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**WORLD'S MOST MYSTERIOUS PAPER AIRPLANE:
CUTOUT MODEL INSIDE**

BRAIN PACEMAKERS: PLEASURE ON COMMAND

**PALM READERS AT THE PENTAGON:
WHY THE MILITARY IS SERIOUS ABOUT ESP
MUSEUM OF THE IMPOSSIBLE**



OMNIBUS[®]

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Auriculo and colorful depiction
of the artistic achievement
in psychophysics. Laser beams
take ideas locked deep within
the human brain and etch them
directly onto a metallic plate

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FIRST WORD

By Joyce Milton

● *The self-delusion that set the stage for the Cold War remains. Our generation might yet have its own Rosenberg case* ●

In this age of nuclear anxiety it is sometimes difficult to imagine that less than 40 years ago the creation of the atomic bomb was a source of comfort and reassurance to most Americans. The reason, of course, was that the bomb belonged to us and to us alone. Policy makers and the general public just following World War II vaguely understood that America's nuclear monopoly would end sometime in the indefinite future. But the future seemed far away.

Major General Leslie Groves, the military chief of the Manhattan Project, was able to create the impression that the Soviet Union would be unable to build its own bomb because it lacked fissionable raw material. President Truman expressed a similar opinion. Even though the basic principles of nuclear fission might be known the world over, he said, "American know-how—the technical savvy that had made the bomb's actual construction possible in the Forties—was an unexportable commodity."

American physicists repeatedly made suggestions during this early postwar era that America seize the initiative afforded by its temporary superiority and negotiate an international cooperative agreement. Their pleas went unheeded. America lionized in what nuclear physicist Chester Bernard called the "deadly elation" of atomic supremacy.

When the Soviet Union exploded its own bomb in 1949, the illusion was shattered. The reaction was a stepped-up search for scapegoats—"atomic spies" and communist traitors.

Some of the individuals whom the press branded atom spies during the great spy roundup of 1950 later turned out to have no connection whatsoever to atomic espionage. Two who did, Julius and Ethel Rosenberg, were convicted of what FBI director J. Edgar Hoover termed the crime of the century. The judge who sentenced the Rosenbergs to death went beyond even this. The Rosenbergs, he said, had caused the Korean conflict and bore personal responsibility for the war's 50,000 American casualties, as well as for the deaths of millions who might yet perish in some future Soviet nuclear attack.

The most recent information available confirms that there was indeed a Rosenberg spy ring engaged in the theft of military secrets. That most of the ring's activities were conducted on a fairly amateurish level does not change the fact that Julius Rosenberg, with his wife as his accomplice, was guilty of a serious crime. No doubt the Rosenbergs would happily have given "the secret" of the atomic bomb to the Soviets if it had been in their power to do so. But it was not. The Rosenbergs at best provided backup

for the data the Russians were receiving from a more highly placed spy, Klaus Fuchs, whose name is more important. The overall contribution of spies to the development of the Soviet A-bomb was marginal. Blaming the Rosenbergs for the Soviets' success distracted public attention from the real problem: that the nuclear-arms race would escalate indefinitely unless we could find some sort of political solution.

Today, of course, it is hardly possible to share Harry Truman's smugness about the superiority of American know-how. And while Soviet spies continue to be exposed with some regularity, they no longer seem quite so menacing—perhaps because today's breed of foreign agent is more likely to be motivated by simple greed than ideology. But the self-delusion that set the stage for the spy hysteria of the Cold War years remains very much with us. The belief that our nation's security rests in our ability to keep secrets is more entrenched than ever. And the definition of what is secret keeps expanding. The present administration in Washington, while seeking to pass a law that will phase a lifetime gag rule on public servants, is controversially pushing to broaden the areas of scientific and technical research that come under the rubric of classified information.

The danger is that we will end up keeping secrets only from ourselves. While foreign powers will undoubtedly go on collecting data through illegal channels, using sophisticated computer technology, our own scientists may be hobbled by increasing restrictions on the free exchange of information.

In the meantime we continue to think of the realm of science and technology as a sort of Pandora's box that must be kept closed so that its contents won't be allowed to escape into the world at large. It requires no great leap of imagination to realize that our generation might yet have its own version of the Rosenberg case. It is much more difficult today to envision public figures seriously suggesting that atomic secrets be placed under the control of an international body, such as the United Nations—a proposal that was discussed after World War II. The very idea now seems hopelessly naive and utopian. Today even the idealism among us thinks in terms of freezing the arms race, not ending it.

As for the possibility that the human race might eventually develop the wisdom to control the technology it is smart enough to invent—that seems more elusive than ever. □

Joyce Milton is the coauthor, with Rosalind Redson, of *The Rosenberg File*, recently published by Holt, Rinehart and Winston.

CONTRIBUTORS

OMNIBUS



CLURENT



OATES



HOOPER



MORRIS



SOLOVYOV

For the first time anywhere, *Omnibus* presents detailed plans for a paper airplane that incorporates the extraordinary Kline Fogleman wing. Since its appearance on the CBS program *60 Minutes* in 1973, the wing has received considerable national publicity. But in 1968, when Richard Kline sat down at his kitchen table to make a paper glider for his son, Gary, he had no idea he was about to launch a media event. To the delight of his son, he fashioned a paper bird that soared. It simply would not stall. To his own amazement, he had designed an elegant little craft that defied the laws of aerodynamics.

Until now the inventors, who hold two patents on the wing, have withheld the key information needed to make the plane. In *Fancy Flights*, beginning on page 64, *Omnibus* provides step-by-step plans for two gliders that you can cut out and assemble. In the accompanying text, *Games* editor Scott Morris explains why the wing has baffled aeronautical engineers for the past decade.

This month *NASA* will once again capture the nation's attention with a fancy flight: the most dramatic mission in years. As the shuttle *Columbia* hovers 310 miles above Earth, astronaut George Nelson will amap on a jet-propelled backpack, step outside the mother ship and fly the length of a football field to the broken but orbiting *Solar Max* satellite and its scythelike solar panels. Nelson will attach himself to the satellite, and

Columbia will move in. A robot arm will grab the satellite and bring it into the shuttle's cargo bay for repairs. When the faulty components have been replaced, *Solar Max* will be released again to space.

As veteran space writer James Oberger reports in *Sol Salvation*, on page 46, *NASA* is setting many records with this flight, the first attempt ever to rescue a satellite. The idea of snatching large moving objects from their orbital paths was once the domain only of science fiction, but if the salvage job is successful, this mission will bring us closer to exploring space as profitable territory.

On another frontier, this spring *St. Martin's Press* will publish the book *Mind Wars* by Ronald McRae, former investigative reporter for columnist Jack Anderson. The work is an exposition of U.S. and Soviet research into possible applications of parapsychology in the military: the police, and the intelligence community. McRae describes bizarre covert activities: from Madame Zodiak, a Washington, DC, palm reader who was paid by Naval intelligence to use her psychic powers to predict locations of Soviet submarines; to the military tested the capability of telepathic hypnosis to create real-life Manchurian candidates.

In our excerpt, "Psychic Warfare" (page 58), McRae cites projects funded by our government as part of the secretifying psycho-arms race with the Soviet Union: clairvoyance, low-frequency mind control, and psychotronic weapons.

"Researching the material was especially difficult," McRae says, "because of the controversy surrounding the issues, the arcane technical subjects, and the complete unwillingness of the government to cooperate."

Controversy of a different kind surrounds Robert G. Heath, the subject of this month's interview (page 66). For years the wizard of Tulane University's department of psychiatry and neuroscience in New Orleans, has been treating behavioral problems by inserting electrodes into his patients' brains and supplying a curative trickle of electricity. The technique is seldom mentioned in psychology texts, but it works.

Science writer Judith Hooper reports that Heath is a model of thoughtfulness and charm—"a reflective man who postpones an immediate judgment to consider all the implications."

And last, we highlight an exceptional artist, Andrei Sokolov. Last year the Soviet Union honored him with the title Peoples Artist because of his premier position as chronicler of space. Sokolov, who has never been in orbit, sends his paintings to cosmonauts to critique and then uses their suggestions for his final renderings. Our pictorial, "Circles in Orbit" (page 76) compares Sokolov's originals with his finished versions. Writer Frederick C. Clurent IV, who is responsible for promoting Sokolov's work in the West, spent time with the artist at Star City, the cosmonaut training center. □

DIALOGUE FORUM

Omn welcomes speculation, theories, commentary, dissent, and questions from readers in this open forum. We invite you to use this column to voice your hopes about the future and to contribute to the kind of informal dialogue that generates breakthroughs. Please note that we cannot return submissions and that the opinions expressed here are not necessarily those of the magazine.

I read with great interest Albert Rosenfield's story "Polio Rewisted" [The Body, October 1983]. The controversy between Dr. Salk and Dr. Sabin over their polio vaccines is very important to me. You see, on May 4, 1983, two and one-half weeks after she had received the Sabin oral polio vaccine, my healthy baby girl was stricken with poliomyelitis and was temporarily paralyzed from her neck down. She spent the next two months in an intensive-care unit, struggling to hold onto life. I was shocked to learn that lab reports from the Centers for Disease Control, in Atlanta, confirmed that her polio virus was definitely vaccine-related.

Today my daughter, now ten months old, continues to suffer paralysis in both legs, and her doctors give us little hope that she will ever walk, run, or play as other children do. She was robbed of this ability by a vaccine that was supposed to protect her from this disease!

I am angry that the drug manufacturer and the medical profession continue to produce and administer the vaccine knowing full well that it causes polio in about six to eight children every year.

Most parents are not aware of the risks they take in giving their children the oral polio vaccine. My daughter was the third case this year in the United States, and there have probably been more cases since. As Dr. Salk argues, "Why settle for any?"

Lois Swartzlander
Kansas City, MO

Leslie Epstein, editor of Forum, replies: Although its effectiveness is undeniable, the use of Albert Sabin's oral polio vaccine, the so-called sugar cube

vaccine, is a controversial issue. The vaccine consists of a live-but weakened virus, and it has dramatically reduced the number of cases of polio since its licensing in 1963. But Jonas Salk, one of the vaccine's detractors, argues that it is now the "principal, if not the sole, cause of the disease in the United States."

There is an inherent risk of infection involved in every live-vaccination program. The oral polio vaccine (OPV) is supposed to produce a mild form of the disease to enable the body to develop antibodies and immunity. But because it is an active virus, there is always the possibility that a form of polio will develop in people who have an immunodeficiency problem.

OPV detractors claim that there is no reason to risk any lives when there is an alternative treatment. The Salk vaccine, made from dead virus, prevents polio and cannot cause the disease itself. According to the Centers for Disease Control (CDC), the Salk vaccine is not quite as effective in mass-immunization programs. So the federal health agency recommended in 1963 that the OPV become the vaccine of choice. The CDC determined that the risks of using the OPV did not outweigh the benefits it provided.

Since the Sabin vaccine is ingested orally, instead of being injected into the bloodstream, like the Salk vaccine, OPV goes directly into the intestinal tract, where polio first manifests itself. OPV also provides a lifelong immunity to polio, whereas the Salk vaccine does not. More important, since it is a live virus, it can spread in much the same way as any other virus. The CDC reasoned that if they inoculated 80 percent of the population, another 15 percent might become inoculated simply by coming into contact with someone who has been vaccinated.

Dr. George Rutherford, of the New York City Department of Health, tells Omn that the vaccine virus, similar to the polio virus but genetically altered and nonvirulent, is excreted in the stool. The vaccine can then be spread by the simple act of changing a child's diaper. In other words, the vaccine, like the disease itself, is contagious.

Poliomyelitis, or infantile paralysis, is caused by a virus that enters the body through the mouth and attacks the spinal cord and central nervous system, often leaving its victims partially or totally paralyzed. Before 1950, when Jonas Salk discovered that the isolated virus could be killed with formaldehyde and then used it to prevent the disease, polio claimed 16,000 victims a year. By 1962 only 1,000 cases of polio were being reported yearly. Today there are fewer than 20 cases of vaccine-related polio annually and virtually no naturally occurring cases.

When Albert Sabin's vaccine was developed, it was viewed by many experts in the medical profession as the major breakthrough in the eradication of polio. A drive was started to immunize all school-age children. When cases of vaccine-related polio appeared, drug companies began issuing warnings to doctors. Some of the victims took their cases to court but, in most instances, did not win. In a landmark 1974 decision, the U.S. Court of Appeals ruled in favor of Mary Jane Griffin, who had ingested a dose of defective Sabin vaccine, contracted polio, and been rendered quadriplegic. The court found that the government had been negligent in carrying out safety procedures affecting the specific lot of vaccine from which Griffin's dose came. But when a victim has been determined to have an immunodeficiency and the vaccine is not effective, there is little that can be done legally.

Such cases are rare. But how many are too many? And who has the right to decide the issue? The U.S. Public Health Service judged that the risk to individuals who are immunodeficient did not warrant a change in its immunization program.

The question of a safe and effective polio vaccine has yet to be settled. Research and debate continue at the CDC and at Johns Hopkins University, where the results of a four-year study will be released next year. For now, it is the individual doctor's responsibility to discuss the risks and benefits with parents of potential vaccinees. **OC**

RUINING HERCULANEUM

EARTH

By Peter Rondinone and Kathrine Jason

Walking down the narrow, cobblestone streets of Naples we saw ragged eight-year-old children smoking cigarettes and begging for coins. They told us they smuggled contraband through sewers linking the Bay of Naples to the inner city. Then, in full view of the police, they offered us bargains on Timex watches and rolls of aluminum foil.

But perhaps our hotel clerk best summed up the situation. "In Naples," he said, "it's a true democracy. Everyone does what he wants, especially the government." Most officials, according to the clerk, are too incompetent to preside over even the most basic programs, and political appointments depend more on the right connections than on ability.

"For example," he charged, "every policy to stop the black market, and every program to get children off the streets has failed: even the garbage pickup has failed. That's why Naples has more cholera outbreaks than anywhere, save Africa." Indeed, on the streets at night we noticed that the rats outnumber the

prostitutes. Yet we never imagined that problems such as these would jeopardize one of the most important archaeological finds of the century—the reason we had come here—Herculaneum.

Built on the shore of the Bay of Naples below the cliffs of its famous neighbor Pompeii, Herculaneum was once the Miami Beach of the Roman Empire. Both Pompeii and Herculaneum were destroyed by the volcanic flood of Mount Vesuvius in A.D. 79, but tourists have always preferred Pompeii, legendary for lava mounds of victims long since smothered and turned to dust.

Herculaneum, boasting only a modest display of ancient homes and pathways would have remained a sideshow to Pompeii forever but for an accidental archaeological find. In 1960, when underground springs damaged the site's public bath, the Italian Ministry of Public Works dispatched engineers to install pumps and drain the water. While digging in the mud, workers struck something hard—the skeleton of an ancient Roman lady, gold rings still on her fingers.

Archaeologists were then called in to take over the digging, and months later they found five stone chambers below the baths. Excavating three of the chambers, they discovered dozens of bodies huddled together—mothers curled protectively around children in the last throes of death, and other grisly scenes as well. Still later, the workers uncovered a dazzling array of gem-studded bracelets, money boxes, bronze coins, a soldier's sword, and an overturned boat, its sailor sprawled facedown on the beach clutching his cat.

When the finds were announced in November 1962, there were spectacular claims. Almost all the bones belonged at Pompeii had disintegrated centuries ago, forcing scientists to glean information about ancient Rome mainly from art and artifacts. But the skeletons at Herculaneum—there were more than 120 of them—would give researchers their first chance to study a population of ancient Romans more or less directly.

Intigued by these ancient lives and horrific images of death, we traveled to Italy the following summer in hopes of learning more. We found ourselves on the edge of modern-day Herculaneum, above a great pit where the ruins lay revealed. Within we could see empty houses, a maze of dusty streets, and the public baths. Clutching our cameras, we spoke to a worker who asked if we would like to photograph the bones. We pointed to the ornate sign hanging above the chambers, but the worker made it clear. "For a little donation," he said, "the sign can disappear."

Once inside we saw the skeletons spaced arched upward in agony as if trying to push off the hot ash that had engulfed them. Then we noticed that the bones were labeled red. Why we wondered, hadn't we read about this strange detail in the papers?

Back outside, the worker directed us to the office of Giuseppe Maggi, director of excavations. We found him in Herculaneum's new museum—a cubic structure of white stucco. Gaunt and balding, Maggi had the nervous air of a man



CRITICAL COSMONAUTS

SPACE

By James E. Oberg

The cosmonaut's crew cut was tinged with gray, and his broad face was heavily lined. Georgiy Grechko, who had spent two long orbital-duty tours aboard Salyut space stations, had an urgent message for his countrymen. Last August he told a Soviet television audience: "We know that sights for laser weapons have already been tested on the first shuttle craft, and there are plans to deploy antisatellite systems in space." Grechko aroused grave concern among his compatriots by appealing—"as a cosmonaut and as a father"—to the United States not to darken the skies with space weapons.

The Grechko broadcast signifies a new trend in the official Soviet smear campaign against the American space program. Increasingly, the USSR is recruiting propaganda mouthpieces from the ranks of its most beloved people—its space pilots and engineers. An informed pilot, Grechko knew the charges were counterfactual. It was Russia, not America, that had been testing such orbital weapons as killer satellites. The space shuttle, which together with its crew had become the target of an exceptionally virulent attack from the Soviets, had not tested any weapons.

Camaraderie between astronauts and cosmonauts, which reached its apogee during the Apollo-Soyuz Test Project a decade ago, is in serious decline. In the past it was possible to maintain personal relations fairly independent of diplomatic restraints. But the situation has changed radically since the USSR decided to involve cosmonauts in its intensified propaganda assault. The new campaign includes personal attacks on American astronauts and exaggerated and often entirely false assertions about the alleged militarization of the American manned space program. Obviously these dramatic claims hint that there is a genuine need for a Soviet response.

Such a policy was reflected in a statement attributed to General Vladimir Shatalov, three-time spaceflight veteran and commander of the Soviet space-pilot corps. Shortly before the first space-

shuttle mission, Shatalov said: "We Soviet people, particularly cosmonauts, are pained to hear that some people in the United States are trying to use space technology for military purposes." In turn, Western experts were pained by the cosmic scale of Shatalov's hypocrisy, considering the massive scope of Soviet military activities in space, which include orbital weapons testing—an activity the United States currently avoids.

The shuttle, in particular, has drawn verbal flak. Shortly before the first launch of the Columbus, in April 1981, the Soviet press voiced concern over the background of copilot Robert Crippen. He was "a representative of a new profession—military astronauts," warned the Tass news agency. The inclusion in the crew of a specialist of this type is added evidence of the big attention shown by the Pentagon," Tass continued. Yet a look at Crippen's past reveals almost no evidence to support the Soviet charges. Apparently the comment was based merely on his participation, 12 years before, in the Air Force's Manned

Orbiting Laboratory (MOL), a program that was eventually canceled.

Another space-shuttle astronaut who has been singled out as a villain by the Soviet press is Jack Louma, commander of the third shuttle mission and a veteran of the 1973 Skylab program. Louma, who has since retired from spaceflight, was quoted as having approved the development of the United States' antisatellite missile system. In an interview, Louma had, in fact, backed such a move—but only under the condition that this country first be provoked by the Soviet killer-satellite program. The Novosti news-agency writer who reported the comment pretended to be horrified (while carefully omitting any reference to the Soviet killer satellite, a program whose existence Moscow officially denies): "How can a space pilot say such an irresponsible thing? The Russian demanded. And he's a mission commander, too!"

The most dangerous astronauts so far, if the Soviet-bloc media are to be believed, are Ken Mattingly and Hank Hartsfield, of the Department of Defense's STS-4 mission, conducted in mid-1982. During the mission's seven days in orbit, the Soviet press raised alarm over the laser weapons the astronauts were supposedly testing in space. (They weren't.) Their "warmongering cargo of destruction and death" was compared with "purely peaceful" Soviet space activities. The Soviet press neglected to mention that Russia had tested a killer satellite only a few weeks before the shuttle's fourth flight.

In contrast, Soviet cosmonauts have been repeatedly trotted out to testify to their love of peace and to their opposition to American space activities. Cosmonaut Aleksey Leonov, speaking at the launching of a trio of Soviet space pilots in April 1983, pontificated: "The Soviet space program has always been aimed at resolving peaceful scientific and national economic tasks. I, who participated in the Soyuz-Apollo program, will remember meeting U.S. scientists and astronauts. During the meetings, the



Cosmonauts' new Russian propaganda

cosmonauts on page 101

MONKEY AIDS

LIFE

By Tom Gauntt

For 11 years now Dr. Roy Henrickson's patients have been dying painful, inexplicable deaths. "I know them all as individuals," he says. "I watched them grow up." The course of death seems to be related to Acquired Immune Deficiency Syndrome (AIDS)—the strange killer that primarily strikes homosexual men and drug addicts.

But Dr. Henrickson's patients aren't humans. They're monkeys, residents of the California Primate Research Center, in Davis, where Henrickson is a clinical veterinarian. He, along with a group of other researchers from various primate centers and the National Institutes of Health, is trying to unravel the puzzling simian counterpart to AIDS. Conceivably such research will reveal important clues about the causes of, and cures for, the disease that has already killed nearly 1,500 people.

Studies at several research centers in Texas are under way to transfer plasma and tissue from human AIDS victims to chimpanzees and rhesus monkeys. At the Davis primate center, researchers

have successfully transmitted the disease from afflicted monkeys to a number of healthy simians. "We've demonstrated that it is a filterable agent, probably a virus," Henrickson says. Both the Davis group and researchers at the New England Regional Primate Center have managed to isolate the D retrovirus (a relative of the human T-cell leukemia virus, which some scientists believe may cause AIDS) and have inoculated healthy monkeys with it. If what they suspect is true, those monkeys will soon be showing symptoms of SAIDS (simian AIDS).

When the center's monkeys first started exhibiting symptoms of the disease 11 years ago, AIDS was still an undiagnosed assailant. Initially, Henrickson suspected that the center's less-than-perfect location (it's built on top of an old isotope dump) might be causing the deaths. But then, in the late Seventies, a major outbreak of the disease claimed an alarming number of monkeys at Davis and at the primate center in New England. "It was very frustrating and bothersome," says Henrickson. "All of us who work with the

animals develop a strong empathy with, and feeling for, them."

As AIDS began to gain attention—first in medical circles and later in the media—Henrickson and other primate researchers began to realize what had been afflicting their colonies. The monkeys' symptoms were remarkably similar to those of AIDS victims, and the relentless courses of the two diseases seemed to parallel each other.

Still, there were differences. Simian AIDS seems to afflict mainly the young, both male and female, and male homosexuality, the common thread connecting most AIDS victims, is unknown among monkeys. Although most male monkeys do exhibit mounting behavior, this is a means of demonstrating social dominance and is not sexual in nature. Male rhesus monkeys, however, like certain groups of homosexuals, are frequently promiscuous, a similarity that is being investigated. "Once we establish the agent of transmission," explains Henrickson, "we can see whether it's in semen or saliva or both." (The monkeys bite one another frequently.)

Even if the infecting agent is isolated, one question about both AIDS and SAIDS will remain: Where did the diseases come from? Henrickson is tracking down primate-center records to check the origin of monkeys that came to Davis just before the first outbreak. He believes the disease may have been carried by Central African monkeys and notes that Kaposi's sarcoma (one of the cancers common in both AIDS and SAIDS) is a major cause of death among young men in Uganda.

The more hard facts researchers learn about SAIDS, the closer they may come to understanding its human counterpart. But Henrickson feels the SAIDS research is important in its own right. Some of the afflicted species of monkeys are endangered in the wild and thrive only in captive colonies, where diseases can ravage a population. "If the disease were to get into a closed population like the San Diego Zoo," says Henrickson, "it would be devastating." □



A disease that parallels AIDS has been causing inexplicable deaths among young monkeys.

MUSIC MEDICINE

MIND

By Robert Brody

As Dorothy Anderson lay stricken with advanced cancer, one leg paralyzed, her face pink from radiotherapy, Lucienne Magill Bailey played guitar and sang songs in a sweet mezzo-soprano, sequencing from "Country Roads" to "Day (by Day)" to "Here Comes the Sun." Then, with Bailey strumming along and swaying in her seat, Anderson created lyrics for her own song, called "Come to the Ocean with Me."

"Hear the waves roar," the sixty-year-old Californian sang. "Feel the mist of the water. Watch the floating clouds." She leaned back, closed her eyes, and, in a moment of transport, sang, "I feel like a bird in flight," while she raised and lowered her arms in winglike fashion.

"This song is about the movement I no longer have," Anderson said, beginning to cry. Briefly, she wiped her nose and smiled. "The music helps me feel free."

Helping cancer patients lose themselves from anxiety, pain, depression and isolation is what Lucienne Bailey does for a living. She is a full-time music therapist at Memorial Sloan-Kettering Cancer Center, in New York City. Wheeking a cart bearing her guitar, music books, song sheets, and hand instruments, she moves from one room to the next, visiting patients referred to her by doctors, nurses, and social workers under this center's new supportive-care program.

Like most professional music therapists, Bailey is skilled in reading the moods of patients and can tailor the lyrics, tempos, and rhythms of her songs accordingly. Her repertoire is intended to ease discomfort, minimize fear, and inspire hope. Still, the music is meant not as some kind of cure-all but rather as a means of encouraging patients to tap into—and express—whatever emotions they might feel at the moment.

Doctors worldwide are gradually discovering that music therapy—the systematic application of rhythm, melody, harmony, tone, and pitch—has vast potential to influence and benefit both mind and body. As an adjunct to traditional treatments, music can be valuable therapy for physical conditions ranging

from insomnia, headaches, and nervous disorders to drug addiction.

Researchers have already shown that music can act as a potent tranquilizer. In one study, at the Duszynski-Hadroy Medical Center in Poland, 408 patients suffering from severe headaches and painful neurological diseases were split into two groups. One group listened to periodic 20-minute doses of symphonic music; the other group of patients did not. After six months the music listeners needed significantly fewer sedatives and analgesics than the control group did. And at the Royal Victoria Hospital, in Montreal, music therapist Susan Munro has spent years playing music to the terminally ill to help them accept their situations. Some of these patients are so soothed by Munro's flute playing and tape recordings of folk songs that they can be taken off painkillers altogether.

Music therapy is also showing promise in treating addictions. One patient who benefited is Gregory Barnes (not his real name), a thirty-three-year-old Brooklyn insurance salesman. Strained by insomnia

and a recent divorce, he drank himself into a stupor every night and was so hung over every morning that in one year he missed 42 days of work.

Enter Dr. Jean-Robert Leonidas, musician and clinical instructor in medicine at the State University of New York Downstate Medical Center, in Brooklyn. He prescribed that Barnes listen intently to classical music for 20 minutes every night before retiring. Dr. Leonidas instructed him to keep his eyes closed and to breathe in a measured fashion. "I concentrate on the music until I start to go blank and become sleepy," Barnes says. In so doing, he has overcome his insomnia and stopped his drinking.

For now, music therapy is most widely accepted as a treatment for psychiatric disorders—a way to pry open the subconscious. A study conducted in England showed that mental patients in a hospital wing adjacent to a chapel whose daily hymn singing was heard happened to recover faster than those in a distant wing. At Temple University, in Philadelphia, music-therapy professor Kenneth Bruscia well remembers just how powerfully music affected an institutionalized psychotic woman he counseled a few years ago. At first she never spoke with anyone, but singing in sessions—especially "You'll Never Walk Alone" and "Hello Dolly"—became a catharsis for her. Through the subliminal pull of music, she soon began sharing with Bruscia her innermost dreams and thoughts.

And at the University of Kansas Medical Center, in Kansas City, music therapy figures in a more benign setting—the delivery room. Under a five-year-old program, women in the last six weeks of pregnancy spend six hours with therapists and select music for a personal tape recording to play when they are learning breathing-relaxation exercises. This unique approach routinely lowers the amount of anesthesia required and shortens labor. One expectant mother went without an anesthetic even when the doctor used forceps during the birth. Another sang throughout her delivery.

One beneficiary of this type of music



WIND PROBE

BREAKTHROUGHS

By Richard Wakimir

The blinking laser eyes on a new satellite will be able to see what meteorologists cannot: which way the wind is blowing.

National Oceanic and Atmospheric Administration (NOAA) officials say their new branchchild—the high-tech equivalent of a moistened finger in the breeze—should make air travel cheaper, shipping safer, and the chances for rain on your picnic slimmer. That is because the satellite will map the world's winds, keys to global weather.

Right now, gathering wind data is a hit-and-miss affair. Every 12 hours, more than 500 weather balloons in various locations around the world drift up toward the stratosphere, radiating their positions as the winds puff them this way and that. They report continental winds extensively, but provide few clues about oceanic winds. For maritime-wind reports, meteorologists depend on airline pilots who fly the long ocean expanses. In addition, sensing stations track local, low-altitude winds, and satellites snap pictures of scudding clouds. In cloudless

regions, however, winds are invisible.

Pacing together data from all these sources, meteorologists try to map global wind patterns. But many areas, particularly over the oceans, are blanks. As a result, meteorologists are not good at making long-range forecasts; their crystal balls become misty when they try to predict next week's weather. They believe Windstar, the proposed satellite, would dramatically extend their vision. The satellite, designed at RCA's Commercial Communication System Laboratories, will shoot two laser pulses per second into the atmosphere. These infrared beams, bumping into windborne dust and pollen, will bounce back to the satellite, enabling sensors to compute the wind's speed and direction. The beams will be able to probe winds at 15 different altitudes.

NOAA scientists have already measured winds as far up as 90,000 feet, using ground-based infrared beams.

Researchers are positive that a satellite could be even more effective. The only major questions are whether winds carry

sufficient dust and pollen to give the lasers targets to track and whether engineers can develop a laser that works in space. That laser must also be sufficiently long-lived to justify the satellite's \$154 million price tag, which includes installation in a modified Ticos-N, the current weather orbiter.

Finding the dollars will be as challenging as developing the technology—the Reagan administration already has announced its inclination to sell off all federal weather satellites to private industry. And Windstar, as NOAA's Freeman Hall told reporters, "would be the most sophisticated—and expensive—weather sensor ever put on a satellite."

Yet, NASA officials are partially funding Windstar, which they hope will begin orbit in about 15 years. As meteorologists from both NASA and NOAA point out, the satellite could have a big payoff.

Consider the airlines. NOAA scientists predict that, with Windstar providing more detailed global data on the speed and direction of upper-atmosphere winds, they could give airline pilots sophisticated flight paths, enabling them to avoid head winds and exploit tail winds. That could cut worldwide airline fuel consumption by \$1 billion a year. Annual savings in the United States alone would be \$200 million.

Ships, too, would benefit. Today's marine-weather reports are iffy because meteorologists have little data on the patterns of winds over the open sea. With Windstar, meteorologists could give skippers advance warning of storms in their paths. And if the large sailing ship indeed makes a comeback in a modern, computer-informed form, as some shipping experts predict, Windstar could help these modern clippers maximize their speeds.

Meanwhile, meteorologists are convinced that, in order to generate accurate long-range forecasts, they must know how the world's winds are blowing. And they argue that this new orbiter, with its blinking infrared lasers, would give them what they need: a Zeus-eye view of the atmosphere's ruffs and puffs. **CC**



A proposed satellite would allow meteorologists to measure which way the wind is blowing.

SUPERMASSIVE STARS

By Derral Mulholland

At the 1939 dedication of the McDonald Observatory in Texas, Otto Struve, a brilliant astrophysicist and the observatory's founder posed a question to astronomers: "Why are there no stars with greater than one hundred times the mass of the sun?" Now astronomers think they know the answer. They also think that Struve's question wasn't quite right. What he should have asked was, "Why are there almost no stars greater than one hundred times the mass of the sun?"

There has appeared a new class of objects, called supermassive stars, that are coming into greater prominence in both observational and theoretical astronomy. There aren't very many of these objects, but they are out there despite the fact that conventional theories of star formation and evolution cannot explain them. A good example is R136a, an obscure star beyond the edge of the Milky Way Galaxy. In 1981 the International Ultraviolet Explorer (IUE) satellite turned its eye on a clump of dust and gas called the 30 Doradus nebula. A

fuzzy patch of light located in the Large Magellanic Cloud, one of three galaxies (the Large, the Small, and the recently discovered Mini-Magellanic Cloud) that orbit the Milky Way.

When the data from IUE were analyzed they showed that the brightest star in the nebula, R136a, was as luminous as 1,000 ordinary stars or several dozen of the very hottest stars. Since the light was coming from a very small space, the astronomers concluded that they had probably found a superlarge star some 3,000 times as massive as our sun.

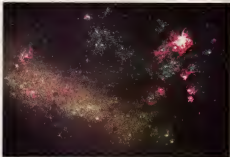
The second example of a supermassive star appeared in connection with a new model of quasars proposed by University of Texas astrophysicist Greg Shields. Quasars, or quasi-stellar objects, have been puzzling scientists for two decades. Shields's model suggests that a quasar is a single, enormous star, with gaseous jets that spew particles from its surface, which then fall back, creating a sort of aurora. Shields is only mildly distressed that his calculations require such a star be some 10 billion solar masses large.

It doesn't matter whether the number of solar masses is 3,000 or 10 trillion; classical stellar theory precludes stars this large. Yet everybody believes Shields's theory is correct, and almost no one recoils at the idea of such enormous stars. What's going on here? Are astronomers crazy or worse...illogical?

As with so many notions in the bizarre world of astronomy, the answer is simply that we have encountered yet another example of the wonderful universe of Albert Einstein. The classical theory of stellar behavior does not take relativity into account. According to purely Newtonian physics, any star larger than 60 solar masses will collapse or explode. But, in the universe of Einsteinian physics, even more massive stars are possible. These stars may be 1,000 to 1 billion solar masses large. And if they happen to be rotating rapidly, their masses can be even larger. Such a star is called supermassive.

One aspect of Newtonian physics still applies to supermassives. The larger the star, the shorter its life span. R136a, for example, is about 100,000 years old and has a life expectancy of 1 million years. Compare that with our sun, which has been around about 5 billion years and has at least that much longer to go.

Shields's quasar model is still just a hypothesis, but the likelihood that R136a is a supermassive star is quite another story. At the California Institute of Technology, astronomer Alan Moffett has detected variations in the radio brightness of the object, suggesting there is indeed a single star in R136a's location. Optical surveys done at the Cerro Tololo Inter-American Observatory in Chile show that R136a's peculiar spectrum is consistent with a star of 2,000 to 3,000 solar masses. Noting the similarity of R136a's spectrum to those of the brightest stars in a nearby galaxy, astronomers Dennis Ebbots, of the Space Telescope Institute at Johns Hopkins University in Baltimore, Maryland, and Peter Conti, of the University of Colorado, have concluded that R136a "may be the brightest and nearest of an exciting new class of stellar objects." □



The Large Magellanic Cloud. Deep in its interior lurks one of the monster stars of the universe.

SMART TV

ARTIFICIAL INTELLIGENCE

By Len Hiltz

You are watching the summer Olympics of 1988. The TV cameras follow the breathtaking finish of the 1,500-meter run as three athletes sprint abreast down the stretch. Just as they reach the tape, you hit the **FREEZE** button on your remote-control handset. Then you touch **PAUSE**, and the picture beside your TV starts chattering.

Without waiting for an instant replay, you recall the frozen picture—now stored in the TV's memory—to the screen and see an unparalleled sports-action photo of a historic finish. A few minutes later the printer finishes its reproduction of the picture, and you have a permanent record of the great event.

This little scenario is possible because your 1988 TV set belongs to the new "third generation" of television. First there was black and white. Then there was color. And now television has gone digital. It has evolved from an analog device into a digital computer with a monitor. As a result, it can do dozens of things never before possible. And every year, the

TV-computer acts smarter and is more responsive to viewers' interests.

Some of the new capabilities, in addition to freeze-framing and printing, include ghost-free images; a fantastically sharp picture; thanks to a screen with twice as many lines of resolution as today's TVs, self-diagnosis of malfunctions; constant automatic upgrading of color quality; handset-controlled zoom; and a second picture inset into one corner of the screen so you can watch one program while monitoring another. Overall, the technology means viewers can be more active participants in the shows they watch.

You won't have to wait until 1988 for digital TV to arrive. Major manufacturers such as Zenith, GE, and Sony are expected to market sets with digital circuitry before the end of this year. No one knows which features will be on the first digital sets, but manufacturers won't need more than a few years to produce a whole new kind of TV.

In a way, digital TV began in the late 1960s, when our astronauts relayed

photographs from the moon. Most people were impressed by the quality of these pictures but didn't question how they were sent. After all, we had had Wespphotos for a long time, and the electronic transmission of photographs didn't seem all that unusual. But in fact, the beaming of pictures from the moon was a sophisticated exercise in digital electronics. The pictures were broken down, dot by dot, into binary code and sent to Earth as a stream of 0's and 1's.

Here, the code was translated, line by line, back into a picture. The digitizer doing the work took its reference points from the code, then thoughtfully interpolated more lines and dots to fill the gaps in the picture, giving it better detail than a standard TV would.

Designers of TVs began to adopt digital circuits shortly after that. The first use came in remote control units, which replaced older mechanical systems and made computerized channel selection possible. Then Zenith eliminated the old horizontal and vertical hold controls, replacing them with a digital circuit to do the job automatically.

In 1984 we'll see a quantum leap in the analog-to-digital evolution, as digital control is extended to the processing of the TV picture itself. It will be possible, thanks to VLSI (very large scale integration) chips developed by ITT Semiconductors in a research project that lasted more than five years.

These chips are a kind of signal-processing factory inside the TV set. The analog signal transmitted by a television station is received by the TV's antenna and relayed into the set, where it is broken up into a digital signal by the VLSI chips. Once the signal is in digital form, it can be processed in many ways. First, it can be cleaned up by removing the noise and clutter that could cause ghosts on the screen. Then it can be enhanced by scan conversion, the addition of more lines. The pictures generated by television receivers in North America comprise 525 horizontal lines. An additional line between each existing line can be inter-



Freeze-framing, self-diagnosis, zooming in on command—it's all possible with new TV circuitry.

PIGEON POSSES

EXPLORATIONS

By Odean Cusack

For Baron Arnaud de Rosnay, world-class wind surfer and, some say, daredevil outboard-skier, participating in a Coast Guard helicopter search-and-rescue effort is the consummate role reversal. In his quest for world records, the innovative adventurer, who once wind surfed the treacherous Bering Strait, between Alaska and Siberia, has been at the receiving end of rescue missions more times than he would care to remember. Once, in the South Pacific, he was stranded for 12 endless and frustrating days before he was finally found. "I could see the search helicopter circle over me many times," he recalls, "but they couldn't see me."

From his new vantage point, in a Coast Guard helicopter, De Rosnay can easily understand why. At an altitude of 170 meters, the waters of Kaneohe Bay, off the Hawaiian island of Oahu, are unending shades of blue interrupted only by the whitecaps of breaking waves. Even to the copier's crew—experts trained in aerial reconnaissance—a speck of international orange, which signifies the life jacket of

a survivor stranded at sea, will often be swallowed up in the expanse. Suddenly, De Rosnay spots the A light flashing on the control panel. Something has been sighted. In short sequence, the C light flashes, and the pilot is able to zoom in toward the direction indicated. As the craft descends, De Rosnay swings part of his body out the door to get a better view. "I finally see it," he says. "It looks like a pinhead in the immense blue."

This time, the "survivor" is an orange buoy, a preplaced target that approximates the visual surface of a life jacket. This light is one of many tests being conducted to determine the utility of Sea Hunt, a new search-and-rescue system. What makes Sea Hunt extraordinary is its diminutive spotting crew: three specially trained, but nonetheless ordinary pigeons. These sentinels can spot the target an impressive 80 percent of the time on a first pass, a vast improvement over the 40 percent success rate of humans.

Search-and-rescue operations are, by their very nature, near-impossible missions. Helicopter crews often must

search vast expanses of ocean, looking for lost objects or personnel," explains naval scientist James Simmons, inventor of the Sea Hunt system. "Limited fields of view and such optical problems as sun glare make objects on the ocean surface difficult to see. Search effectiveness is further reduced by competing duties, such as having to plot or navigate the aircraft, and by the loss of concentration that flight crews experience over an extended time period."

Pigeons, however, by virtue of their retinal structure and behavioral proclivities, are ideally suited to the task. The bird's brain is able to rapidly process a much larger proportion of the visual field than humans can. Furthermore, pigeons remain vigilant during tedious and repetitious tasks long after their distractible human counterparts have become fatigued and lost their concentration. "Pigeons are ideal subjects," says Simmons, "because they are common, domesticated, highly adaptive, easy to train and maintain, and have a life expectancy of more than ten years. As a result, Sea Hunt has an increased search-detection capability that operates best when conditions are the worst for people—just when it is needed."

The system is remarkably simple. The pigeons, in separate chambers angled 120° apart from one another, are securely based in a comfortable compartment that fits on the underside of the aircraft. Since the visual field for each bird is approximately 200°, their viewing angles overlap. Trained to distinguish red, yellow, and orange, the birds pick at a response key when they sight a target, thus activating visible and audible signals in the pilot's compartment. The visual signal consists of a flashing light for each pigeon, indicating the direction in which to concentrate the search until the human crew can confirm that the detected object is the one sought.

The project required time to develop, of course. The first use of Sea Hunt ended in tragedy. In February 1979 Simmons and his team were called in to search for five men missing from a fishing boat, presumably somewhere between Maui



Be kind to the lovely pigeon. One day it may save you from a watery demise.



CONTINUUM

SPACE-STATION POLITICS

President Reagan recently declared his intention to fund a permanent manned space station. The announcement made this past January in the State of the Union message, represents a landmark for NASA—as well as a challenge to Democratic candidate John Glenn. According to news reports, White House advisers had urged Reagan to approve plans for the multibillion-dollar station so as to upstage the former astronaut.

Some of Reagan's political doyens apparently saw Glenn as the most formidable Democratic threat to their boss's chance of winning a second term in office. Glenn is widely known to voters as the first astronaut to orbit the earth, and his image as a great American hero is being deployed by his advisers as one of his primary qualifications for the Oval Office. Glenn's first television commercial paid almost no attention to the Ohioan's nine years in the Senate, concentrating instead on his space-related "vision of the future," which, according to media adviser David Sawyer, will "very precisely define the theme and message" of Glenn's campaign.

Glenn's already exalted public profile was further raised, some believed, by the movie *The Right Stuff*, which *The Washington Post* called a "television-length ad" for the Senator's candidacy. Indeed, the movie portrays Glenn as a strong leader—an almost aseptic patrol who brims with pride, integrity, compassion, and clean-cut American vigor.

And what's more, the ad seems to be working. A study conducted by George Washington University researcher William C. Adams showed that at least one third of 650 Washington-area moviegoers who saw the film had a "mixed opinion" of Glenn as a strong presidential candidate. Although the movie "probably won't put Glenn into presidential orbit," Adams concludes, "it's an unmistakable boost."

All of which had at least some of the President's men yearning to take the offensive in this new and decidedly earthbound space race. The best way to capitalize on some of Glenn's "space glamour," they reasoned, was to jerk outer space from under the ex-astronaut's platform. They hoped to accomplish this by putting the President squarely behind the construction of a permanent space station, which Reagan is billing as man's next great step into the future.

Obviously, the President heeded this advice. Even so, he has had to face stiff opposition from both government and science. The permanent station, which would begin operation in 1991 or 1992, is expected to cost between \$6 billion and \$8 billion, and Democratic Congressman Tom Harkin, of Iowa, is already asking where the money is coming from.

So are a majority of the members of the Senior Interagency Group on Space (SIGS), a team of government officials hailing from NASA, the Office of Management and Budget (OMB), the Department of Defense, the Central Intelligence Agency (CIA), and the Department of Commerce.

Of all the SIGS agencies, the OMB has been most vocal in expressing its opposition to the station. "It's extremely simplistic," says one agency official. "We face two hundred billion dollars in deficits as far as the eye can see. The space station is ultimately a very expensive proposal."

Although the Pentagon and the CIA decline public comment, news reports indicate that both agencies are opposed because the money spent on the station will ultimately reduce their share of the budgetary pie. The National Academy of Sciences' Space Science Group has reported that while a permanent space station could prove useful in the twenty-first century, most of the experiments and missions planned for the next 20 years can be adequately handled by such vehicles as the shuttle and various unmanned satellites.

The only SIGS agencies to say yes are the Department of Commerce and NASA. Commerce likes the economics of manufacturing drugs and metal alloys in zero-gravity environments (Fairchild Industries has already received a NASA contract to build an experimental manufacturing platform), and NASA contends that improvements in such operations as satellite repairs, intelligence, and TV broadcasting make the permanent station not only attractive but essential.

In the end, though, factors outside politics and progress may have had the most impact on the President's decision. Like most occupants of the Oval Office, Reagan is concerned with his place in history. He recalls pugnantly—and perhaps with some envy—John F. Kennedy's 1961 commitment to land a man on the moon by 1970. "What," Reagan recently asked his staff, "will we be remembered for?"—BILL LAMREN



CONTINUUM

MUSICAL TYPES

A fine-tuned orchestra can sound like a single musician playing a single instrument. But when it comes to assessing one another's personalities, musicians may be just as factionalized as any other large group.

Psychologist Jack Lipton,

In general, Lipton says "People were positive in describing their own sections, particularly the brass players, who saw themselves as confident, gregarious, and even hell-raising. Woodwinds tended to describe themselves as 'sensitive individuals' with a 'cool sense of humor' and the percussionists' self-

them "fun," "confident" and even "sexy." But the feeling was not mutual. As far as the drummers were concerned, string players were "stuffy, competitive prima donnas."

Undoubtedly the worst blood in the orchestra was between the strings and the brass. The horn players saw the violinists as "frustrated, snobbish, chicken-shit wimps." And the string players viewed all the horn players—from trumpet leaders to tuba players—as "bassholes."

"If thou follow thy star, thou canst not fail of glorious heaven."

—Dante

LIVING LENSES

The invention of the contact lens literally opened new vistas for people who either could not or would not wear glasses. But until recently there was still a subgroup of eye patients—babies, people with dry eyes, and some postmenopausal women—who couldn't take advantage of even the most sophisticated contact-lens technology. Now researchers at Louisiana State University (LSU) can offer good vision to many of these unhappy patients with the help of living corneas.

Perfected by LSU ophthalmologist Herbert Kaufman, the procedure involves using parts of a donated cornea to replace the patient's own focusing mechanism in the eye. First, the donor cornea is treated



The latest contact lenses are made from human corneas.

to restore its water balance. Next, the tissue is delivered to a special machine called a cryolathe which freezes the cornea to -70°C and then shapes and focuses the lens—with the help of a computer—until it exactly matches the patient's own prescription.

In a simple operation, the outer cells of the patient's eyes are rubbed off with a cotton swab, and the new "living lens" is sewn on. The healing process takes about seven weeks, and the lens can be removed in the doctor's office if it should become necessary.

According to LSU surgeon Marguerite McDonald, the 250 patients who have thus far undergone the procedure include the near-sighted, the far-sighted, infants, cataract sufferers, and one commercial pilot who was on the verge of losing his job because of extreme myopia. So far there have been no reported cases of biological rejection.

—Bill Lawren

"We are only cave-men who have lost their cave."

—Christopher Morley



An imperfect analogy of snobbish, uptight violinists, wimpy woodwinds, party-loving infantile drummers, and "bassholes."

of Union College, in Schenectady, New York—emailed a bassist—recently completed a personality inventory of the members of 11 symphony orchestras, including Philadelphia in Los Angeles, Boston, and Calgary. Musicians from each of the orchestra's four major sections (strings, brass, woodwinds, and percussion) were first asked to rate themselves for such characteristics as security, competitiveness and athleticism. They were then asked to describe musicians in other sections.

Image was "reliable," "fundamental," and "sexually active." The only group to describe itself negatively was the strings, who admitted to being "competitive," "neurotic," and "insecure."

But the real fun began when the musicians were asked to describe one another. Woodwinds, for example, saw percussionists as "unintelligent and immature, but fun at parties." Percussionists despised woodwinds as "wimpy, inverted women." Strings seemed to like the percussionists well enough, calling

SCHOOL FOR ELEPHANTS

Not only are elephants smart and endowed with splendid memories, in northern Thailand they're even sent to school. Three-year-old elephants at the Forest Industries Organization training school, near Lampang, are separated from their mothers to begin six years of lessons in hauling timber from the jungle, explains school director Cha-um Kurwudhi. And their first instructor is a forty-eight-year-old witch doctor, who casts things off on the right foot with offerings to the spirits.

"The witch doctor is the only one who knows how to tame the elephants," Cha-um notes. While the mother elephant is led to the far side of the mountain to graze, the witch doctor's chants seem to penetrate the psyche of the baby.



Elephants have a 50-year career and retire in style.

elephant so deeply that trainers (mahouts) can take over after two or three days.

The mahout begins each morning perched atop the elephant's neck, Cha-um says. By means of shouts and stick prods behind the ear, the pupil learns such tasks as dragging teak logs with a chain harness, pushing logs with feet and trunk, log raising with tusks, and log stacking with trunk and feet. He also learns to pick up the mahout's training stick and raise one front leg, creating a handy step for the trainer to mount. Afternoons are spent grazing in the forest for the hundreds of pounds of leaves an elephant must consume daily to survive.

Elephant school is followed by 50 years of logging in deep jungles inaccessible to trucks. Each animal has two mahouts, so that if one dies, a female human carries on. After they retire, elephants spend the rest of their days—the next 30 to 50 years—grazing leafy in the forest, but their mahouts still check in on them twice a week.

—Ben Barber

"He hadn't a single redeeming vice."

—Oscar Wilde

SUICIDE ON THE FLIGHT PATH

People who live under flight paths near major airports are more likely to be murdered, commit suicide, or die of heart attacks or strokes, according to

UCLA researchers who studied two Los Angeles neighborhoods.

Aerotoxicologist engineer William Meecham and Neil Shaw, his research associate, compared death statistics from two socio-economically similar areas for 1970 through 1977, and they found some startling differences.

the airport were double those for people in the control area. All age groups living in the test area had higher mortality rates caused by cardiovascular disease and violence, Meecham adds, though not all of the differences were statistically significant.

What can be done to reduce this life-threatening



Coffee, tea, or an artery grave? The thunder of a T47 over your family region may lead to suicide, murder, or fatal heart disease.

In the area directly under Los Angeles International Airport's landing pattern, there were 60 percent more violent deaths caused by homicide, suicide, and accidents among people seventy-five years of age and older.

Similarly, they discovered that the death rate due to cardiovascular disease within that age group was 18 percent higher than that of people living in an adjacent but less noisy area. Suicide rates for residents forty-five to fifty-four years of age living near

ing cacophony?

Meecham says the long-term solution is to move the airport out of the center of the city and into the country, but he doesn't believe that will happen. He suggests that since most of the noise results when planes land, the problem might be ameliorated if flights approached from the ocean rather than from the city.—Joel Schwarz

"There's a divinity that shapes our ends/Rough-hew them how we will."

—William Shakespeare



CONTINUUM

UMPIRE VISION

"Strike three—you're out," yells the baseball umpire as he dispatches a disgruntled batter to the dugout. From the stands comes the jeer of an angry fan: "You're blind, ump!"

Well, the umpire isn't blind. But he may need a new pair of glasses, according to Philadelphia optometrist Arthur Seiderman who examined a random sampling of umpires and referees at college, high school, and other amateur sports events.

Of the 40 umpires and referees tested, just 29 demonstrated 20/20 vision or better. And 12 of the 40 had difficulty with depth perception (discerning the distance of an object) and spatial localization

(judging an object's movement through space).

"All umpires and referees should have eye examinations," Seiderman recommends, "and if they can't pass, they should be required to take steps necessary so they can."

Such steps might involve eye exercises to improve depth perception and spatial localization, Seiderman says. Otherwise, eye-glasses or contact lenses should be mandatory.

—Eric Meshana

"We would not have conquered Germany without the automobile, without the airplane, without the loud-speaker."

—Adolf Hitler

THE FOREST THE DAY AFTER

If the damage caused by radiation were reversible, reckoned ecologist Frank McCormick, there might be hope for survival after nuclear war. With that

thought in mind, he used a potent gamma-ray machine to irradiate a Georgia pine forest and returned every so often to monitor the results. As expected, plants closest to the machine browned and died almost instantly, while those farther away died after two or three days. But in the five years that followed there were definite signs of recovery. Dead trees were replaced by seedlings, and plants began to grow. The obvious implication: A pine forest would eventually revitalize itself, "even if exposed to

radiation that could kill everything."

This year, nearly two decades after beginning his experiment, McCormick returned, expecting to see a forest reborn. Instead he found a few seedlings and some vines sprawled along the forest floor. His disturbing realization: Contrary to his original conclusion, a forest exposed to nuclear fallout might per-

To learn the cause of the devastation, McCormick has recently asked the Department of Energy to help him study the long-term effects on a variety of sites irradiated during the Sixties. "Answers obviously can't be gleaned," he says, "in an ecologically short period of time."

Moreover, he adds, the subzero temperatures and the darkness predicted



We knew thermonuclear radiation was bad for trees and other living things. Now it seems the forests may never recuperate.

manently succumb.

McCormick, now director of graduate studies in ecology at the University of Tennessee at Knoxville, says that the previous studies were incomplete. But he's still not sure that radiation was the culprit. It's possible, he notes, that radiation induced sterility in the trees, that the forest was destroyed by a fire, or that other, unknown factors contributed to the forest's total demise.

In the latest nuclear-war scenarios can never be incorporated into experiments, long-term or not. —Giselle Dodeles

"Don't rely on words, or equations, until you can picture the idea they represent."

—Lewis Epstein and Paul Hawitt

"The saddles are changed, the donkeys are the same." —Turkish proverb



Bad calls are sometimes the fault of the umpire's myopia.

UNDERTAKER HONEYBEES

Although most honeybees die while foraging for food, a bee occasionally drops dead inside the hive. To prevent disease and a buildup of corpses, a fellow bee soon arrives with a clear intent. It grasps the body in its mandibles and drops it as far as 400 feet from the hive.



Hive mender: Bees don't go for flowers, uncaring monuments or long eulogies—just a simple service called necrophoresis.

Undertaking, according to Cornell University entomologist Kirk Visscher, now can be added to the long list of tasks shared by members in a honeybee society. At any one time, he says, about 2 percent of a hive's population specializes in necrophoresis—the carrying of the dead.

To determine whether necrophoresis is a special behavior or simply part of general housekeeping, Visscher filled a hive with

freshly killed bees and balsam wood models that resembled dead bees. While it took more than seven hours for the models to be removed, the corpses were removed in an average of seven minutes. 'Undertakers,' he notes, 'somehow recognize a dead bee. Otherwise corpses would be treated just like other motionless foreign objects, such as

freshly killed bees, for various lengths of time before putting them into the hive. He found that the longer the bees were dead, the sooner they were removed. That indicated the presence of a chemical that becomes stronger the longer the insect has been dead.

As with most jobs in a hive, the dismal duty of undertaking is temporary—an individual bee performs the task for just a few days.—Susan S. Lang

"Make no more gains,
Lord, but elevate me."
—Robert Browning

SIGNING BABIES

Maybe babies are bustling with things to say but their tongues don't work right yet. That possibility was raised by a study of infants who "speak" American Sign Language (ASL), the language of the deaf.

After watching autistic children learn to communicate with ASL, psychologist John Bonvillian, of the University of Virginia, started wondering about the age at which infants become capable of signing. He reasoned that the children of deaf parents, who learn ASL in the crib whether or not they have hearing impairments themselves, might provide the answer. So he visited households where signing was the native language—where parents modeled signs into their infants' hands, just as speaking parents encourage their children to repeat words



Sassy talk: Are babies in the cradle simply tongue-tied?

According to the researcher, most of these babies had begun to sign words by the age of nine months, two or three months earlier than babies whose first language is vocal. One baby made her first sign at the tender age of five and a half months. One-year-olds typically knew more than ten words, such as cookie, Mommy, Daddy, bye, and no. By 18 months, most babies had vocabularies of 40 different signs and were combining signs into phrases like "Daddy work" and "Where ball?" Speaking children do catch up to their signing peers in the second year. But Bonvillian can't help wondering what someone who learned to sign at three months might say.

—Susan Tyler Hitchcock



CONTINUUM



Donning a new mechanical gill, a humpback whale calf is fitted with a human gill. They call it the hemisponge.

ARTIFICIAL GILLS

Ever wonder why fish can "breathe" underwater and we can't? There's a simple explanation. Fish have gills that extract oxygen from seawater, and we don't—or didn't until now.

Biologists Joseph and Celia Bonaventura, a research couple at Duke University's Marine Biomedical Center, recently announced that their development of the "hemisponge" will pave the way for artificial gills that can extract oxygen directly from the sea. The scientists fabricated their sponge by combining hemoglobin—the molecule that carries oxygen in blood, with a polymer similar in consistency to the foam of seat cushions. The resulting sponge is confined in a container, and when seawater is passed through, the hemoglobin extracts the oxygen. Finally the research-

ers explain, the sponge releases oxygen when jolted with electricity.

Theoretically, say the researchers, "a container some three feet in diameter by nine or ten feet in length could provide oxygen for one hundred fifty men on the ocean floor. For individuals a backpack of hemisponge canisters could replace an aqualing or a surface-to diver Meline. Patent rights for the hemisponge have been purchased for \$1 million by Aquanautics Corporation of San Francisco, a major manufacturer of survival and scuba-diving equipment. The company hopes to have working models of the artificial gill within two to three years.—Rick Boing

"As a rule the philosopher is a kind of mongrel being a cross between scientist and poet, anxious of both."
—Gustave Flaubert

PRIMES

They're called primes—numbers that are divisible only by themselves and one—and their smaller varieties are used for devising codes and in computer security. But the larger primes (the current world's record has 25,682 digits) are of no earthly use to anyone, with one exception. They are a status symbol and a sales tool for the manufacturers of the supercomputers that find them.

It's like racing computers, says David Slowinski, a software engineer for Cray Research Inc., of Chippewa Falls, Wisconsin. Slowinski not only holds the world's record for the largest prime—which he located a year ago using a Cray T—he has also discovered a record-breaking candidate (39,751 digits) on the new Cray XMP.

Although Cray doesn't advertise in the mass media accomplishments of the XMP and its cousins are trumpeted in company publications that go out to current and potential customers. "We're pleased to have any discovery made on our computers," Slowinski says. "If a Ford was the Indianapolis 500, then people who own Fords are happy to think that their car is faster. It's the same with land-speed records or runs down to Baja."

But Cray is certainly not the only entrant in the great prime derby. While the millions of calculations necessary to find the current record holder were per-

formed on a Cray T in roughly 1.5 hours, the same calculations can now be performed on a Cyber 205 in about an hour, and on an International Computers, Ltd. DAP in 38 minutes.

How safe, then, is the record held by Slowinski and Cray? Even with the new superfast XMP—which runs a prime program 12 times faster than its predecessor—Slowinski sounds nervous. Conceding that the DAP is "quite fast," he notes that he himself is able to work on prime programs only as a hobby, when his company lets him test a new machine. The DAP, on the other hand, hums along on a systematic and relentless search for primes at Queen Mary's College, in London. The Japanese are also said to be competing. Despite the millions of dollars in setup expenses and the \$7,500-an-hour price tag on the computer's prime time, the race goes on.—Bill Lawton



Photo hunter David Slowinski testing the magic of a Cray



Sweet surprise: Whether it's the additives or the sugar, junk food has an unwholesome effect on some young delinquents.

SUGAR AND CRIME

The old adage "You are what you eat" may soon take on special meaning to prison officials. According to criminologist Stephen J. Schoenfelder, antisocial behavior is linked to diets high in sugar and "junk" foods.

Schoenfelder, who coordinates California State College's criminal-justice programs, found that when he reduced the quantity of processed foods consumed by young adults at several detention centers, the result was a significant decrease in antisocial behavior. For example, among 276 juvenile inmates in a Virginia detention center, the percentage of chronic offenders decreased by 66 percent and the number of well-behaved juveniles increased by 71 percent. Two years after the program began,

there is still a 50 percent reduction in overall antisocial behavior at the institution.

The dietary changes were relatively simple and inexpensive. Fruit juices replaced cola drinks. Canned fruits, packed in heavy syrup, were rinsed in cold water before serving. Unseasoned cereals were substituted for the prewaxed variety. Candy and sugar-laden treats were eliminated, fruit, nuts, cold cuts, and popcorn were made available for snacks.

Similar dietary changes at institutions in California, Alabama, and elsewhere have resulted in such dramatic, documented changes in behavior. In fact, that Schoenfelder asserts, "I am absolutely sure that nutrition can have a sizable impact on human behavior."

He is quick to add, however, that these studies do not necessarily implicate sugar as a cause of crimi-

nal behavior. The juveniles may have had nutritional deficiencies that were taken care of when they ate more wholesome foods. Or the chemical additives and dyes found in the sugary foods could be at fault.

The new research has sparked interest from the Federal Bureau of Prisons and other adult correctional systems. But Schoenfelder notes that administrators are hesitant to change anything in the inmates' food, lest a riot erupt. "Nonetheless, I can't think of any other programs that don't cost anything and yet reduce antisocial behavior. The bottom line is, it works." —Sherry Baker

"You can't have everything. Where would you put it?"

—Steven Wright

GENES AND SHRUBS

Are we genetically programmed to appreciate certain shrubs and trees over others? Yes, according to two environmentalists who say we may prefer the botanical forms common during our evolutionary development in African savannas 1 million years ago.

To investigate the issue, Gordon Orians and his wife, Betty, of the University of Washington's Institute for Environmental Studies, recently traveled to Kenya where they measured features of vegetation that had changed little over the last million years. Then they compared the wild vegetation with trees and shrubs in immediately

manured gardens around the world.

The result: Domesticated versions of two dozen Japanese species more closely resembled African forms than did the same trees and shrubs in the wild. Garden trees, for instance, had shorter trunks, broader canopies, and more branches, and "in the case of broad-leaved maples," said Gordon Orians, "there was clear evidence of prior selection in favoring original forms."

The Orianses are now developing methods to test preferences for natural tree and shrub shapes by showing photographs to college students. "Ecobiology suggests that we can understand what we are now by understanding our evolutionary history," Gordon Orians says. "And since habitat selection isn't an inflammatory question involving sex and aggression, we can discuss it in a rational manner."

—Allen Meyer



African acacia trees do us long for prehistoric plants.



CONTINUUM

SPERMPRINTS

A recent outbreak of rapes was beginning to prey on the minds of the Oakland, California, police, investigating the crimes, they took semen samples and turned them over to forensic serologists to test for certain enzymes and blood substances. When the same combination of markers turned up in all the samples tested—a combination found in only 1 in 50—the police had a strong hunch they were after a sole culprit.

Indeed, the "spermprints" soon helped break the case. When a burglary suspect got his cheek scraped in the course of resisting arrest, police applied a gauze bandage—which they later turned over to the forensic lab. The variants in the suspect's blood matched those in the semen samples from the rape cases. The evidence helped persuade a judge to issue a search warrant, and stolen goods were found at the suspect's home. He was later convicted on four counts of rape.

In the last few years, crime labs around the country have begun to identify at least some of the chemicals in semen samples with the help of electrophoresis, a technique in which electric fields are used to separate proteins. This has helped to increase rape convictions throughout the country.

But according to George Senaibaugh, who teaches forensic science at the



Human sperm: For rape, better than a fingerprint

University of California at Berkeley, ejaculate samples deteriorate so rapidly that they are frequently useless as evidence by the time they reach the lab. And lab tests aren't yet refined enough to detect a unique spermprint for every man.

Senaibaugh nonetheless thinks that genetic engineering will come to the rescue. "Five years from now," he predicts, "we'll be using monoclonal antibodies to zero in on a variety of genetic markers." He also hopes that by isolating DNA within sperm cells, serologists will eventually be able to state definitively whether two semen samples come from the same individual. —Eric Goldstein

"I pray these are me safe up, and for my coming down let me shift for myself"

—Thomas More on his way to the scaffold

"The average Ph.D. thesis is nothing but a transference of bores from one grievous yard to another"

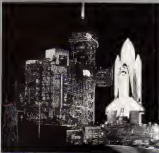
—J. Frank Dobie

SHUTTLE TOURISM

If a still-anonymous travel agency has its way, NASA may host a space-shuttle-passenger tour with an emphasis on leisure.

The travel group, which regularly schedules excursions to Antarctica and other exotic locales, doesn't want its identity disclosed just yet, but stands ready with a deposit of \$100,000 in

daily jaunt, according to Leonard David, a spokesman for the National Space Institute. Tourists would use a pressurized cabin tucked into the shuttle cargo bay, perhaps based on a Rockwell International design featuring a 60-passenger "tourist" module with two decks and extra toilets. If the tours become popular, Rockwell engineers are ready with an



A ticket costs \$1 million and no on-flight movie is warranted, but 50 people are already interested in the tourist shuttle

"earnest money" if NASA gives the go-ahead for the first shuttle reservations in 1989. A confidential market survey of the group's adventurous clientele turned up 40 to 50 interested parties willing and able to pay the sky-high fare about \$1 million per ticket.

Each tour would carry 50 to 75 people on a three-

even more ambitious concept—a rocketliner that could take off from, and land right at, the airport.

—Robert A. Freitas

"A new fact is bedding strenuously for access to your ears. A new aspect of the universe is striving to reveal itself"

—Lucretius

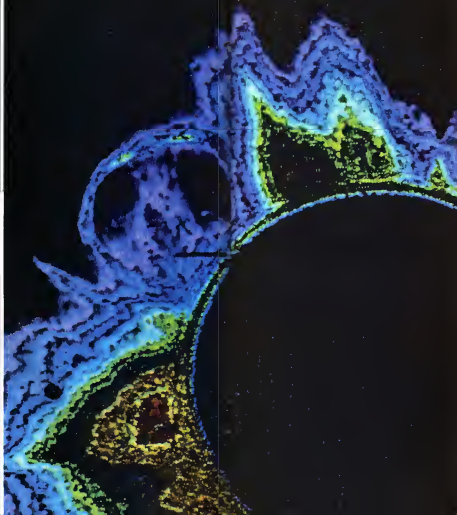
SOL SALVATION

BY JAMES E. OBERG

More than 300 miles above Earth, astronaut George Nelson will fly his personal rocketpack close to the satellite, its slowly spinning solar panels along the expanse above him. In a display of orbital call wrangling, he'll use backpack jets to wrestle the pickup-truck-size Solar Max satellite to a standstill. Then he'll wait, alone, for the mother ship Challenger to approach from its position 500 feet away. If all goes well, the shuttle will pluck the crippled satellite from its orbit and lay it gently to rest in the payload bay for repairs.

Nelson's mission, scheduled for this month, is dangerous. No one has ever done anything like it. But if given the chance, every astronaut in the country would switch places with him in what some observers say will be the last shuttle flight with passengers.

Each succeeding mission has demonstrated new capabilities for the exploration and exploitation of space. When, late in 1982, the fifth shuttle launched in a paying customer's service, the crew proudly deployed a payload booster, we'll see. When, in mid-1983, the seventh mission deployed and then retrieved a lost satellite, the shuttle became a pickup-and-deliverer. For the Solar Maximum Repair Mission, or SMRM in NASA jargon, the shuttle will again be expanded: We'll PICK UP AND DELIVER—AND WE'LL BE, TOO.



*Alone, far above Earth,
an astronaut
is set to attach himself
to a spinning
satellite and bring it in
for repair*

Subsequent missions will place claims to fame. But most of them will be routine cargo-carrying orbital operations. The shuttle will move from the launch, and most space engineers will probably be glad about it.

So SMRM is something of a last hurrah for glory shuttle flights. In terms of space spectacle, the mission will have it all: rendezvous, free-flight EVA (extravehicular activity), intensive repair in the bay, then a fresh launch for the newly repaired satellite.

"It's one of the neater things we got to do," one of the crewmen says of SMRM's combined rendezvous-grapple-repair-deploy operation. It is a twist of the astronaut corps that "there are no bad missions." But among the flight assignments given out early last year, the ones connected with this flight were highly coveted. "All missions are equal," the astronaut says, "but some are more equal—like this one."

He explains, "This flight takes all the things the shuttle has done separately—basically nothing is brand-new, except some methods—and puts them together. From a crew standpoint, this makes it very interesting."

The pick-up-and-deliver-and-fix-it squad includes commander Robert "Crip" Crippen and copilot Francis R. "Scooter" Smith, with payload Specialist, who is called Dick by crew col-

leagues. Terry T. J. Hart is the flight engineer and mechanical-arm operator. James "Doc" Van Hoften is the spacewalking repairman, and George "Pinkie" Nelson, the free-flying satellite stretcher.

Crippen is on his third shuttle mission and he has already been tagged to command a fourth mission only four months after this one. The other four men are rookies from the class of 1978, the first new crop of astronauts in more than a decade. In a parody on the avalanche of shuttle acronyms, they named themselves the TENG—thirty-five new guys (and gals).

If any thing space vehicle deserves rescue, it is the Solar Max. It got its upbeat name because it was launched in 1980 during a period of maximum sunspot activity. During its 10-month active lifetime, the satellite tested our theories of the sun. At a news conference, Burt Edelson, NASA associate administrator for space science, listed the Solar Max's major discoveries. "It indicated that the so-called solar constant varies considerably. The energy decreases a little bit with large sunspot activity" (The solar constant is the quantity of radiant heat normally received at the outer layer of our atmosphere.) And it told us that solar flare energy is as much as one hundred times greater than we ever suspected. We feel that nuclear reactions are taking place right at the flare spots. Solar Max ceased functioning when a set of poorly designed fuses in the satellite's attitude control system blew.

Edelson praised the repair effort on grounds of science alone. "This is a valuable mission in itself," he asserted. "It will cost us about a quarter as much as building a replacement spacecraft would."

At the same late-1983 press conference, James Abrahamson, associate NASA administrator for spaceflight, expanded on the value of the mission. The repair work "will certainly be worthwhile in terms of restoring [the satellite] to service for the science community of equal importance," Abrahamson continued, "it will lay out what we can do and as a result of that, designers will come to gain confidence in repair and servicing as a concept." Once this happens, "we can bring down the cost of building payloads."

It is a truism that the last few percentage points of reliability cost the same again as the first 90 or 95 points, doubling or tripling the cost of space activities, while paining only marginal improvement in overall performance. In the old days, there was no choice. But today with a proven repair capability it may be cheaper to pay for a fix-it mission (or even several) than to build a nearly perfect satellite in the first place.

The astronauts must rendezvous with the crippled satellite at a record high orbit for the shuttle—310 miles. (Some Gemini missions went higher, but no previous shuttle has gone above 200 miles.) To do so the Challenger will be employing a new launching profile: direct insertion. Under this scheme the three main engines are

left on several seconds longer than usual, which lifts the shuttle into a higher orbit but also propels the throwaway fuel tank far beyond the normal impact point in the Indian Ocean. Instead, the tank will complete a nearly full circuit of the globe and will streak back to Earth, within sight of the Hawaiian Islands. The extra burn time is possible because earlier missions revealed that residual fuel had been left over—and wasted—in the drop tank.

Rendezvous navigation in space has always been an esoteric subject. There are no signposts or well-worn trade routes in orbit, so navigating even a single spaceship is a delicate process. To connect that spaceship with a target satellite requires superhuman coordination.

"It isn't comparable to formation flying," notes captain Scobee. "You have to trust your senses and your targeting computer. There is just no way to do it by the seat of your pants."

The shuttle will start the rendezvous se-

**● In terms of
space spectacle, the
mission will
have it all: rendezvous,
free-flight EVA,
intensive repair in the
bay, and a
fresh, high launch. ●**

quence far behind and below the Solar Max. Launch will have placed it in an orbital plane very close to that of the spinning satellite, thus reducing the rendezvous problem to two dimensions—up/down and ahead/behind—with only minor out-of-plane (left/right) corrections required.

The blastoff is scheduled for early in the morning, when the launchpad is cooled by Earth's rotation through the target's orbital plane. But the satellite passes overhead about one half-hour earlier every day. If the launch is delayed more than six days, it puts us into a pre dawn liftoff and landing," Scobee explains. "So Crip and I have trained for that as well."

Spaceships travel faster in lower orbits than in higher orbits. So the satellite, which is in an elliptical orbit, will travel fastest at its lowest point and slowest at its highest point. All this occurs without rocket power—or earthbound logic.

An orbital rendezvous is performed by firing rocket engines to raise or lower the shuttle's orbit, thus decreasing or increasing shuttle speed relative to the target satellite. In Mission Control, rendezvous spe-

cialists navigate using computers and some rules of thumb. One such rule is the so-called 2:1 law. In order to raise a portion of your orbit by one mile on one side of the earth, you must apply two feet per second of forward thrust at a point on the other side of the earth. That two-foot kick will put you into a higher orbit with a lower average velocity.

Given a starting position below and behind the target, it is theoretically possible to perform one rocket burn that places the shuttle alongside the target within one hour. There is a second rocket firing would match velocities, putting the shuttle and the Solar Max in the same orbit.

In practice, the navigation computers simply do not know the shuttle and satellite positions exactly enough to specify such a maneuver and the rocket engines are not sufficiently crisp in start-up and cutoff to perform a precise enough burn, even if the size of such a burn could be computed. Instead, the shuttle gradually closes in on the target, using its onboard sensors to sequentially refine its knowledge of the target's position. Each new sighting of the crippled satellite—through a star tracker, the short-range radar, or a sextant in the shuttle's overhead window—allows the spacecraft's computers to calculate a new course to reach the next preplanned approach point. After each burn the computers also note how accurately the burn was performed, and they attempt to accommodate any errors in execution.

Crippen and Hart will be flying the Chalk, longer from the aft station, at the back of the cockpit. Looking aft, Crippen will be on the left, viewing the target through the large overhead window and making course changes with hand-controlled joysticks. Hart will navigate from one of the front seats and will then move to the right-hand aft position to prepare the shuttle's remote manipulator arm for the planned pickup. Scobee will be downstairs in the mid-deck, assisting Nelson and Van Hoften in their EVA preparations. It will probably be the busiest few hours in space-shuttle history and it's only a prelude to the real action.

If all goes as planned, the shuttle will follow a five-hour rendezvous sequence on the third day of the SMRM flight. Three hours into this profile, the shuttle will be at the same altitude as the target but eight miles behind. Since this is a high point for the shuttle, it will begin dropping again. At this point (called Transition Initiation, or T1), the shuttle's small radar will have provided a final, accurate determination of the target's range and velocity, and a course correction will have been made. The shuttle will then pick up speed as it drops lower and zooms below and ahead of the target. The astronauts will observe the satellite through their overhead window and, when the shuttle reaches a point about 1,000 feet in front of the target, they will make final manual course corrections to match the two crafts' velocities.

Then the shuttle will park until the two

formation-flying objects reach the proper sunlight conditions. At that point the final approach will begin. Two space-suited crewmen will move out through the space-ships airlock and prepare their equipment in the payload bay.

Just getting outside is a considerable project. Stung by the dual spacecraft failures that forced cancellation of an EVA late in 1982, NASA engineers have opted for "defense in depth"—redundancy. For the two spacewalkers, there are components of three complete suits. Since Van Hoften is six feet three inches tall, the backup suit is oversized on the shorter Nelson. ("But Pinky can work inside it," Scoobe says.) An extra life-support backpack is also included. There are two Mained Maneuvering Units (MMUs) in the payload bay though only one is essential to the mission.

All effort has been made to avoid any single-point failures—failures in gear for which there is no backup equipment.

NASA planners have also considered the threat of space sickness. Scoobe himself has undergone EVA training as part of his preparation to assist Nelson and Van Hoften. Is there any chance he could step in if one of the others were too ill?

Not at all, no way "he tells Orson. "Pinky and Co. will do it." Van Hoften is fully trained for the dramatic flyover and space grab of the Solar Max. So if Nelson were not fully healthy, the other EVA crewman could perform that job. "But space sickness should be a problem by day three," Scoobe points out. "Most crewmen who get sick feel worst on day two," in the event that sickness affects the astronauts' performance, the repair could be delayed one or more days, even after the rendezvous.

NASA has tried to compress in advance for such human liability. In April 1983 three frustrated and embarrassed Russian cosmonauts aborted their space-station-linkup mission when a radio-dish boom didn't deploy fully. They tried to judge their distance from the target by measuring its perceived size. But because they had never done it before, they failed. For the space shuttle space breakdowns are also conceivable, but the crew has been much more thoroughly trained in alternate procedures. "If any single sensor fails we can still make it," says one crewman.

The flyover to the slowly spinning Solar Max will be the most exciting and worrisome several minutes of the mission. When Nelson was asked how he would approach the crippled satellite and its scythelike solar panels, he said, "Very carefully." But he went on to assure his listeners that "it is simply a manual flying task." At the Houston space center, MMU expert Ed Whittell told reporters: "He's just as able to fly this thing as you're able to walk around in this room."

Nelson will not have to grab the Solar Max with his gloved hands. A special docking device will be mounted in front of him, connected to the armrest of his MMU. He will slam this unit onto one of the truss

members protruding from the main body of the satellite. Once the attachment is secure, he will command his MMU guidance system to bring itself—and the attached Solar Max—which weighs three tons on Earth—to a complete halt in its spin.

That backpack has the thrusting capability to stop all of our motions in space—its own motion, the motion of the satellite, and my motion," he told a press conference. After the spinning stops, Cropper will slowly fly the shuttle to within 40 feet of the satellite/astronaut combination, a maneuver he has already conducted in space. Then Hart will manipulate the robot arm to grab the satellite and place it into a special cradle in the payload bay.

All the mechanics of the repair operation have been practiced exhaustively. The Solar Max's defective attitude-control module is a box about two feet by four feet by six feet. On the ground, it would weigh 500 pounds. The crewmen will remove it and replace it with a new one. Toward the end

**☼Solar-flare
energy is as much as
100 times
greater than we suspected.
We feel that
nuclear reactions are
taking place
right at the flare spots.☼**

of the six-hour EVA, they will make adjustments to several other instruments and begin work on installing a temporary ring on a second major module in need of repair, the MEB (main electronics box).

There is a day of rest scheduled between the first and second spacewalks. The second repair is much more difficult than the first, since the MEB was not built to be serviced in orbit. The astronauts will have to remove numerous screws and unbolt webs; the job will require considerable strength and dexterity. If all succeeds, however, the coronagraph polarimeter, a device used to study the sun's corona, will again be operational.

Back on Earth, observers will have been treated to a wide array of visual reports on the entire process. Much of the imaging will be necessary for the Solar Max engineers keeping track of the repair. But other sequences will be just plain spectacular.

"There are so many cameras aboard, it's pathetic," one crewman says. The repair is impressive. For real-time transmissions there are ten television cameras. Four are mounted in the corners of the payload bay, two are on the "arm" (one at the "elbow

and one at the "wrist"), one each is on the helmets of the two space suits and two more are installed inside the cabin. Normally, television transmissions must go through the shuttle's dish antenna to the relay satellite in its 24-hour orbit. But during rendezvous that antenna will be used in radar mode, so live television will be possible only during brief passes over tracking sites in Hawaii and the continental United States. For postflight review, there is the normal complement of 35mm and 70mm still cameras, a 16mm movie camera, and a camera with a fish-eye lens mounted in the payload bay. Once the two spacewalkers are outside, Scoobe expects to be bouncing around the flight deck, operating as many of these as he can.

The rest of the mission is pretty routine at least in terms of spacecraft. Once engineers on the ground give the green light, the revitalized Solar Max will be released (Several years from now, astronauts will bring it back to Earth for a more thorough overhaul.) The astronauts will inspect their space suits in case they need to perform any other emergency repairs, such as closing the payload-bay doors in case of a motor failure or a jammed latch. If all goes well, there will be time for some sightseeing. Then, after six days in space, the five-man crew will fire up the craft's maneuvering rockets for the return to Earth.

Although there have been numerous suggestions for similar repair missions in the future, none are currently scheduled. The Landsat-4 satellite, in polar orbit, is a prime candidate for rescue, but such an effort would require use of the Vandenberg launch site, in California, which won't become operational until late 1985. Other broken polar-orbit satellites include Seasat and the spectacularly successful Infrared Astronomy Satellite, which merely needs a refill of liquid helium. But these are or bring several hundred miles above the shuttle's operating ceiling.

Frank Capolonia, project manager at the Solar Max's home base at the NASA Goddard Space Center, in Maryland, discussed the cost of the operation. "Excluding the transportation flight, which we share, the cost is less than a million dollars. That includes refurbishment of the [broken] hardware that's brought back, such that we can put it on the shelf and fly it again on some other mission."

Whatever developments follow the SMR, the mission itself is regarded as a breakthrough, the culmination of years of independent developmental efforts. It may be the most dramatic and difficult space mission since the moon landings 15 years ago, if certainly promises to be the most productive. And, as astronaut Dick Scoobe proudly announces, "It's getting up back in the space business hot and heavy." Never has a handful of burned-out fuses kicked off a more elaborate repair effort. But seldom has a set of circuits had more potential to help shed new light on some old scientific questions. **DO**

FICTION

FIRE

*An ancient object
provokes mutiny during an archaeological dig
on the planet Xerxes*

BY JERE CUNNINGHAM

A novent volcanic plumes ran in the sand like fingers. Vents of ash made little purple puffs under her nonadhesive soles.

Dust always rose at dusk on Xerxes, making Frances Cole unaccountably depressed. The barren planet looked as and as Agene.

A hundred meters ahead, the gladiolac quarters dome shone clearly against the horizon. The blowing dust meant complete darkness was moments away.

Frances sniffed the breakdown of today's skin conditioning as accreting body fluids dissolved it. Xerxes, a Class C planet with limited water, required a semipermeable skin protection to retard fluid loss—just another plan in the ass on this wretched dig site she'd chosen.

Loosen up, Finn, she told herself.

She would bathe in the dome, rest, and face another night with the team. Feet sinking, she climbed the ashcan crest. Her hair was shaved for desert radiation, habitually she ran a hand over the fuzzy nape.

The dome no longer looked inviting. With each un-

eventful day, the team was becoming more sullen.

The dig is shit, and they know it, she kept thinking.

Fifty meters ahead, the quarters dome read her contours, she heard the squatty hiss of the unsealing door. She lifted her chin and felt hot ticks of dread. She was an archaeological-site dig-crew chief, out on her first command dig, and hadn't found a thing. Frances was learning that respect is earned only by success.

She paused. She thought she heard a voice, a dry, echoing, in the blowing red-black wastes behind her. The team was surely inside by now. Then the voice echoed again, faintly but more clearly.

"Go, Cole!"

Now she saw a blur of motion.

"Cole, look over here!"

There they were, out on the darkening plain near the site itself. The lights in the dig were bright around the painstakingly disinterred blocks, ancient stone that she'd interpreted as an edifice. Like holograms, two shapes moved against the grainy, artificial work lights.

PAINTING BY JAMES CHRISTENSEN



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Test your skills in the Canon Photo Contest and you could win one of six trips for two to the 1984 Olympic Games in Los Angeles, including round-trip airfare, three nights, four days at a hotel, tickets to Olympic events, ground transportation to the games, \$500 in spending money plus a Limited Edition Canon New F-1 professional camera!

We encourage you to enter a photo you've already taken, or get your camera out right now and shoot to win! There are 864 prizes in all, worth over \$70,000!

Your \$1.00 Entry Fee is a contribution to the U.S. Olympic Team

Subject categories are SPORTS, PEOPLE and NATURE, with separate competitions for SLR and non-SLR owners. A \$1.00 contribution to the U.S. Olympic Team is your entry fee. Canon will match your dollar if your entry was taken with a Canon camera. 5" x 7" color prints made from original 35mm negatives or transparencies taken after March 31, 1983, are eligible. All entries must be received by May 31st, 1984. Complete rules and regulations are provided on the official entry form available at your authorized Canon dealer or by writing to Canon U.S.A., Inc., One Canon Plaza, Lake Success, N.Y. 11042. Requests must be received by May 1st, 1984. Limit one request per envelope. Open to U.S. Residents, 16 years of age or older. Void in Vermont and where prohibited by law. Contest closes May 31, 1984.

Canon®

Now she recognized the shapes. The wobbly silhouette in front was Griffen, the team's plump little stunts specialist. Behind Griffen was Warren, the lanky dig mechanic, his body straining forward, making fat Griffen hop. They were lugging something between them.

She yelled back at them now. What are you doing?

Why the hell were they bothering her? If they had anything worthwhile they wouldn't be carrying it. Now, against the peripheral glow of the dome's greenish illumination, she saw how their pinkish bodies gleamed with dark sweat, rivulets of it breaking their skin conditioning. She felt quick anger—the dehydrating state was dangerously pretense on Xenos.

"What are you doing?" she shouted at them again.

Griffen was grinning like a pig, she thought, a pig who'd found an apple. The thought was practically mythological, since Frances had never tasted an apple.

"Damn!" she cried. "Have you just picked something right off the surface? Carrying it like that?"

Whatever it was, there a long, crooked shadow. Behind Griffen, Warren looked greedily excited, full of swagger. Griffen's eyes were shining and blinking.

Frances ran toward them.

"Don't stress it!" Her feet sank into the blowing ash, her tongue tasted dry and acrid. "Don't—"

At close range the mechanic's dark, oily face broke its skin conditioning with a snarl.

"Dr. Cole," said Griffen officially. "It's only a dead tree you know, not an alien Rosetta stone."

Frances stopped in her tracks, staring. "What?"

"A tree," said Griffen.

"Wood?"

She saw its dark, twisted length now. The two men suddenly stumbled in a loose parable of volcanic ash. She dropped to her knees, reaching to catch the tree. They regained balance, and her fingers brushed the wood.

Her first impression was of an arthritic limb, deep brown in the hazed illumination. She rested her hand next to it, tactile and emotional—that the agonized shape of wood radiated incredible antiquity.

"There's more," said the mechanic. Dr. Griffen agreed. "We could have a—"

A lie: the mechanic completed, boldly. Frances felt the roots of her scalp burn with a rush of anger she forced herself to conceal. Her emotions constantly dismayed her. A lie? she repeated, and she could not have heard right. A tree?

"How long has it been since you've seen wood?" he asked.

"Ages," Frances answered. "Be careful. Put it down."

"There's more where this came from," said Warren.

Damn you, Frances said. "Damn you both, we're not here to burn things."

"But what a temptation." Griffen knelt in the purplish ash, his fat face pleaded with her like a schoolboy's. "How long has it been since you've warmed yourself by a wood fire?"

"Ages," Frances allowed. The truth was, she had never seen wood burn. She knelt, ran her hand over the length of smooth strong limb with a brief and helpless fascination. Abruptly she stood. "And as long as I am dig chief my team will not behave like vandals."

The mechanic's eyes caught hers. "Feels good to touch, doesn't it? Almost like it was alive."

"Get it into the hermetic shed. I mean now." Frances said with as dry a look as she could muster. "I don't care if it's from the size or not, seal and scan it."

Frances sank into the hot tub. The skin conditioning soaked off her as she strove to empty her mind. But she could hear the others clearly.

From the primary quarters room came fragments of animated debate about the site, renewed theories about the significance of finding wood. Frances heard Griffen and Warren. Their voices bounced against those of the other two members of the team, an aged and worn-out couple long ago ostracized from the scientific community when they'd insisted upon the quaint marriage ceremony. Albert and Emma Stone were addressees. Frances had picked them for the dig because their experience was grossly undervalued. Because they traveled as a pair, she got them cheap. And she not only respected their knowledge but liked them.

Albert and Emma once had archeological digs of their own.

That why you like them? she wondered. Money loves company?

The archival computers had clearly warned her that this site area was marginal, even prehistoric. It had been passed over dozens of times. That had been the challenge, perhaps. A find here would draw enormous attention.

And she wanted attention and respect.

Sixteen years of dawk paying in dirt and stone, on her hands and raw knuckles, had been the price tag on this expedition. First she had slaved in the exhausted student digs of Earth, learning. Then she'd worked under a bewildering series of officious prices at remote locales. Archeology said that the future was in the past, but Frances, setting deeper into the hot tub, thought that the truth might be just the opposite. She thought grimly of all the archeological-cum-dig crew chiefs before her who'd gone down into oblivion.

"It isn't from the dig," she heard Warren say. "I claim the right to see what I want to. Namely, see what happens, see some combustion."

Emma Stone's high, cracked voice. "Your claim, Mr. Mechanic, is not a valid one. The dig-olow chief has already evaluated the wood so fit for study."

CONTINUED ON PAGE 102



PSYCHIC WARRIORS

BY RONALD M. McRAE

*Forget death rays and
the bomb. Psi is the weapon of the future*

PAINTING BY DI MACCIO

The sign on the modest storefront reads "MADAME ZODIAC PSYCHIC PALME BEACH ROAD 50-1035 INTERSTATE Madame Zodiac's Washington, DC, parlor opens at eleven, and many of her regular customers have readings during their lunch breaks. The usual charge is ten dollars.

Every third Tuesday for 11 months during 1979 and 1980, Madame's parlor opened early for a special customer. A little after nine o'clock, a Navy commander discreetly dressed in a civilian suit and carrying a government briefcase handcuffed to his waist, was ushered into the private parlor. Madame made tea while the commander, after pushing aside her crystal ball and tarot cards, spread photographs and charts on the table.

The commander fumbled for a cigarette. He was down to a half-pack a day that June but hadn't been able to quit. "You'll quit by the end of the year," Madame predicted. (That prediction proved accurate. The commander is now running six miles a day and hopes to compete in the next Marine Corps marathon.) But he didn't give Madame Zodiac an envelope stuffed with \$400 in cash every month to help himself break the nicotine habit. The money was from the Office of Naval Intelligence, and the photographs and charts on the table depicted Soviet submarines and their estimated travel routes along the eastern coast of the United States. Madame Zodiac's mission, to use her psychic powers to do what the Navy's ships and aircraft sometimes could not—track and predict the movements of Soviet missiles and subs. Madame Zodiac is what the Pentagon might call a medium-technological-risk project, not exactly a conservative one but not as far-fetched as some others.

In December 1980 the *Military Review*, the professional journal of the United States Army, featured an article entitled "The New Mental Battlefield: Brain Me Up, Spook" by Lieutenant Colonel John B. Alexander. Situated alongside such standard articles as "The Deployment of the Pershing II to Europe—Some Implications," and "Preparing for War: Administrative Logistics Systems Program," Alexander's piece made some startling assertions.

- * "There are weapons systems [now in existence] that operate on the power of the mind and whose lethal capacity has already been demonstrated.
- * "The ability to heal or cause disease can be transmitted over distance, thus inducing illness or death for no apparent cause. While this has been demonstrated on lower organisms, flies and frogs, the present capacity for human death is still debated.
- * "The use of telepathic hypnosis also holds great potential [for use by the military]. This capability could allow agents to be deeply

planted with no conscious knowledge of their programming.

- * "Clearly psychotronic weapons already exist; only their capabilities are in doubt."

Is Alexander serious? Does the Pentagon really believe that palm readers can track submarines? or that psychic agents might hypnotize American generals? According to Alexander, many individuals consider the information in his *Military Review* article ridiculous. "Since it does not conform to their view of reality, But some people still believe that the world is flat." Others, however, view the use of sub-tracking swarms as a conservative approach compared with antimissile time weapons that are intended to ward Soviet missiles hurtling into the dinosaur era.

There are individuals in top defense posts who take psychic warfare very seriously, which is why psychic research may get as much as \$6 million annually. Reliable figures are unavailable, in part because much of the research is hidden in

◆ *Madame Zodiac's mission, to use her psychic powers to do what the Navy's ships and aircraft sometimes cannot—track and predict the movements of Soviet missiles and subs* ◆

the secret intelligence budget and in part because even unclassified programs are disguised. For example, a 1978 CIA study of Soviet ESP was given the innocuous title of "Novel Biological Information Transfer Systems." Of course \$6 million is pocket money to the Pentagon. A single modern airplane can cost \$250 million; a single ship \$15 billion; and a major weapons program, such as the MX missile, \$98 billion and up.

Critics have attacked projects that attempt to apply parapsychology to practical problems—such as tracking submarines—on the grounds that you cannot apply a science until that science and its theoretical foundations have been established. But what if Madame Zodiac really does find Soviet submarines? "Psychic powers might have extremely important military and political consequences; should the enemy be able to use them to break through national-security defenses," warns Marcello Truzzi, a sociologist at Eastern Michigan University and a specialist in deviant sciences. Even if it is highly unlikely that such powers exist, he says, the possibility "is simply too important to neglect."

In the Seventies the Navy signed a \$50,703 contract with the California think tank SPI International to determine whether psychics could detect remote electromagnetic sources. If psychics can sense a flashing light in another room, the thinking went, perhaps they could also detect the very weak electromagnetic emanations from submerged submarines.

Yet an official statement from the Navy public-affairs branch flatly denies that the Navy uses or has ever "used psychics to track submarines." It describes one psychic ant submarine project as an "investigation of the ability of certain individuals to perceive remote, faint electromagnetic stimuli at a noncognitive level of awareness." In plain English, professional psychics ("certain individuals") may detect a flashing light in another room ("perceive remote, faint electromagnetic stimuli") using psi ("at a noncognitive level of awareness"). The lengthy project report never once mentions the word psychic, although the researchers, SPI's Harold Puthoff and Russell Tang, are perhaps the world's best-known physicists in the field of psychic research.

SPI delivered the final report for this contract in 1978, claiming success with several psychics. But the Navy isn't bragging about its apparent success. In response to congressional inquiries about the contract in 1982, Navy spokesmen refused to characterize the study as psychic.

Despite its denials, however, the Navy has thus far employed at least 34 psychics to track Soviet ships and submarines. Madame Zodiac is one of them. Her name is a pseudonym because her Navy contract included a secrecy agreement. But Shawn Robbins, asked by the *National Enquirer* as one of the nation's top ten psychics, agreed to let her name be published.

In 1973 Robbins was an experimental subject in a psychic-research program at Maimonides Medical Center in New York City. In a typical experiment, some subjects viewed "emotionally arousing" or "erotic" film while others tried to determine the contents of the film telepathically. As the subjects slept after the films, their brain waves were monitored for evidence of rapid eye movement, or REM sleep, which is associated with dreaming. After REM sleep, researchers awakened the sleepers and asked them to describe their dreams.

Robbins's dreams correlated as closely to the contents of the films as did the dreams of those who had seen the films. According to the research team, this indicated that Robbins had extraordinary psychic abilities.

Shortly after the tests ended, a man whom Robbins had known as an officer of the private foundation that funded the study contacted her. He identified himself as a commander from the Office of Naval Intelligence. The Navy, he said, was interested in testing Robbins's psychic abilities against Soviet naval targets. Robbins agreed, and, like Madame Zodiac, she was

green charts and photographs of Soviet ships and asked to locate them and predict their movements.

"He said I did well," Robbins claims, "and he wanted to do more tests." But Robbins declined because of a previous commitment to go treasure hunting in Greece.

Seven years later the same Navy commander again asked Robbins to participate in the Madame Zodiac project, and he tested her again. Robbins scored well, but "the Reagan budget cuts" eliminated her from the program.

Some of the most interesting research past and present has been funded by the Navy, which began serious parapsychology research during World War II. Many of the experiments involved "an ps," the psychic powers of animals, and were pragmatically directed to the problems of the day. One small project attempted to psychically direct sea gulls to defecate on the periscopes of German submarines.

A more ambitious study, headed by J. Gardner Pratt, of Duke University hoped to discover a psychic navigation mechanism in homing pigeons. Such a bird would have enabled submarines to navigate without surfacing and would have helped bombers locate German targets at night. The Navy continued to fund psychic research at Duke through the Sixties.

But by far the weirdest project ever funded by any government agency was the "multispectral image analyzer station," which the Navy bought in 1977 from Virginia chiropractor and psychic Charles Whitehouse. Whitehouse is a board member of the United States Psychotronics Association, Inc. (USPA), an organization producing electronic devices that supposedly amplify psychic energies. Whitehouse assured the head of photographic research and development for the Navy, Captain Robert Skillen (now retired), that the Navy could locate a Soviet submarine simply by inserting a photograph of the sub into his machine.

"It is possible to detect a submarine this way," Skillen still asserts. "We have trained several persons from Skillen's department and from the CIA to operate the device, and the Navy shelled out a grand total of \$5,111 for the little black box." The work that Whitehouse did was credible, Skillen maintains.

For his part, Whitehouse still proudly displays the check stub and the receipt for ONE MULTISPECTRAL IMAGE ANALYZER STATION. He has also used the same machine to treat cancer patients at his chiropractic clinic, "correcting 'holes' and 'imbalances' in the patients' auras (an invisible psychic field) by shining various combinations of colored lights on their bodies. Any malady can be cured by the proper combination of lights," Whitehouse claims, and the analyzer's technical manual even lists a cure for COMES (V. and H. disease).

Other government agencies (no civil defense and the Air Force) showed no interest in a machine that could "cure" the

A-bomb, but the Virginia board of medical ethics did. Board investigators accused the doctor of defrauding patients, and Whitehouse has immigrated to Thailand, where he hopes "life will be more leisurely."

Equally astounding, however, were the conclusions of a 1972 Defense Intelligence Agency (DIA) study, originally classified top secret but released in 1978. "Soviet efforts in the field of [psychic] research," the agency predicted, "sooner or later might enable the Russians to do some of the following:

A. Know the contents of top-secret U.S. documents, the deployment of our troops and ships, and the location and nature of our military installations.

B. Mold the thoughts of key U.S. military and civilian leaders at a distance.

C. Cause the instant death of any U.S. official at a distance.

D. Disable at a distance U.S. equipment of all types, including spacecraft."

These apocalyptic predictions, incred-

**•The Navy began
parapsychology research
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War II. One project tried to
psychically direct
sea gulls to defecate on
the periscopes
of German submarines. •**

ble as they seem, have been voiced repeatedly in intelligence evaluations. According to another DIA study released in 1976, Soviet psychotronic weapons "would pose a severe threat to enemy military embassy or security functions." The DIA also suggested that telepathic hypnosis could be "tailored against U.S. or allied personnel in nuclear-missile sites."

So in 1981, the Air Force seriously considered buying "psychic shields" for its missile crewmen. The shields, produced by a member of the USPA, would be activated by a drop of blood or a lock of hair from the bearer.

Alexander's article also cites "telepathic hypnosis" as holding great potential. This capability could allow agents to be deeply planted with no knowledge of their programming. In movie terms, "The Manchurian candidate" lives and does not require even a phone call.

Retired Army Lieutenant Colonel Thomas Bearden, formerly an Army intelligence analyst, claims that the Soviets have something even more sensational: "hyper-spatial nuclear howitzers." These psychic weapons could "denude the strategic ca-

pability of the free world with a single shot" by transmitting a single nuclear explosion instantaneously to a limitless number of sites anywhere in the universe. Congressman Charles Rose, a seven-term Democrat from North Carolina, calls the concept "really something."

If the United States loses a psychic arms race with the Soviets, no one will blame Congressman Charles Rose. "The Russians are up to their hip pockets in this stuff," he says. "We shouldn't fall behind." Rose should know. Not only does he sit on the House Select Committee on Intelligence, but he has investigated psychic weapons himself.

In some ways, Rose fits the Southern image. He is a devout Presbyterian, a former county prosecutor and a champion of the tobacco lobby. He is also the House's acknowledged expert on computers and the founder of the Congressional Clearinghouse on the Future, an informal caucus financed by private contributions.

Rose founded the clearinghouse after futurist Alvin Toffler, author of *Future Shock*, convinced him that Congress needed to consider the impact of future technology. Today the clearinghouse newsletter publishes articles on space colonies, gene manipulation, "soft" energy and other New Age issues.

At present, Rose doesn't think the United States needs to spend a lot of money on psychic weapons. That's because "we just don't know how to build them." When the needed technological breakthroughs come, he says, we may need a "psychic Manhattan Project."

The congressman's personal experience has convinced him that such breakthroughs are on the horizon. He has attended CIA-arranged classified demonstrations of remote viewing—the ability to see a distant place telepathically. Says Rose, "I've seen some incredible examples of remote viewing. I think we ought to pay close attention to developments in the field and especially to what the Soviets are doing. If they develop a capacity to have people mentally view secret centers within this country, we could reach the port where we didn't have any secrets."

Rose thinks skeptics in the Pentagon and CIA are hindering U.S. research in remote viewing, and he wonders openly about their motives. "We may have to investigate them," he warns.

"Some of the intelligence people I've talked to know that remote viewing works," Rose says. "They block further research on it, however, because they claim it's not yet as accurate as satellite photography." But it seems to me that it would be a hell of a cheap radar system, and if the Russians have it and we don't, we are in serious trouble. This country when I tried to look into the strange physics behind lasers and semiconductors, and I don't think we should be afraid to look at this."

According to a survey by Charles T. Tart, a psychologist at the University of Califor-



No one knows why this wing flies. But now you can prove it does

The sleek and silvery airplanes shown here flying in formation with its creators, Richard Kline (left) and Floyd Fogelman, isn't just any paper airplane. It is a paper airplane so remarkable and original that it is protected by two separate U.S. patents.

It is a paper airplane so revolutionary that mockups of its wing have been put through wind-tunnel tests by NASA, the Navy, the Air Force, and the Army.

It is a paper airplane so unconventional that it drives aerodynamics experts crazy. It seems to violate one of the major laws of flight, the Bernoulli principle, which explains, theoretically, what keeps all ordinary planes aloft. And it is a paper airplane whose plans are made public, for the first time, in this issue (beginning on the next page).

Most wings are round on top, flat on the bottom, so air flows faster over the top. This means the air is less dense on top and more dense on the bottom. As a result, there is greater pressure on the bottom which provides lift.

This wing, however, is flat on top and notched—partially hollowed out—on the bottom. Because it has more area on its underside, its "flap" should propel it toward the ground; it should sink like a rock.

It soars. So much for Bernoulli. Richard Kline, a New York advertising-art director, had no idea he was about to start such a stir when

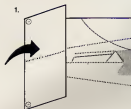
CONTINUED ON PAGE 14

FANCY FLIGHTS

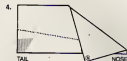
BY SCOT MORRIS

PHOTOGRAPH BY
MICHEL TCHEREVKOFF

INSTRUCTIONS



1 To build the plane, you will need a pair of scissors, a ruler or straightedge, some rubber cement, and cellophane tape, and possibly a paper clip or two. First, carefully cut out the plane along its outer perimeter. Fold along line 1. Run the ruler along this fold—and succeeding folds—to increase sharpness.



4 Turn nose to your right, and fold upper-right-hand corner down along line 4 so that B falls below line 2 and aligns with A on the other side. Again, sharpen the fold.



6 Hold plane by the nose and tail. Fold wing toward you along full-length line 6.



8 Fold wing up along line 7.



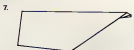
2 Turn over the paper, and fold it in half along line 2.



3 Fold upper-left-hand corner down along line 3 so that A falls below line 2.



5 Turn nose to your left, and tape A and B together, tucking the tape under the plane and back up the other side.



7 Turn nose to your right, and fold other wing toward you along line 6. Make sure wings are aligned with each other.



9 Turn nose to your left, and fold other wing up along line 8. Wings should still be perfectly aligned.



10 Pull up on wings and down on fuselage at arrows, and flatten out plane as shown (the same configuration as in Figure 5). Cut notch along the two lines labeled 9.



12 Refold wings down along lines 5 and 6, and up along lines 7 and 8 as shown.

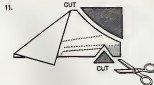


14 Apply rubber cement to inside of entire fuselage and inside of tail (dashed surface). Press together, let harden.



16 Bring wings to horizontal position. Pull down on points A and B while pulling up on top of fuselage to open slots under wings. Wings should have equal volume.

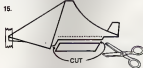
17 To fly, hold plane as shown between your thumb and middle finger, support with index finger behind A. Launch overhead, from over your head, with nose level or pointed slightly downward. Throw with a gentle flick of the wrist, as if knocking lightly on a door. After flying, repair nose tape as needed to keep fuselage streamlined. If necessary, use tape to reinforce section in front of the tail.



11 Cut through both wings along line 10.



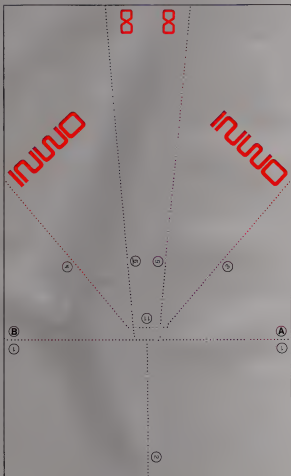
13 Push tail up, inserting fold, so that dark surface is hidden. Open nose and fold backward, up into fuselage, along line 11.

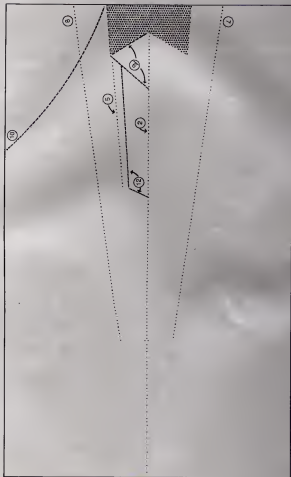


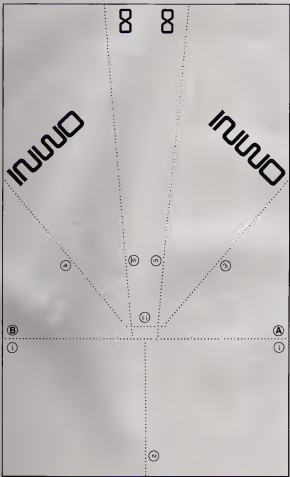
15 Cut along line 12. Pinch fuselage together in front of wings and wrap with two layers of tape. Trim excess tape.

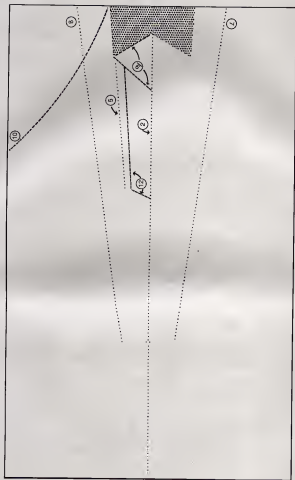


To experiment with flight characteristics, insert a paper clip into glued fuselage, just behind nose. (Try clips of different sizes.) If the plane veers left, increase the opening of the slot on the underside of the right wing. If it veers right, increase the opening of the slot on the underside of the left wing.









FLIGHTS

CONTINUED FROM PAGE 55

In 1968, he sat at his kitchen table in Mount Vernon, New York, to make a paper airplane for his six-year-old son, Gary. He folded back the leading edge of a deli-wrapping design in such a way that he left an open slot on the underside of each wing. The plane flew straighter and farther than any paper plane he had ever seen before. Even a large living room was too small for a fair flight test.

More significant, when balanced and launched properly the plane wouldn't stall. Stalling is one of the principal causes of airplane accidents. The plane turns at too great an angle to the wind, loses its lift, and crashes into the ground. Some crashes can be traced to engine failure or an onboard fire or explosion, but most are tied to stalling. The plane suddenly loses its lift, and all the pilot's controls become worthless.

Kline's little paper plane simply refused to stall. "I was just trying different things," Kline said later. "I had this idea that I wanted to make a glider that would reach its apogee and automatically level off."

"One day I cut this thing out of paper, and it did exactly that and I said, 'That's what I'm looking for.'"

Kline noticed that the plane was more stable when he opened the slots under the wings, but it was really his friend and advertising colleague, Floyd Fogelman, a weekend pilot and model builder, who realized that the notch under the wing represented "a whole new concept in aerodynamics." A partnership was born, and the men kept the discovery to themselves until their first patent was granted in December 1972. Soon after, the articles began appearing in magazines and newspapers. There were stories in *Time*, *The London Daily Telegraph*, and *The Paris Express*. A 1973 feature on CBS's *60 Minutes* proved so popular that it was repeated three years later.

Kline and Fogelman remained cautious about revealing the instructions for folding their marvelous plane. Hobbyists studied pictures of the plane and footage of the few seconds of the *60 Minutes* segment during which Kline shows TV interviewer Morley Safer the first few folds. Viewers tried to reconstruct the design, but most failed miserably.

The fold-in fact isn't simple. You'll probably make a few mistakes before you get it right. You can make two planes from our master designs—one to practice on and one to get exactly right. Even so, you might want to practice first on an ordinary sheet of heavy typing paper. Cut the paper down to the dimensions in our diagrams, and use the fold lines on the master designs to get all the proportions correct.

A few flying hints. Before each launch, wear the plane head-on and make sure the tops of each wing are horizontal and that both wings are of equal thickness. Check

to see that the vertical stabilizer is pointing straight up and that the tape on the nose has no loose ends. You can wedge a paper clip into the fuselage, just behind the nose, to balance the plane and extend its flights. Experiment with clips of different sizes. And when you find one that works, use a small piece of tape to hold it in place. You can also use tape to reinforce the fuselage just in front of the tail. Fogelman reports some exceptionally long glides after tossing the plane up into the wind. It properly launched, the craft gains altitude rapidly and then flies with the breeze.

Aerodynamics experts who looked at the plane said that it would never fly—not with that notch, or "slit," on the underside of the wing. "They would tell me, 'Forget it, it won't work,'" Kline says. "But me, I never heard of Bernoulli. So what do I know? It works, that's all."

How does it work? The inventors didn't know. So with patent papers safely in hand they set out to find someone who could tell

“Aerodynamics experts would tell me, ‘Forget it. It won’t work.’ But me, I never heard of Bernoulli. So what do I know? It works, that’s all.”

them. They took it to one of America's leading aerodynamics experts, John Nicolaides, a former NASA official and onetime head of the aerospace-engineering departments at both Notre Dame and California Polytechnic State University at San Luis Obispo.

Nicolaides, whose "flying blower" was the subject of a story in one of *Omn's* first issues [A Flyer for the Masses, December 1978], was skeptical at first. He became a believer, however, when the men visited him at Notre Dame and tested a paper model in the campus athletic center. One of my throws went into the lights of the arena, struck the roof, and then glided clear across the building and into the seats, says Kline. "Nicolaides couldn't believe it."

This one flight, more than anything else, convinced the aerodynamics expert that the toy deserved some serious wind-tunnel tests. "The data were strange," Nicolaides said. "Not like any wind-tunnel data I had ever seen." Nicolaides confirmed that the wing was a true breakthrough in design and that it greatly resists stalling.

But why? I don't know. Nicolaides told Safer on *60 Minutes*: "A conventional wing

with increasing angle of attack, increases its lift. But eventually, at a steep critical angle, the wing can suddenly lose its lift, causing the plane to crash. The Kline-Fogelman wing doesn't do that. It has good lift for small angles of attack, but at the larger angles, the lift declines, and the plane just levels off. This happens even at very large angles of attack, which allows it to avoid the tragic stall phenomenon." Wind-tunnel tests showed that the Kline-Fogelman wing was stable at angles well over 18° to 19°. That's the inclination at which ordinary wings lose their lift and begin to stall. In fact, the Kline-Fogelman wing stubbornly resists stalling all the way up to a 45° angle of attack.

Fogelman says that the tests complement observations he made using a home-built radio-controlled model plane with a sail-like wingspan. "I tested our design with different curvatures on the top and the bottom of the wing," he says, "and the most impressive thing about them all is that they don't want to spin. There is a spinning maneuver in competitions. You take the normal radio-controlled plane and fly it up to a stall angle and it will suddenly snap over and go into a spin. Our plane won't do that. You have to cut the throttle and control the ailerons and rudder all at once to force it to spin. And you can spin it in either direction, which is unusual. Most planes will spin only in the direction of their torque, opposite the way the propeller is turning. Our plane seems to resist that torque, so you can spin it either way. When you take your hands off the controls, the plane comes out of the spin in less than half a turn and returns to straight and level flight."

Just as you have to force the plane to spin, you also have to force it to stall. "You can't get it to stall like an ordinary plane," Fogelman says. "It just keeps porpoising on ahead. When you cut power on landing, it doesn't stall either, as other planes do, but just keeps going flat ahead. Also, other airplanes will tip stall—one wingtip goes down, and the plane spins out of control and crashes—if they are brought in for a landing at too slow a speed and too high an angle. Our plane just refuses to tip stall."

One would think that the Air Force and NASA would be eager to perform exhaustive tests on the Kline-Fogelman wing and its variations. Apparently that hasn't happened. "We know NASA tested it," Fogelman says, "but we couldn't get any results from them, and neither could Nicolaides."

In 1979 P. K. Pierpont, then manager of the airfoil-research program at NASA's Langley Research Center in Virginia, told *Omn* about three studies, one of them partially funded by NASA. All had come up with the same results. The Kline-Fogelman wing was found to have a poor lift-to-drag (L/D) ratio—a standard measure of wing efficiency. These results indicated that the airfoil had no practical application, Pierpont said, so no further tests were made.

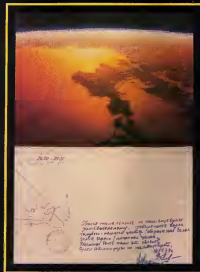
And according to Bud Bobbitt, chief of NASA's transonic aerodynamics division,

CONTINUED ON PAGE 54



CRITICS IN ORBIT

BY FREDERICK C. DURANT III



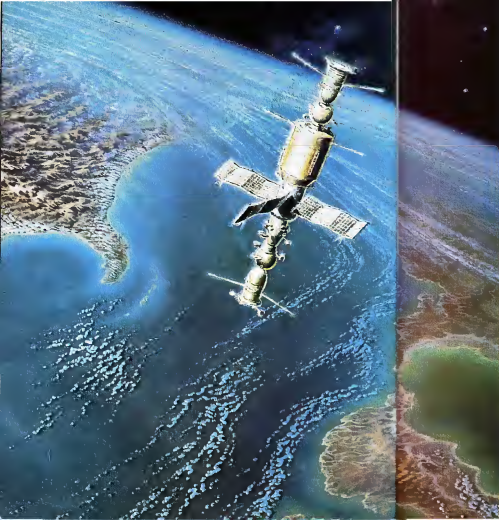
Soviet painter Andrei Sokolov makes the view from space look realistic by using cosmonauts as critics

“The land color is a bit too strong, too differentiated. . . . Soften the edges between the land and water.”



They were the first art critics in space. When Russian artist Andrei Sokolov wanted his paintings compared with the real view from above, he gave them to cosmonauts, who took the art into orbit for on-orbit comparison. American astronauts also offered critiques from memory, noting color inaccuracies between Sokolov's sketch of Baja California (above). A corrected version shows the space shuttle approaching Russia's linked Salyut-Soyuz spacecraft (right).



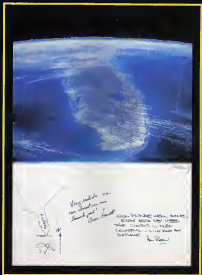


●The sketch comes close to what twilight looks like when the sun goes down, but the cloud shadows are missing.●



On occasion Sokolov used closed-circuit television to talk directly with orbiting cosmonauts, who carefully check his sketches against the views from their spacecrafts and assist him in making revisions. While moving over the Caspian Sea, cosmonauts Vladimir Ryumin and Vladimir Lyakhov helped Sokolov redo his sketch (above). The artist worked realistic cloud shadows into the background of a painting of the orbital station Salyut (left) with docked Soyuz spacecrafts.

◀ This sketch looks realistic, except the clouds in the lower-right-hand section aren't quite right ▶



Astronauts Michael Collins, Alan Bean, and Owen Garriott critiqued a sketch of Florida (above). Solskyv made changes and added the shuttle orbiter (right) making its turn toward home. Sinskey, Solskyv's sketch of the Block 55 on the opening page was reworked into a finished painting of a communications satellite deploying its inflatable antennas (opening spread, left) ... proving that an artist needn't have been in orbit to see the earth clearly. ◀



FLIGHTS

CONTINUED FROM PAGE 14

tests showed that the Kline-Fogelman wing was inefficient. The L/D numbers weren't encouraging, so studying the wing's resistance to stalling became a top priority.

Max Davis, of the Air Force Flight Dynamics Lab at Wright-Patterson Air Force Base, in Dayton, Ohio, told a similar story. A few tests were performed after all the publicity in 1973, he said, but preliminary studies indicated that the wing was not suitable for a full-size aircraft because it has too much drag and not enough lift.

"All that is true," Nicolaides says, "but it misses the point. This airfoil doesn't have great lift at low angles. I grant that. But at high angles, where most planes open out of control and crash, this one keeps flying."

Furthermore, Nicolaides found that at subsonic speeds, the wing worked even better when it was turned upside down, with the notch on the top instead of on the bottom. In the notch-up mode, the wings lift improved by 44 percent and its L/D ratio improved by about 30 percent. And it still refused to stall.

That was enough to convince Nicolaides that the Kline-Fogelman wing deserved serious study by the U.S. government.

In April 1973 Nicolaides wrote letters to NASA, the Air Force and the Navy, urging them to test the Kline-Fogelman wing in all conceivable configurations: notch down, notch up, rounded leading edge, curved wing surfaces, varied curvature and placement of the notch; and so on. Nicolaides enclosed copies of his encouraging wind-tunnel data.

Apparently the government experts with the big testing facilities generally ignored most of Nicolaides's recommendations. Even when they put the Kline-Fogelman wing through its paces, they concentrated on the lift and drag data, not the resistance to stalling, or they studied only the razor-edge version, not the rounded more wing-like variation. In explaining the space agency's lack of interest, Perpert said in 1978 that the flight characteristics of the Kline-Fogelman wing were no better than those of a flat plate. But this assertion was disproved by the wind-tunnel data in Nicolaides's 1973 letter to NASA.

All of this would seem to indicate a marked lack of interest in exploring an idea that could save lives and airplanes. At work it suggests that the government did test wings that qualify as Kline-Fogelman variations but won't reveal the test results.

It boils down to this: If the suggested tests weren't done, why not? And if they were done, why weren't the results made known to Nicolaides, Kline-Fogelman, or an inquiring reporter from *Omni*?

One line of speculation is that the government is withholding the data for national security reasons. Another is that officials perceive a possible overlap between the Kline-Fogelman idea and the so-called

Whitcomb supercritical wing. This wing, invented by Richard Whitcomb and patented by NASA in 1976, permits planes to fly closer to the sound barrier without being buffeted by turbulence on the top of the airfoil. This feat is made possible by the wing's unusual shape. It's relatively flat on the top, with a concavity on the underside. The hollowed section with the abrupt notch of the Kline-Fogelman patent drawings, but it is well within the range of variations that Nicolaides suggested for testing. (When I asked Nicolaides to describe the Whitcomb wing, he called it "a regular wing with a smoothed out Kline-Fogelman notch on the bottom.")

It's possible that Kline and Fogelman were awarded a patent on an idea that includes features of the Whitcomb wing. If so, government officials, firmly wedded to Whitcomb's design, may be trying to sharpen the distinction between the two ideas by downplaying the airworthiness of the Kline-Fogelman prototype.

●One of my
throws went into the
lights of
the arena, struck the
roof, and
then glided clear across
the building
and into the seats.●

"I don't know whether the whole story will ever come out," Nicolaides says. "But the important thing to remember is that the Kline-Fogelman wing doesn't stall. If the government testers say that it is not quite as good as other wings in terms of lift-to-drag ratios, they are neglecting to say that it is infinitely better in terms of not killing people. That's what the Kline-Fogelman wing is all about."

"What I keep coming back to," says Kline, "is the whole question of what makes our airfoil so stable. We believe that the notches cause pockets of air turbulence to be trapped on the underside of the wings and that these pockets somehow support the aircraft at steep angles of attack. No one as far as I know has studied what's going on in these pockets."

Until proper tests are conducted, it is hard to tell what promise the Kline-Fogelman wing holds. So far the most encouraging findings come from model-plane hobbyists, backyard testers and small-aircraft companies.

Amerjet, Inc., an Ohio firm producing single-engine planes, is testing a Kline-Fogelman wing to be used on a two-seater

aircraft. If the stress-analysis and wind-tunnel tests go as expected, the company will build the first full-scale Kline-Fogelman aircraft in about two years.

J. B. Mitro, president of Amerjet, told *Omni* that preliminary tests indicate that the wing will actually improve the efficiency of flight, bringing about a 25 to 35 percent savings in fuel.

On the model-airplane test, findings continue to be impressive. Pete Reed of Avon, Connecticut, laid a Kline-Fogelman wing on a radio-controlled model plane that had a habit of stalling. "It solved the problem," he says. "The plane doesn't stall anymore, and the difference is spectacular. It flies better than any other plane I have used. With my old plane, if you slowed it down it would stop flying and it would tip stall to one side or the other. I can haul the Kline-Fogelman model up to a very high angle of attack or slow it way down, and the plane still won't tip stall. The only problem is that the wing adds a lot of drag, and the plane flies slower than before."

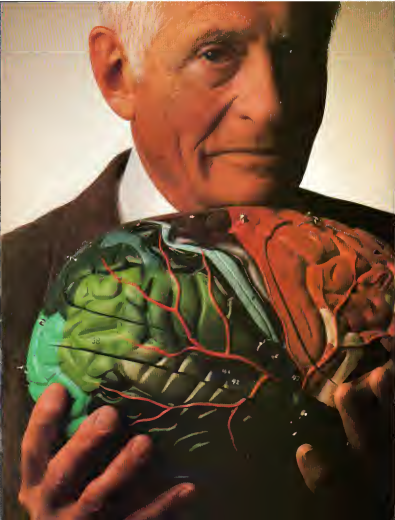
Reed thinks the drag problem might be corrected if the Kline-Fogelman shape were used only on the outer quarter or third of each wing, rather than along its full length. "If a stall starts at the base of the wing, next to the fuselage, you have time to correct it. But if it starts at the wingtip, it spreads to the rest of the wing before you know it, and there's nothing you can do but watch the thing crash."

Reed suggests another promising variation: carving the blades of a propeller into a Kline-Fogelman profile. "I tried it once. I didn't take any hard measurements, but the plane seemed to fly faster," he says.

In another test of the idea of a Kline-Fogelman propeller, George Lau, of South Orange, New Jersey, cut a Kline-Fogelman notch into the two blades of an 11-inch diameter model-plane propeller.

When he attached a fish scale to a plane equipped with an ordinary propeller and served the engine, he got a maximum pull of about ten pounds. "When I put the Kline-Fogelman prop on the same plane, I got sixteen pounds of pull. It was amazing. The plane I was flying with could hardly believe it. Fish scales aren't the most accurate devices, but the one I used did measure a positive difference, and that sure makes me think this design has possibilities. When I slow the plane with its Kline-Fogelman prop, it seemed to have a lot more vertical power than before, and I needed to give it less correction than usual to get it to do such standard maneuvers as rolling and looping."

The romantic in us would like to think that a significant breakthrough in aerodynamics had its beginnings on a kitchen table in New York. That a father, making a toy for his son, hit upon just the right combination of paper, glue, Scotch tape, and luck. Whether this is a tale of genuine discovery or just a fantasy of what might have been has not yet been answered. We're rooting for the kitchen table. □



By planting electrodes deep in the brain's pleasure centers, this radical neuroscientist has relieved violence and insanity where straitjackets, drugs, and shock treatment have failed

INTERVIEW

ROBERT G. HEATH

I'm about to start singing that song, "Those Were the Days, My Friend." Before we got busted and we came down from that wave to a more earthlike level, things were really anchoring. We were like children that live on the same block.

So says a patient in one of Dr. Robert G. Heath's remarkable neuroscientific movies. Blue spirals of marijuana smoke dance around this patient's bandaged head, and a dreamy smile passes over his face. Simultaneously, on the other side of the split screen, the observer can watch the spidery scribbles of an EEG, recording from the electrodes inside the patient's brain.

"There—do you see the big delta wave in the septal region?" says the sixty-eight-year-old Dr. Heath, as large, languid waves move across the line labeled SEP. "Notice that when this man remembers past marijuana experiences, he gets the same brain activity as when he's actually smoking marijuana."

At the outset of this film there are sharp spikes in the young man's septal EEG, and he is full of what the narrator calls "ragged, paranoid ideation." The septum, buried under the folds of the frontal lobes, is the brain's pleasure center. If you peel off the outer layers of the plastic model brain in Heath's office, you can see the septum, the seahorse-shaped hippocampus, the round nut of the amygdala, and the other parts of the human emotional apparatus. In 1948, when Heath came to Tulane University School of Medicine, in New Orleans, to head its neurology-psychiatry department, these parts of the human brain, with names as exotic as those in a medieval bestiary, were little studied and less understood. Just about everything that counted, scientists thought, resided in the cortex, the brain's wrinkled outer mantle.

But these evolutionarily older parts that Heath probed in the

PHOTOGRAPH BY DON SPARKS

What's a Rusty Nail?



a) the rock group from New Guinea that's breaking records in America.



b) the latest decorator color that's sweeping Beverly Hills.



c) the delicious combination of equal parts of Drambuie and scotch over ice.

early Fifties, known as the limbic system, were almost entirely terra incognita. Today we realize this ring of interconnected brain structures, which governs drive and motivation, joy and pain, is our emotional core. We no longer imagine that human beings live and think entirely in the cortex.

Animals with lesions in the limbic regions, Heath had noticed, showed dramatic changes in behavior: uncontrollable rage, catatonia, fear. So when he put multiple lead electrodes into his first human patients at Tulane in 1960, he chose those subcortical sites. It was the first time anyone had implanted electrodes in human brain tissue and left them there—recording deep brain waves while a patient talked, recorded the past flow into a rage, hallucinated, or had a seizure. Specific sites in the limbic system could also be stimulated with a low current, triggering sudden rage, joy or fear.

The patients were schizophrenics, severe epileptics, chronic pain patients, and other seemingly hopeless cases, and Heath and his colleagues made movies of them. But the psychiatrists, neurologists and neurosurgeons who saw these movies in 1962 did not hail the enterprise as a medical miracle; they accused Heath of mind tampering, unsafe human experimentation, and other unbecoming acts. One film provoked particular outrage: It shows a brain-stimulation session in which the patient grimaces, cries out as if in pain and tries to strike his doctors—all of which looked like cold-blooded torture. "They thought we were hurting him, but we were not," Heath says of his colleagues' reaction to the film. "We were stimulating a site in the patient's midbrain, and he was taking rage. Right afterward he remarked that the feeling reminded him of his spontaneous rage attacks. He didn't feel we had hurt him in any way."

There was another factor working against Heath, too: In the Fifties, the Golden Age of Psychoanalysis—when schizophrenia was thought to be the result of schizophrenogenic (schizophrenia-causing) mothers and other psychic traumas—Heath was a heretic. He had learned the Freudian trade at Columbia University's Psychoanalytic Clinic, but neurology was his first discipline. When he observed the shattered inner world of psychotics, he thought not of unresolved Oedipus complexes but of the organic brain diseases he'd been trained to treat. "I never thought that mental disease was anything other than biological," he recalls. A decade later the world would catch up with him.

If Heath is some sort of neuroscientific Dr. Strangelove, his kind, rather courtly bedside manner belies it. When he was fifteen, his father, an old-fashioned Pittsburgh family doctor, arranged for him to witness an autopsy. As later would have it, the body being carved up in the icy light of the morgue turned out to be Heath's childhood acquaintance. "I'll never forget the horror of that. This was a man I'd known

and liked, and the doctors were callously cracking jokes. It's very important not to lose sight of the human side of medicine."

In any case, Heath's discovery of the brain's Papez's box would help to heal no small number of afflicted people. Psychoches he found, had a peculiar spike and slow-wave EEG pattern in the septal region. When a patient lies into a psychotic rage, the electrodes show small electrical storms in part of the amygdala, the hippocampus, and the tegmentum—the so-called aversive or rage/fear circuits.

The root of schizophrenia, Heath reasoned, is a defective pleasure system and an overactive aversive system, and this analysis led him to a new form of therapy. By stimulating the septal pleasure area, Heath could make the homicidal maniacs, suicide attempts, depressions, or delusions go away—sometimes for a long time. Direct brain stimulation could also turn off some epileptic seizures and alleviate intractable physical pain.

In 1976, he adapted the cerebellar pacemaker to treat pathological behavior. The pacemaker is an array of tiny battery-powered electrodes that sits under the skull, on the surface of the cerebellum, at the very back of the head. It was one of Heath's most revolutionary contributions. No standard definition of the brain's emotional system had ever embraced the cerebellum, a primitive brain structure governing movement and equilibrium. But Heath had uncovered a crucial feedback loop between it and the limbic system. By stimulating a precise half-inch of the cerebellum, Heath was able to turn on the pleasure circuits and inhibit the pain circuits, so there was no need to invade the areas farther forward in the brain.

One patient, a physician, had spent much of his adult life in mental hospitals. Troubled by black depressions, religious delusions, and voices that told him to choke people, he had tried to strangle his wife several times. Psychiatric drugs and electroshock were no help. Then, in 1977, he received one of Heath's pacemakers. His hallucinations and violent compulsions waned, and he and his wife were reunited and dined together in restaurants for the first time in years.

Another patient, a twenty-one-year-old former librarian, lost most of her frontal lobes (connected to the limbic system) when she was shot in the head during a holdup. She had seizures, barely spoke, and had to be fed through a tube after she stopped eating. A year later she tried to kill her father, began laughing out at anyone within reach, and complained of constant, excruciating pain all over her body. After her brain pacemaker was installed, her constant rage subsided, she started eating, her memory improved, and she became increasingly pleasant.

These are some of the success stories, and perhaps half of the forty-odd pacemaker recipients have been moderate to glowing successes. There have also been

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many equipment failures, broken wires and dead batteries along the way. And, ironically, the pacemaker doesn't seem to take the agony out of schizophrenia: the very disease that Heath has been trying to cure all his professional life.

In the early Fifties Heath suggested that schizophrenics manufacture antibodies to their own brain tissue—that they suffer, in fact, from an autoimmune disease. In a series of experiments, normal prisoners volunteered to receive injections of a specific fraction of blood from schizophrenic patients; these volunteers then became temporarily psychotic. Heath was soundly criticized when some researchers could not reproduce his results, even though others did successfully replicate the experiments. A decade later more refined biochemical studies seemed to identify the mysterious psychosis-producing substance as a specific brain antibody, but the psychiatric mainstream remained skeptical. Today the autoimmune theory of schizophrenia is making a small, isolated comeback. One prominent scientist who is trying to track down the schizophrenic antibody remarked, "Robert Heath is a genius of our time, and like many geniuses he has always about twenty years ahead of his time."

Tacked to Heath's wall is a Dorian Gray comic strip. It shows a television set blaring a story about Dr. Robert G. Tuleneas

research on the effects of marijuana on rhesus monkeys, concluding: "THEY WERE NORMALLY EXCITED. The last frame shows Zerkar slumped in his armchair, saying 'uh oh.' Curious about possible therapeutic effects of marijuana on the brain's pain-pleasure system, Heath launched rhesus-monkey studies in the mid-Seventies. When his senior smokers showed alarming signs of lasting brain damage, he told his cautionary tale to those who would listen, including several congressional committees. But he claims that pro-marijuana groups continue to obstruct grants for further research."

In his lab in New Orleans—a city that has served as host to his controversial experiments for the past 35 years—the nominally retired Heath continues to map correlations between brain states and behavior. A faint, cloying scent of midday hange over the French Quarter in the evening as Heath, a modern Virgil in the gaudy night world of Bourbon Street, stops gingerly around the drunks and points out the sights: the street where the young aristocrats once kept their afternoon mistresses, the square where slaves practiced voodoo, the best gasstations in town. At an age when many doctors hide comfortably into a golf resort sunset, Heath contemplates the future. What will happen in a world where everyone tampers with his pleasure/pain circuitry? Will drugs create a guiltless society? How long

will it take to find a cure for schizophrenia?

Heath was interviewed the past fall by science writer Judith Hooper.

Overt. The textbooks focus on the researchers who mapped the pain/pleasure centers in rats and cats. But you'd already put deep electrodes into two dozen human brains before McGill University's James Olds and Peter Milner published their animal self-stimulation studies in 1954. Has there been some sort of prejudice against your work?

Heath: Well, we were certainly outcasted. When I presented films of our first twenty-six patients in 1962, the stuff really hit the fan. People accused us of turning pleasure on and off, tampering with nature, playing God. But if you want to know anything about the mind, you must work with humans. Animals can tell you what they feel if you stimulate a cat's brain with electrodes and its hair stands on end, as it does when the cat is in a rage, that doesn't necessarily mean you're putting it into a rage. You might be hitting a final motor pathway that has nothing to do with any psychological state. For that matter, you can remove a cat's cortex and nothing much happens. As you go up the evolutionary scale, you get more cortex—and more anticipation of the future. The lower down you go, the more animals live in the here and now. I think it was the well-known nineteenth-century

physiologist Claude Bernard who said, "In animals nothing is left to the ignorant will of the individual."

Orrin: Perhaps we pay a price for all our cortex. Is there such a thing as a schizophrenic cat? Can a guinea pig, for example, have delusions?

Heath: Actually, schizophrenia is caused mainly by a defect not in the cortex but in the deeper areas of the brain—those that govern pain and pleasure. It's true, however, that the more you depend on learning to adapt, the more opportunity there is for mislearning. Fear and rage are basic survival emotions, but severely anxious people—depressives and obsessive compulsives—lose the damndest things, like dirt on the floor. Lobotomy worked best on these types of patients because it relieved the pain associated with anticipation and memory, which are higher cortical functions, if made them live more in the here and now. It also made them more extroverted. We called it the used-car-salesman syndrome.

Orrin: But didn't lobotomy produce a certain emotional shallowness, too?

Heath: Yes, there were many undesirable side effects. If you lose your ability to anticipate, you don't anticipate being punished for doing bad things, either. So you sit down at dinner and you belch; you don't care about the consequences. The operations also didn't touch the basic pathol-

ogy in schizophrenia: the disturbances in feeling and sensory perception, the faulty, dreamy thinking that leads to delusion, the distortion of reality.

Orrin: You worked on the Columbia Grey-stone project [a 1947-to-1949 study of topectomy, or surgery on selected parts of the frontal cortex, as an alternative to more drastic lobotomy]. Did that lead you to look beyond—or should I say below?—the cortex for a solution to mental illness?

Heath: That proved to be the classic study on the frontal lobes, the only really controlled study. After that I wanted to get away from the cortex. I thought we had mislaid it; it's true that when certain parts of the frontal lobes were removed, you got some beneficial effects. So I looked to see how these parts were connected to deeper [subcortical] brain sites. That's when I got interested in the septal region, the area just beneath the frontal lobe.

Orrin: When did you begin exploring this country in human beings?

Heath: I moved to New Orleans in 1949 to set up my own department at Tulane, and several outstanding scientists joined me. We had done animal experiments with depth electrodes, and we adapted our methods to humans. Within a year we had our first electrodes in a patient. We went right into the septal region. By stimulating these deep-lying areas and then taking recordings of them, we were able to localize

the brain's pain/pleasure systems. We would interview a patient about pleasant subjects and see the pleasure system firing; if we had a patient who flew into a rage, as many psychotics did, we would find the opposite emotional system, the pain system, firing.

Most of our first patients were incontestable schizophrenics who weren't responding to any other treatment. We found they had this abnormal electrical activity—spiking—in the septal region.

Orrin: What do these septal spikes—abrupt changes in electrical potential—have to do with schizophrenia?

Heath: Well, the septum is a key site in the pleasure system. I'd always noticed that one of the most consistent symptoms of schizophrenia is anhedonia, a deficiency in the pleasure response. Schizophrenics have a predominance of painful emotions. They tend to function in an almost continuous state of emergency emotion—fear and rage, fight or flight—because they don't have the pleasure to neutralize it. Patients will say, "I just don't have pleasure, I don't know what it is."

Orrin: For instance, if you talk to schizophrenics about falling in love—

Heath: They don't fully understand it. They've read books, so they know how one is supposed to act, and they copy what other people do. But they simply do not have the qualitative feeling



"Remember what happened the last time I got you one of those?"

Most schizophrenics remit and relapse so we could record them when they were very psychotic and when they were in relative remission. The spike, we discovered, correlated with the psychotic state. And it did not occur in nonpsychotic patients. For diagnosis and treatment, we had implanted electrodes in some epileptic people who were having several seizures a day despite high doses of medication. We had some Parkinson's patients, too, because in the early Fifties, people were treating Parkinson's disease with brain surgery. And we had patients with intractable pain. These patients proved that the abnormalities we saw in schizophrenics were not just a result of the procedure.

Omni: Besides recording spontaneous brain activity, you also used the deep electrodes to stimulate certain areas. Can you describe that?

Heath: Yes. First of all, we needed to stimulate various sites to see what behavior we turned on. But the stimulations were also the treatment. We thought that if we could stimulate the septal region, which was interesting, we might be able to correct the dysrhythmies. In those studies it turned out that the pain/pleasure systems were in inverse relationship. Stimulating the pleasure sites automatically inhibited the pain sites and vice versa. If we stimulated the pleasure system, violent psychotics stopped having rage attacks. We even stimulated the septal area in people suffering from inoperable cancer or arthritis, and we were able to turn off the physical pain. All of this makes sense. When you're feeling pleasure, you don't feel angry, and when you're in a rage, you certainly can't feel pleasure.

Omni: Deep-brain stimulation sounds like a miracle cure, but is it not that simple, is it? A four-millamp zap doesn't make schizophrenia go away.

Heath: No. At first we thought one stimulation would reverse the psychotic process. One of our first patients was a young gal who was hopelessly psychotic; she was catatonic, wouldn't eat, and her life was in danger. We stimulated her septal area a few times, and she stayed well for four years. We thought we had cured her (but she did eventually regress, as did most of the early electrode patients).

In the old days we could leave the electrodes in for only a few days; we'd stay up all night making recordings. After we refined our method, we started leaving the electrodes in up to several years so that the patients could be restimulated when symptoms recurred. Eventually of course we developed a pacemaker with its own internal power source to provide the patient with continuous stimulation.

Omni: Can't you also use drugs to activate the pleasure/pain system?

Heath: Yes. For instance, marijuana produces a strong pleasure response in the him you saw, we have a split screen so that you can simultaneously view the patient's brain waves from sixteen sites as you watch his behavior. When he gets high you can

see it in the septal region. Another pleasure chemical is the neurotransmitter acetylcholine, one of our naturally produced chemical messengers. Along with the electrodes, we surgically implant a canula, a small tube through which we could deliver very precise amounts of a chemical to these subcortical areas. When we put acetylcholine directly into the septal area, patients felt very good, and we recorded vigorous septal firing. In one female patient, this was associated with sexual orgasm—multiple orgasms lasting as long as thirty minutes.

Omni: From what you've seen of the corresponding brain activity, is sexual pleasure distinct from generalized pleasure?

Heath: Well, the recording changes are in the same places, but the orgasmic activity is more explosive. The activity at the deep brain spots is similar to what you see in the brain during an epileptic seizure.

Omni: Have you ever taken recordings from a person while he or she is having sex?

•Schizophrenics have predominantly painful emotions. They function in a state of emergency—fear and rage, fight or flight. They have no pleasure to neutralize it •

Heath: Yes, we had a homosexual who was also intermittently psychotic, who wanted to see whether he could change. He'd never been able to function sexually with a woman, though he had made several attempts. We set up a fairly prolonged program to see whether by altering pain and pleasure physically, we could change his psychological outlook. He wanted to do it.

We located his pleasure sites by stimulating them, and we gave him a self-stimulator to wear on his belt. It had three or four buttons that were connected to electrodes in different places in his brain, and it recorded the number of times he stimulated each site. That way we could determine which site produced his most pleasure—the one he stimulated most. I think the stimulus was set to stay on for a half-second or so every time he hit it, and he stimulated the maximum-pleasure site in the septum almost constantly—about fifteen hundred times an hour, I think.

In order to make the pleasure specifically sexual, we showed him stag movies while he stimulated himself. He got very excited and told us he'd very much like to have a woman. To make it ethical and le-

gal, I went to the district attorney and told him what we wanted to do. He agreed and even assisted us in locating a lady of the evening. We paid her fifty dollars. I told her it might be a little weird, but the room would be completely dark.

In the next room, we had the instruments for recording his brain waves, and he had long enough been running into the electrodes in his brain so he could move around freely. We stimulated him a few times; the young lady was cooperative, and it was a very successful experience.

Omni: Did he "convert"?
Heath: Not for long, because we only did it once. After that, he went back to being homosexual.

Omni: Do humans lose interest in other things, say, food and sex, when given the chance to self-stimulate?

Heath: No, the few patients who used our device did not prefer self-stimulation to food or sex. In fact, if a patient was feeling good, he self-stimulated less often, if he was depressed, he got a much more dramatic pleasure response from stimulation. There are so many factors that come into play in the human pleasure response: experience, memory system, sensory cues. We had one patient at the state hospital who suffered from narcolepsy [brief attacks of deep sleep]. He stimulated quite a bit, and he got a little horny from it. He went out and started fooling around. I think a jealous husband shot him in the foot.

Omni: So if we all had self-stimulators, we wouldn't turn into electrode junkies?

Heath: I remember seeing Timothy Leary on television. He was asked whether drugs were a bad influence on young kids, and he said, "This is nothing. In a few years kids are going to be demanding septal electrodes." But it doesn't work like that.

Omni: Do you suppose that some of the holy men meditating in Himalayan caves and experiencing otherworldly bliss have somehow tapped into the limbic system's septal pleasure area?

Heath: Oh, I think so. We did many experiments that showed that the pleasure system is automatically fired by all sorts of things: happy memories, stag films, pleasurable thoughts, eating or even the expectation of food anticipation or sex.

Omni: How does your research into the neurophysiology of pleasure and pain correlate with Freud's concept of the pleasure principle?

Heath: You know, of course that Freud experimented with cocaine, which is a pleasure-producing drug. He thought, correctly, that if you could get pleasure, it would relieve neurosis, and he believed that cocaine would cure neurosis. That might be true if you didn't ultimately pay a price. Cocaine makes more of your own internal pleasure chemicals available to the brain so that you get a momentary rush of pleasure. Eventually, however, you deplete your own internal supply and get the opposite effect—depression.

Freud's pleasure theory was partly right

but he made some big mistakes. He saw pleasure as a primary drive and ignored the survival aspects of emotion. Because he saw many patients who were full of anxiety and had inadequate sex lives, he concluded that they were anergic because they had inadequate sex. But he could just as easily have reasoned that anxiety impaired sexual function. Much later, when he was nearing severity, he saw his mistake and wrote a monograph on anxiety in which he said poor sexual performance was secondary to fear. Anxiety and fear are responses to danger. Like rage, another mechanism for dispensing with danger. They are survival mechanisms. In Freud's culture, sex was made dangerous. It was linked to fears of injury and castration. Freud also erred by not dealing with rage as a survival-related emotion.

Ques: Where is the brain's rage/fear system located?

Heath: We recorded strong physiological responses of rage or fear most consi-

derly from the hippocampus and part of the amygdala. The amygdala is split. Activity in part of it is pleasurable, in the other part, it's aversive. You can also activate rage or fear by stimulating parts of the tegmentum in the midbrain.

I'll show you a film of a psychotic patient in whom this occurred. After we stimulated a site in the tegmentum, he wanted to kill one of the doctors. He would have, too, if he hadn't been restrained. He had a wild look. It happens that the tegmentum is a site where the fibers go to the eye muscles, so his eye moved strangely. We were not hurting him, as many people thought when we showed these movies in 1952. The stimulus activated the brain's rage mechanism—the same aversive center that fires when a person gets angry for psychological reasons.

As soon as we turned off the current, the patient returned to his usual state. He said, "That reminds me of another time when I lost my temper; my shirts weren't soiled

right, and I wanted to kill my sister." That showed us we had activated the same or circuit that was fired by his spontaneous rage attacks. Afterward, he said, "I felt like a gorilla, I just wanted to kill." When we asked him why he wanted to kill the doctor, he said, "He was just there."

Another patient had an electrode in the amygdala, at the junction of the pleasure/rage circuitry, so we could stimulate rage or make her feel pretty good. We would get her up to four millamps, a relatively low level of stimulation, and she wanted to strike us or tear up things. We'd drop the current one or two millamps and she'd say, "Now why did I do that?"

Ques: Do you think that some sociopaths have rage systems that spontaneously fire out of control?

Heath: Well, sociopaths supposedly kill for tangible gain, but some people diagnosed as sociopaths kill for no reason at all. The circuits probably just fire off. We have some films of patients flying into rages, and you

Come to Canada.



Photo courtesy, Rocky Coward/Brand

can see the circuits fire. Some epileptics, you know, have rage attacks between their seizures; there are cases of epileptics who have stabbed nurses with scissors or have shot members of their family. Ordinarily they were very nice, decent, and non-violent people.

Omer: That raises some profound questions about free will. For instance, I believe that I don't commit murder because I'm an ethical, humanistic person.

Heath: So are some of the people who can't stop their rage and violence when they're out of control.

Omer: Would you say that means that our ethics are illusory?

Heath: No, they're not an illusion. But how are our ethics set up? You're taught, "Thou shalt not kill." I'm sure you've had rage attacks during which you've felt like killing someone. Why didn't you kill, even if you wanted to? Because you were scared and knew the consequences. That's the inhibitory influence. When you were a child, your

parents were the authority figures, who would punish you, later the authority figures get internalized as God or whatever. But all moral learning is ultimately based on this pain/pleasure circuitry in our brains that is our internal reward-and-punishment system. In religion, of course, the ultimate reward is heaven and the ultimate punishment is hell. But the psychopath feels no guilt at all; his reward-and-punishment system is defective. He can't be taught, and he doesn't learn from experience. Because he lacks internal restraints—the conscience—he needs external ones—like jail.

Omer: Do you foresee these biological issues coming into the courtroom? "Your Honor, my client didn't intend to kill; his rage center just misfired."

Heath: Sure, it has already happened. There will be a lot of neurobiological testimony in John Hinckley's trial. In our culture these people so often go after the president, the pope, the biggest gun. It could

be anyone, but if they're paranoid, they're likely to go after the dominant father figure. **Omer:** Obviously then, most of us are kept in line by inhibitory mechanisms that exist in our brains.

Heath: The biggest inhibitory influence is in the cerebellum. It automatically inhibits the rage centers. That's why the first patient we selected to treat with a cerebellar pacemaker was the most violent patient in the state-hospital system.

Omer: Would you explain the pacemaker and how you developed this unusual form of therapy?

Heath: We implanted the first pacemaker in 1976. Our first patient, a mildly mentally retarded young man, was uncontrollably violent, as I mentioned. He slashed himself repeatedly and he tried to kill several people. He had to be bed to the bed because no medication could control him. Up until then, of course, we'd been putting electrodes in the deep limbic areas, and the patient had to come into the laboratory for

CONTROLLED ON PAGE 117

The Endless Surprise.



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• The UFO may
be an interface between
our reality
and a parallel reality •

ANTI-MATTER

Close Encounters of the Third Kind and I suggest that UFOs are space vehicles piloted by extraterrestrials. This simplistic solution to the UFO problem is suitably rejected by most physical scientists—and, with good reason. Even the most sophisticated propulsion devices could not cover the astronomical distances involved in an "round trip" length of the "round-trip," our sophisticated surveillance systems have yet to detect any UFOs approaching or departing from the earth.

And having come from vast distances, UFOs make sub-optimal use of their short visits. So unlike us! We would land prominently, bearing gifts and orders to establish our credibility. They leave lonely tracks late night hours and few witnesses.

Though these factors argue against an extraterrestrial explanation, they do not demolish the reality of the UFO phenomenon. UFO sightings continue to be reported from all over the world by military and commercial pilots, engineers, technicians, and other people judged sane and responsible. UFOs just won't go away.

The inconsistency of the situation of course begs some questions: Why are there UFO reports in the first place? Why not reports of pink elephants, for instance, or very dragons? What sorts of people make UFO reports? Under what conditions were the UFO sightings made? And how can we explain UFO photographs, inexplicable radar blips and other bits of physical evidence?

The questions are so diverse that research could be



UFO UPDATE

conducted by any number of professional scientists: physicists, astronomers, sociologists, psychiatrists or theologians.

The best person to investigate these questions, however, might be the visionary, someone who applies his particular expertise to the study not of UFOs (we have none in custody) but to the myriad reports of UFO encounters.

As far as I'm concerned, studying such reports may open a whole new arena of which we are only dimly aware. The key to this alternate reality might lie in the supernatural nature of UFOs. Much like the

Cheshire Cat in Alice's Adventures in Wonderland, UFOs appear spontaneously within limited areas, remain visible for a short time, and then disappear without a trace.

This peculiar behavior reminds us of the duality of light, which acts either as a wave or a particle, depending on the particular situation.

Can the UFO likewise have two aspects? Can it be an interface between our reality and a parallel reality, the door to another dimension? Surely we haven't had our last revolution in scientific thought: twenty-first, twenty-fifth or twentieth-century science may well hold concepts as unimaginable to us as nuclear energy would have been to the pavement. —J. ALLEN RHYNE

Editors note: J. Allen Rhyne is director of the Center for UFO Studies in Evanston, Illinois. This is the first of a two-part series on the meaning of UFOs. Next month, Orion will print a response from UFO skeptic James Oberg.

ET'S AND THE DEAF

When young William Ortiz fell from a horse in Bucaramanga, Colombia, his chin struck a stone, shattering the bones in his ears and rendering him deaf. Yet, Ortiz claims his hearing has slowly returned.

How? With the help of aliens, explains Center for UFO Studies (C.F.U.S.) investigator Virgilio Sanchez Goepo of Miami. This may be the first time, says Sanchez Goepo, that extraterrestrial beings have communicated with a deaf mute.

Sanchez Goepo read about Ortiz in a 1979 C.F.U.S. newsletter and later found him working as a freelance portrait artist at a Las Vegas hotel lobby. Though Ortiz was unable to speak, Sanchez Goepo adds, he did paint a picture documenting his first encounter with aliens. (Ortiz is shown below, sitting next to his painting.) Says Sanchez Goepo: "Or-

tiz told me that these creatures have been following him all his life—even in Las Vegas."

Though Ortiz can't explain exactly how the ET's restored his hearing, he claims he has visited the alien base in Bucaramanga. But I can't go, I've been told, says Sanchez Goepo, because it's a ban enclave and it's dangerous to Colombia. "If the communists would let me," what does a 34-year-old, nekk head of the national C.F.U.S. office in Jackson, Florida, think of it? "I would think of it as a good idea."

Ortiz would be a tremendous time-consuming investigation, and I dropped it," he says. "Not only is a deaf-mute, he's also an expressive, mischievous, peace-loving, and down-to-earth person. When he writes down answers to questions, he makes his unintelligible scribbles fit."

Sanchez Goepo, however, contends that the Ortiz case inspired him to produce the nation's first UFO radio show devoted "The special relationship between aliens and the handicapped."

"I've discovered many cases where aliens have helped the blind to see and crippled to walk," he says, "which proves that, though humans at first discriminate, aliens recognize the disabled as people."

Peter Rodinore

"I can assure you that flying saucers, given that they exist, are not constructed of any power on Earth."

—Harry S. Truman



PERMANENT EYELINER

There's new hope for the terminally vain. Using the latest in microsurgical techniques, a Las Vegas ophthalmologist has developed a permanent eyeliner. Known as Permald, the makeup represents—in the words of its inventor, Dr. Gloria P. Angres, of North Las Vegas Hospital—"the start of high tech cosmetics eventually making it possible for every woman to be beautiful with a minimum of effort."

Inspired by the plight of a former beauty queen whose failing eyesight caused her to scratch her cornea with an eye pencil, Angres worked for seven years to develop his procedure. The operation itself is performed using a special microsurgical tool to implant a pigment in the dermis, the layer of flesh directly beneath the outer skin. The surgery, which Angres

calls a "permanent" lines, 20 minutes and requires nothing more than local anesthesia. Results, applied in the before-and-after shots shown above, can last as long as ten years.

Although there is an undeniable element of wickedness about all this, Angres says that the procedure does have serious medical applications. Permald can aid people with poor vision as well as arthritis who can't raise their hands. Moreover, since Permald keeps eye pencils away from eyes, it also helps prevent ocular infections.

Currently, says Angres, Permald comes in two stylish earth tones, gray and brown. But what if a patient turns out to be a punk rocker requesting cadaver purple or metal false zebra stripes? Angres pooh-poohs the idea. "If punk rockers ask for this operation," he says, "I'll probably ask for drugs, too."

—Gil Lawren



STORM DRAIN CROCODILES

It's an old story: Tiny crocodiles owned by New Yorkers grew too large for comfort, so they were flushed down the toilet. Instead of succumbing though, these intimidating reptiles flourished in the city's sewers, where they live and breed to this very day. The story is only a rumor, of course, but a similar account of crocodiles in Carné, Australia, may have more validity.

According to Carné police sergeant Jim Butts, worth most of the animals are fairly small—three to four feet long—and rarely cause residents any problems. But at least one croc seems to have developed a taste for people. Twenty-one-year-old Leon Phelps was walking along a main city street recently when a crocodile locked its jaws around his leg. According to police sources, Phelps

sucked the reptile away from him and with the help of a nearby cabdriver.

The croc dived back into the drain and is still at large. Sergeant John Mac Donald later explained, "We've issued an all points bulletin for it."

But how did the fresh water crocodiles end up as urban inhabitants in the first place? Sergeant Butts worth has a familiar explanation. "We think somebody had a small croc or two and when they got too large they released the animals into the storm drains." —Sherry Baker

For an item ever to be fashionable is ominous since it must afterwards be always old-fashioned.

—George Santayana

Beast is not the beginning but the end of all knowledge.

—Johann Wolfgang von Goethe



CORPORATE DEVIL

Every year, Fortune magazine picks the top 100 American corporations. This year the Procter & Gamble Company gave in to a host of dollars to the Christian Satan. But according to Maylene Bradford, a Procter & Gamble public relations officer, that's not the whole story. She recently turned at her company. Another view: the company's logo—a diamond-shaped human profile with a circle of 13 stars—has the devil's face. The suggestion was that the top 100 is connected to a conspiracy to form the United States 666. Explains Bradford, "which is the symbol of the devil, or Antichrist."

The efforts of Maylene Bradford, vice president, disturbing. Some 100,000 people boycotted the company's products, and at its baby food to pull out the "pac" without teeth. Consequently, Bradford adds, officers hired private detectives to see if the competitors would find the same "mystery" as she did that an Atlanta "weather man" had "sunk" a female religious leader that spread his "evil" mouth. Procter & Gamble won't identify the perpetrator, says Bradford, "but a buddy agreed to stop, he can play after we threatened him with a million-dollar lawsuit for slander."

Despite the company's victory there are still those who contend that the corporate devil is real. Jack Chick, a Los Angeles publisher, for instance, uses a comic book called *Satan*



and other items, "using powerful words and pictures that offend Satanists for us on the world." Boston companies that manufacture such occult products as Ouija boards, tarot cards and astrology books, he charges, "the devil's best ally." He records industry particularly rock and roll.

Rock bands, he claims, use Druid drummers to summon demons and "hypnotize sacrifice victims." In fact, he adds, "the Beatles used these books to hypnotize fans and become a phenomenal success."

What to do about it? "Go home," Chick suggests, "dig out your astrology books, Ouija boards, and rock records, and burn them behind a church."

—Peter Rindone

If paranormal phenomena say anything, suspect that this is not about spirits, demons, or ghosts but about human personality.

—William G. Roll



SPARE-PARTS SALE

Justi Nicolli, a twenty-seven-year-old self-described jack-of-all-trades, placed this simple ad in the Tampa Tribune: kidney FOR SALE. \$30,000. CALL AFTER 5 PM. Out of work and desperate for money, Nicolli was trying to cash in on the highly publicized shortage of organs by selling one of his own.

While he didn't find any takers, Nicolli isn't alone. According to Amy Peele, president of the Chicago-based North American Transplant Coordinators Organization, "The whole thing is growing to tad proportions. I get live calls on the subject a week."

A proposed U.S. law, notes Peele, would make the sale of organs illegal. But already people like

Herold Hedrick, a forty-seven-year-old carpet-lactory worker in rural Dalton, Georgia, have retained lawyers to help them sell organs and research their rights. "There are plenty of people who need a kidney and who would be glad to pay the twenty-five thousand dollars plus expenses that I'm asking," says Hedrick, who wants the money to buy a fast-food restaurant. "I'm real healthy and this is a way for me to help someone while they help me. It makes me feel sad to hear that someone has died waiting for a kidney while I have one just ready to go. The problem," he adds, "is finding a doctor to do the operation."

But doctors and other critics of organ selling list a host of possible horrors. Dozens of destitute people

might undergo potentially dangerous surgery for the promise of quick cash. And since many patients are in low-income brackets, they could become the victims of a bidding war in which only the wealthiest could afford organs. Finally, donors could develop disease in their remaining organs, making them candidates for transplants.

These fears, though, have not stopped people from trying to sell parts of their bodies. After that first ad appeared, we were deluged with people offering other organs," says Ivonne Shroeder of the Tampa Tribune. "It's hard to believe, but there are people who want to sell lungs, eyes—even arms and legs."

—Sherry Baker

"No fact is so simple that it is not harder to believe than to doubt at the first presentation."

—Lucretius

MYSTERY NAMES

It may not be surprising to find that Devil's Swamp, Louisiana, is steeped in mystery and folklore. But why do cities as innocently titled as Logan, Utah; Decatur, Illinois; and Fayetteville, Arkansas, appear as recurring sites for unusual phenomena?

That's the question being asked by Loren Coleman, who noticed that strange events occur most often in towns with particular, but seemingly innocuous, names. Author of *Mysterious America*, Coleman has

for instance, recorded a "beast of Lafayette Lake, California," a "headless horseman" in Fayette County, Ohio, bigfoot and UFO sightings in Fayette County, Pennsylvania, notorious hauntings near Fayette, Maine, and a rash of oddities from Fayetteville, Arkansas.

Researching the origins of the names, he found that the root word "fayette," from Old French, means little enchantment. Likewise, he connected Logan, another town name associated with oddities, to the ancient ritual of rolling logan stones. And he says anomalies in towns named Decatur might be traced to the novel hero Stephen Decatur, a man linked to hauntings and the occult.

Coleman also reports that certain surnames are often connected with mysteries, though the stranger the name, the more bizarre the encounter. His personal favorite is the 1988 sightings of two mysterious creatures by two different Charlie Wetzel's. One reported a scaly bigfoot in California; the other, a "mystery kangaroo" in Nebraska.

"Of course, it's difficult to come to any conclusions from all this," says Coleman. "What can you do with a mystery kangaroo and two Charlie Wetzel's?"

Casey McCabe

"There was a door to which I found no key/There was a veil past which I could not see."

The Rubáiyat of Omar Khayyám

FIRE

CONTINUED FROM PAGE 36

Frances smiled, glad that the old couple supported her. But then she heard Albert nod to his wife.

"Methinks the dig chief might pre-empt too much," he said. Albert snickered when curiously excited.

"What does that mean?" asked Griffin. "A lie," said Albert.

"How lovely a wood fire would be," Emma said with a sigh.

After Frances air-dried from the conditioning removal, she slipped on a sheath. On the video panel was a favorite from Griffin's prized collection—rapt faces watched Beaver Cleever, who lived in a simple and insanely random tree-land neighborhood of dwellings.

"How I love that place," breathed Griffin. "Great ages, and those dwellings, made mostly of wood."

"Incredible," agreed Albert.

"Incredible to you," Emma grouched. "Criminal to me."

Perhaps the site would pan out, Frances considered. Some evidence coated of fire erosion of the half-billion stones. Organic evidence of wood might lead to evidence of animals, to peripheral suggestions that the site she had chosen was indeed architectural, not a simple accident of events. Illogical or emotional, she felt surging hope.

She stood in the conditioning spray, working it into her pores. An hour later she was outside, walking toward the site. She loved the squally feel of the ash between her toes. The shuffle's pad glistened a thousand meters beyond the geodesic quarters dome, a silvery dot in orbit streaked above her head, waiting to take her away either in brilliant success or abrupt failure. Failure meant she would never be given one choice again, not the way inflation had ripped apart the budgets.

Though the conditioning warmed her, she hugged herself, arms squeezing naked skin. The site was below.

Frances looked down at outlines of stone, like cosmic teeth embedded in a big vein of volcanic ash. She envisioned eruptive events—magma flowing, sinking back, the molten fumarole's terrible crown. But did anyone see it? Was the life form destroyed in flame?

The finding of wood increased the possibilities a thousandfold. Frances thought. Walking back, she imagined flame. Glowing gas at combustion temperature. That was all it was, she'd seen it in the archives lab demonstration.

Frances stopped.

A shiver seemed to run across the night—up, out of the site below her. She thought she saw a ripple sweep across the ground like a wave at sea, and the soles of her feet tickled where she stood. She'd never felt this sensation before. She was

breathing rapidly. She fell west all over.

Frances made herself stop.

She was panting, she had been running, she realized. She'd run only a few steps. She looked, looking down the sloping veins of ash and sand, her imprints in it. Balm-relief by the indirect illumination from the dig site.

She walked back, retreating her steps.

Another fragment of wood. Black and ancient and gnarled with death and time it protruded from one of her footprints like a withered arm, its broken hand reaching forever toward stars it would never know. Frances shivered.

What do you know? she thought. Kneeling. What have you seen in your time, you forgotten thing?

"Perhaps a small fire could tell us a thing or two," Albert suggested.

Dawn pinkened the translucent dome. The matrix of the site worked on multiple topological screens. Frances looked away from the computers, toward the fultons where the team ate breakfast. Albert wasn't even looking at her. He was staring at one of the video transcriptions, a thing called Woody Woodpecker, in which a drawing of a creature with green tail feathers conversed about destroying wood and interfering with the rights of others.

"Tell us what?" demanded Frances, feeling an unprofessional rush of anger that increased when no answer came.

The destructive and violent creature danced about the screen, laughing raucously, bugles cry. Albert's face was paralyzed with delight. Emma, sitting beside him and sipping slowly, even laughed. When the mechanic guffawed as a whole tree fell down upon a crude vehicle, Griffin's plump, red-checked face wrinkled as if smothering the pain that the wood seemed to feel. Their fresh skin conditioning caught the video glow like styrene.

The woodpecker warmed his hands over a burning log. Frances hit the master channel; the woodpecker disappeared. Faces twisted at her in astonishment.

"I found a new site of wood last night," Frances said.

"Where?" demanded Griffin. They all stared at her, the excitement in their eyes almost sexual. The mechanic, Werner, was repairing the nozzle of one of the particle abrasers; the microwave units used by archaeologists to strip dig sites grain by grain, soil layer by soil layer—an instrument of patient destruction. The mechanic pointed the nozzle at her as if by accident. She flinched automatically and he grinned his dark, greasy grin.

"Where?" he asked, as Griffin had.

"Don't ever point that at me, you idiot." She was snaking. As a student years before she had seen a particle abradant fall from a dig-site table. Its nozzle, though nearly a meter away, had swept another student's arm. The effect had been a flawless removal of skin, and even now she could picture the tissue gleaming like an



"There goes Sunday afternoons."

anatomical demonstration in one of the biobeds.

"Sorry," the mechanic said, and winked at her.

Frances thought: *I'd love to stick that abraded nozzle up his—*

"Where?" Griffen repeated, rising. "Where did you find new wood?"

The sky of Xenos was a parched whiteness, the horizon a patchwork of purple ash and red sand. Griffen's skin gleamed in the stark glare; his skin conditioning a sheen like mother-of-pearl.

"This team," Frances said. "Class Four, behaving like kids."

Griffen glared at her impatiently.

"Griffen," she said, stopping him.

He turned impatiently, looking over his shoulder at the protruding organic material beside Albert.

"Griffen, I might understand the mechanic lobbying to burn some wood for a thrill, but not you. Not Albert. Certainly not Emma. What's gotten into you?"

"Might I give you a bit of advice?" Griffen said softly and with an odd, sly smile; his eyes made her feel queer.

"Please do," Frances said, frowning.

"Choose your fights carefully," he said.

"What does that mean?"

"It means if the wood proves of little value, peripheral to the site, the team works very badly to experience a limited fire."

Frances gazed past him at a patch of dark ash, fibrous lengths of the ancient material rose from it, near Albert, like bones in a pile.

"I am dig chief," Frances said.

"Exactly," said Griffen.

Within the translucent glow of the hermetic shed, the cataloged organic fragments made a precious grouping. Each work period that passed brought fresh grumbling. They perceived her as a tyrant, she realized.

The team's desire to have a fire had almost grown into open rebellion. They spoke of a rare chance at a poor site—the possibility of saving her dig from utter failure through reassignment of a local campfire. It seemed to be a need they all had, an itch in their minds.

"I will not be party to animalistic indulgences," she said, flatly denying them.

Emma told her: "You think it's barbarism but what difference does it make? When I had my own site, it was a failure, same with Albert and Griffen. The mechanic doesn't matter. But you do. Salvage something and allow us some pleasure as well."

Frances ran her hands over her fuzzy nape. The hair was growing out more now. Her dig evaluation was due, and she had nothing to show. Time was short, and she felt the first sting of panic.

"No," she said, this is "crazy."

Emma stared off at the purpled horizon where the dying light sent broken shadows from the gaunt enormity of stones. "I have dreamed," she said vacantly. "Have you?"



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"Dreamed of what?"

Emma's wrinkled face reflected the ashen color of dusk. She sounded infantile. "The wood isn't... to move. It was burning, and I felt it curl about my leg."

"Have you told Albert?" Frances asked dismally.

"Medication hasn't changed anything."

Emma said, looking straight at Frances. Frances averted her eyes.

Emma took her hand, the touch was shocking, an insane invasion of privacy. "You haven't? You haven't dreamed?"

"I never dream," Frances lied.

Her heart hammered, and she tore free, her conditioning separating at the wrist as Emma's grip was broken. She felt the sting of the atmosphere.

The night chill was coming, and she turned toward the quarters dome, thinking of the hot tub and oblivion.

The voices from the central room bubbled together, a collective murmur that came to her in the hot tub like the drone of a low frequency. Over the voices was the rhythm of an ancient chamber music called rock, a tenor named Manson sang of the disintegrating flame that transcended physical life. The music form had been a wildly emotional one, reflected Frances.

The alarm tolled her nostrils. She felt more secure today. No one had mentioned fire at all. At last the idiosyncrasy had blown over. No need to embarrass them with a viciously clinical report. In the murmur from the big room, she heard no malicious trace, no resentment. She drifted, releasing her mind from its training, letting it roam out of all patterns of control.

It was laughable, now that the crisis was over. Ancient Campfires 221B, Professor Frances Cole.

Her father had told her of the vast fires of antiquity, how whole cities had been burned by accident, by wars. Fires had once run like oceans, like deserts, jumping from one thing to another, as emotional as those who started them, as rampant as mass insanity when whole environments had been fermenting. She well understood the temptation to see organic material such as wood burn. It was some terrible indulgence that lurked back to the darkest urges of mankind. She understood it because she herself had dreamed of the wood ablaze. Like Emma she had seen it happening. The flame dancing like a living art form—like on a planet so savage that beings ate one another, roared and—

Frances tore herself out of the dreaming state. She sat up in the hot tub with both hands clamped over her mouth, stopping the scream in her throat, shuddering and dripping.

Had they heard her?

No one stood in the doorway. No one stared in at her, but she still heard the mingling of soft voices out there.

But something was odd. Whose voice was that?

Frances climbed out of the acrylic tub.

Emma? Albert?

Quickly she stepped through the conditioning shower and went to the doorway. On the video Beaver Cleaver sat placidly in a treehouse and whittled wood with a pocketknife, muttering to another boy who muttered back.

There was no one in the big room. Frances was alone.

Her hand darted to the monitors.

The hermaphroditic monitor made her gasp, the wood was not there. The shuttled monitor showed nothing that shouldn't be. The dig-site monitor, as her hand jerked over the panel, looked blurry. Someone had put something over the image sensor, but she could hear voices there.

"Everybody ready?" she heard the mechanic's voice.

Then Albert's. "Do you think it will actually create smoke?"

"Well certainly see," said Emma's voice excitedly, and Frances stiffened, not even breathing.

•Fifty meters ahead, the quarters dome read her contours, she heard the squeaky hiss of the unsealing door. She lifted her chin and felt hot trickles of dread•

"The capacitor," said the mechanic's voice. "It insulated the leads for ignition, but I dunno if the spark will—"

"In the old stories, it's said that flames actually dance!" Albert's voice came faintly.

Frances took two steps backward.

She almost turned to walk back to the hot tub, almost pretended she did not care. From the video, she heard a crackle and she envisioned the shadowy pile of dead material in the shadows of the ancient stones. The roots of her scalp tingled with a sourceless fear. She struggled to turn it into anger.

They deceived me! The vulgar, destructive bastards—

She was out the door and running in the half dark. Under the stars her feet whispered on acorns of ash. The glow from the site was undulant, uncertain, and she ran harder, imagining the first glowing flicker searing into an arched curve of precious antiquity. Terror rippled under her anger. The crackling sound on the monitor was like something being awakened, a crude yawning of popping joints. She had lost control. She had lost everything because the wood was the solitary end, the only life

form, the sole chance to probe whatever form of life had once existed in the barren place. She had failed. They had betrayed her and she would have to make them stop make them obey, keep them from burning her future in a collective hysteria.

"Albert!" she screamed as she reached the crest of ash above the dig. "Emma, don't! Stop!"

The veins of sand and ash about the stones seemed to ripple, to rise upward past her. She smiled something acid on the rain air that made her stop. It was like nothing she'd ever smelled—dark and old and devilish stale. The stones shimmered deep in their vortex, and she realized what was causing that dirty glow.

An urge more primal than possessiveness moved her. Frances ran downward, slipping onto her back and buttocks and sliding in the ash. She saw the acrylic partitions glowing around the uppermost blocks, the first they had excavated.

And she heard the first scream.

It was more a cry of wonder than fright. But the second scream was full of ululating terror, electrifying Frances at the threshold of the dig.

She looked down into the regularity of levels.

They had turned off all illumination. In an instant of disbelief she stood paralyzed by what she saw.

The four team members were crouched like beasts around the wood. Stars of energy (a that flame?) were bouncing in the wood, which was piled at right angles. The mechanic jumped up and was dancing. A flash of blue-orange whipped back and forth in his greasy hair. It burrowed into the nest of his hair, and he was striking. Emma and Albert were up, pulling at each other. Griffin seemed frozen, watching as splinters of energy dripped from the mechanic's skull, streaming in patterns down the surface of his skin conditioning as if feeding upon its chemistry.

Frances instantly rejected what she saw. Teams often suffered dreams in remote digs; psychic mental aberrations often afflicted expeditions that were forced to work in alien and unpredictable environments.

I do not accept this, she thought.

Griffin made a funny squeaking sound as a trail of flame darted from a blazing limb of wood, leaping onto his toes. The conditioning coat on his foot sparked ran in an outward swirling pattern that grew almost hypnotically.

Emma, pulling at Albert, shouted. "This is happening!"

The mechanic was a flaming shape that swirled about like something covered in veils of energy. Frances, staggering back a step, saw no flash on his face. He was a melted anthropoidal pattern that elusively began to climb toward her. He had to be dead, yet he moved as if the flame itself were motivating him.

Griffin grabbed for Emma. Albert tried to push her away. Emma's hair smoked, burst into undulant waves of light. Emma

was climbing toward Frances, and Frances saw Emma's skin flow with flame that ate the conditioning in patterns.

Something howled. Frances jerked aside, feeling pain, saw the mechanic groping for her. The wall of heat preceding him cracked the fire hair at her ear.

Frances ran.

She fell, panting, bawling, looking up at a thing with burning, scorching eyes. From the dig came wails of such anguish and pain that when she was up and running again she could not feel her foot being ripped by a new patch of protruding wood. Glowing shapes wavered in the dark behind her. Near the quarters dome she fell again. Ash filled her mouth and she tasted it—salty, ash of ancient flames. Behind her, only meters away, came something that might once have been a failed archaeologist named Griffin. She couldn't be sure because she was up again and fleeing with a scream of her own.

Her hands pressed the magnetic door lock, and it did not open immediately, her sweat was poky.

"Nooooo!" she groaned.

The burning thing two meters behind her was awesome—beautiful and terrible—a stalk of living flame that closed its arms around nothing as she fell backward into the opening magnetic door. The door closed, and her impression caught other shapes behind the closest—bright holes of flame in the dark, flame hair flowing over

featureless faces. She was gagging first. Then she was laughing, throwing her head back in a helpless, horrible hilarity.

Behind her on the video the woodpecker with the bugling cry was flopping about. She crawled to the monitor and looked at magnetic panels. She had no thought of escape, only a chilly need to sleep.

She thought of the hot tub.

Time later to send messages. She slid along the styrene wall toward the bath passage. When she sank into the tub, her eyes would not close at first.

Her lids flickered, shut, then opened.

The deep purple-black sky was blurry through the skylight above the tub. Flames cut into one crystalline edge, brilliant, like tendrils of bright hair. She heard the pian of the dome creak with pressure. And then a flame shape, howling, looked down through geodesic panels at her, out of holes of flame in its ashen face.

Abruptly she felt lean and empty and implacably calm. Frances stood up in the bath, climbed out, backed away, returning the baleful stare of what she now realized had been Warren, the mechanic who'd hated her, who'd wanted her sexually, who'd constantly defied her.

Whatever he was now—still wanted her.

The thing above her howled, and she felt a wave of heat like instant sunburn. The cry was ragged, gaseous, inhuman.

The team was dead, or she was dream-

ing. No base existed for what she now perceived. And yet she realized the simple choice of believing or refusing to believe. A terrifying sense of stoniness seized her.

The geodesic panels above her groaned with scorching heat. The thing roiled on them. Edges darkened, curled, began to melt. The geodesic frame was buckling in the contours of a man.

Frances screamed.

She spun around. The outer door made a shaking, metallic sound. It squealed open. Frances edged backwards, stepping into the conditioning shower.

Against the night, eroding shapes of flame wavered. She saw fluorescent skeletal elms deep within the flame swirls. She smelled what they were. She saw what they were. She heard them coming in through the door. Quickly she turned on the conditioning spray.

Above her head the panels split apart. Frances saw the incandescent shape drop through. In molar over the hot tub it turned trailing purplish ash and flame, breaking apart even before it hit the steaming liquid of the tub. The boiling tub roared. Scalding steam poured up into the dark. Frances glimpsed wooden twists, limbs turning in steam, purple ash blowing the dark air like volcanic sand. She ran from the shower. Conditioning instantly crystallized protectively on her skin.

She vaguely sensed the bite of broken skylight panels under her soles. If she could make it into the monitor room she had a chance to get outside and run to the dig site or the shuttle pad. She pushed a buckled panel out of her way and came to the threshold of the monitor room.

Boomer Cleaver's barren face filled a video screen as a flame shape about Albert's height bumped against it. A second figure stumbled toward her, its hair flowing in veils. They blocked the way outside. There was something terrible, something hungry about the way they reached, as if they could see her. Only instant reaction kept a fiery hand from searing her arm.

She ran back into the steam room and saw stars glittering in the jagged hole in the skylight. That was the only way out.

Light flamed at the doorway. She was able to catch a metal tube overhead and pull herself up. Broken panel edges smoked her wrist and elbow. Under her in the tub the water was gone. The woodlike pieces glistened in spots, smoked, and began popping with little flames. A wave of heat brushed her dangling leg, and Frances saw one of them reaching.

She hardly remembered the exertion. Suddenly she was up and over, rolling on the outer panels, tumbling down the dome's outer geodesic pattern into the sand.

Always on Xerxes she had found vials of ash in the sand. And she knew why the ash analyses had been so odd. And she knew that she had found the life form that had probed here, dormant. She had found everything she'd yearned so desperately to find. Her dig was a roaring triumph, and



"Do you have any idea what they're getting these days for a two bedroom couch?"

her name would be famous...all except for one little detail—

You're going to die

Around the outer wall of the dome they came, their glow preceding them. Frances sat up. Pain nearly blinded her. Her back was hurt, damage extent indeterminate. The things that came around from the magnetic portal, back out of the dome seeking her, were crawling now: pieces of them breaking apart but alive with that impossible energy that motivated the crumbling inner structure.

Damn it, no!

It was pure rage that made her move. She made her body function, stubbornly dragging her trembling legs over the next hump of terrain.

Behind her a trail of fire crept in her wake. Bones in some of the smaller fragments were becoming white in spots, incandescent! as phosphorus grew radiant.

The crest of the mound revealed the dig site below her. She pulled herself upright with an exertion that blurred her vision. Not a meter from her numb feet crawled the leading piece, the slench of saline ash hit her face on a dimer wave of heat.

Frances lurched headfirst. The motion sent her plunging, rolling toward the dig.

Her body hit an acrylic partition and rolled past, slowing. The first exoskeletal stone loomed over her, against the stars like the head of a mythical beast. Her body hit its rough base.

On the crest above the dig something was happening. Through bleary pain-racked vision, she saw the flames coming together, coiling, massing like magnetic particles about some invisible matrix.

It climbed upon itself, taking height, or angle against the purple-black night sky. Its mounting shape took increasing definition. And whatever it was began to come down the slope toward the dig.

Frances forced herself to look away. Move it, Franne!

With what she thought was her final effort, she threw herself down into the first dig level. Her shoulder and face scraped against stone. But a pricking sensation was becoming alive in her legs. She could move them a little.

The wind stirring brought a stench into the dig pit. It was so quiet yet she could hear a howl, an unintelligible guttural keening that she knew was meant for her. She clawed to the second level, where the base of the stones was exposed. She dropped into it.

How many others had found this place? How many others had been where she was now? How many?

With a kind of radiant majesty the blaze arched its shouldering shape above the last acrylic partition, the sheet of material curled, sank, disappeared in a flash of smoke.

Frances jumped into the vortex of the dig. She was in the pit of ash, trapped, her

arms across her heaving chest. Her tears made rivulets in her skin conditioning. When she was washed clean she would die. But that would never happen, because now it was descending into the first dig level.

Against her back the enormous stones left vibrant.

Her leg buzzed, pain flashed up her calf. And she saw the black snout of the particle abrador half-buried in the pit beside her. Her leg bled. A swirl of shifting ash whirled about the abrador nozzle.

The radiant mass above her had reached the second level and wavered above the third. Below it she heard her short hair whispering with heat. Her hand found the metal back of the abrador and her fingers closed upon it.

Like water the fire flowed over the stones, tracing their shape almost caressingly in front of her as if retracing ancient steps, fondling old hermanes.

She thrust the abrador forward. She did it to shove, to push at whatever was almost upon her. She did it out of a last desperate need to act.

But the effect was astonishing. Where the nozzle pointed, a hole appeared in the flame. The hole was a cone of dark smoke—a swirling space where the microwave blast connected.

The flames whispered, sucking toward her and as her back hit and slid on stone. Frances flopped the abrador pattern to maximum. A sweep of her arms tore a path of darkness through lengths of fire clinging to her. She backed away, crouched on the bleeding leg.

She jugged seeds, and flame swirled upon stone. She lunged the nozzle making a vertical line ten meters high, splitting the thing in two shimmering halves. It wavered, then it backed away. "Yes!" she cried, cutting it horizontally.

The superheated air moaned. She could have sworn then that it tried to enter the stones. Its random fragments ran over the dig, and she destroyed the ones that passed her feet. It seemed to have forgotten her, but she worked relentlessly, crawling on the bleeding leg, her skin conditioning now dangerously perforated and wet.

The last flame was gone. She lay at the surface of the dig and saw the first light make red veins in a purple hushness of sky. Move your butt, Franne.

She couldn't move a muscle. But if she did not move, if she didn't find the strength to crawl the half-kilometer or more to the shuttle and its hermetic conditioning, she would die. Some future dig would find her bones. Maybe they would try to light a fire, having found wood, too.

Move it or die.

Only anger could now make her move. Only the deepest animal illogic: the out-rage of beasts. Without that rage she would soon be dead.

Move your ass.

She moved it. **DD**



Therapy was twenty-six-year-old Pamela Styles, who was wheeled into the hospital's fifth-floor delivery room one Sunday afternoon in 1982 to have her second child. Styles was anxious and tense because her husband was absent. So was a friend who had promised to be there. Once in the room, she waved for her music therapist to turn on her tape. First came the triumphant-sounding theme from *Chinatown* of Fire. Later, in pain while a minor incision was being made, she was about to ask for

a painkiller but was inspired to go without it by the rousing theme from *Rocky*.

Moments later, she lay in bed coughing eight-pound, thirteen-ounce Patrick Joseph Styles II, her first son. More music waited in Ave Maria, by Schubert; Evergreen, by Barbra Streisand; "Songs of Life," by Neil Diamond; "You Are So Beautiful," by Joe Cocker; and "Beautiful Boy" by John Lennon (a lucky choice).

Playing music is a technique for diverting attention, for getting women to focus on something other than discomfort and pain, explains Dr. Sterling Williams, co-founder of the expectant-mother program at the University of Kansas Medical Cen-

ter. He now plans to try music therapy with cancer and postoperative patients as well.

Music seems to influence the body according to the dictates of the mind. As near as researchers can tell, music affects the "pleasure centers" of the limbic system, the brain network governing emotional experience. Pinketing effects come about when twinges of aesthetic pleasure in the right hemisphere cause the pituitary gland to release natural opiates known as endorphins. Soothing music in particular seems to lower the level of catecholamines, chemicals such as adrenaline. This soothing action can lower heart rate, blood pressure, and the amount of free fatty acids in the blood, leading to reduced risks of migraines, hypertension, coronary heart disease, and stroke.

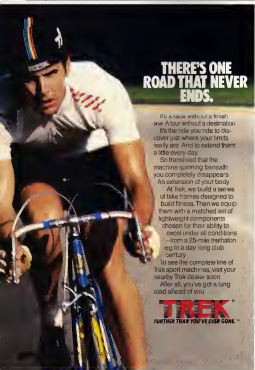
At the heart of our response to music is tempo, or beat. "The very first rhythm we hear—in utero—is the heartbeat of our mother," explains Carol Marie Fahrmann, president of the American Association for Music Therapy. A baby's breathing and pulse tend to become synchronized with its mother's. And so in later life, music with a slow tempo and a smooth rhythm can be relaxing; music with a percussive rhythm, a swift tempo, and a complex harmony tends to excite us. In a recent experiment, child psychologist Lee Sakl played a recording of a normal heartbeat to newborns in a hospital nursery. Most were lulled to sleep. Then he played the accelerated thumping of an excited person's heart. All the infants awoke immediately, some of them fussy and crying.

Will doctors someday prescribe Beethoven for backache or Sinatra for stress? "Music therapy can ultimately save us all a lot of money on health care," suggests Frederick Tims, president of the National Association for Music Therapy.

For Karen Regan, a twenty-four-year-old lab technician recovering from an operation for breast cancer, music is a stepping stone to hope and faith in recovery. One afternoon last fall at Memorial Sloan-Kettering, Lucienne Bailey stopped off to see Regan for a session. During the visit, Regan mentioned that she had become engaged three weeks earlier.

When asked what music she would like to hear, Regan expressed special fondness for songs by the Beatles. Together the women sang "I Got By with a Little Help from My Friends" and "Here Comes the Sun." Regan gradually smiled, then sang louder with more gusto. She confided that she no longer fears pain, loves life more than ever, and is determined to survive. Sighing, she asked Bailey, "How about a song with the word home in it?" Bailey suggested the John Denver ballad "Perhaps Love," and Regan nodded with enthusiasm. Together they leaned over to read the song sheet laid out on the hospital bed, and they sang: "In these times of trouble, the memory of love will see you home."

"Hey," Regan said at the end, "that would make a nice wedding song." ☐



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INTERVIEW

CONTINUED FROM PAGE 56

stimulation. But our experience suggested that only continuous treatment would have a lasting effect. The battery-powered pacemaker delivers a continuous current to the brain. At first the patient carried the battery pack in his pocket or on his belt; a few years later we implanted it in his abdomen. Eventually we discovered that the cerebellum was a better conductor to the pain/pleasure circuitry, so we put the pacemaker right on the cerebellar surface.

Q: Did some of your clues about the cerebellum's role come from Harry Harlow's isolation-raised monkeys? (Harlow, a psychologist, performed his famous experiments at the University of Wisconsin in the Fifties and early Sixties.)

H: Yes. Here were animals that looked schizophrenic as a result of sensory deprivation. They had minimal visual and auditory stimuli and no opportunity to touch or play with other animals. After three months these monkeys were severely impaired. They'd sit in the corner of the cage, looking back and forth, as some mentally retarded children do. They couldn't relate to other monkeys, nor could they function sexually. And they were often violent. After six months in isolation, they apparently could never return to normal.

Q: What was it specifically about these monkeys' isolation that produced this severe emotional damage?

H: Bill Mason, who worked with Harlow, started wondering what the crucial sensory input was. At first, of course, everybody said these monkeys confirmed psychoanalytic theories that schizophrenia is the result of inadequate mothering. Harlow disproved this concept by showing that monkeys raised in a cage with siblings but no mother developed normally. In the late Sixties, Mason set up a controlled study. Monkeys in one group were raised with their mothers. A second group was reared with a movable surrogate, a bleach bottle that hooked to a motor, would swing and bat the monkeys about. A third group had a stationary surrogate, the same bleach bottle covered with cotton or attached in place. The ones raised on the stationary surrogate developed the deprivation syndrome, but the ones raised on the movable surrogate acted pretty normal.

Q: And that implicated the cerebellum, which regulates movement, balance, and other motor activities?

H: The paleocerebellum, or old cerebellum, governs proprioception—the input from your muscles, joints, and tendons that lets you know what position your body is in, where you're located in space. The old cerebellum also regulates balance, your vestibular sense. We already know from human studies that sensory deprivation can create psychosis. If you're suspended in weightlessness, you'll hallucinate, have delusions, and experience what is called

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that cultures that permit a lot of physical pleasure are less violent than cultures that discourage it.

Omer: Is the notion that the cerebellum has anything to do with emotion a widely accepted one?

Heath: There have been various candidates for the brain's emotional system, of course, the latest being the limbic system. But no one has ever included the cerebellum. The textbooks still don't say anything about the cerebellum's connections to these forebrain sites, they show projections running only as far forward as the back part of the thalamus. But in working out the pathways from the cerebellum, we found direct connections to the sites for emotional expression, the septal region, the amygdala, the hippocampus and so on.

Omer: How do these limbo-cerebellum connections affect behavior?

Heath: That's most important. We already knew the pleasure system inhibited the pain system, and vice versa. Now we found that the cerebellum activated the cells in the pleasure system and inhibited the pain system. That led us to stimulate the cerebellum and then to use the cerebellar pacemaker, an array of electrodes that would continuously stimulate the cerebellum. We tried the implanted pacemaker after another scientist used it successfully to treat epilepsy and epilepsy.

Omer: Did the pacemaker help your first

patient—the violent young man who you mentioned earlier?

Heath: Oh, yes, dramatically. He's now in vocational rehabilitation and doing well. At one point his wife broke and he went on a rampage. He tried to kill his parents and severely injured a neighbor. He was about to be shot by the sheriff when he was subdued. We reattached the wires, and he no longer has rage attacks. He's had the pacemaker in for seven years now. Our equipment failures, incredibly frustrating as they are, actually give us the perfect controls. A patient will be fine for months or years and then suddenly relapse. One patient, for example, tried to choke his wife. Invariably, we'd find the power source had been deactivated.

Omer: In the late Sixties a team of scientists who had been doing brain-electrode work in humans suggested that some of the people involved in urban riots could be suffering from brain damage. I believe these researchers later modified their statement, but it prompted a lot of outrage at the time. Would it be theoretically possible for some nefarious government agency say, to try using brain pacemakers for crowd control?

Heath: No. I don't see how you could do something like that, and certainly not with groups of people. In the early days of our electrode work, we were accused of mind control and all sorts of things. That was

absurd. With the techniques we've used, you cannot control a person's mind. Paradoxically, many of the same people who were concerned about our physiological procedures advocate mind-altering street drugs, which could be used to control the minds of large groups of people.

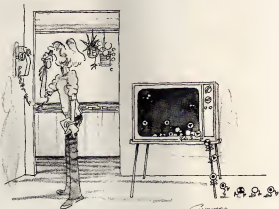
Omer: Do you envision the pacemaker becoming a common treatment for schizophrenia and other mental illnesses?

Heath: I don't think so, there are too many technical problems. Once we figure out which brain chemicals stimulate the pain/pleasure pathways and how the receptors [sites where neurotransmitters bind to neurons] for those chemicals work, I hope to get the same beneficial effects with pharmacological treatment.

Actually, the pacemaker has been *least* successful with schizophrenia. Although it does control some symptoms, like violence, it doesn't change the basic attitude, the autistic behavior, or the emotional flatness. It has worked most effectively on depressives, violent patients, and certain epileptics.

Omer: Why is schizophrenia so intractable? And what causes this heartbreaking illness anyway?

Heath: Schizophrenia is a specific biological illness. Many things can affect the same brain circuits, creating a similar psychosis—brain tumors, infections, drug toxicity, syphilis, you name it. We don't yet



"Hello, Computerworld? You're not going to believe this."

know what causes schizophrenia. It probably has nothing to do with what your family is like, though family influences may perhaps modify the course and intensity of the condition's symptoms.

Greif: Some researchers now think that schizophrenia is actually several different illnesses—that paranoid schizophrenia may be totally distinct from, say, catatonia. Do you see schizophrenia as one disease or many different ones?

Heath: I think it is one disease, and I have several reasons for saying that. For one thing, more than half of my patients have remissions and relapses. I've seen the same patient come in one time with a clinical picture of catatonia, and the next time with paranoid symptoms or hebephrenia [a severe form of schizophrenia that manifests itself in infantile behavior]. Second, schizophrenia has basically the same symptoms in every culture.

The other evidence comes from our work with the schizophrenic serum fraction. When we gave a healthy volunteer two different blood samples on two different occasions—one from a paranoid and another from a catatonic—had often have the same reaction to both. Sometimes we'd take a serum fraction from the same schizophrenic donor and give it to several different healthy volunteers; one would become catatonic, one would be paranoid, another would get hebephrenic. It's like senility or aphasia of the brain. The same disease process affecting the brain produces a whole range of symptoms.

Greif: Your work with taraxen, the substance that seemed to produce schizophrenia in healthy people who received it by injection, caused quite a stir. How did you get into that line of investigation?

Heath: Well, we were getting abnormal electrical recordings from schizophrenics but no one had ever found a structural defect in the brain to account for these readings. So the only logical thing to conclude was that something was wrong with the chemical transmission. That's when we started looking at known chemical transmitters. A group of researchers came out with the interesting idea that schizophrenics had a faulty breakdown product of adrenaline. That didn't hold up, but it set people to thinking about chemical metabolites that might be toxic.

We took blood serum from schizophrenics, fractionated it to get the active protein, and injected it into monkeys. The monkeys given the taraxen fragment behaved strangely and showed receding changes from the same deep-brain sites where we'd seen abnormalities in human psychotics. By 1955 we'd determined the method was safe, and we gave taraxen to a series of healthy human volunteers. We used the comparable serum fraction from normal people for control. The volunteers given taraxen became psychotic for an hour or so. Some hallucinated and had delusions and thought disorders, some became severely anxious or paranoid, some were

withdrawn and catatonic. Afterward they went back to being entirely normal. Further experiments suggested that taraxen, the protein fragment that caused transient psychosis, was an antibody to brain tissue—specifically to the septal region.

Greif: Your taraxen studies provoked a lot of criticism when other researchers were unable to replicate your results. Despite that, do you still think schizophrenia is an autoimmune disease?

Heath: It is difficult to replicate this sort of experiment. In fact, several researchers did replicate our findings, though our critics never mentioned that.

But, yes, it makes a lot of sense to think of schizophrenia as an autoimmune process, like lupus erythematosus, myasthenia gravis, or Hashimoto's disease. In Hashimoto's disease, for instance, the body makes antibodies that attack thyroid tissue. In schizophrenia, the antibody would attack brain tissue.

Greif: If schizophrenia is an autoimmune

Their brain recordings showed abnormal rhythms in the emotional pathways—in the pleasure circuits of the septal area and in the aversive sites, too. That seemed to correlate with chronic irritability and anger. The changes seemed to be relatively permanent. I can show you deep-brain recordings taken after the monkeys had been off marijuana for eight months, and they are still pretty bad.

Greif: Does this suggest that everyone who ever smoked a few joints at a Grateful Dead concert is brain damaged?

Heath: Definitely not. It wasn't until the early Seventies that you began to see reports in the medical literature about behavioral changes in chronic marijuana smokers—decreased motivation, apathy, poor academic performance, and so forth.

In the Sixties the amount of THC [tetrahydrocannabinol, marijuana's main psychoactive compound] in the available marijuana was quite low, less than one percent. Around the mid-Seventies the THC content of street marijuana rose sharply. The THC levels of the samplers that is now being grown in California have been measured at between eleven and fourteen percent. We found with our monkeys that you need at least two or three percent THC to do the kind of damage we saw.

Greif: Then you did postmortem studies of the monkeys, and your electron-micrograph pictures showed evidence of brain cell damage, right?

Heath: Yes, we sacrificed the monkeys after they'd been off the marijuana for eight months. We looked at their brains and found structural damage at the synapses [the clefts between the neurons across which nerve impulses are transmitted]. When you magnify the cells, you can see that the synaptic cleft is widened and irregular. And it's full of opaque material. We don't know what it is. We've also found that part of the cell's cytoplasm, the rough endoplasmic reticulum, is disrupted.

Greif: What does all this mean?

Heath: We don't yet know exactly what marijuana does to brain cells. The changes at the synapses would fit with the finding that the drug somehow impairs chemical transmission.

I think the widespread abuse of drugs is potentially catastrophic for our society. I'm speaking of all the commonly abused drugs—the pleasure inducers, like marijuana and cocaine, and the anxiety agents [like Valium].

Our sense of values, our conscience is tied down within the framework of reward and punishment, pleasure and pain. Some anxiety is needed, but anxiety can also be adaptive. Fear, for example, keeps us from straying. If you get a chemical reward for doing nothing, the result is shoddy, impaired performance. It is no small thing to tamper with your own pleasure/pain system—especially during adolescence, when the brain is still developing and your sense of self isn't formed. That's the real mind control. □

Many of the same people concerned about our physiological procedures advocate mind-altering street drugs that could be used to control the minds of large groups of people.

disease, it might be curable, right?

Heath: That's the hope. But, of course, lupus is an autoimmune disease, and we can't cure that. Schizophrenia could well turn out to be easier to treat, though. Our thinking now is that the antibody attacks the receptors in the septal area. For example, the antibody might attack the receptors for dopamine, a neurotransmitter that is known to be disturbed in schizophrenics. It may be possible to treat the besieged receptors chemically so they aren't vulnerable.

Greif: Speaking of chemicals, your recent studies with monkeys suggest that marijuana is far from the benign substance many people have believed it to be. In fact it appears to produce rather frightening and long-lasting brain changes, doesn't it?

Heath: Yes. We saw distinct changes in our heavy-smoking rhesus monkeys—those who got the equivalent of three joints a day five days a week for six months. The moderate-smoking group, who got two exposures a week, were affected, too.

The marijuana group seemed listless—diminished in general awareness even when they were no longer getting the drug.

that lead poisoning, known to cause mental and physical disabilities, helped destroy the Roman Empire. The Romans stored their wine in lead vessels and drank water from lead pipes, she told us, and the evidence of that consumption is in their bones. In a preliminary study, she found that Herculaneum bones had up to 6,350 parts per million (ppm) of lead, whereas samples of Greek bones had 1,000 ppm and neolithic bones only 3 ppm.

After a day at Herculaneum, we were eager to get back to Naples before the rush-hour crunch. As we stood to leave Basil exclaimed, "It is the only sizable population of Roman bones in the world, yet it's being ruined!"

"What if this experiment works?" we asked. But she merely scoffed. Later, as we made our way down the empty corridor, we turned to see her standing, head down and shoulders slouched, in the door of her lab.

The next day we called Maggi from the airport to find out why he hadn't mentioned the plastic. "I don't know anything about it," he claimed. Then he added, "Why is Basil making such a big stink? She should understand. She's an American. You're all Americans. You always talk risks, like the space shuttle. No one did that before, but you tried. I'm doing the same."

On that note, we left for the United States. Months later, we learned that Maggi had finally sprayed some bones with plastic. But according to Basil, the stuff never dried. Making matters worse, the Italian government changed hands. Maggi was demoted to assistant director, and his new boss, Giuseppina Cerulli-Irelli, stopped all work at the dig to reevaluate her predecessor's plans. She finally agreed to dig up and preserve the bones in the chambers, but those previously exposed, Basil says, have already decayed. "They're even worse than we expected. I guess the Italians have uncovered so many archaeological treasures, no one cares if fifty percent of this find is ruined. We'll never know how much we don't know or what we've lost. That's the tragedy."

Cerulli-Irelli, however, claims that Basil is exaggerating. Basil's declarations, she says, apply mostly to the third chamber. She wanted all the bones for herself even before we tried our experiment. But we must learn to share this antiquity.

Joseph Judge, who is overseeing the project for National Geographic, tends to see things both ways. Bones have deteriorated, and the Italian bureaucracy has not been cooperative, he says. "But we might still find a way to work together and save this valuable find for posterity."

Basil, though, has little hope. She's still in Italy attempting to finish her studies if it's possible. But she can't wait until her stint is over so she can go somewhere and write a book. As for Herculaneum, she tells us, it's best summed up by a line in a Jack Nicholson film: "Forget it. Jake, it's Christown." □

GAMES

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FLAP. The paradoxical paper is cut from one piece (about 3" x 5"). First make three crease cuts, each halfway across the card, as shown in the top drawing. Fold the flap toward yourself so that it is flush with the bottom side, and press it flat. Then turn the right end of the rectangle over, as shown in the middle illustration. The rectangular outline suggests that the whole upper surface of this sheet was on the same side of



the original piece of paper. Obviously, the paper you start with must be unlined and have the same color and surface texture on both sides.

The pine at the corners prevent anyone from accidentally discovering the solution by picking up the paper and fiddling with it. It is considerably more challenging to imagine turning half the card over than to actually do it and stumble on a solution. If you can't secure the card to a background sheet, show your audience both sides of the card, and then set it down and ask them to try to explain, without touching it, how it was constructed.

BIG THINGS IN SMALL THINGS

EGG. If the egg is soaked overnight in vinegar or acetic acid, its shell becomes plastic. The procedure described on page 135 will put the egg in the bottle and a cold-water rinse will restore the shell to its original hardness.

LINKS. Cut out the outlines of the keys and ring from one piece of cardboard, as shown



in the design above. Then cut only halfway through the cardboard along the right dark lines shown, and cut halfway through on the dotted lines from the other side of the sheet. With a razor, split the card to half-thickness at the four little squares formed by these lines. The keys will come loose on the ring, and there will be no point at which the paper was cut and rejoined. □



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INTELLIGENCE

CONTINUED FROM PAGE 32

polated by the computer, thereby doubling the resolution and providing an extremely sharp picture.

Carl Meicheldt, vice president of color-TV engineering at Zenith, says of the digital operation: "One of its big advantages is its storage capability. In digital TV you can store picture information. You can examine it in storage and, if acceptable, pass it on to the screen. If it isn't good because of a ghost or because it doesn't do something desirable you can perform electronic surgery on it. After the image has been corrected, the computer passes it on. In an analog system, you can't do that."

Once the digital circuitry has done its work, the signal is translated back into an analog form and sent to the TV screen. The important difference between an analog TV and a digital TV is that the digital set functions like a computer. But instead of getting its information from a keyboard, as a computer does, it gets it from the signal provided by an antenna, cable, telephone line, or satellite dish. The signal is controlled by software—computer instructions—that is built into the set.

Many of the future enhancements in digital TV will be the result of revisions made in the set's software programming, rather than in the development of new hardware.

TV designers look on this feature as one of the great advantages of digital TV.

If you know anything about computer graphics, you already have an understanding of how digital TV works. Once the set has the picture information in digital form, it can process it just as a computer processes graphics. The zoom effect, the freeze-frame, and the inset picture are different types of computer graphics.

The new ITT chips that make up the digital factory replace about 350 resistors and other parts and do the work of approximately 300,000 transistors. Engineers expect chips to increase the reliability and longevity of television sets: just as earlier TVs were improved when solid-state circuits replaced tubes.

TV engineers realize that television is no longer just an entertainment medium. Many of the practical chores planned for the computer—home banking, instant news coverage and electronic shopping, for example—now can come into your home through the TV screen. A separate computer installation won't be necessary.

Zenith's Meicheldt says, "The transmission of data is digital as is digital TV develops a whole new generation of services involving data will develop. The data can come from any source—including off-the-air transmission cable and telephone lines—and then be processed in the TV set. Right now we can't even guess at what

those services might be. But as people see a need, digital-TV technology will make it possible to develop a service for them.

NEW WARES: HARD AND SOFT

The heart of any computer is the central-processing-unit (CPU) chip, the component that does the computing. Now there's a new chip on the block, the Intel 80186, which offers faster operation and more power for microcomputers. The handy 3500, one of the first small computers to use the chip, is two to three times faster in benchmark tests than micros with earlier CPUs. It retails for \$2,750 with two 5.25-inch disk drives, or \$4,250 with a built-in hard disk capable of storing 10 million characters. (Sold in Radio Shack stores.)

Microsoft Word, a word-processing program, performs particularly well on the new faster computers. What you see on the monitor—underscores, superscripts, subscripts, boldface and italic type, and so on—is what you get on the printed page. (With many compiling programs, you can underline words by typing in commands, but you won't see the actual underline until you print the copy.) Microsoft Word allows display and editing of up to eight documents at once, and words can be transferred between documents. (\$475 from Microsoft Corp., 10700 Northrup Way, Bellevue, WA 98004.) **DC**

EXPLORATIONS

CONTINUED FROM PAGE 38

and Hawaii. During the first day, the birds correctly detected several pieces of orange-colored debris in the water, but the objects proved to be driftwood. On the second day the copter made an emergency landing in the water, and the pigeon compartment was dislodged, drowning the birds. Because Simone had no backup team at the time, the mission was aborted, and the fishermen were never found.

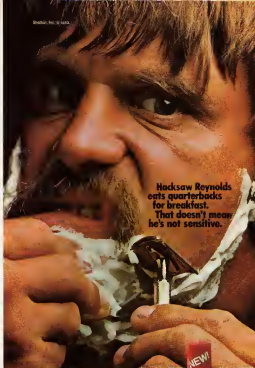
Simone immediately reevaluated the project. He developed a helicopter simulator to approximate actual flight conditions in order to train his birds more easily. Like any specialized military personnel would be, pigeons are carefully chosen and drilled. Only the finest of the flock will be used in the Sea Hunt system. Each trainee receives an average of 170 hours of instruction in the course of a six- to eight-month period. The original birds were taught only to distinguish international orange. The new recruits must add yellow and red to their repertoires. To qualify for advanced training in an actual flight condition, the birds must excel during their basic studies. They must respond to the target within ten seconds, detect more than 90 percent of the given targets, work at a noise level exceeding 100 decibels, and search tirelessly for two hours or more.

In the more than 100 test flights conducted since the system became operational, Sea Hunt proved to be reliable, easily serviced, and easy to maintain. Most significantly, the program more than doubled the probability of detection. The pigeons even performed well during inclement weather, although good conditions characterized most of the test flights.

For Baron Arnaud de Rochem, the results of the Sea Hunt test flights speak for themselves. His primary interest during the Berling Strait crossing, he explains, was to test the practicality of new lines, visual signals, and other equipment. These things, after all, take the pursuit of the perilous from the realm of the reckless to the stark ground of the simply daring. As a consultant to the Coast Guard in matters involving missing wind surfers, he is the last civilian photographer to have accompanied a mission. He predicts that within a few years, the pigeon system will take hold worldwide, particularly in the Mediterranean, where the proximity of small islands off the French Riviera makes wind surfing an especially pleasant and sometimes precarious pastime. Eventually a technical extension of Sea Hunt will expand the capabilities of the project to search over land as well as sea.

Pigeons, no doubt, will continue to be the bane of city dwellers worldwide, but to search and rescue personnel, they've proved their worth. "After all," chuckles an experienced search-and-rescue pilot, "where else can you get superior expert searchers to work for chicken feed?" **OD**

Photo: Bob G. Katz



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WARRIORS

CONTINUED FROM PAGE 63

Washington instead of Moscow? Do silos need psychic shields? The Pentagon would certainly like to know.

Some of the [government's] interest in psi lies into the security of nuclear weapons—according to Ron Robertson, the security officer at California's Lawrence Livermore Laboratory, which designs nuclear warheads. If Uri Geller can use psychokinesis to bend spoons and keys—and demonstrate Geller gave at Livermore convinced Robertson that he can—then he can trigger a nuclear bomb. All it takes is the ability to move one eighth of an ounce a quarter of an inch. Robertson estimates that the Pentagon funds between 30 and 40 psi-research projects.

Admittedly it's difficult to know who or what to believe about psychic research funded by the government. Definitive documentation does not always exist. And within the government, even within particular departments that have funded psychic research, dabbling in the occult generates witch hunts. Take the case of Joel S. Lawson, the former head of the Naval Electronics Systems Command, who once admitted: "I have always believed that ESP is the only way to fight submarines." Lawson had always been one of the few Navy officials willing to discuss psychic warfare openly. At that time, he was the government's representative for two contracts with the Stanford Research Institute. Both projects were designed to test the feasibility of his idea. Lawson was officially silenced and today he isn't giving interviews.

A 1952 CIA memo released in 1978 reveals that the agency decided to "push [psi] research as far and as fast as we can in the direction of practical applications" to military and intelligence problems, while being exceedingly careful about thorough cloaking of the undertaking. Funds necessary for the support of the work would carry no identification and raise no questions. Psi researcher Stanley Kruppper did not learn until seven years after the fact that half of his funding for the 1975 Maimonides experiments with Shawn Robbins and others came from a CIA office. "I read about it in a magazine article," he says.

The cloaking policy has never changed according to the funding officer responsible for covert parapsychology research funding in the late Seventies. "For the most part, the officer reports, the agency just doesn't want to be embarrassed, but there are other considerations as well."

Concealing from psychics the source of funds poses special problems. If the psychics are genuine, the agency reasons, they might learn the truth telepathically from the middleman or sense psychic fingerprints on documents that had been prepared in the agency headquarters. On the other hand, if the psychics do not pick up the clues, they are not genuine; the

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project, therefore, would be a waste of money. The CIA solves this dilemma by using two middlemen for psychic funding—one who knows the CIA connection and another who believes the cover story. Such double-blind security precautions are unusual, even for the most dangerous overseas counterintelligence operations.

Is the government still funding psychic research? According to former Reagan White House aide Barbara Hanegger, the National Security Agency (NSA) is trying to use remote viewing to break codes. Even NSAs acres of computers are often overwhelmed by the trillions of combinations needed to crack sophisticated codes. If psychic enhancement of the computer can reduce the workload by even 0.1 percent, trillions become billions. Those are still formidable figures, but high-speed computers can handle them.

In 1977 Samuel Kostov, the Navy's Assistant Secretary for Research and Development, learned that the Navy had a contract with the Stanford Research Institute to study "ELF and Mind Control" (ELF stands for extremely low-frequency radio waves.) Because the human brain generates extremely low-frequency electrical signals, scientists speculate that transmitting strong signals in these frequencies might interfere with the natural brain activity of people nearby, producing effects ranging from hyperintension to sudden death. But the mind-control label upset Kostov. He ordered all Navy-funded parapsychology research stopped.

The SRI contract was canceled, but other projects were spared. Currently research on the effects of ELF on the human brain is well funded and highly classified.

Does all this—the doomsday intelligence estimates, open support in Congress, and suggestions that psychics may be able to sabotage computers or remotely view secret documents—make a psycho-arms race?

Skeptics say no, it makes for at most an expensive and time-consuming mutual delusion. Kostov dislikes even the mention of psychic weapons: "This sort of talk encourages people to take off on wild-goose chases," he says. "If the Soviets are really wasting any money on this nonsense, they are doing so because their newspapers reported that we had opened a psychic arms gap. I can show you the clippings."

Press reports on parapsychology, even in the Soviet Union, are sensationalistic. Nevertheless, parapsychology is undergoing a revival both in the United States and the Soviet Union. The official Soviet encyclopedia no longer defines parapsychology as "antiscientific idealistic fiction" as it did during the Stalin era. Today many eminent scientists in both nations believe parapsychology research may lead to fundamental new discoveries. Such opinions cannot be ignored entirely. Indeed, the Pentagon feels it has a legitimate responsibility to investigate the military implications of this research. **DO**

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COMPETITION

By Scot Morris

Propper Frogger, Communist Mutants from Outer Space, The Earth Dies Screaming—video-game titles like these prompted us to launch Omni Competition #28 in hopes of identifying the next quarter eater before it shows up at the arcade. To get things started we suggested obvious themes like these:

Laundromat Wash as many clothes as possible without munging white and colored fabrics, using the wrong temperature adding softener in the wrong cycle or running out of quarters.

Pack Man Manage the New York Yankees for one season and make a fool out of yourself in public to sell tickets. If attendance doesn't increase—pack man.

Video Game Put out a virtual replica of someone else's video game and make as much money as you can before you are hit with a restraining order.

Somewhere on our list of finalists is the next Pac-Man or Donkey Kong. Which one will it be? We're not saying until our patient application goes through.

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Vid-Man You control a tiny Vid-Man and guide him as he plays the various games in a small-screen arcade. You manipulate Vid-Man's hands with your buttons or joystick, depending on the game. The real challenge comes after your Vid-Man has mastered all the regular video games in the miniature arcade. Then he gets to play Vid-Man.

—Henry Peterson, Glen Mills, PA

RUNNERS-UP \$25 EACH

Psychic Chase Maneuver your Gelfin-man across the country, scoring points for each spoon he bends. Each mind he seems to read and each million books he sells. Avoid the dreaded Randa, a bearded creature who relentlessly pursues you, unleashing spoons and spreading skepticism. Thus far, no way has been found to end the game.

—Mar Ripacci, St. Johnsville, NY

Kill the Smurfs The obviously cute little creatures are trying to destroy you for violating their copyrights. You must keep your Taiwan factories open while simultaneously waging a court battle. If you win, you move to the next level and take on Strawberry Shortcake.

—Brian E. Claus, Chicago

Fossilizer You and fellow dinosaurs get points by dodging meteors, hiding from nearby supermoles, solar flares, and cometary showers, outrunning exploding volcanoes and shifting continents, and adapting to the resulting climatic changes—while stomping out the small mammals that keep eating your eggs.

The player with the lowest score gets put on display in the lobby of a natural-history museum.

—Christopher Krayer, Park Ridge, IL

Hair Balls Cal figure wanders through a maze-like house and says "Hack hack hack." Human figures in pajamas follow with a roll of paper towels. Lose points if cat leaves mercuric stains on the furniture or if human barks shin on the coffee table.

—Joseph E. Swift, Westmont, PQ

Omnihoarse-Object Read an entire issue of Omni on company time. Gain points if you convince the boss that the articles are vital to the company's welfare. Bonus for answering all questions in the Games section.

—David Blair, Eagan Rapids, MI

The Three Stooges Object: Bring narked tuxedo back with no damage. On the way, avoid Mae, Larry and Curly Dodge incoming peas and duck swinging two by fours. Jump over freshly poured cement. If you encounter a Stoooge, use hand shield to guard eyes from being poked out. Jump over Curly with a timed hop as he spins circles on his side using his shoulder as a pivot. Once in the shop remove tuxedo while Shemp paints the ceiling white.

—David H. Schnabel, Jr.
Kasson, MN

Thesis Compile your research while avoiding the Murphy monster and keeping your grades up. Then you must get all of your committee members into the meeting room at the same time before anyone goes on sabbatical. Two levels of difficulty: M.S. and Ph.D.

—Karen Prestero, Blacksburg, VA

Dragons and Wizards and More To play you first create a character, then imagine an exciting setting for your character. As the game progresses you imagine your character going through a series of adventures within this setting. Problems arise. You choose a response to each and imagine the outcome. The game ends when you've imagined your character through the entire setting. You deposit another quarter and start again.

—David Schaeff, Omaha

My proposed new video game is called Donkey Dong. Need I say more?

—Eileen A. Hunter, Seaside Beach, FL

HONORABLE MENTION

Autoblasts You are a celebrity trying to shoot down wild rumors and unfattering pictures before they reach the *National Enquirer*.

—Cindy Halterstey, Torrance, CA

Punk Man Mix several bottles of dye together and color your monawk with the mixture. Penalty for hitting on any color combination that occurs in nature. Extra points for swallowing a whole dye bottle and having it out your clothing on the way out. Avoid the pursuing alligator in polo shorts.

—Lisa K. Ables, Atlanta

Frog-Dave It's time for the annual reeling orator cleaning, but watch out. Use your Gastro blaster to destroy the Mooky Oldies, Slimy Salad, and the dreaded Mystery Meat. At advanced levels, you sponge out the gunk hidden under the vegetable crispier and get extra points if you figure out what it is.

—Tony Aubry, Irving, TX

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Anxiety Attack Get the child safety lid off your bottle of Valium before you succumb to coronary arrest.

—Daniel Christensen North Bend, OR

Videopurge Chase Pac-Man frogs, cin-
tereaders and barrel-throwing apes and
shoot them out with buckets of water.
Meanwhile, pizza-eating teenagers try to
capture you. A splash of water will slow
them down temporarily, but only if it wets
their nerd packs.

—M.J.E. Eger Houston

Rocky Kong The Italian Stallion meets
Danky Kong for the heavyweight cham-
pionship. Bonus points are scored for each
sequel.

—Joseph G. Lega Chicago

Mail-Man Get your letter to the mailbox
before the price of stamps goes up. If you
forget your ZIP, you lose points and have
to go back to Topkap for resorting.

—Mike Bush Altus, OK

Moving Day Points for wrapping chins and
breakables; deductions for wrapping re-
frigerator coils, garbage. Bonus for finish-
ing prior to double the estimated time. On
the next screen you head for your new job
in Portland. Win bonus points if you guess
correctly whether it's in Oregon or Maine.

—R. Ellington Rusin, South Korea

Politics The original party game. First
shoot down your opponents, then dodge
the issues. Find the key to the White Castle
and you win.

—Andy Stetko Vancouver, BC

Remote Controller Watch television, but
turn off the sound or switch channels as
soon as a commercial comes on. Get back
to your program just as the commercial
break is over. If you survive three sets of
commercials without losing any program
time, your video monitor splits and dis-
plays two channels at once.

—Dale Tjepren Peterborough, NH

Reaganmontron Fast-paced, supply-side
action! Try to stay employed until age sixty-
five, collecting as many dollar points as
possible. Avoid the vicious percolat' sights
that attack the points you have earned.
Unpredictable benefits await you at the end
of the game. Deposit two quarters if you
want to stay the course.

—Richard D. Heath Chicago

Reaganvaders Try to keep your sanity as
you run through the bureaucratic maze.
Fight off

Bushy, an invisible gramin you trip over
since no one can figure out who he is or
what he does.

Stool-Man who can stain you senseless
with budget overruns.

The game ends when you lose your mind
three times.

—Raymond Ielle, College Point, NY

Frogger (Provençal) Object: Make it out of
a new-wave American restaurant with your
dignity intact. First, interpret the menu while
asking the waiter a minimum number of
seemingly dense questions about the
sauces. Then get extra points if you re-
member all the specials that aren't on the
menu. Order the wine that evokes the
smallest smear from the waitperson and
the entrée that covers the largest area of
plate. Penalties for mispronouncing any-
thing in French, for winning upon receipt
of the check, or for stopping at Mc-
Donald's on the way home.

—Joan M. Tarpasta Upper Darby, PA

Candidate-Man First, insert at least 1 mil-
lion borrowed quarters into slot. Move
Candidate-Man from town to town, making
as many promises as possible. For extra
points, pick up acting lessons, caps for
teeth, and juicy rumors about other can-
didates. If elected, you enter the next level,
Term of Office, in which the object is to get
back to the first level and become a Can-
didate-Man again.

—Chris A. Kortege Clarkson, MI

Eee-Pee-Ay Level 1: Player starts with 1.8
billion superfund units and must strategi-
cally maneuver around reporters while
lunching with industry executives to build
points. Each 10,000 points gets you a re-
decorated office.

Level 2: Continue building industry points
while dodging congressional investiga-
tions and whistle blowers. Blasting certain
political careers increases superfund. Use
paper shredder button for protection.

Level 3: Relocate residents from one
toxic town to the next (or buy out town; town
for 30 million superfund units). Use the ex-
ecutive privilege button for protection.

—Dennis A. Newase Kansas City, MO

Face Invaders Try to blast hordes of in-
vading pimples with your deadly zit gun.
Pimples turn up at unexpected places on
the screen and grow larger until they ex-
plode into hundreds of other pimples. Only
the player with a quick hand and a fast
squeeze on the trigger can hope to de-
stroy all the dreaded Face Invaders before
prom night.

—Brian Hawkins, Chichester, ON

Cosmos Object: Find new stars and gal-
axies and attempt to communicate with
extraterrestrial life. Avoid black holes. Hy-
perspace to a new TV series and get bil-
ions and billions of points.

—David Holey Atlanta

Dig Dug Dump Soak by dumping as much
chemical or nuclear waste as possible.
Earn extra points by selling down as a new
kind of fertilizer. Use red-cap rockets and
paperwork bombs to zap pesky environ-
mentalists. Store plutonium in a secure
soap dish. Win the game when the
cookbooks start packing their bags.

—Greg Biquel Moten, LADO

SPACE

CONTINUED FROM PAGE 30

Soviet side repeatedly underscored the fact that space must never be allowed to be used for deploying weapons. This position meets the aspirations of all the peace-loving forces of the planet. In sharp contrast to this background are the efforts by the current U.S. administration for the loved militarization of space.

Other cosmonauts have obediently taken up the refrain. In the June 1983 issue of *Aviation and Cosmonautics*, three-line space veteran Colonel Valery Bykovsky wrote an emotional appeal. He denounced the "insane plans" of American militarists and continued: "Why does their president not think about the future of his nation about the children?"

The claim that laser weapons had already been tested aboard shuttle missions (both on STS-1 and STS-4) is a common theme. It first appeared in the January 9, 1981 edition of *Pravda*, in which a Tass correspondent in Washington DC referred to an article published two days earlier in the *Baltimore Sun*. "One of the first tasks of the crew of the shuttle will be to test the reliability of an aiming device for a laser weapon," wrote the Russian correspondent, who added that this project was code-named *Talon Gold*.

The story then bounced like a shuttlecock between the superpowers.

The charge was repeated in other Soviet newspapers and in both domestic and foreign broadcasts on Radio Moscow. Next news of the charge was reported from Moscow by Western wire services. And then the accusation was repeated in the Soviet press as confirmation of the story (minus the detail that it was only an account of a Soviet claim).

Once the mission landed, on April 14, Soviet papers reported that the tests had indeed taken place. "The American astronauts tested a sight for laser guns on Columbia's very first flight," thundered the newsmagazine *Novoye Vremya*.

The fuss could have been avoided if someone had carefully read the original *Baltimore Sun* article, a reprint of a Reuters dispatch from Washington. It asserted that "one of the space shuttle's early missions will be to test an aiming device for a space-based laser weapon." The dispatch quoted congressional sources as claiming that the *Talon Gold* test would occur early in the flights of the shuttle program—but not specifically on the first mission as Tass later reported.

The source of the Reuters account is harder to track down, because it is inaccurate. *Talon Gold* is indeed a real project, one of three associated with the Pentagon's \$500 million program to develop laser weapons in space. But sources in Washington, confirmed by Air Force spokesmen, indicate that the project won't be tested for several years.

The source of the Reuters report is probably the August 28, 1983 issue of the *Congressional Record*. In it, a congressman included the text of an article by David Ritchie, published in *Inquiry* magazine. Ritchie wrote: "DoD [the Department of Defense] plans to put a huge laser weapon in orbit in the next few years. The project, code-named *Talon Gold*, is a scaled-down version of Darth Vader's *Death Star*... DoD plans a laser test on one of the early space shuttle missions."

Ritchie was obviously mistaken in reporting the schedule and scope of the *Talon Gold* project. Since Reuters repeated this misinformation, it is reasonable to assume that Ritchie's *Inquiry* article was the source of the uproar.

Apparently in the name of self-defense the Soviet public is deliberately being conditioned to accept the use of force against hitherto-respected American astronauts. Writing on the "Strategy of Space Madness" in the Soviet Army newspaper *Krasnaya Zvezda* (*Red Star*), Colonel Engineer M. Rebrov referred to the "madman's delusions of the Pentagon manuals—military bases above the human planet, bunkers among the lunar craters, powerful laser guns aimed at Earth, satellites colliding in orbit, blinding flashes, lethal particle beams, the destruction of all living things. This is an everyday matter in the Pentagon's militarist preparations." Rebrov continues: "In connection with the first flights by *Columbia* and *Challenger*, the Pentagon is already elaborating the most delirious and inhuman plans, a fever of mad ideas. The task of preventing an arms race in space is becoming more and more acute to halt the unbridled mimics of space war."

Of course, the not-so-subtle message behind all these warnings is that the USSR should take action against such a threat. In light of this ulterior motive, perhaps another cosmonaut's speech needs more attention. At a ceremony in Ulan Bator, in honor of Mongolia's first (and only) cosmonaut, veteran Russian cosmonaut General Georgy Beregovoy noted that "only cosmonauts have the right to fly over the territory of another country without a passport." But he continued ominously, "This imposes certain responsibilities on them." Just what the USSR would do if it perceived astronauts flying overhead as being irresponsible is impossible to predict. But in view of Soviet xenophobia, as evidenced by the attack on Korean Air Lines flight 007, there may be reason for anxiety.

Grachev was no doubt sincere in his appeal to American astronauts when he said: "We will shake hands in space and not look at one another through gunights, we will not exchange laser blows but exchange information." Sadly Grachev's speech—and dozens of other public statements like it—are setting the stage for just the kind of orbital confrontation the cosmonauts say they want to avoid. To do so they could start by stopping their cosmic deceptions. ☐

SYMBOLS

Learn the Secret Code of Your Subconscious



Have you asked yourself, "What does my strange dream-image mean?" Does a symbolic picture, flashed into consciousness, haunt you as to its inner message? What is it, cloaked in mysterious signs, that is trying to come through from the depth of your subconscious?

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PHENOMENA

A small constellation of sea anemones dances in a dazzling display of light and texture on the floor of the Pacific Ocean. While underwater photographer Jeff Rotman was skinning along the ocean bottom off the coast of Southern California, near Santa Barbara, he spotted a brilliant patch of white among the rocks. Moving in ever closer, he took a series of photographs until he finally got what he had been looking for: a starburst assemblage of sea anemones whose raylike tentacles seem to lunge at the viewer. Rotman confesses to a particular fondness for sea anemones. His photographic studies of this creature and its varied environments have taken him all over the world—from the waters of the Pacific to the depths of the Red Sea. Rotman recorded this eye-filing image using Kodachrome 64 film in his Nikons II camera. **DO**

COMING IN THE MAY

OMNI

INTERVIEW



James Watson was one of three men to win the Nobel Prize in 1962 for discovering the structure of DNA, the master molecule of heredity. Today he heads an important genetics lab that is trying to reveal the dreadful workings of tumor-causing oncogenes. In this rare interview, Watson addresses a novel blend of questions: What is life? Could computers have discovered the double helix? What will be the biggest payoffs from recombinant-DNA research? Why will the Catholic church have to approve abortion? For Watson's pungent answers, tune in to *Omni's* May issue.

COMET RIDING



While some scientists draft plans for intricate vehicles to carry humans to the stars, futurists are looking to "natural" spacecrafts: comets. Future settlers may land on frigid cometary surfaces and build mines and water collectors. They'll draw clouderium from the frozen water to fuel fusion plants. And from on-hand materials, they'll construct space habitats to float near the comet as it continues on its vast circuit around the sun. Cometary colonies will support later generations of pioneers on their way to the stars. The plans of two American scientists—and speculation about the kinds of people who would hitch their fortunes to a comet—are outlined in May's *Omni*.

HOT FLASH



The geothermic hot spot of Vestmannaeyjar erupts onto the pages of *Omni* this month. Photographer Peter Turner caught the magnetic moment when the volcano began to spew its molten rocks and fiery gases over a tiny island in the North Atlantic. Descendants of the Vikings, the inhabitants of this island have learned to accept with casual indifference this awesome example of the earth's tempestuous nature. But its beauty and spectacle are captured in May's pictorial.

RIGHTEOUS STUFF



"I felt an overwhelming sense of the presence of God on the moon. I felt His spirit more closely than I have ever felt it on Earth, right there beside me—it was amazing." "I felt a hand on my shoulder pulling me out of bed, and I got up and went into the next room and knelt down, and my hands went up in surrender to God." The testimonials carry the conviction of sermons delivered along the stardust trail. But these and other statements of religious fervor come from a special group of astronauts: men who have landed on the moon. Our next issue introduces the gospel according to James Irwin, Edgar Mitchell, and Charles Duke, three men who, after their return to the world, began to go public with views of the hereafter. Scientists all, they once had the right stuff but now have begun to view material things in a different light. (Mister, says Mitchell, is "dense thought.") And each now believes his spiritual quest is more exciting than his trip to the moon.

GAMES

By Scot Morris

"I'll tell you what I think in two words—
impossible!"

—Samuel Goldwyn

Goldwyn was talking about a movie idea, but his line—or a variation on it—has been said about all kinds of plans, projects, and claims: "It can't be done."

What can't be done? First are those classic problems that have been proved to be insoluble, such as trisecting the angle, doubling the cube, squaring the circle, creating perpetual motion, or drawing a planar map that requires more than four colors. These futile endeavors will be the subject of a future column.

For now we'll concentrate on things that only appear to be unattainable. They look as if they couldn't exist, but there they are. In two words—impossible! We have assembled a collection of these objects, to be put on display at Omni's Museum of the Impossible.

FLAP For example, consider the piece of paper shown on the facing page (left side). The illustration shows what you would see if the card were placed on a table in front of you. The pins at the corners hold the paper down to a piece of backing paper. The paradox is in the rectangular flap that rises defiantly above the rest of the card. The flap has the same total area as the two notches on either side of it, but how can it have been cut from two places on opposite sides of the sheet? Close examination of the paper shows that it is all one piece, that it hasn't been glued or taped together, and that the only places it has been cut are along those lines that are clearly visible in the illustration.

How was this apparent impossibility created? Once you know, it seems absurdly simple. But if you make one of these cards and toss it on a coffee table at a party, many very intelligent observers will be stumped as to how you did it. Some may even say that the thing is impossible and leave it at that. The flap-card problem shows how our thinking is influenced by traditions and unspoken assumptions. Can you break out of the

mental rut and discover how to put a piece of paper so it looks like the one in our illustration?

THE ART OF PUTTING BIG THINGS IN SMALL THINGS

The most common "impossible objects" appear to contradict the commonsense notion that you can't pass something of one size through an opening of a lesser size. It is as preposterous as passing a camel through the eye of a needle. Since a glass bottle has definite, fixed proportions and usually cannot be cut open and put together without leaving telltale marks, our Museum of the Impossible has a whole wing that is devoted solely to things in bottles.

EGG A classic of this type is the hard-boiled egg in a bottle. First you drop some paper and a lighted match in the bottle, then place a peeled egg upright over the neck. (The stunt used to be done with a common milk bottle. Today it may take some searching to find a bottle

of the right size. The neck opening can be up to one-half inch narrower than the egg.) The fire consumes the air in the bottle, and atmospheric pressure pushes the egg inside with a pop. List! you wash the match and ashes out with water. This trick was often used by high-school-physics teachers to liven up a lecture about air pressure.

In our Museum of the Impossible display, this exhibit has a slight difference. The hard-boiled egg in the bottle is unpeeled, and its shell is hard, intact, and without cracks. How did we do it?

CUBE The Rubik's Cube in a bottle (below, at upper right) was created by Bob Easter, of San Francisco. The cube is a genuine, working model, about 1.25 inches on a side. The bottle is uncut and has a neck diameter of 0.75 inch. How did Easter do it?

PEAR The picture below, at left, shows a bottle of Penner Williams pear brandy that we bought from a New York liquor



Mysteries in bottles. How did the pear, the screw, the Rubik's Cube, and the arrow get in there?

store. Inside the bottle is a whole pear, much too large to get through the bottle's neck. The bottle is perfectly ordinary, with no breaks or patches, and the pear is real—a solid piece of healthy fruit. It looks like the sort of souvenir one might bring back from a trip to the fourth dimension. If the brandy bottlers didn't do it that way, how did they do it?



A flap of paper tucks delicately above the paradoxical card (left); at right, two keys linked on a ring, all cut from one piece of cardboard

ARROW Bob Foshee, of Issaquah, Washington, is responsible for the Coke bottle with the arrow through it. At either side of the bottle there is a half-inch diameter hole that is just large enough for the shaft of the arrow to pass through. The arrow's "point" and "feathers" are each nearly an inch wide. The entire arrow is a single piece of wood, with no discernible cuts or breaks.

Foshee assures us that the arrow is one solid piece and that the bottle is genuine and untempered with, except for the holes. In fact he would like to acquire a large quantity of these discontinued 6.5-ounce bottles, and he asks any *Corn* reader who can help him in this regard to contact him at 16005 268 Avenue SE, Issaquah, WA 98027.

How was this impossibility achieved?

SCREW Tom Caskey, of Decatur, Michigan, sent us the remaining bottle at left. A solid-wood dowel barely fits through the neck. Inside the bottle a wood screw passes horizontally through the bottom of the dowel. The wood and the bottle are whole, and there is not enough room at the neck for both the dowel and the screw to pass through at once, even if the screw were turned vertically.

Can any reader find a way to duplicate the screwy impossibility?

CARPENTER'S NIGHTMARE This final example of big-through-small is a thought experiment that seems to violate common knowledge about solid geometry. If cube A is larger than cube B, is it possible to cut a hole in cube B that is large enough for cube A to pass through?

It seems absurd, but the answer is yes. How would you do it?

THE IMPOSSIBLE AS PROOF OF THE IMPOSSIBLE

Many people, on seeing our impossible collection, jump to the conclusion that these items must have been created in some supernatural, unscientific manner. Most observers just assume there's a trick to it, no matter how bizarre the object. One parapsychologist has proposed that if an "impossible object" of just the right type came along, it would constitute final, definitive proof of the existence of the paranormal. The parapsychologist is John Beloff, a senior lecturer in psychology at the University of Edinburgh, Scotland. Beloff is concerned about the lack of progress in his field. "There have been interesting results," he told the *Manchester Guardian* last summer, "but not of such a way to convince a scientist that something unusual is going on."

In a 1981 speech at the Parapsychological Association convention at Syracuse University in New York, he called for a commission of inquiry to produce such a "definitive and foolproof demonstration" to settle the question once and for all.

What Beloff would like to see is a set of two interlinked rings of wood, from two different species of tree.

"The simplest example is that of a linkage composed of two seamless rings of material that could not have been carved from a single block or manufactured in any way," he said. "Wooden rings of different timber would answer to such a specification."

LINKS The closest examples we have seen are variations on the illustration at left. The keys are loose on the ring but there is no seam anywhere on the three pieces. How would you go about making such an object from a single piece of cardboard?

This doesn't meet Beloff's specifications, of course. It's just a trick (one of Sam Loyd's, in fact). But if someone could produce a similar linkage of different kinds of wood, it would be a tangible miracle. "It would be hard to see how skepticism could long survive such concrete evidence as this," Beloff says. "The only snag is that such a possibility is at present purely hypothetical."

Is it? We have heard rumors that such an object exists, but we have never seen one. And if we did, we would probably assume it was just a trick. If any reader can send us an example of an extraordinary object that might impress Beloff or a commission of inquiry, we will do our best to find a parapsychologist who will certify that an *Omni* reader has been the first person to indisputably visit the fourth dimension.

Since the column is the best of two parts and since it deals with such a maddening array of apparent impossibilities, we're giving the answers to only a few questions this month: **FLAP EGG**, and **LINKS**. Next month we will take a tour of another part of our museum and give answers for **CUBE**, **PEAR**, and **CARPENTER'S NIGHTMARE**.

As for **ARROW** and **SCREW**, we invite imaginative readers to send in their hypotheses about how Foshee and Caskey pulled off their stunts or about how the effects could be duplicated in a future issue. We'll report on the best explanations received.

After next month, we will give the rules for a special competition. We'll be looking for more objects to add to our museum. So start thinking of how you would create things that are incredibly, head-scratchingly preposterous—things that are, in two words, impossible.

Answers on page 123 **DO**



LAST WORD

By Randy Cohen

● **Swapping his telescope for a microscope, Dr. Carl Sagan turns from the vastness of the cosmos to the teeny-weensiness of "The Teeming World in a Drop of Dog Saliva."** ●

From the wildlife programs on HBO to the computer buff on BBC's *Wild Kratts*, science and technology are featured more than ever before on this season's television schedule. In deference to this entertainment trend, here are some sneak-preview highlights of upcoming shows.

Micro

Swapping his telescope for a microscope, Dr. Carl Sagan turns from the vastness of the cosmos to the teeny-weensiness of "The Teeming World in a Drop of Dog Saliva," part 37 of an examination of the very small, by the very annoying.

National Geographic Special: The Sharks

Thanks to such grisly movies as *Jaws*, sharks have a definite image problem. But in this 1991 close-up of shark life in the waters near Africa, Australia, and Mexico, the sharks, instead of attacking swimmers, prefer to perform tricks for ophears in hospitals, run marathons foriling widows, and make large anonymous contributions to charity.

The Galileo Trial: The 352nd Year

Live pixel-to-pixel coverage of the Vatican hearings conducted in order to clear the name of the great scientist prosecuted by the inquisition of 1633 (program will run as long as it takes).

With My Heart in My Mouth

Gripping docudrama of a cannibal's suicide. Dr. Denton Cooley is the host. Potential guidance advised.

Did We Gorge (TV movie)

A story of prehistoric gluttony.

Doctor in the Plaza

Cyber? Leeching? That's what Mandino (Alan Alda) asks himself when he runs up against a particularly tricky case: a pox in the debut of this program about medical high jinks in sixteenth-century Milan. Apothecary, Jesse Fast Barber-surgeon. Gary Burghoff.

The Island of Dr. Moreau

Adventures of a demented geneticist (Burt Lancaster) who creates creatures that are half-animal, half-man.

Unnecessary Surgery (game show)

Constant-patients spin a wheel of fortune to see whether they need an operation as badly as the doctor needs a vacation in Barbados.

Ornithology (science series)

All about Ornes.

Rat and Stamen (crime drama)

The generative organs of a rhododendron set up shop as an unlikely team of private investigators operating out of the Brooklyn Botanical Gardens. No flower work. Not much action.

We Owe You

Bucky's going to get it—her mom just came home and found out that she ate the cat... and the solar.

Gruntling! Goes the Weasel

Kids get a real-life, unsentimental look at nature when a weasel is introduced to a chicken.

Call of the Wild

Adventures of a lost wolf raised by boys. Tonight, Lobo Blanco gets a lot of social-studies homework and pays a visit to the local orthodontist.

Wide World of Spores

Corn-arsut finals taped at last week's lows. Open coverage of the Tokyo international wheat-rust semifinals, and live from Atlanta, the second leg of the cotton wilt. (May be blocked out in some areas. Check local listings.)

Rhesus Pieces

A cartoon special on vivisection.

Meet Mr. Magdoosh

Bucky stings along on a military space station. Tonight it's one thing after another for General Weesler (McLean Stevenson). First, one of Bucky's frogs gets loose, and then a test of a new antisatellite laser goes haywire and encroaches Carson City.

Mendel & Lend!

By day, Gregor Johann Mendel (Bill Cosby) is a humble monk, devoted to his genetic experiments with garden peas. But by night he dons his robes and joins forces with superstar tennis pro Ivan Lendl (Robert Culp) to fight crime in nineteenth-century Austria.

I Givewize Lucy (metallurgic comedy)

To impress a reporter from Life who is coming to interview Ricky, Lucy has herself electroplated with a thin layer of zinc. Ricky is furious.

Father Glows Best

Nuclear war has come and gone, but the Anderson family finds that good posture and consideration for others are still important in an America with a population of 792. In the same opinion, Jim and Margaret (Robert Young, Jane Wyatt) aren't sure whether they should let Princess (Elmer Donahue) date a mutant.

Shit, Frightening Noise

This has been a test of the emergency broadcast system. It was only a test. Repeat: only a test. Had it been an actual emergency, you would be dead.

Check your local paper for the correct times and channels. ☐

Randy Cohen is an amateur TV programmer in search of the right network for his shows.