution she did make to our understanding Her book *Gorillas in the Mist* is just packed with information She was also accused of anthropomorphizing the gorillas How can you avoid it with animals like gorillas and orangutans? Their emotions and intelligence are so similar to ours that we know when they are upset or happy The Indonesian forestry department gave me some bears to rehabilitate I couldn t read them I had no way of predicting what they'd do next But orangutans are no problem We share ninefy eight percent of the same genetic material We only separated fen million to fifteen million years ago For gorillas it is ninety-nine percent and five million years It is not anthropomorphizing to read what goes on with them in our terms as long as it doesn f interfere with your observations as a scientist It didn t with Dian It doesn't with me

Omni: Did you know Fossey well?

Galdikas: We were friends and saw each other from time to time Jane [Goodall] Dian and I gave three talks together in the United States in 1981 And I spent some days with Dian in England before I first went fo Indonesia in 1971 She was never much interested in orangutans gorillas were all that mattered to her, and I was glad to hear her talk about them But she and Jane are the only people I know of who have devoted their lives to studying an animal with no notion of personal gain They liked nothing better than to be left alone Dian was like a gorilla in many ways majestic intelligent sensitive gentle beneath a ferocious blustering temper

Omni: Some critics claim she courted her own death with her confrontational manner toward those she saw as threats to gorillas

Galdikas: I don't think she wanted to be a martyr but she became one, like Joan of Arc or Benigno Aquino No doubt she will accomplish in death what she wanted in life—the protection of the mountain gorillas The Rwandans have already said they will strengthen patrols Her Digit Fund [for the gorillas] has received many contributions, and a national memorial may be made of her cabin

Omni: Would you be willing to give your life, as you say she did, for your apes?

Galdikas: I might I have, almost Rod left saying I loved orangufans more than him That s not the same as giving up life but I sfill loved him But he said his wife had to love him more than anything else on this earth. I've given up a lot for orangutans I ll never have a life with Rod, a house with a mortgage paid off, or tenure or any of the trappings of success But even better, I have Pak Bohap And like Jane and Dian, I don't care about the rest

There is an important way that Dian and I are different I think she was stuck in a place where she believed gorillas were better than humans. They're not They do all sorts of horrible things, like kill each other, though perhaps they do it without malice, unlike us Dian died believing the worst about people Maybe in that sense she was committing suicide If I was involved in that sort of confrontational life, I d have an armed guard If my health was failing, as hers was, I'd give up smoking she smoked like a chimney I m married I have children I have a strong belief in the future of humankind

Omni: Haven't you turned your back on Western society?

Galdikas: I never turn my back on anything! Irvin DeVore the Harvard anthropologist says people are always looking for a Garden of Eden outside of society, whether it be among primitive hunter-gatherers or primates I have looked for the animal that never left the Garden of Eden, never came down from the trees But I've never been disillusioned with humankind. Working with orangutans has made me much more aware of humankind's compassion The higher in my estimation orangutans rise the higher we do They've gone off on a path divergent from ours and developed this incredible strength of character denied us because we are a gregarious species I always prided myself on my ability to withstand solitude I enjoyed it, craved it But I ve followed orangutans day in day out for a month, and they d never meet another of their kind And if they did they d run away to avoid contact It was just mind-boggling to me I began to realize that I m not built that way and I began to accept my humanness more It is like in literature Pound or Eliot or whoever said it. In the end you come back to a different kind of innocence an innocence born of experience Fossey was stuck in the middle of that wheel I ve come full circle DO

STAR TECH

ACCESSING THE FUTURE

PROGRAMMING YOUR VCR BY TELEPHONE

Now there's a gadget that lets you use a Touch Tone phone to program your VCR when you're not at home.

Called HAL after the talking computer in the movie *2001*, the device operates with any VHS or Beta VCR equipped with infrared wireless remote control. Say you decide to stay out later than you anticipated and haven't set your VCR to record *L.A. Law*. Or maybe you set your VCR before you left the house, but the TV schedule was thrown off by a presidential press conference. No problem.

Simply call your home with a Touch Tone phone and HAL—through an electronically synthesized voice—gets on the line and takes you through each of the programming steps, telling you which phone buttons to press and when.

HAL—developed by Craig Grossman, president of Advanced Video Dynamics in Blue Bell, Pennsylvania—has the ability to store an event up to a year in advance. If you also own an answering machine, don't worry. HAL's special microprocessor tells him whether the call is for him or the answering machine.

—Marjorie Costello

Access: Should be available in video stores, electronic stores, and department stores by the time you read this. Price: $189. Or contact Advanced Video Dynamics, 1777 Walton Road, Suite 201, Blue Bell, PA 19422.

AND NOW... CARBONATED MILK

Will Johnny drink more milk if his mom buys it in the supermarket's soda section? The United Dairy Industry Association (UDIA) hopes so. Its research arm, DRINC (Dairy Research, Inc.), is developing carbonated milk.

The process, which is not yet under patent, is similar to carbonating water. Carbon dioxide is added to skim milk under pressure, resulting in an 86-calorie (per eight-ounce glass) beverage that tastes, according to Mary Payne, spokeswoman for the UDIA, "pretty much like seltzer, though a tad fizzier." Carbonating the milk has been fairly easy, though cleaning the machinery poses a problem because carbonated milk, unlike carbonated water, leaves a residue.

DRINC is experimenting with flavors such as chocolate, cola, peach, strawberry, and pina colada, which have no dairy taste at all but do add to the calorie count.

For the moment, carbonated milk has a two- to three-week shelf life, but it has to be refrigerated. A future possibility is an ultra-high-temperature version that could stay out of the dairy case for up to three months.

—Francesca Lunzer

Access: When development of the product is finished, the UDIA will work with American and foreign processors and foreign countries, and Max Headroom will probably be able to serve carbonated milk to his friends by the summer of 1989.

COMPUTERIZED CLERGY

Computer software is now helping pastors solve such vexing problems as dwindling attendance, lagging donations, and soporific sermons.

F1 Software in Beverly Hills, California, promises that its *PowerChurch Plus!* program can provide an early warning system on contributors whose donations have begun to lag. And with Sermon Filer, one of 12 modules comprising *PowerChurch Plus!*, the *au courant* clergyman can build a library of sermons and see instantly when sermons have been preached on a particular subject before.

Parish Data Systems, Inc., in Phoenix, publishes a program that can locate those people who are not involved in the church and send them personal letters appropriate to the situation. Parish also plans to publish *Cemetery Package*, to provide for the location and billing of cemetery plots.

With such software available, will the confessional one day double as a database? After all, computer analysis of his congregation's transgressions can aid a pastor in customizing his sermons. Why admonish the flock for gluttony when adultery is their major downfall?—Ruth Papazian

Access: *PowerChurch Plus!* is available from F1 Software, Box 3096, Beverly Hills, CA 90212. *Cemetery Package* will be available from Parish Data Systems, 3031 West Northern Avenue, Phoenix, AZ 85051.

STARTECH

CARNEGIE HALL IN A BOX

The ongoing promise of the home hi-fi system has been to deliver the most accurate audio reproduction of a live musical performance. Now Yamaha Electronics is applying digital technology to further improve sound reproduction by re-creating the acoustics of noted concert halls in the average living room.

Yamaha engineers have developed a digital technique for scientifically quantifying data on various types of sound fields—the way sound waves react within a particular environment. The data—which were gathered by measuring the acoustic "personalities" of many concert halls, churches, and other musical environments around the world—are now stored in the memory of Yamaha's DSP-1 digital sound field processor. The DSP-1 includes highly sophisticated integrated circuits that draw on the memory to reproduce or synthesize 48 acoustic environments, including a jazz club, a disco, a cathedral, and an outdoor stadium, among other settings.

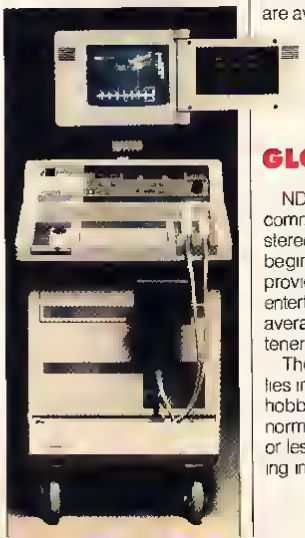
Controlled by a remote keypad, the DSP-1 requires a stereo system with a minimum of four channels of amplification and four speakers. The source of the sound can be a CD player, a turntable, a tape deck, or even a radio. Equipped with the DSP-1 and the right mix of components, a listener can hear Barbra Streisand in a Carnegie Hall-type environment or Handel's *Messiah* in a European cathedral—without leaving the living room.—Marjorie Costello

Access: The Yamaha DSP-1 is available for $899 from audio specialty dealers, or contact Yamaha Electronics, 6660 Orangethorpe Avenue, Buena Park, CA 90620.

STROKE ALARM

A new medical imaging machine combining the best of ultrasound with Doppler radar technology makes it possible to peer inside a person's blood vessels and see if a stroke is imminent.

Developed by Quantum Medical Systems (QMS) of Issaquah, Washington, the Quantum AngioDynograph-1 (QAD-1) uses the new technology of angiodynography, which means the measurement of dynamics in blood vessels. Like ultrasound imagers, the QAD-1 (shown below) provides doctors with noninvasive images of tissue in a patient's body. Like angiography, which uses iodine dye injected into the bloodstream, the machine also clearly shows blood flow.



The difference, says QMS president Lonnie Edelheit, is in the use of advanced Doppler radar technology. "Angiodynography measures the rate and direction of blood flowing in the veins and arteries," something standard ultrasound cannot do. Powerful computer programs translate those data into a moving color image. Red means blood is moving away from the machine's ultrasound wand, blue means toward it.

With the QAD-1, doctors can see blood vessel constrictions or obstructions directly and can measure the turbulence they cause. That will make it much easier to determine if a patient is at risk of a stroke or heart attack.—Joel Davis

Access: QAD-1 imagers are available from Quantum Medical Systems, 1065 12th Avenue NW, Issaquah, WA 98027, for $125,000 to $175,000 each.

GLOBAL RADIO

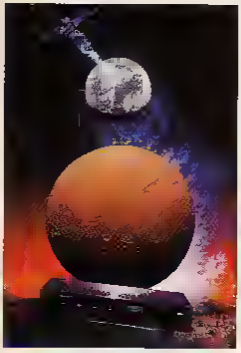
NDXE—the first worldwide, commercial high-frequency stereo radio station—will begin broadcasting this fall, providing news and entertainment to an estimated average of 40 million listeners around the world.

The uniqueness of NDXE lies in its power. Whereas hobbyist shortwave stations normally generate 100 watts or less, NDXE—broadcasting in the international HF

spectrum alongside The Voice of America and the BBC—will be coming at you with *3 million watts* of radiated power. And for the first time in commercial radio history, NDXE will be beaming a reliable, continuous signal around the globe with the help of a state-of-the-art device known as the rotatable log periodic antenna.

Privately owned, NDXE will be transmitted 24 hours a day from Opelika, Alabama. With its international mass-appeal format, the global station will feature popular music from big band to rock and roll, sports, political and financial updates, travel forecasts, old radio shows, specials, and news, as well as talk shows.—A.J.S. Rayl

Access: Tune in NDXE on any radio with a shortwave band. For information, a program schedule, and a



free copy of the *NDXE Planet* newsletter, write Dickson Norman, NDXE Global Radio, Box 569, Opelika, AL 36801. Phone: 1-800-USA-NDXE.

ETHICARD

For all those people who wonder if the money they have in the bank is working in the best interest of their principles, a company called Working Assets (WA) may have just the thing.

This San Francisco-based company, America's largest "socially responsible" money-market fund, now offers a Visa credit card that some are calling the Ethicard, or the card with a cause.

Each time you use it, no matter how small the purchase, WA donates five cents to nonprofit groups working for peace, human rights, the environment, and aid to the hungry—groups such as Amnesty International, Greenpeace, Planned Parenthood, Oxfam, and the Children's Defense Fund. Donations of $2 are also made whenever a new cardholder signs up (the fee is $15, the interest rate a competitive 17.5 percent).

Acting as something of a progressive United Way, WA has contributed more than $32,000 so far to 16 organizations, and this March of Nickels, as cofounder Peter Barnes calls it, allows consumers to charge into the valley of the shadow of debt but otherwise keep their consciences clean.

—Gregg Levoy

Access: Working Assets, 230 California Street, San Francisco, CA 94111. Phone: 1-800-52-APPLY.

COLD KILLER

Cold-causing germs have settled in noses and caused sneezing and related miseries for eons. Robert Krauser of Greenwich, Connecticut, has invented a gizmo that appears to end cold symptoms when used at the first sign of the sniffles—by zapping heat-sensitive rhinoviruses with hot air.

"I'm not allowed by the FDA to say this is a cure for colds," Krauser says. "But in clinical trials, the device was ninety percent effective in reducing the duration of colds from about a week to a couple of days or less."

Dubbed the Viralizer, the contraption (below) looks like a small hair dryer. It plugs into a wall outlet, heats air to 120°F, and blasts it up a cold sufferer's nose. An antiseptic and a decongestant can be added to treat secondary sinus infections and to relieve allergies.

Physician Allan Aven of Arlington Heights, Illinois, is using the Viral-

izer to treat other virus-caused conditions. He reports dramatic success with using the machine's hot-air blasts to zap herpes sores and warts into remission.—Sherry Baker

Access: The Viralizer has been approved by the FDA and will be on the market soon for $34.95. For more information, contact Viral Response Systems Inc., 34 East Putnam Avenue, Greenwich, CT 06830.

PIONEERING

CONTINUED FROM PAGE 50

timately responsible for the formation of hydrothermal regions where we find concentrations of minerals. So the better we understand where these things are and how deep they extend, the better we'll be able to predict places that might have mineral deposits where we haven't looked before. That sort of understanding should be further enhanced by drill hole technology. In fact, a current hole being sunk in Colorado's Creede Mining District is being drilled *underneath* known gold and lead deposits. This may reveal the inner-Earth "incubators" where those deposits are actually born.

Energy prospecting also stands to gain much from this new geology. Some oil companies, notably Gulf and Amoco, are using a localized version of seismic tomography to search for oil, and Amoco at least reports that the technique has successfully verified the existence of some new deposits. Caltech scientists have also used seismic tomography to locate a previously hidden magma chamber beneath Southern California's Owens Valley. That chamber and others like it may in turn prove to be valuable sources of exploitable hydrothermal energy. And if Thomas Gold is proved right by findings at the Siljan hole, if in fact inner Earth holds vast stores of untapped methane, global energy problems could go the way of the dinosaurs that spawned them.

At the same time, current probings of middle Earth may one day provide information that will help to combat two previously unassailable enemies: volcanic eruptions and earthquakes. DOSECC's Cajon Pass drill hole, for example, will help scientists understand the nature of the stresses and pressures near the San Andreas Fault by providing information that may eventually make long-range earthquake prediction a reality. There is even a tantalizing suggestion that detailed profiles of fault lines could someday help scientists not only predict but prevent earthquakes or at least diminish their intensity to relatively harmless levels. Past experiments have shown that reducing underground fluid pressure by actually pumping fluids out of faults can decrease the frequency and strength of earthquakes. Although the idea has lost much of its currency because of political factors—local governments in earthquake zones have shown little enthusiasm for offering their territories as test sites—the notion, according to C. Barry Raleigh, director of the LaMont–Doherty Geological Observatory in Palisades, New York, is at least theoretically possible and should not be dismissed out of hand.

Oil and mineral prospecting, exotic new chemistries, catastrophe prevention—these are some of the possible near-term rewards that may arise from the contem-

porary scientific journey to the center of the earth. But there are interesting prospects for the more distant future as well. The sounding of Bloxham's alarm for an impending reversal of the magnetic field (in geologic time, after all, 2,000 years is shorter than an eye blink) may help us prepare for the inconveniences and outright dangers that would accompany such a reversal. Beyond that, David Hilton speaks of using data from isotope analysis at sites like Loihi to predict the composition of the atmosphere eons from now; surely a vital enterprise in the calculation of the future of life on Earth.

In fact, today's geoscience may well be in the process of giving the earth a new lease on life. Although this is still controversial, Jeanloz's new calculations of core temperatures seem to favor an "oil on water" model of the whole earth, in which the various zones are sharply separated from one another and thus "communicate" or intermix fluids very little. In this model, Jeanloz explains, the upper layers would act like a blanket to contain the heat of the lower layers. This would mean that the earth would retain its heat for a much longer time period than we had previously believed. "So instead of being in the process of cooling down," he says, "the earth may be as vigorous as ever, and its ultimate geological demise instead of taking place billions of years from now, wouldn't take place for *tens* of billions of years."

If validated by future experiments and calculations, Jeanloz's estimate will amount to a sort of geological reprieve, a tenfold increase in the life span of our home planet. Given all that time and given a natural progression of technology will we someday realize Jules Verne's dream, perhaps not only journeying to, but actually taking up residence in, the heart of the earth? Certainly there are no present plans to dot middle Earth with condos—the tremendous heat and terrible pressure would instantly turn human beings into little packets of hot, dense flotsam. "I've been in mines down to about six thousand feet," says Robert Andrews, "and even there the rocks are hot enough to burn your fingers."

Even so, back here near the surface there have been some tiny and tentative approaches. Near Kansas City an industrial complex has been carved out of a vast system of underground limestone caverns, and some 3,000 people now work in this "subterropolis." In Canada a high-tech gold mine thousands of feet underground is so self-contained, with air-conditioned shops and residences, that miners need to return to the surface only a few times a year. And South Africa now has on the drawing boards a new gold mine that will plunge 17,000 feet into the earth's insides—*Homo sapiens'* deepest in-person penetration of inner Earth. It could be that these efforts represent the first halting steps in an even-deeper penetration, a journey that may someday take an awed group of "terranauts" on a tour of middle Earth. ☒

Here is the answer key to last month's qwertycrypt

● We put the typist's fingers on SDFG KL, so all keys struck are to the *right* of intended keys. V is typed for C, Y for T, etc. Spaces between words are no problem since the space bar works no matter where it is struck; the typist's thumb produces spaces in the usual manner. ● Capital letters and quotation marks are more complicated. Since the letter Z is struck instead of the left shift, all would-be capital letters on the right side of the keyboard start with a Z, while the first letter of the word remains in lower case. To capitalize letters on the left side of the keyboard, the right shift key is employed, but in this case the asterisk—found to the right of the shift key on computer keyboards—is struck. ● Because of the addition of Z or *, all capitalized words appear to contain one more letter than they actually have. Since the return key is pressed in place of quotation mark/apostrophe, a new line is created each time these characters are required. ● The return is always preceded by the Z when quotation marks are called for since the shift key must be used to produce them. ● In the case of *Here's*, the word appears as a five letter word on one line—Z plus *here*—while the return key (in place of the apostrophe) moves the last letter *s* to the next line. ● The author's name also moves to the next line when the return is pressed in place of the closing quotation marks.

Here is the solution to last month's qwertycrypt.

"Let us be thankful for the fools. But for them the rest of us could not succeed."—Mark Twain

Here's to Rare Character.

LIKE AN EGYPTIAN

CONTINUED FROM PAGE 74

more sophisticated—what with the introduction of electromagnetic equipment, electronic devices, infrared photography and metal detectors.

Omm Sety hoped that someone who understood the importance of uncovering these treasures would undertake an investigation. "I think that the discovery of the annals will be the biggest find in Egyptian history since in them would be a recording of events at a very critical period in Egypt's history," she told El Zeini. "They were probably hidden during the reign of Ptolemy the Third [circa 246 to 221 B.C.] when he ordered all the temples in Egypt to turn in their books to the great library of Alexandria. Anything of real importance," she asserted, "would have been hidden."

"And I also believe," she continued, "that the secret treasury has not yet been discovered. In the set of rooms that we call the archives, or the library, there is a mention of such a treasury, and so far no part of the building has been discovered that reasonably could have been used as a treasury. There is another peculiar thing. The height of the floor in these archives and the height of the floor of the halls immediately to its east reveal a difference of nearly four meters. So what is under there? Perhaps there is another set of rooms!"

In 1964 Omm Sety celebrated her sixtieth birthday. The eight years she had spent in Abydos had been the happiest of her life. Now faced with mandatory retirement, she was again advised to return to Cairo to find part-time work. Once more she refused. (During her years in Abydos, Omm Sety visited Cairo only once.) The Egyptian Antiquities Department decided to make an exception and allowed her to continue working in Abydos for another five years. There were no more extensions to be won after that, and in 1969, as she said, "they put the old mare out to pasture."

Superannuated and having to make do on a pension of not more than $30 a month, Omm Sety now realized that she was going to have to expand her activities. She started making needlepoint embroideries of the Egyptian gods, scenes from the temple and hieroglyphic cartouches. These she would sell to visiting friends and tourists.

In addition to working as a part-time consultant for the Egyptian Antiquities Department, she now began guiding tourists through the Sety temple. "People who came on cruises met me," she once commented, "and when they returned home they mentioned me as being sort of among the monuments here, so when their friends showed up, they too wanted to see the horrible specimen in life." Omm Sety could immediately sense whether or not tourists were truly interested in the temple. If they were, she would devotedly spend several hours taking the "chosen few" around the holy shrine, after which she would sometimes invite them to her home or to the rest house for a cup of tea.

In 1972 Omm Sety suffered a mild heart attack and spent a few nights at the Balyana hospital. She refused to remain bedridden for long and was soon up and about, in defiance of the doctor's orders. During this period she decided to sell her old house. She had a little mud-brick house constructed for her by the son of Mahmoud Soliman, the onetime keeper of the Sety temple, who had met her on her first pilgrimage to Abydos. His son Ahmed now looked after her—and she him—and Omm Sety lived like a member of his family in this dwelling that was attached to Ahmed's property, just a short walk from the temple.

She called her new dwelling the Omm Sety Hilton. Here, over the next nine years, according to entries in her secret diaries, King Sety visited her frequently at night.

Having lived in hardly the most sanitary or luxurious environment for almost a quarter of a century, Omm Sety—now a septuagenarian—was showing signs of her age. A heart attack, a broken knee, phlebitis, flus, dysentery, eye catarrhs and chronic appendicitis had all taken their toll. No longer the vigorous, heavyset woman of the past, Omm Sety was now thin and quite frail. She began to prepare for her death by building a tomb for herself on the western side of her garden. At the head of the tomb she carved a figure of Isis with her wings outspread.

"Now thin and frail, she began to prepare for her death by building a tomb for herself in her garden. At its head she carved a figure of Isis with her wings outspread."

In October 1980 Julia Cave, a producer and director for the BBC, arrived in Abydos with a film crew to begin shooting scenes for a movie entitled *Omm Sety and Her Egypt*. This 50-minute documentary presented the history of Abydos, described the excavations that had taken place there, and featured interviews with T.G.H. James of the British Museum. The star of the film was, of course, Omm Sety, who talked at length about her life and who, though in great pain (she had recently broken her right leg), managed to rise to the occasion and walk haltingly on crutches to the temple.

The same week that Omm Sety was working with the BBC, she received a visit from the American producer Miriam Birch, who was writing and producing a one-hour documentary entitled *Egypt: Quest for Eternity* for National Geographic Films. Birch had come to Abydos to find out whether Omm Sety might be willing to participate in it. She agreed, and the producer and her crew carried this valiant woman to the Sety temple. She was in a lot of pain, but she ignored that, Birch recalled. It was March 21, 1981, and this was to be Omm Sety's final visit to her beloved shrine.

"Death holds no terror for me," Omm Sety once said. "I'll just do my best to get through the judgment. I'm going to come before Osiris, who'll probably give me a few dirty looks because I know I've committed some things I shouldn't have."

On April 21, 1981, Omm Sety died in the holy city of Abydos, thereby fulfilling the second half of her lifetime goal. "I consider myself to be a very lucky woman," she had commented two years previously, "and give heartfelt thanks to the ancient gods who heard my prayers and brought me home."

The local health department refused to allow her to be buried in her garden tomb. Instead, her body, facing west, was interred in the desert on the fringe of the Coptic cemetery, just northwest of the Sety and Ramses temples. A gravestone has still to be erected, and the burial site is marked only by a few limestone flakes—on which offering prayers have been written in hieroglyphs—and by a broken teacup placed there by unknown friends.

For those who love her, Omm Sety once wrote, Abydos still has a mysterious life. Other ears than mine have heard music at night in the Hypostyle Halls of the Temple of Sety. The tinkle of sistrums, the beat of a tambourine, and the wail of a reed pipe have been heard. I have seen the golden glow of a lamp in the Cult Chapel of Osiris when no lamp was lit, and I have stood alone at night in Pega-the Gap, on the first evening of the Great Feast of Osiris, listening to the howling of the jackals. But when midnight came the cries of the jackals were hushed, a deep silence fell, and then suddenly I felt as though I were surrounded by a great multitude of people. I could see nothing but the starlit desert, but all around me I could hear the breathing of many people and the soft whisper of sandaled feet upon the sand. I walked in the midst of this unseen crowd right up to the walls of Kom El Sultan. Then it seemed as though all the people went through the gateway and vanished into the past, and I was left outside, cold and lonely in the present."

But surely she has by now made her journey through the gateway to the West, where she has undoubtedly met up with all her beloved friends and, in the words of the *Pyramid Texts*, is sleeping that she may wake, dying that she may live.

BODY

CONTINUED FROM PAGE 20

immune system into defending against tumor cells it might otherwise tolerate.

"In preliminary trials with animals," Kohler says, "our anti-ideotype cancer vaccine has worked to treat and prevent cancer."

Although it sounds like the answer to past immunization woes, the anti-ideotype vaccine does have its flaws. Apparently the immune system becomes depressed when pumping out all those antibodies in response to the anti-ideotype antibody. The evidence suggests," says Muller, "that repeated exposures to anti-ideotype antibodies may make some people more susceptible to attack by the AIDS virus. We just don't know enough yet about the immunological mechanism of autoimmune diseases," she cautions.

While some critics contend that the vaccine revolution should be put on hold until the long-term consequences of immunization have been fully investigated, scientists are forging ahead with a variety of brave new vaccines. Here are a few of the most promising shots to come:

• A genetically engineered vaccine aimed at eradicating hepatitis B has recently been approved by the FDA. While the old hepatitis "blood" vaccine was derived from human plasma (the availability of which is limited), the new "gene splice" shot is composed of yeast cells saddled with the hepatitis virus.

• Researchers across the country are developing "vaccines" for people with certain types of cancer, such as melanoma (skin cancer) and colorectal cancer. Unlike vaccines that prevent contraction of disease, these shots inhibit the reoccurrence or worsening of symptoms. The vaccines, which contain parts of actual cancer cells, are thought to stimulate the immune system's response to tumor cells.

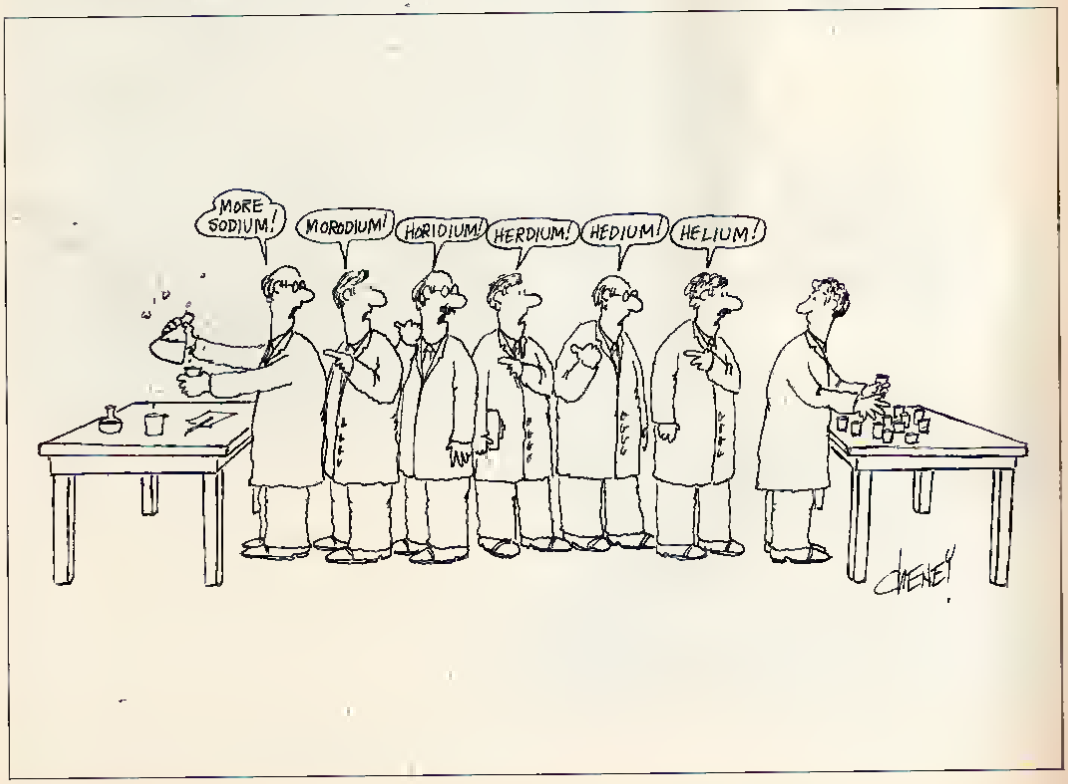
• A contraceptive shot is undergoing clinical trials in Australia, and if tests are successful, it could become *the* birth control choice for millions of women by the mid-Nineties. The antipregnancy vaccine, administered once a year, works by manufacturing antibodies to human chorionic gonadotropin, which stimulates production of progesterone, the hormone necessary for maintaining the uterus for pregnancy. Because the contraceptive shot doesn't interfere with a woman's menstrual cycle, no side effects like those birth control pill users experience have been reported.

• Doctors are developing a vaccine for toxoplasmosis, a disease often transmitted to pregnant women by cats or undercooked meat. Toxoplasmosis, which causes about 3,000 birth defects annually, infects 2 million people each year. It can also cause brain damage—and even death—in those with weakened immune systems. The new vaccine, which would be administered to cats, could be available in four to five years.

• A number of vaccines are presently being developed to protect us from the scourge of sexually transmitted diseases. According to the World Health Organization, a herpes vaccine is currently being tested in England and could be available by 1990. Gonorrhea could be wiped out completely if clinical trials for a vaccine currently being run at the Stanford University School of Medicine are successful. An anti-ideotype vaccine to prevent the transmission of the AIDS virus is at least ten years down the road. Researchers at San Antonio's Southwest Foundation for Biomedical Research, however, have begun preliminary testing on primates.

To encourage vaccine production, the Ninety-ninth Congress recently passed legislation establishing a no-fault compensation system for vaccine victims. Yet in the face of all the ground-breaking immunization research, and the legislation that accompanies it, comes this irony: More and more parents are rejecting the whole idea of mass inoculation.

The battle lines are drawn. As the vaccine controversy heats up, you can expect to see more changes in both the policy and the production of what was once considered our most potent weapon against infectious disease. ∞



The World's Hardest Pronunciation Test

GAMES

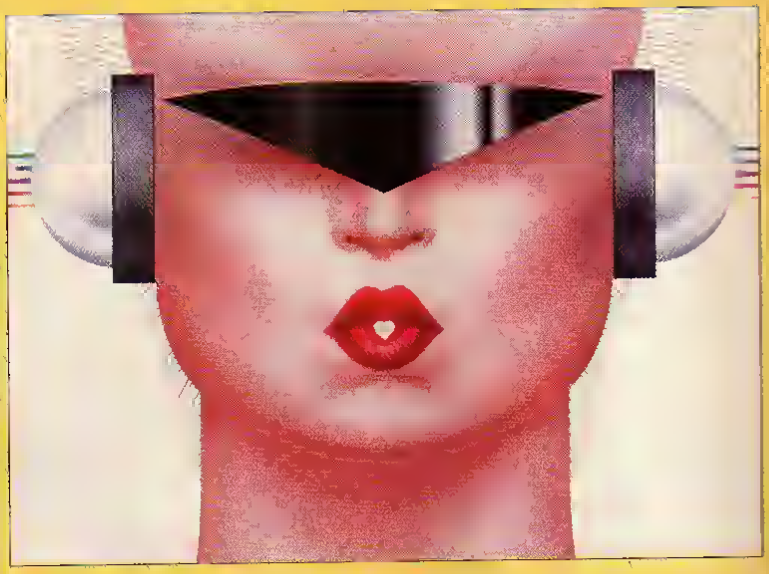
By Scot Morris

English-language purists define their field as *orthoepy* the study of "the correct or accepted pronunciation of words." They insist there is only one correct way to pronounce any word but a glance through three or four contemporary dictionaries indicates there is wide disagreement among the preferred or allowed soundings. In the sentence "Pronunciation is disputable," for example the second syllable of *pronunciation* can be "nun" or "nunt" and *disputable* can be accented on the first or the second syllable. Even *orthoepy* has two possibilities: "OR-thuh-wep-ee" or "or-THO-uh-pee."

There is some measure of consensus however. Preferring correct or at least *consistent*, pronunciation, CBS News has compiled its own set of recommendations for its announcers and correspondents. Entitled *CBS News Pronunciation Guide*, it specifies general American pronunciation not a regional preference, a British English sound (like FORE-mid-a-bull and not the British fore-MID-a-bull), or a correct pronunciation in a foreign language ("Paris" instead of "Paree," for example).

Having discovered several surprises in the *Guide* we used them to compose a test in the form of a nonsensical narrative. It includes more than 100 of the most commonly mispronounced words in the English language.

Even though you may do well on this news announcer's final exam remember: The "correct" pronunciation is a matter of majority rule.



Dictionaries don't dictate how the language must be spoken; they only report *how* it's spoken. As CBS correspondent Charles Kuralt reported, a pronunciation pundit stopped for lunch in Mexia, Texas. Unsure of how to pronounce the name of the town, he asked the waitress, "Would you say very slowly the name of the place we're in?" She said, "Sure. Daaairy Queeeeen."

THE OMNI NEWS ANNOUNCER'S TEST

Read the following paragraphs slowly and clearly into a tape recorder.

1. J.R.R. *Tolkien* was taking *chemotherapy* for his *asthma*. "I already gave my *hemoglobin* and *albumen*," he said with *vehemence*, "and I have a *donor coupon* among my *memorabilia* to prove it. My last meal was made with *basil*, *herbs*, and *chestnuts* with *cognac* and *root* beer on the side. I never use *conch* shells because they can cause *bacilli* to grow and *wreak* havoc with this *exquisite gourmet* dish."

2. "Such *banal*, *puerile gibberish*," said the long-*lived* king *Oedipus*, who had *often* been called *controversial*, *mischievous*, *ingenious* and even *genial*, but who underneath was a *consummate blackguard* with *bestial* habits. "Our *transient envoy* has agreed to share our *nuclear expertise* with his *clandestine liaison* in *Kenya*."

3. P.G. *Wodehouse*, *Evelyn* Waugh, Georges *Seurat*, *Auguste Rodin*, William Butler *Yeats*, Vladimir *Nabokov*, Paul *Klee*, Eleanor *Roosevelt*, and other *cognoscenti* took the following *route* around the word world: from *Puerto* Rico in the *Caribbean* to *Cannes* and *Lourdes* in France, then a quick hop to *Tunisia* and up to *Edinburgh* and *Copenhagen*, Denmark. They flew from there over *Peking* to *Hawaii*, then back to *Nevada*, *New Orleans*, *Louisiana*, *Oregon*, *Minneapolis*, Minnesota, and *Louisville*, Kentucky.

4. "*Forensics* is not my *forte*," said *Modigliani* with *acumen*. To be *succinct*, he said he found his *niche* putting *calk* on *poinsettias*. He looked like an *archangel* with *antennae*. "I am *implacable*."

5. "*Tsk*, *tsk*," said the *prelate* from the *pulpit*. "Avoid

all *familiarity* with *grievous* sins and any *sacrilegious machinations* designed to achieve *supremacy* or cause a *melee*. Take a *Quaalude*. Don't accept *jewelry* as a gift from the *magi* or allow a *heinous siege* on the *enclave* in the city." As a *coup de grace*, the *mayoral* candidate drew a *fleur-de lis* on the *gondola*, thus putting his *imprimatur* on the *vehicle*.

WAIT, THERE'S MORE

Recite the following words. What do they all have in common?

Advertisement, adult, amenable, angina, apricot, cerebral, conduit, culinary, data, domicile, dour, era, flaccid, genealogy, giblet, grimace, harass, Hiroshima, incognito, inexplicable, inquiry, lamentable, Moscow, presentation, research, sadist, schism, secretive, status, slough

ANSWERS

The preferred pronunciations are given by paragraphs, using simplified phonetic spelling throughout.

1. *TALL keen.* KEM o is still preferred, but KEE-mo seems to be gaining ground fast. *AZ muh* (not AZTH-muh). *HEE-muh-gloh bun* (not glob-un). *al BYOO-men* (not al BOO men). *VEE uh-muns* (no "h" is sounded). *DOH-nur* (not DOH-NOR). *KOO-pon* (not KYOO-). *mem-ur-uh-BIL-ee-uh* (not -BEE-lee-uh). *BAZZ ul* (rhymes with *dazzle*). *URBS, CHESS-nuts* (no 't' sound). *KONE-yack, ROOT* (rhymes with *boot*, not *foot*). *KAHNK* shells, *buh SIL-eye* (not back sil-eye). *REEK* havoc (not wreck). *EX qui-zit* (preferred to ex-QUIZ-it). *goor-MAY* (not gore-MAY).

2. *buh NAHL, PWER il* (not -ile). *JIB-ur ish* (not GIB-). *long-lived* (rhymes with *dived*). *ED-uh-pus, OFF-un* (no 't' sound). *con-tro VUR-shul* (not VUR-see-ul). *MIS chuh-vus* (not -CHEE-vus or -CHEE-vee us). *in JEEN yus* (three syllables, not four). *JEE-nyul* (two syllables). *kun-SUM-it, BLAG-ard, BESS-chul* (two syllables). *TRAN shunt* (not TRAN-zee-ent). *EN-voy* (preferred to AHN-voy, which would sound more like an attempt to imitate French). *NOO-klee-ur* (not NOOK-yoo-lur). *ex per-TEEZ* (not -TEES). *klan-DESS-tin* (not DESS-tine or KLAN-duh-stine). *LEE-ay-zahn* (preferred to lee-AY-zahn). *KEN-ya* (not KEEN-ya. Kenya may be the only country to officially change its pronunciation to make it rhyme with the last name of the late president Jomo Kenyatta.)

3. *WUD-house, EEV-lin* Waugh. *suh RAH-oh GOOST roh-DAN, YATES, nah BAWK-off, CLAY, ROH suh-velt, kahn-yuh-SHEN-tee, ROOT* (rhymes with *boot*). *POR to* Rico. *kehr-i-BEE-un* Cannes (rhymes with *can*, not *con*. The *s* is silent, as in *LOORD, to NEE-zhuh* (three syllables, not four). *ED in-burr-oh, KOH pun-hahg un PEE KING* (equal stress) is the long-established American pronunciation still preferred over the Pinyin version, Beijing (BAY JING). *hah-WYE-ee* is suggested, *nuh-VAH-duh*. New or *LEENZ, loo-ee-zee-AN-uh* (not LOO-zee AN-uh). *OR-uh-gun-mn ee-AP-lis* (four syllables, not five). *LOO-uh-vul*.

4. *fuh REN-siks* (not -REN-ziks). *FORT* (not for-TAY). *mo-deel-YAH nee-a, KYOO-men* (not ACK-yu-men). *suk-SINGT* (not suss-). *NITCH* (rhymes with *itch*). *kawk* (no 'l' sound). *poyn-SET ee-uh* (four syllables). *ARK-angel* (not ARCH-). *an TEN-ee* (not -TEN-ay). *im PLAY-kuh-bul*.

5. *Tsk, tsk* is not pronounced 'tisk-tisk.' It is a sound made by squeezing air between the tongue and palate. *PREL-it, PULL-pit* (first syllable rhymes with *pull*, not *gull* or *pool*). *fa-mil YAR-i-ty* (not -i-ar-i-ty). *GREE-vus, sak-ri LEE-jus* (four syllables, not five). *mak-uh NAY-shuns, suh PREM-uh-see* (not soo-). *MAY-lay, KWAY-uh-lood, JEW-ul-ree* (not JEW-ler-ee). *MAY-jye* (not MAG-eye or MADJ-eye). *HAY-nus* (not HEE-nus). *SEEJ* (not SEEZH). *EN-klayv, KOO-duh-GRAHSS* (not -GRAH). *MAY-ur-ul* (not may-OR-ul). *fluer-da-LEES* (not LEE). *GON-duh-luh, im-pri-MAH-tur, VEE-uh-kuhl* (not VEE-hik-ul, the *h* is silent).

PART 2. Each word has two or more perfectly acceptable pronunciations.

advertisement. Accent VER or TISE.

adult. AD-ult or uh-DULT.

amenable. Accent MEE or MEN.

angina. an-JYE-nuh or AN-juh-nuh.

apricot. The first syllable may be pronounced AP or APE.

cerebral. SEHR-uh-brul and suh-REE-brul.

conduit. CON-dit, CUN-dit and CON-doo-it.

culinary. KYOO-la-ner-ee and CUL-i-ner-ee.

data. DAY-tuh, DA-tuh and sometimes DAH-tuh.

domicile. DOM-uh-sile, DOM-uh-sil, DOME-uh-sile.

dour. It can rhyme with *poor* or with *sour*.

era. EAR-uh or AIR-uh, but not AY-ruh.

flaccid. FLAK-sid or FLASS-id.

genealogy. jen-ee-AL-uh-jee, jee-nee-AHL-uh-jee, and JEE-nee-AWL-uh-jee.

giblet. JIB-let and GIB-let.

grimace. gri-MACE and GRIM-iss.

harass. HARE-us and huh-RASS.

Hiroshima. Accent RO or SHI.

incognito. in-KOG-nuh-to or in-kog-NEE-to.

inexplicable. Accent EX or PLIC.

inquiry. in-KWAI-ree and IN-kwuh-ree.

lamentable. Accent LAM or MENT.

Moscow. MAHS-coe or MAHS-COW.

presentation. PREZ-en or PREE-zen.

research. Accent RE or SEARCH.

sadist. SAD-ist or SAYD-ist.

schism. SIZ-um or SKIZ-um.

secretive. se-KREET-iv or SEE-kruh-tiv.

status. STAT-us or STAY-tus.

slough. slow, sluff or slew.

For his assistance in preparing this quiz, we'd like to thank Mark Caldwell, professor of English at Fordham University who, as CBS's consultant for the *Guide*, used *The American Heritage Dictionary* as his primary source. We also thank A. Ross Eckler, editor of *Word Ways*, and Willard Espy, author of *Say It My Way*.

LAST WORD

By Terry Runté

"It was as if no one had a will of his own. Everyone dressed the same, ate the same food, talked the same way, attended the same meetings, drove the same cars."

It all started with a shooting star that landed on the Upper West Side of Manhattan one night. The sky glowed with an eerie neon light, and the ground shook. Shortly afterward a whole group of people appeared who began walking around like zombies. But no one noticed because, after all, it was New York, and there were so many of them. But their numbers kept growing. The few normal people left called the invaders Trendies.

Soon the same thing began happening in other cities, like the North Side of Chicago and all of Los Angeles. It was as if no one had a will of his own. Everyone dressed the same, ate the same food, talked the same, attended the same meetings, drove the same cars. This new race of beings was everywhere.

But then something happened. The Trendies began to develop strange ailments, the direct result of their life-style. And for the first time, there was hope.

The first ailment to strike was *BMW wheel burn*, a nonfatal but ultimately crippling condition. Trendy behavior is imprinted by any medium that can plant a message in a Trendy's mind in thirty seconds or less. The Trendies all learned how to drive their expensive German cars by watching expensive German commercials. They also tried to imitate what the racing-car drivers did in the commercials—letting the steering wheel spin through their hands as they careened around corners. Because they always forgot to buy expensive racing gloves, however, the spinning steering wheels abraded the skin from their baby-soft hands.

So what, you say. With their hands rubbed raw from driving BMWs, Trendies were no longer able to play *squash*, which is how they reproduce!

But what about the Trendies who drive domestic cars? Is there nothing that can stop them? Fortunately, there are other afflictions we can count on. Each year thousands of Trendies die of *lime lock*. When they carelessly guzzle a gin and tonic, a Perrier, or a fashionable light beer, many accidentally choke to death on the chunk of lime the Trendy bartender invariably throws into the drink. (Another interesting fact: It has been proved that alcohol has *no* effect on Trendies. It's the lime that gets them drunk.)

Some of the Trendies' dietary habits can be their undoing. In Chicago, for example, Trendies ritualistically eat deep-dish pizza one night and sushi the next. Because Trendies have a primitive nervous system, one similar to that of planaria, they always repeat their mistakes—like biting into a piping-hot pizza the instant it comes out of the oven. This causes *roof scorch*, searing the roofs of their mouths. And the following night, as Trendies eat their sushi, microscopic *sushi worms* bore through the raw, exposed flesh until somehow the little creatures manage to locate the Trendies' undersize, primitive brains, killing them instantly.

Another beverage that is innocuous to the average Earthling but lethal in high doses to Trendies is coffee. Because of their mania for freshly ground coffee, many Trendies purchase exotic gourmet coffee beans and own computerized bean roasters and coffee grinders that have won design awards. What they don't realize is that whenever they grind the beans, they inhale tiny particles of coffee dust and over time develop a condition known as *mocha lung*.

In advanced stages of the disease, mocha-lung victims walk along so permanently wired that even Robert Young can't save them. Their lungs become filled with caffeinated soot, which is continually released into the bloodstream. Consequently, many Trendies succumb to terminal insomnia.

Yet another lethal side effect of the Trendy life-style: *paisley dementia*. It is well documented that Trendies are also obsessed with finely printed luxury fabrics, and there are recorded cases of caffeine crazed individuals falling prey to the hallucination that their paisley-patterned clothing is actually covered with huge paramecia (even though everyone knows paisley patterns are just *pictures* of germs). Trendies so afflicted have been known to swat themselves to death in Liberty of London dressing rooms.

Still other style-conscious Trendies may cripple themselves beyond repair with the clothes they wear. Take the apparently innocuous style of enormous shoulder pads installed in women's clothing. Over the years, as the weight of these pads slowly bears down, they gradually and imperceptibly cause the shoulders to droop downward, which is manifested as a severe case of *shoulder slope*.

Shoulder slope in itself is not harmful, but one day some guy in Paris will suddenly declare shoulder pads obsolete. Female Trendies, accustomed to being shaped like inverted triangles, will then have no place from which to hang their purses—the bags will slide off their sloped shoulders. And without their purses, Trendy women will have no place to keep their lip gloss, without which they die of chapped lips within 24 hours. It's hard to believe, I know, but it's true.

Slowly, one by one, the Trendies will perish, just like the creatures in *The War of the Worlds*, leaving behind a vast wasteland of empty gelato shops. The few who survive will no longer be a threat to the rest of society, having been rendered sterile by their lap-top computers or controlled by their computerized jogging shoes. In time, their invasion will have become a faded memory, just like the foiled "Invasion of the Happy-News Newscasters" of the early Eighties.

Then all we will have to do is figure out how to deal with the Boomboxians. ∞

Terry Runté is a Chicago-based humor writer who drives a BMW with his gloves on.