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TRANSCENDING SCIENCE

THE NEW MYSTICISM

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VOL. 11 NO. 3 DECEMBER 1988

CONTENTS

She represents the "Venus of the future," says artist Jean François Podevin, who created Alien of Troy for China Sky's upcoming record from CBS. The figure is an expression of technology, humanity and nature—with a dimension of mystery.

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FIRST WORD

By Allan McDonald

"Space engineers can help develop a strategy for sending a manned mission to Mars or take part in putting together a feasible plan that will send a new colony of Earthlings into outer space"

Thanks to NASA's most recent success, our future in space now seems secure. If the upcoming age of space engineering is going to be great, however, the responsibilities of tomorrow will be even greater. I believe it's time for engineers as both professionals and citizens to take a more active role in the decisions that space technology creates. Engineers are more aware of the risks, the costs, and the feasibility of certain technologies and should also be involved in the decisions as to how these breakthroughs are applied. Our progress in space is indeed a technological feat, but there are more issues at hand than just a technical challenge.

Professional engineering associations today are a sadly underdeveloped source of expert counsel. It is essential for such associations to be actively represented on national steering committees, planning commissions, and policy development groups if a rational and affordable national space strategy is to be developed and put into action. It only makes sense that those who are on the forefront of space development should be among the people who choose the direction our space program will take.

We also need to know when it is best to use robotic explorers. Every space mission presents a calculated risk, but we need to determine when that danger is too great for man and when a robotic instrument can do the job as well. Should we spend more energy designing and building equipment to replace astronauts? And when does a mission require the skills and intellect of a human being? It is our responsibility to define this balance in order to get the job done right and protect our astronauts at the same time. After all, choosing the best combination of abilities to fit a given situation is what engineers are trained to do.

Not only will the increased participation of engineers help work out some of the kinks in our space program, but it will also create a greater opportunity to accomplish our goals more quickly. Engineers can help develop a strategy for sending a manned mission to Mars, for instance, or take part in putting together a feasible plan that will send a new colony of Earthlings into space.

Engineers also have a responsibility to make sure the public is educated in both the pros and cons that go along with extending our world into space. Every engineer understands that a space disaster of one kind or another is a very real possibility. Yet that understanding has not yet penetrated the public sphere. The average citizen as well as the media expects our space program to be 100 percent successful and 100 percent safe.

After the space shuttle *Challenger* was lost, we mourned the death of the seven crew members. Our hopes and dreams to explore other worlds seemed bleak at the time, and our missions into space came to a standstill. Even now people are still wondering how the *Challenger* accident could have happened. The success of *Discovery* puts us back on track, but every American citizen needs to understand that a risk is still present.

I have often been asked what is the criterion for determining whether the redesign of the space shuttle solid rocket booster is safe. My answer to this difficult question has always been: The solid rocket booster is safe when there has been sufficient testing and analysis of the new design that I am willing to fly in it myself. But there is no way that I would ever let my wife or children fly on a shuttle mission into space. The risk is still too great.

The first flight of the DC-3 occurred 53 years ago. Today airplanes are 20 times safer than cars. There is, however, an accepted danger in commercial air travel, and we still have accidents. With spaceflight, we must allow ourselves the time to develop the same level of experience and knowledge. The space shuttle is the most complex machine ever built by man, and every mission is flown on the ragged edge of design and technology. Routine access to and from space is a legitimate goal but not a short-term one.

The future of space engineering is as boundless as anything I know. Its possibilities are unlimited and its rewards abundant. What we need, however, are dedicated professionals willing to accept a wider sphere of responsibilities—responsibilities that should naturally go along with a profession that affects so many lives.

We are on the threshold of a commercial space market as vast as the one that began with the development of the airplane. The incredible field of opportunity that is opening up for many Americans in engineering is stimulated by intense international competition to develop launch vehicles, microgravity manufacturing, communication satellites, advanced propulsion, robotics, and applied artificial intelligence.

Our recent success in returning the space shuttle to active flight marks the beginning of a new era of space exploration. It is fitting that the orbiter *Discovery* was the vehicle chosen for this first mission, for it will be most of all an era of discovery.

Allan McDonald is a chief engineer for Morton Thiokol, the company that designed the solid rocket boosters for the Challenger *and* Discovery *space shuttles.*

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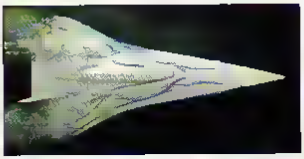

SILVERBIRD

ON THE EDGE

BAUBLES BANGLES AND BYTES

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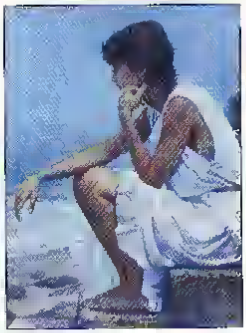

MYSTICAL EXPERIENCE

Imagine a world statute that forced you to stay within 100 miles of your birthplace and banned all types of communication—television, telephone, newspapers, even mail service. For most of us this would be little better than prison. For the last part of this century we've had access to virtually the entire planet, with a few people traveling beyond that boundary into space. And with the dawn of the New Age, there are those people who have felt a far greater connection—one with the cosmos as a whole.

Having a mystical experience—feeling connected to something greater than oneself—may be attained by following the 12 exercises compiled by *Keith Harary* in "How to Have a Mystical Experience" (page 137). You won't need any special props or training—just a little uninterrupted time. The benefits vary from understanding how your identity evolved to infusing your life with a sense of objectivity. Artist Steve Hanks provided the illustrations.

Why do mystical experiences—the visions witnessed by saints and the out-of-body journeys taken by psychics—happen in the first place? In "Transcending Science" (page 54) by *Dennis Stacy*, read about the controversy brewing among traditional theologians, parapsychologists, and nuts-and-bolts scientists. Can reports of religious revelations, paranormal experiences, or alien encounters be traced to geological disturbances or electrical impulses in the brain? Michael A. Persinger, head of the neuroscience laboratory at Laurentian University in Ontario, has devised a "magic hat" said to induce mystical experiences in his subjects.

Ronald K. Siegel, a psychopharmacologist at UCLA, is one of the world's leading experts on hallucinations. In "Long Day's Journey into Fright" (page 86) Siegel writes about his work with patients who suffer from these sometimes heavenly, sometimes hellish epiphanies. Like any scientist, Siegel methodically studied the symptoms of this phenomenon. Setting up situations that mirrored the circumstances present during his patients' hallucinatory episodes, Siegel found that he, too, experienced shifts in reality. Asked to investigate a case of a man accused of kidnapping and murder, Siegel underwent a dangerous experiment to help the court determine if the man was sane. The scene of the crime was reenacted, with Siegel as the prime player. After reading the article, take a few moments to fill out the questionnaire on page 89 about your own experiences with altered states.

For mind excursions of another kind, read this month's fiction, "On the Edge" (page 70) by *Sharon N. Farber* tells the story of a doctor whose preoccupation with an alternate world changes her life. The second piece of fiction, *Carol Emshwiller*'s "Fledged" (page 96), is a tale of a winged woman who drifts in from the rain, causing quite a dilemma.

Kate Wilhelm won a Nebula award, given by the Science Fiction Writers of America, for her story "Forever Yours, Anna," published by *Omni* in July 1987. The Bram Stoker award, given by the Horror Writers of America, went to *George R. R. Martin* for "The Pear-shaped Man," published in October 1987. Congratulations to the authors and our fiction editor, Ellen Datlow.

In "Silverbird," the pictorial on page 63, you'll learn how the West Germans are going to bring the world closer with the development of their aerospaceplane. It will travel at a speed of Mach 7, seven times the speed of sound. America promises an even faster vehicle—the X-30, which will fly at Mach 25. But it looks as if the Germans will have theirs off the ground before we do.

American ingenuity is evident in a new type of jewelry—and the boxes to house it (Arts, "Baubles, Bangles, and Bytes," page 34). The box shown here (created by New York designer Altemus) represents a new trend of combining art with electronic components.

This month's interview (page 102) is with biochemist Luc Montagnier—the French codiscoverer of the AIDS virus. Montagnier notes that 'AIDS is a disease of the Boeing 747. Without them [the big jets] there would be no AIDS epidemic.' With man crossing the boundaries between countries, he's spreading more than goodwill. OC

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DECEMBER

LETTERS

COMMUNICATIONS

Reigning Monarchs

The article by Jessica Maxwell on animal oddities ["Into the Woods," September 1988] was both accurate and interesting. Your readers may want to know more about the threats to the monarch butterfly and the efforts being taken to conserve these magnificent "cinnamon sailors." Lumber being cut for timber and firewood poses the greatest threat to the wintering colonies in Mexico, while urban and agricultural development has destroyed roosts in the Golden State. Fortunately, the Natural History Museum of Los Angeles County is working with the U.S. National Park Service and state agencies to ensure the monarch will continue to grace our fields and gardens for decades to come.

Christopher Nagano
Natural History Museum
Los Angeles

Sari Dressing

Regarding the painting that accompanied the story "Schrödinger's Kitten" [September 1988], it does faintly disturb me that an Arab girl, however advanced, could so rapidly forget how to wear her native garb. Technically, the garment is of Afghan origin, worn by nomadic tribes. The high, unslit portion of the dress is properly worn in the front of the woman, not in the back! It is, however, a beautiful piece of art, stunning in its color and undeniably a very expensive, authentic costume.

Ellen Norris
Seattle

Finger Exercises

Raymond Kurzweil's statement [First Word, September 1988] that twenty-first-century music will be more interactive through the use of electronics is hindsight. The theremin, a device that gained popular use in early science-fiction movies, was an electronic musical instrument controlled by moving one's hand through an electromagnetic loop in a fashion described by Kurzweil as "interaction." Electronic instruments can be traced back to the late 1800's with the invention of Thadeus Cadhill's TeleHarmonium. For that matter, even cavemen were able to produce acoustic sounds "digitally" without computers—assuming, of course, that they knew how to snap their fingers.

Jim Eshleman II
Macon, GA

Wanna Bet?

I was particularly pleased to note that Professor Edward Thorp [Interview, September 1988] has done more than merely make money. His mathematical discoveries will, of course, endure long after his wealth has been reduced to large integers in a yellow-paged bankbook. His cryonic quest for physical immortality, however, is amusing to those of us who realize the cockroach shall inherit the earth.

Harold Sieglaff
Phoenix

Fossil Correcting

I wish to respond to your article "Fossil Wars" [Explorations, October 1988]. Professional commercial fossil collectors collect and donate many fossils for research and have supplied many of the display-quality specimens exhibited in museums. They are also the source of most of the fossil specimens used for teaching. They supply these services with greater efficiency than government and academe do, and at a fraction of the cost.

There was a critical error near the end of the article, where it was incorrectly stated that there were four vertebrate paleontologists and four fossil dealers on the National Academy of Sciences committee that made recommendations concerning government regulation of fossil collecting. The committee actually consisted of one environmental engineer, two attorneys, eight paleontologists, and two geologists—only one (myself) a fossil dealer.

Peter L. Larson
Black Hills Institute of Geological Research, Inc.
Hill City, SD

FORUM

By Nina Guccione

Imagine a world with no creatures other than man: how quiet and barren it would seem. And how lonely for those who treasure their special bonds with animals. The ties between man and other species may be just a simple mutual caring, or perhaps it's a basic biological understanding of one another.

In December 1986 *Omni* ran the first national experiment on interspecies communication. By dialing a 900 number, readers could listen to seven animal sounds. These sounds related to the first part of a 34-question poll.

Sound I: The wolf. Sixty-eight percent of the respondents were correct in answering that the wolf was lonely.

Sound II: The wolf. The majority of respondents, 55 percent, felt that the wolf was expressing its identity. It was actually protecting its den.

Sound III: The elephant. We asked if the sound indicated anxiety, joy, or grief. Forty-nine percent were correct in assuming they were listening to an anxious elephant.

Sound IV: The chimpanzee. Was it screaming, whimpering, or laughing? Only 26 percent made the correct choice. It was whimpering.

Sound V: The orca whale. We asked how listeners felt when they heard the whale's vocalization. Most of the respondents, 61 percent, were irritated.

Sound VI: The orca whale. Was it communicating a warning, part of a conversation, or a signal that it was lost? Fifty percent of the respondents recognized that its vocalizations were part of a conversation.

Sound VII: The tiger. Seventy-two percent of the respondents felt the tiger was communicating a greeting. It was actually sending a warning.

The remainder of the questionnaire dealt with how we perceive and relate to animals. Which species did our readers have the most contact with? Ninety percent of respondents replied that they spent more time with dogs and cats than with any other animal. Of those people who communicate with pets, 60 percent do so with words. Do the animals understand? Sixty-one percent of the female respondents felt that their pet understood them as well as some of their friends do. Sixty-three percent of males felt their pet understood them fairly well, considering it wasn't human.

When you come home late at night, how does your pet respond? Most people who responded said their animal both touches and "talks" to them.

What would you do if your pet turtle died? Seventy-three percent of respondents would give it a burial.

Almost all respondents would neuter their pet only as an alternative to sending the animal, or its offspring, to the pound.

Of all respondents, 63 percent felt they'd grown emotionally because of their relationships with animals.

A Doberman rushes toward you. What would you do? Most respondents—55 percent—said they'd stand still.

Why do we think animals respond to us as they do? Sixty-four percent of the men felt that animals responded from need or want, whereas 69 percent of women felt that the animals respond because they care for us.

How did the reader feel about Mr. Ed, televisions talking horse? Sixty-seven percent of the respondents knew it was make believe but loved it anyway.

Are intelligent animals such as apes and dolphins capable of emotions? The majority of respondents said yes.

Endangered species—do we really care about their destiny? Ninety-six percent stated that wildlife programs should be funded to establish breeding programs for endangered species.

The majority of the respondents, 53 percent, felt that teaching animals a human language may somewhat alter their innate psychological characteristics.

How does the reader act when he communicates with animals? Eighty-seven percent treat the animal as an equal. And why might animals communicate with one another? Seventy-three percent felt they did so for basic reasons—to eat, copulate, and warn others of danger. The majority of respondents felt that the animals sometimes use their own language to express memory of events.

Asked whether animals understand human facial expressions, 50 percent of respondents said animals did some of the time, and 48 percent felt they did more often than humans.

Four statements were listed, asking readers which ones they perceived to be true. Most, 72 percent, agreed that an animal may be upset if it observes a family quarrel. Can an animal feel remorse? Thirty-five percent think so. To what extent can animals love us? Thirty-seven percent think they can fall in love with us, while only two percent feel animals can't truly love a human.

Why would a chimp use sign language to talk to humans? To express emotions, said 59 percent of respondents. And how does a chimp that uses a human language compare to one that doesn't? Ninety-eight percent of the respondents felt that the animals are equal.

Three statements were listed regarding animal emotions. Fifty-eight percent of respondents agreed that animal emotion is just as powerful as human emotion.

When is it okay to kill animals in the wild? The answer, for 52 percent, is only as a means to prevent overpopulation.

A couple who are studying primates raise a chimp at home, allowing it to play with their young son. Most of the respondents, 73 percent, felt it was eccentric but scientifically important. Twenty-seven percent felt it was unfair to the chimp, while only two percent felt it was unhealthy for the child.

It seems unlikely we'll ever be able to teach animals a human language and just as unlikely that we'll be able to imitate their tongues. Musical sounds may be the bridge between the species. Of all respondents, 76 percent felt that music may one day allow human beings to communicate with understanding with other species.

Has an animal's song ever moved you emotionally? Fifty-six percent replied that they were often affected by animal songs, and the respondents felt this was due to the songs' emotional content. DO

RUNNING ON EMPTIES

SPACE

By Randall Black

Shuttle astronauts may soon add garbage collecting to their in-flight duties but they won't be collecting junk. Instead they'll be hauling in a valuable raw material—the large rust-colored external tank (ET) that supplies hydrogen and oxygen to the shuttle during liftoff.

Currently, after the ET has carried the shuttle 99 percent of the way to orbit it is jettisoned from the craft, disintegrating as it falls toward the Indian Ocean. But the 15-story tank, with its considerable reserves of fuel, has always seemed to NASA like a terrible thing to waste. After all, America's first space station, *Skylab*, was just a Saturn 5 upper-stage fuel tank modified on the ground to house three astronauts. The question for NASA was how to salvage the tanks without simply putting them in orbit where they'd form a potentially deadly swarm of high-velocity space junk threatening to drop unexpectedly when their orbits decayed.

Now NASA thinks it has cracked the problem. Give free use of the tanks in space to any private party that comes up with a reasonable plan to provide for safe reentry. As a first step, the agency recently advertised the offer in the *Commerce Business Daily*, a U.S. government publication. "Our advertisement does not talk about companies taking title to the tanks, just having use of them," says Barbara Stone, who directs the ET privatization program in NASA's Office of Commercial Programs. As the launching nation, the United States is responsible for the ultimate disposition of the tanks, so NASA technically can't give them away. But the distinction between using and owning becomes somewhat academic if the user can keep a tank's orbit from decaying. "Once you are assigned a tank and are keeping it in orbit," says Stone, "we will not take it back."

Even before NASA's ad, two companies had expressed interest in picking up the gargantuan, no-deposit, no-return tanks. Randolph Ware, president of External Tanks Corporation (ETCO), began lobbying for the chance to make use of spent ETs in 1985 and already has signed an initial agreement with NASA that will allow ETCO to install scientific instruments in the ET's "intertank," the 5,000-cubic-foot space between the tank's hydrogen and oxygen carriers. The instruments will record the forces exerted on the tank after it separates from the shuttle and plummets toward Earth. Ultimately, Ware hopes to convert all 70,000 cubic feet inside the ET (the same volume as that of a 747) into a pressurized "Labitat," a space warehouse that could support scientific as well as commercial activities at low cost.

If Labitat can be described as a warehouse, then Global Outpost, Inc.'s proposal qualifies as a Space Age trailer park. According to the company's president, Tom Taylor, for just $20,000 a customer would get six months of essential services (such as power and communication capabilities) for an experiment or minifactory which would be attached to the outside of the unpressurized external tank.

"We would like to keep costs so low," says Taylor, "that people who have always thought it was too expensive to do business in space will realize they can get their feet wet without a huge initial investment." He sees a potential market in the companies that have had their shuttle "Getaway Specials" delayed. (Getaway Specials are experiments placed on the shuttle in containers about the size of oil barrels. NASA charges $10,000 per container.)

"If a company can afford ten thousand dollars in transportation and twenty thousand to thirty thousand dollars for the experiment inside a Getaway Special, they can get into the space research business in a reasonably sophisticated way," explains Taylor. "We're suggesting that if they spend another twenty thousand dollars, we can figure out how to take their Getaway Special out of the payload bay, attaching it to our platform, and letting them research for six months instead of five days."

It's too early to tell how many companies will be willing to join Ware and

CONTINUED ON PAGE 145

Heavy metal manufacturing. Someday industry might make I beams from orbiting tanks.

SURF AND TURF

EARTH

By Dwight Holing

Japanese architect Kisho Kurokawa has a vision. In the year 2016 a glistening city of glass and steel will rise from Tokyo Bay. Through a web of underground tunnels, goods will be imported to the island aboard computer-controlled subways, while oil, water, and other vital liquids will be pumped through a grid of 45-foot-wide pipes. Magnetic levitating trains barreling at speeds approaching 300 miles per hour will transport the 5 million to 7 million residents of Japan's new capital to surrounding cities.

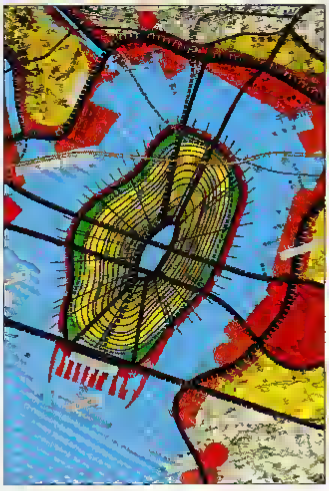
This ultramodern island is an idea that exists only on paper. But with 121 million inhabitants—30 million of whom reside in the greater Tokyo area—confined to a slender belt of coastline plains, a new man-made island that would take over capital-city responsibilities may be Japan's only hope against bursting at its own seams.

Along with Tokyo, which is so overpopulated that some commuter train stations employ white gloved "packers" to jam bodies into cars, other cities have attempted to relieve congestion by moving their borders out to sea. To avoid crowding during the 1939–1940 Golden Gate International Exposition, for instance, the United States colonized Treasure Island in San Francisco Bay. And more than 20 years ago the Dutch built Europort, a man-made island/harbor complex at the mouth of the Rhine, which helped turn Rotterdam into the world's busiest seaport. But no country has constructed as many islands as Japan, which has already added 400 square miles to its borders and plans to add hundreds more.

Currently the largest artificial island complex in the world sits in Osaka Bay, offshore of Kobe. Some 15 years in the making and built at a cost of more than $2 billion, Port Island is home to 20,000 residents, who live in modern apartments clustered around four separate parks. The island boasts adjacent office buildings, restaurants, a hospital, an international convention center with hotels and conference halls, and an electric-powered light rail transit system that links it to the mainland. The designers of this nine-square-mile system of interconnected landfills and waterways tout it as a residential, commercial, and industrial Utopia.

"It is a cultural city on the sea," says Mitsuya Ohtsuka, director of the Kobe Port Authority. "It was designed in an attempt to pursue the vision of a future city in the twenty-first century."

In addition to islands, Japan is looking at constructing huge floating hotels, airports, and nuclear power plants. One employment agency, the Temporary Center Corporation, has proposed a plan for a 35,000-ton shiplike office anchored in Tokyo Bay that would accommodate hundreds of workers who would commute by water-bus and helicopter. Not only will space in the floating offices go for a tenth of the price of a comparable Tokyo high rise (last year choice downtown land went for the equivalent of $6.7 billion an acre), but according to the company, it will also be safer. Should an earthquake hit, the self-propelled ark will dodge the ensuing tsunami by weighing anchor and steaming out to sea. Fittingly, the endeavor is called the Noah Project.



Japanese ingenuity. Real estate that floats.

About 35 other projects are either under way or have been proposed for the use of reclaimed land in Tokyo Bay. For example, Kurokawa's island would need 13 billion cubic yards of landfill to complete—that's the equivalent of 26 billion loads in a half-ton-capacity pickup truck. Mud dredged from the bottom of Tokyo Bay and sand and rock from two canals will have to be cut around the existing city and across the Boso Peninsula to the Pacific. The canals would be part of a firebreak scheme aimed at protecting the tremor-prone capital against the same kind of destruction that leveled it in 1923.

The $1 trillion price tag is undaunting to Kurokawa, who is one of Japan's leading architects. "Real estate on the island should have no trouble attracting plenty of buyers," he says, noting that office space in Tokyo's financial district is nearly $7,500 a square foot now.

But building an island is no small feat. The 1,000-acre landfill that makes up Port Island was constructed from more than 250 million tons of sand and gravel that was excavated from the back side of the Rokko Mountains. The material was transported to the sea by an elaborate system of underground conveyor belts or carried by trucks and loaded onto barges. And while Port Island has given Kobe additional space, life on the island is not without its problems. By altering the coastline and filling in bay lands, natural currents and sea life have been adversely affected. Onshore residents must contend with living amid industrial plants and with traffic funneled through bottlenecks. And Port Island is becoming as crowded as mainland Kobe itself.

The proposed island may run into the same problems. But the alternative Kurokawa wrote in a magazine article this year "is the slow but irresistible metamorphosis of Tokyo into a concrete jungle lacking in human resonance."

VOYAGE TO A FAR MOON

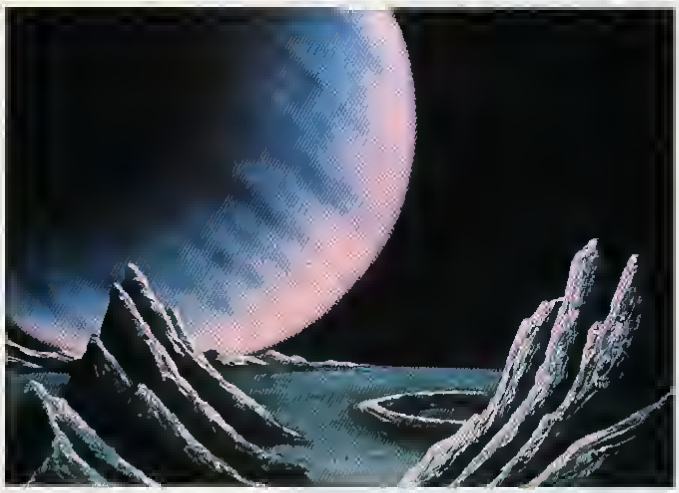
STARS

By J. Kelly Beatty

Dawn breaks on Triton, the larger moon of distant Neptune. The sun takes about 25 seconds to rise in the west. Three Earth days later the pale yellow, far-off sun sets, vanishing over the eastern horizon where space-black night meets a shimmering, frigid sea composed of liquefied gases. But this brief respite from the night does little to warm the eternal chill. The average temperature hovers at −350°F on the moon's harsh surface. Stranger still is the year. Unlike Earth with its relatively simple seasons caused by its orbit around the sun, Triton's seasons are dictated by many factors, including its tilt, its orbit around Neptune and Neptune's orbit around the sun.

Today's astronomer stands no chance of seeing this through an optical telescope. Triton is 2.8 billion miles away, and the light that reflects off its surface must travel through space for four hours to reach Earth. The image is so faint that researchers cannot calculate the moon's exact diameter—although they estimate it to be about the same as that of Earth's satellite. The surface's precise appearance is anybody's guess—at least until next August 25, when *Voyager 2* will fly within 24,000 miles of Neptune's satellite.

One of the odder bodies orbiting the planets, Triton has puzzled astronomers since its 1846 discovery. It's the only large satellite that circles its parent planet in a so-called retrograde fashion—which means that it moves around Neptune in a direction opposite the planet's own solar orbit. Some astronomers have suggested that because of its unique orbit, the moon is a maverick that came drifting from afar and was then captured by Neptune's gravity. They theorize that a major tidal struggle between the two bodies could have torqued and heated Triton's interior. Catastrophic eruptions of gas and liquid may have followed, glazing the surface with nitrogen and methane and in the process scarring the landscape. If it is viewed during *Voyager's* flyby, the surface might reveal clues to Triton's behavior and origin.



The Big Chill: On Triton, Neptune's mysterious moon, daytime temperatures soar to −350°

So far, investigators have based their opinions of Triton on circumstantial evidence. In 1983 Hawaiian astronomer Dale Cruikshank and colleagues Robert H. Brown and Roger N. Clark used infrared spectroscopy—which employs a special filter to break up light into its component spectra—to analyze the infrared rays bouncing off the satellite's surface. The researchers uncovered some evidence that the gas methane, a ubiquitous component of frigid worlds, exists on Triton, too. They also found that the moon seems to be covered with chilled nitrogen—a molecule that dominates the earth's atmosphere. The planet watchers can't yet firmly decide from their sketchy data, however, whether the nitrogen exists in ice or liquid form.

Armed with the findings of observers like Cruikshank, theorists have postulated about what might be happening on Triton. "If nitrogen is present," says chemist Mona Delitsky of the Jet Propulsion Laboratory in Pasadena, California, "some of it is going to be liquid." She theorizes that an entire ocean's worth may exist, perhaps in a nitrogen-and-methane combination. Until the flyby, nothing is certain. There could be no sea at all—or an entire planet's worth.

Triton's bitter cold would slow most chemical reactions to a crawl—including those involving nitrogen and methane. On a body at the far edge of the solar system, ice acts like rock, and everyday gases are liquids. This dearth of molecular activity should have kept Triton more or less unchanged from its beginnings to the present. If a relatively modest amount of energy could get added to the brew, argue the theorists, things might really start cooking. "Cosmic rays are a nice source of energy," says Delitsky, "and they bombard Triton from all directions all the time." Over the moon's 4.5-billion-year history, such rays could have slowly bonded the oceans' molecules of methane into the more complex hydrocarbon ethane, for example. The oceans would eventually become saturated with liquid ethane, which would rise to the top (as it

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ARTIFICIAL INTELLIGENCE

By Darrell E. Ward

Eight years ago Dr. Lance Meagher, a physician living in Oregon, was stricken with amyotrophic lateral sclerosis (Lou Gehrig's disease). Today he is unable to move his head, hands, or legs; he cannot talk, eat, or even breathe on his own. Nevertheless, the forty-year-old physician and ex-pilot one day plans to be placed in the cockpit of an airplane to fly solo around the world.

Perhaps there's a touch of Don Quixote in Meagher, but there is also a belief in the work of Erich Sutter, a theoretical physicist at the Smith-Kettlewell Institute of Visual Sciences in San Francisco. Sutter has designed a system that enables an individual to control a computer, turn on lights, use the telephone, and perhaps even fly an airplane simply by gazing at a computer monitor. This first step toward brain-controlled computers may help free the severely disabled from dependency on others.

When *Omni* first discussed Sutter's early conception for his Brain Response Interface (BRI) in July 1983, it was more science fiction than fact. Indeed to many people, it still sounds impossible. But, explains the Swiss-born Sutter, "there is really nothing magical about BRI. It is based on well-known principles and readily available technology."

Last summer Meagher became the first person to test Sutter's system. He underwent surgery to have four small electrodes implanted beneath his skull. One of the electrodes was placed over the visual cortex, the region of the brain that processes visual signals. It could then pick up brain waves generated from the visual cortex. These waves, which are large and easily distinguished from other brain waves, are produced when the eye focuses on a moving or flickering object and vary according to the type of object perceived.

Once Sutter had put the electrodes in place, he was able to begin testing the BRI. First he plugged the wire leads protruding from Meagher's skull into a small amplifier and transmitter and placed Meagher in a chair equipped with a pair of antennas. After receiving a signal from the transmitter, the antennas carried it to the BRI's processor, a standard off-the-shelf personal computer.

The computer monitor, which served as a visual keyboard, was electronically divided into a grid of 64 squares. Each square simultaneously flickered a unique pattern of dots. Superimposed on each square was either a letter, word, number, or command. When Meagher looked at one of the squares, his brain produced a brain wave determined by the square's flickering pattern. The computer read this brain wave and compared it with the template of his brain waves recorded earlier for each square. When a match was found, the command was carried out.

When Sutter plugged a desk lamp into the BRI system, for instance, Meagher looked at the square labeled LITE ON. A second later the light flashed on. When he looked at the square marked LITE OFF, the light turned off.

The system can handle up to 32 different grids, which the user can call up by looking at a designated square on the screen for switching grids. This puts 2,048 user-programmable commands at his or her disposal, enough for activating a speech synthesizer, or for operating "environmental controls" such as the TV, stereo, or motors that open and close windows.

If the system works well for Meagher at home, it could be made commercially available in the next several years. Meanwhile Meagher has purchased his plane, a 1947 Stinson similar to one he flew in college. In order for him to fly it, the plane will be equipped with servomechanisms to control it, an autopilot, and a voice synthesizer. Sutter agrees that in principle, "if you can control devices with BRI, you can control an airplane," but he is hesitant to embrace the idea at the moment, wanting more time to observe BRI's performance. But, he says, "I think we've shown that it is possible."

Dr. Lance Meagher is regaining mobility by simply looking at a computer

BAUBLES, BANGLES, AND BYTES

ARTS

By Nina Guccione

When I first started working on a computer, I went through a range of emotions: excitement, because I was tackling something new; fear, because I was intimidated by computers—they are so precise, and I'm not. I could not, and would not, see that any creative act could be delivered by so rigid and mechanical a medium as the computer. God, how I hate to be wrong!

In the June 1988 issue of *Omni*, there was a pictorial on computer art—visual interpretations of mathematical equations. Ken and Bonni Evans's abstract forms were beautiful, and to my surprise, I enjoyed seeing them. Now the Evanses, an artist team from Ontario, have transferred their bright, swirling computer images from a flat surface to a three-dimensional form—jewelry. Their latest creations include earrings, bracelets, and pendants. Baked on phymo clay, the pieces are as light as lava rock. Computer chips and battery-powered bulbs accent the jewelry with colorful flickers. It's a shift to high tech, but I'd certainly wear a pair.

Next thing I know, I'm asked to find the computer chip itself beautiful. Apparently some artisans are doing away with the computer as a medium and making it an art form. Numerous fashion and jewelry designers are eagerly embracing this trend of taking the computer's small silicon brain and scraps of electronic gadgets and displaying them as wearable art forms.

Melissa Panages, a designer from San Francisco, has dispensed with the traditional forms and fabrics for clothes and accessories, opting for shock appeal. Panages's creative use of electronic hardware, from computer parts to fallen satellites, proves that one person's rubbish is another's treasure. And it was garbage that spawned Panages's fashions. Almost ten years ago her boyfriend found a bag of discarded gold-filled computer pins, pieces of the machine's inner mechanisms. Fascinated by the "junk," Panages turned the find into clothes, jewelry, and finally, a business. She refers to her line of clothing as twentieth-century armor, appropriately, since entire garments are forged of gold-plated computer chips pieced together. It's great-looking gear, but the cost will take a big byte out of your pocketbook—from a camisole priced around $1,000 to a kimono for $50,000.

There's a tremendous amount of work involved in creating each item, and, Panages adds, "they're waterproof, wrinkle-free, and you never have to take them to the cleaners." Panages's jewelry includes necklaces dangling with numerals—each number constructed of different components—and earrings made from a mishmash of pins and pearls.

Cube Root's merchandise is a tad less ostentatious. Based in San Francisco, this three-designer outfit comprises two electronic engineers—both musicians—and an architect. Their creative talents and electronic backgrounds brought them together. As a group they're "devoted to advanced electronic and machine aesthetics." Finding beauty in today's mechanized world led to creating brooches—square circuit pins, clear bulbs that flash red, and a battery proudly displayed positive side up. Apparently the blinking pins caused a lot of admiring conversation at a recent MIT event. Interesting accessories, but I'm hesitant about anything that comes with instructions. If you should lose your adornments during an evening of frenzied dancing, however, they're easily located—these pieces will light up and flicker for 200 hours.

Allison Stern, a Los Angeles designer, uses whatever she can get her hands on—electronic components from telephones, satellites, even fighter jets. Her work is elegant, with clean, defined lines. A combination of offbeat materials are assembled into futuristic and Art Deco styles. Stern's objective: to encourage other people to appreciate the detail and precision in simple and banal objects, in daily items that affect our lives—like cars and airplanes.

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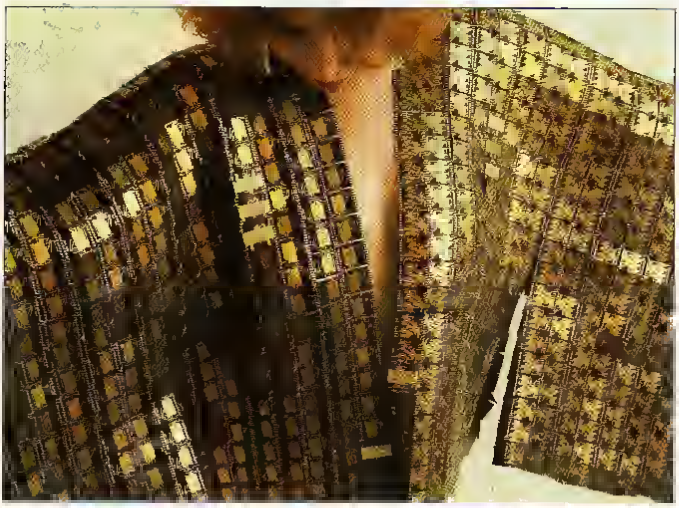
Time out. Surrealist watch collection by Seth Jaben reflects the romance of the New Age

Stern feels that the jewelry appeals to consumers because it's "simultaneously refined and raw."

Seattle's Transistor Sister is a designer group, not a heavy metal rock band. Designer Susan Grzadzielewski originally focused on wood and clay sculpture, incorporating various found objects into her work. When a broken watch exposed its microcircuit, a new channel for her creativity burst open. After that, Grzadzielewski started opening other contraptions and visiting electronics stores, searching for interesting elements. "I try to keep them as direct and pure as possible," she states. "I just add component to component." Her pins and earrings are intricate arrangements of tiny circuit boards. Detailed with multiple circuitry and precise wiring, the compact boards are colorful, delicate pieces. "They're so colorful," Grzadzielewski notes, "because that's the way they're electronically coded." Many of the brooches look like what you'd expect to see if you took off the back of your radio. So before you get rid of that old clunker that hasn't played since Elvis was in the top ten, think of the gem you might be tossing out. Some of Grzadzielewski's other pieces, bright twists with electronic parts, are similar to more standard costume jewelry.

Gemboards, a Chicago outfit, also produces jewelry made of printed circuit boards. More elaborate and stylized than Transistor Sister's, the Gemboards jewelry boasts a classic, dressy look. The printed circuit boards are made to Gemboards specifications for shape, color, and size and are woven together with copper wire. Cut colored stones and Austrian crystals enhance the electronic art. Brooch pins are a bit more arty, with different-shaped boards overlying one another, looking like miniature pieces of modern sculpture. "The response has been fantastic," says Jo Ellen Kohlenbrener, a Gemboards designer. "We grossed nine thousand dollars in 1986, our first year, and expect to see fifty thousand dollars this year."

Thomas Mann, a jewelry designer for 15 years, is based in New Orleans. His line of sculptured collage jewelry, termed Techno-Romantic, weds high-tech materials to humanistic images. One of the reasons Mann's artwork is so appealing is his use of varied materials—smooth Micarta, an artificial ivorylike material (he's concerned about endangered species, so he won't use real ivory), combined with tarnished and textured metals. In addition to the textures, the visual depths of the pieces seem to insist that you run your fingers across their surfaces. Mann designs some of the craziest-looking eyeglass frames I've ever seen (yes, I've *been* to California). One pair in particular looks like a modified version of an eye doctor's apparatus—the one you look through while the doctor rotates the lenses and asks, "Is this one clearer? or this one?" The pair at left sprouts metal lashes and small beads.



Bottom: High-tech clothing made of computer chips. Center: Mann and his vision.

And what are you going to do with all these precious pieces you buy? It wouldn't be appropriate to just fling them in a felt-lined box that plays "Lara's Theme" when opened. You're going to try to find an original Altemus jewelry box. Altemus, a New Yorker designed his first jewelry box at his daughter's request (she wanted something compatible with the bedroom furniture he'd built). The metal boxes, painted with a granite or marble facade, look like architectural works. Starting out at about seven-inch squares, the avant-garde containers are embellished with electronic parts—pins, drive gears, and vacuum tubes, painted in soft pinks and blues and brilliant reds. The interiors are lined with animal-skin-patterned fabrics, rubber tiles, and colored shapes.

Despite the appeal of these creations, I'm still more comfortable with the surreal and romantic efforts of the New Age. Catering to those like me is New York designer Seth Jaben. His creations are gentle reminders of a different path. Like his watches, with their mechanisms modestly concealed behind simple painted faces, Jaben's products are supposed to soothe you. His obsession with mystical and circus imagery combined with his art printmaking background inspired this watch art. "I've always loved miniatures," he says. "My watches remind me of seventeenth-century miniature portraits painted inside tiny frames." His collection is being sold under the label Art Under Glass. All Jaben's product designs and packaging, including posters, boxes, and shopping bags, follow his philosophy of "entertainment beyond product"—giving the consumer a package worth reading as well as seeing. "Products were a natural evolution from packaging," says Jaben, "especially once I learned that people were stealing the labels I'd designed without buying the product." Like a painter poised in front of a white canvas, Jaben approaches product design as a blank surface for his art to decorate. His ultimate goal: "to elevate the status of everyday consumer products with my art."

THE POLITICS OF ALCOHOLISM

MIND

By Joan Rachel Goldberg

When philosopher Herbert Fingarette published *Heavy Drinking: The Myth of Alcoholism as a Disease* this year the battle lines were clearly drawn. On one side was the mild-mannered academic from the University of California at Santa Barbara, who claims alcoholism is not a disease. Instead Fingarette sees alcoholism as a "central activity to a person's way of life." As one drink turns into many, drinking soon becomes an alcoholic's main preoccupation. Problem drinkers choose to drink, and they ought to have some control over this habit.

Aligned against Fingarette are almost the entire medical and treatment communities along with most recovering alcoholics. Dr. Henri Begleiter, a professor of psychiatry at the State University of New York Health Science Center, maintains that an alcoholic is not someone who is just boozing it up too much. "We are talking about someone who is really hooked," says Begleiter. "There is physical dependence and biological consequences."

The public, too, has mainly assumed that the question—Alcoholism: disease or not?—was answered three decades ago. In the Fifties the World Health Organization, the American Medical Association (AMA), and the American Psychiatric Association recognized alcoholism as a disease. And a recent Gallup poll reported that approximately 87 percent of those surveyed agreed with the AMA's assessment.

This year a U.S. Supreme Court decision (*Traynor v. Turnage*), however, turned a spotlight on Fingarette and his concept of alcoholism. The High Court upheld a Veterans Administration policy classifying alcoholism as "willful misconduct." The ruling denied disability payments for veterans with drinking problems but ducked resolving the controversy itself: whether alcoholism is a disease. According to Fingarette, the court based some of its reasoning on a 1970 *Harvard Law Review* article of his in which he maintained that alcoholics have the ability to control their cocktail intake.

Some medical and health professionals, too, have doubts about defining alcoholism as a disease. Certainly alcoholism doesn't fit easily into one framework. "It's a cultural and political question more than a scientific one," says sociologist Robin Room, director of the Alcohol Research Group at the Medical Research Institute in San Francisco. "If you dismiss sin and crime disease then becomes the plausible explanation." "It's easier to understand if you call it one thing," he contends. As a political question, it has far-reaching consequences for the economy and for treatment. Fingarette deserves credit for moving this issue out of the ivory tower and into the fray of public debate.

Alcoholism costs the United States a bundle. $116.7 billion annually, according to the National Council on Alcoholism. A staggering $71 billion is attributed to lost employment and reduced productivity alone. The costs of treatment add up to an estimated $15 billion a year. The issue has tremendous legal significance as well. If problem drinkers suffer from a disease called alcoholism, are they then handicapped individuals, in legal terms, subject to the protection of the 1973 Federal Rehabilitation Act, which prohibits discrimination on the basis of handicaps? That they might be is one of Fingarette's concerns.

Alcoholism: Disease or "willful misconduct"?

While Fingarette stands proudly on the ramparts, his opponents from the research and treatment communities wonder where Fingarette's coming from. "He seems very bright, competent. I wouldn't say he's malevolent," says Begleiter. "I tend to think he's sincere and honest. But he makes generalizations that are not accurate. It's always a little difficult to talk about an area in which you're not trained. He's a philosopher and talks in the abstract. I'm not, and I talk in the concrete. He generalizes from a limited understanding of personal experiences and reading."

Begleiter has been studying young sons of alcoholic fathers and finds that as many as 35 percent of the boys have brain-wave patterns that resemble those of alcoholics. The sons have never even had a drink. Begleiter sees his findings as evidence that some children of alcoholics may inherit traits predisposing them to problems with alcohol.

The evidence for a genetic basis for certain types of alcoholism is misinterpreted, says Fingarette. He says there is no decisive "biological case" for drinking behavior. The organic toll of alcoholism—brain changes and cirrhosis of the liver, for example—is the effect of drinking, not the cause. And he insists that *disease* is a "very vague word" that lacks medical meaning. "It's a way in which we can tell the public that money should be funneled to medical research and treatment, and doctors should be in charge," he says. "What you find are jurisdictional and political boundaries."

"The American health system is based on the study of diseases," concedes Boris Tabakoff, scientific

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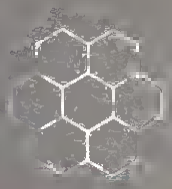


CONTINUUM

THE RIGHT (LEFT) STUFF

James Garner is on TV pitching beef. "Ya heard about the left brain/right brain stuff? The logical left brain understands nutrition, Garner explains while the emotional right brain "just knows it's good." Puhleeeze. Everyone knows that the left hemisphere is rational, logical and Western, and the right is creative, intuitive and Eastern. Everyone knows that is, except the scientists who did the research on which the whole notion of left and right brains is based. To them the idea that the brain's two hemispheres are split into two tidy sections—one the center of creativity, the other of logical thinking—is simplistic and wrongheaded.

Jerre Levy, a brain researcher at the University of Chicago, is perhaps the most prominent of those now trying to undo the "mythology" that has sprung up around right and left brains. "No complex function—music, art, or whatever—can be assigned to one hemisphere or the other," she sputters indignantly. "Any high-level thinking in a normal person involves constant communication between the two sides of the brain."

Levy is funny and articulate, but her message has had as much impact as a newspaper correction rectifying a faulty story. In part, that's because the true tale is complex, and in part, it's because the left/right brain myth has a lot of pizzazz.

Unlike other myths, the left/right brain has its origins in science. In a series of landmark experiments for which he eventually won the Nobel prize, Caltech's Roger Sperry probed the minds of patients who had undergone surgery to sever the corpus callosum, the main fiber bridge linking the brain's two halves. The surgery, a treatment for intractable epilepsy, left the patients seemingly normal. But Sperry and his colleagues showed that things were not so simple. When, for instance, an object was placed in the left hands of blindfolded split-brain patients, they would deny that the object existed. But if the patients were asked to search through a collection of items for one that resembled the object they were told was in their left hands, they would inevitably make the right decision, even though they would say they were only guessing. What seemed to be happening was that the tactile information (what was in the patients' left hands) had been transmitted to their brains' right hemisphere, which is incapable of verbal expression. But the right halves did process the information nonverbally, thus the easy recognition by the left hemisphere of a similar item.

Sperry's split-brain patients were almost literally of two minds, and those two minds he discovered had different specializations. As his findings made their way into popular accounts, the message became as garbled as a secret passed from person to person in the children's game Telephone. In this case, the end message was a vastly exaggerated version of the original. When you worked on your novel, your left hemisphere was busy while the right idled. Switch to a watercolor and the right side takes over while the left slacks off. People were either right-brained (and therefore artistic) or left-brained (and logical). One well-known writer summed up this new gospel in a headline: WHY RALPH NADER CAN'T DANCE.

In fact, Sperry did find that the left hemisphere is superior in the kind of logic used to prove theorems in geometry. But in the logic of everyday life, where the problem is integrating information and drawing conclusions, the right hemisphere is crucial. In almost all activities, there is constant interplay between the brain's two halves. In language, for example, the left hemisphere understands grammar and syntax, which the right does not. But the right hemisphere is better at understanding intonation and interpreting emotion. Read a story or engage in conversation, and the brain's halves are both involved in processing information.

The same is true for music and art. Pop psychology assigns both to the right hemisphere. In some musical skills, such as recognizing chords, the right hemisphere *is* superior. In others, such as distinguishing which of two sounds came first, the left hemisphere is more important. Enjoying or creating music requires integrating both these skills and a myriad of others.

It should really come as no surprise to anyone that the halves of the brain are in constant communication. The corpus callosum is the biggest bridge of nerve fibers in the brain. It is found only in placental mammals, and the smarter the creature, the bigger the connection.

It would, of course, be nice if there were a simple and accurate way to characterize left brains and right brains. But so far there's not, which isn't so surprising considering, as Levy puts it, that "we're trying to understand the most complex piece of matter in the known universe."—*EDWARD DOLNICK*

CONTINUUM

And then the chemists said "Let there be light," and lo the molecules that had been zapped with ultrasound began to glow

LIGHT FROM SOUND

Over the past ten years, high-frequency ultrasound has been used for everything from submarine detection to monitoring the health of an unborn fetus. Now a pair of chemists from the University of Illinois report that ultrasound has yet another unlikely characteristic: It can actually cause the molecules of some liquids to emit light.

Kenneth Suslick and Edward B. Flint beamed ultrasound at small quantities of two organic liquids: dodecane and nitroethane. The high-frequency sound they discovered produced expanding bubbles in the liquids. When the frequency of the bubbles grew to match that of the sound waves, the bubbles imploded, releasing sudden bursts of heat. The heat, in turn, broke the liquid molecules into highly energetic carbon fragments that emitted a blue light—"the same light," says Suslick, "you see when you turn on a gas range."

Will this phenomenon, known as sonoluminescence, lead to liquid light bulbs or a whole new species of exotic, hippie-esque light shows? Suslick thinks not. "The light from this process is not very intense," he says. It's visible in the dark, but it's certainly not the way to light up a room."—Bill Lawren

"Faith may be defined briefly as an illogical belief in the occurrence of the improbable."

—H. L. Mencken

LIFE DEEP DOWN UNDER

Organisms that may have been around since the days of the dinosaurs are living in the unexplored deep recesses of Earth. That's the conclusion reached by scientists at the Savannah River Laboratory near Aiken, South Carolina, who have recovered more than 3,500 microorganisms—all but two of which were previously unknown—from holes drilled 850 feet below the Savannah River nuclear weapons plant.

"No one expected us to find them because no one thought life existed beyond the root zone of plants [30 to 50 feet down]," says microbiologist Carl Fliermans, technical director of the Department of Energy's Microbiology of the Deep Subsurface research program. Fliermans adds that many of the microbes were found in sediment layers probably dating back 70 million years, "so they could be just as old."

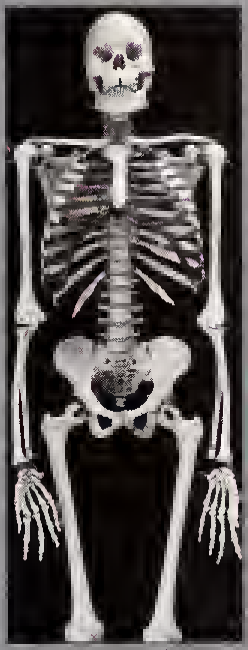
Since the initial discovery in 1986, only about 1,500 of the organisms have been classified. "There are some fungi, protozoa, and bacteria, viruses, but the bulk of the microbes are bacteria," Fliermans points out. "We are looking at their DNA to see if they've mutated. We want to find out if they've been there for long periods or if they're new organisms."

The microbes may be a source of infection-fighting drugs. "About forty percent of them are resistant to antibiotics," Fliermans says. "That means some of the microorganisms in their environment must be producing antibiotics. The pharmaceutical industry is interested in that possibility."

The newly discovered organisms could also play a role in saving the environment. Fliermans says some of them have the ability to break down toxic wastes into safe compounds. "There's great potential for using these microorganisms to help return polluted groundwater to pristine conditions," he says.

In addition to beneficial organisms, could scientists have brought up disease-causing microbes from deep

Carl Fliermans has found organisms as old as dinosaurs



A Russian success story Cutting bones to make them grow longer

within the earth? "We've gone through normal bacteriological procedures to identify any organisms that might have pathogenic tendencies. And we've injected some of them into mice and guinea pigs. So far there's been no kind of reaction," Fiermans insists. "I think we are looking at organisms that don't cause disease."

—Sherry Baker

"Is not the whole world a vast house of assignation to which the filing system has been lost?"

—Quentin Crisp

RACK OF LIMB

If you walked into the operating room during one of Dr. Walter Pyka's operations you might think you had wandered into a medieval torture chamber. Dr. Pyka is an orthopedic surgeon at Stanford University Medical Center and one of the few surgeons in this country who have begun using the Ilizarov procedure, a seemingly arcane technique developed in the Soviet Union for making legs longer by stimulating bone growth.

In the Ilizarov procedure, fine wires are run through a leg bone and attached under tension to metal rings encircling the leg. The outer, solid part of the bone is cut but the marrow and blood vessels inside are left mostly intact. The bone is pulled apart one fourth of a millimeter four times a day by turning nuts on the rings. This allows new bone tissue to grow and gradually fill in the gaps in the bone.

Pyka has used this procedure both for lengthening legs and for altering bone malformations. "We treated one gentleman who had a gunshot wound to his tibia [shinbone], says Pyka. Because of bone loss, his leg was shorter by six inches. We were able to lengthen the damaged bone so that it was equal to the normal one."

In Europe the Ilizarov procedure has even been used to increase the height of dwarfs, but Pyka says that for the time being, anyway, Stanford will use it only to treat bone injuries.

—Oliver Fulitz

MICROWAVING UNDERWEAR

Yeast infections, the bane of some women's lives, occur when *Candida albicans*, a natural vaginal fungus, experiences a population explosion. Unfortunately, once having taken over, *Candida* is sometimes tough to get rid of. But recently scientists at the Baylor School of Medicine in Texas may have come up with an unexpected way of controlling the infection—microwaves.

Dr. Eduard Friedrich suspected that the reason that some women who had been treated for *Candida* became reinfected was because the fungus inhabiting their underwear survived the washing machine. When they wore the panties again, they were reexposed to the yeast. He and his colleagues ran an experiment to see if microwaving the underwear when dry or wet would succeed in killing the fungus. Their results showed that *Candida* fungus survived dry microwaving but was dead within five minutes when the underwear was wet. "If used throughout the duration of an active infection," the researchers conclude, "microwaves may reduce the risk of recurrent disease."

Nevertheless, the researchers warn women *not* to microwave their underwear in part because microwave ovens' power levels vary and the scientists are not yet sure what levels are required to kill the fungus. In addition, panties made of synthetics have been known to catch fire when microwaved.—Paul McCarthy

Democracy is based upon the conviction that there are extraordinary possibilities in ordinary people."

—Harry E. Fosdick

"Everybody gets so much information all day long that they lose their common sense."

—Gertrude Stein

What you didn't learn in home ec: Microwaves can, under the right conditions, destroy the Candida albicans *fungus*

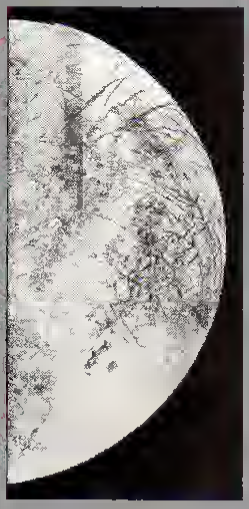
CONTINUUM

WHAT NOW, BROWN DWARF?

What do you call a star that never gets hot enough to light up? Astronomers call them brown dwarfs—accumulations of gas too small (probably only a few times bigger than the planet Jupiter) to generate the pressure and heat necessary for ignition. For years scientists have been searching for these "not quite stars" far too dim to see with conventional telescopes. Only recently, however, has anyone captured a viable candidate on film.

The candidate, located in the constellation Bootes, showed up in an infrared photograph taken by astronomers William Forrest of the University of Rochester, Michael F. Skrutskie of the University of Massachusetts, and Mark Shure of the University of Hawaii's Institute for Astronomy. The problem in establishing the candidate's identity is that another category of stars—very young, low-mass red stars—looks quite similar. The key, says Skrutskie, "is that our candidate is both slightly cooler and slightly more luminous" than the young red look-alikes.

If the object does turn out to be a brown dwarf, the discovery could be immensely significant. Current theoretical models of the cosmos indicate that the universe's total mass should be roughly ten times greater than the amount indicated by actual measurements. "If brown dwarfs do exist," says Skrutskie, "there should be a heck of a lot of them"—enough, perhaps, to help account for at least a little of the universe's missing mass.—Bill Lawren



Dark stars the size of Jupiter may populate the universe

Preparing a corpse for a funeral was [illegible] for one professional undertaker [illegible] he noticed that his testes were shrinking and his breasts beginning to grow

THE STRANGE CASE OF THE GLOVELESS MORTICIAN

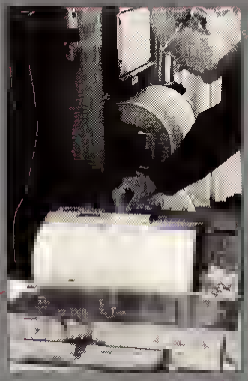
It was a case worthy of the most sophisticated medical spadework. A professional undertaker had, at the age of fifty and after siring seven children, gradually lost not only his fertility but also his libido. As if that weren't bad enough, the mortician found that his testes had shrunk noticeably and his breasts had grown.

To endocrinologist Joel Finkelstein of Massachusetts General Hospital in Boston, the symptoms indicated either an overabundance of female estrogen hormones or a short supply of male androgens. But tests showed that the undertaker was not suffering from a hormonal imbalance. When the patient told Finkelstein and his colleagues that he had rarely used gloves while embalming bodies, the doctors began to wonder whether the culprit might lie hidden in the cream undertakers use on cadavers before they apply cosmetics.

Sure enough, when they analyzed the embalming cream, the scientists found a compound that mimicked the effect of estrogen. The as-yet-unidentified compound had apparently passed through the skin of the undertaker's hands and into his bloodstream. There, it headed for the estrogen receptors in the man's glands, causing the symptoms. A combination of testosterone injections and a cream-free work environment restored the mortician's libido and his sperm count.—Bill Lawren

"I believe I've found the missing link between animal and civilized man. It is us."
—Konrad Lorenz

"Societies that do not eat people are fascinated by those that do."
—Ronald Wright



Quake, rattle, and roll! Do scale measure up?

GOOD-BYE RICHTER, HELLO Mw

The most famous device for measuring the strength of an earthquake may be obsolete. The Richter scale many earthquake experts say, is too limited to give an accurate measurement of an earthquake's force. For one thing, explains seismologist Hiroo Kanamori of the California Institute of Technology, the Richter scale can chart the strength of an earthquake only at its source. In addition, it can't be used for quakes that take place more than 300 miles from the scale, and it's not useful for quakes that are exceptionally small or large.

To replace it, Kanamori proposes an alternative scale known as Mw. Because this scale measures earthquake waves of long duration—200 to 300 seconds as opposed to 0.1 to 2 seconds in a Richter measurement—it gives a far more accurate picture of the total energy or magnitude produced by a given quake. It will give "quick, comprehensive" data on seismic events, says Kanamori.

Because the Mw scale uses the same numerical rating system as the Richter scale, Kanamori doesn't foresee any conversion problems for the press or the public. "They'll be adopting the Mw scale very soon," he says.—Bill Lawren

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"I believe every human has a finite number of heartbeats. I don't intend to waste any of mine running around doing exercises."

—Neil Armstrong

"Look for the ridiculous in everything and you find it."

—Jules Renard

"If all economists were laid end to end, they would not reach a conclusion."

—George Bernard Shaw

THE UNMUSICAL BEAN

Who can forget the poem that begins "Beans, beans, musical fruit,/the more you eat the more you toot"? Well, if food scientist Ben de Lumen of the University of California at Berkeley has his way, the sophisticated trickery of modern genetic engineering may someday silence the malodorous music of the common bean.

The chemical "conductor" of the bean's digestive orchestra, De Lumen explains, may be an enzyme called raffinose synthase. This enzyme is believed to trigger the production of a class of sugars called raffinose oligosaccharides, which, because they are only partially digestible, tend to ferment in the digestive tract, ultimately producing those unwanted postmeal symphonies. If raffinose synthase is indeed the culprit (it's been identified in several varieties), then eliminating the gene that codes for its production may do away with bean-caused flatulence forever.

De Lumen is careful to point out that he and his colleagues have just started the project and that they offer no guarantees that it will—pardon the expression—work out in the end. But if it does, it could be quite important. Beans are an excellent source of protein, De Lumen explains, and many nutritionists think that people would eat more of them if science could eliminate the flatulence factor.—Bill Lawren

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"If I have any beliefs about immortality, it is that certain dogs I have known will go to heaven, and very, very few persons."

—James Thurber

"I am not nearly so interested in what monkey man was derived from as I am in what kind of monkey he is to become."

—Loren Eiseley

"The future is no more uncertain than the present."

—Walt Whitman

"The older a man grows, the faster he could run as a boy."

—Red Smith

Toot, toot, Tootsie, good bye. Genetic engineering may soon take the gas out of the common bean.

CONTINUUM

Tree-starved visitors to California's Muir Woods National Monument can't seem to keep their hands off the giant redwoods, forcing park officials to build higher fences and reroute trails.

DEATH BY LOVE

Managers of Muir Woods National Monument in California are breathing a sigh of relief now that the 1988 tourist crush is over. The giant redwood trees, which they're in charge of protecting, have survived another summer of being loved to death.

The 550-acre park, north of San Francisco across the Golden Gate Bridge, attracts 1.6 million visitors a year, some of whom are harming the trees and other fragile plant life in their eagerness to touch and photograph the redwoods. "People just want to get close to a tree or have their picture taken next to one," explains Glenn Fuller, manager of the national monument. "The public truly appreciates being in the redwoods, but they are inadvertently harming the trees by rubbing their hands on the trunks, which wears down the bark, and by stamping on the trees' roots. They also are trampling ferns and other plants that are growing under the trees, and compacting the soil, making it difficult for the plants and trees to get water and vital nutrients."

In their eagerness to take pictures and touch the trees, which can exceed 300 feet in height, tourists are ignoring warning signs and climbing over protective knee-high railings. Fuller says rangers have been monitoring the tourist damage for five years and have begun to build higher fences and to pave dirt trails through the redwood grove for additional protection. But if the damage to trees continues, says Fuller, they'll be forced to reroute existing trails to divert visitors away from threatened redwoods to healthier trees.

—Joel Schwarz

"Things could be worse. Suppose your errors were counted and published every day, like those of a baseball player."

—Anonymous

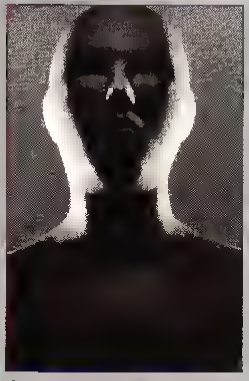
"We know what happens to people who stay in the middle of the road. They get run over."

—Aneurin Bevan

WHY CAN'T A ROBOT BE MORE LIKE A MAN?

Until recently, scientists' efforts to build humanlike robots have resulted in only the palest of imitations: dumb metal beasts that do what their inboard computers tell them to do. Now a small company in Boston has developed a robot that can actually adjust to novel and unpredictable situations, learning as a human does, from its own experience.

According to Michael Kuperstein, a physicist who is president of Neurogen Corporation in Brookline, Massachusetts, the secret of this new robot is its "brain," a software 'neural network' that processes patterns of electronic signals in a way that mimics functioning human brain cells. Using visual input from a pair of cameras that serve as "eyes," the robot can randomly explore the space in front of it, establish the coordinates of a



One small step toward a robot that thinks like a human

target object—a piece of paper, say, or a tool—then use its industrial robot "arm" to grab the object, even if the robot or the object is moved to a new location. And unlike a standard robot, which needs to be reprogrammed to adjust to a new situation, Kuperstein's machine uses each new experience to help compile a more complete picture of the space that it needs to navigate.

Kuperstein calls his new robot INFANT because, he says, it gathers information by random exploration "just like a baby." Is INFANT the prototype for a truly intelligent humanlike robot such as R2-D2? No, says Kuperstein, who thinks that "we're still pretty far from having a machine that's close to human capabilities." He does think, however, that INFANT will lead to robots that can walk quickly and gracefully over uneven terrain and to automobiles that drive themselves.—Bill Lawren

WINDSWEPT GALAXIES

Scientists have long theorized that the fiery deaths of supernovas produce a blast of galactic wind. Only recently, however, researchers Brent Tully and Joss Bland of the University of Hawaii's Institute for Astronomy came up with the best clear-cut evidence yet that the phenomenon exists. They discovered a wind spewing out of our closest neighboring galaxy, M82, at a speed of 375 miles per second.

"Hundreds, perhaps thousands, of supernovas have been going off at the core of the galaxy over the past couple of million years," explains Tully. "The energy that's being released by this has caused everything to heat up enormously, and this wind—composed mostly of hydrogen atoms mixed with helium and other elements—is blowing out of the center of the galaxy."

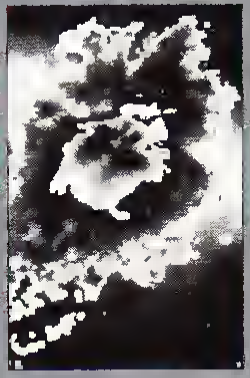
Why did so many stars explode in the first place? Tully thinks the answer involves another, larger galaxy, known as M81. "It is a companion of M82, and the two galaxies are probably passing close by each other, which is causing a great upheaval, especially in the smaller galaxy," he says.

University of Hawaii astronomer Alan Stockton explains that M81 is producing a gravitational effect known as tidal interaction, which is not unlike the moon's effect on the earth. "Gas is normally traveling in circular orbit around the center of M82, but the passage of M81 is perturbing the orbit," he says. "The clouds of gas are losing their orbital energy and falling closer to the center. There they run into one another and start to condense."

From observation of the star-forming regions of our own galaxy, scientists know that these dense gases lead to star formation. "Many stars are formed. Some are small, some are the size of our sun, and some are massive stars," Stockton explains. "It is the massive stars that are going through their life cycles quickly and turning into supernovas after just a few million years."

Tully adds that, though astronomers think of M82 as being "close," it's still 10 million light-years away from us—so there's no chance that the M82 wind will affect Earth. The gas will get lost in intergalactic space and never reach us," he says.

—Sherry Baker



Wind appears to be wreaking havoc in galaxy M81

BUFFER'S BELLY

Two physicians at the University Hospital of Cleveland have identified a new, if not exactly fearsome, technodemon: the supposedly harmless, but potentially insidious, buffing machine.

Seems a twenty-six-year-old maintenance man checked into the hospital with a high fever and severe abdominal pains. Subsequent exploratory surgery uncovered a small abscess on the man's colon—"one of the most unusual abscesses," according to Dr. Michael Kron, the attending physician, "that the surgeon had ever seen." The patient, who worked the night shift at the airport, had developed a habit of resting his "rather large belly" (Kron's words) on the handle of his buffing machine as he polished the airport floors. The machine's vibration, combined with an early colon infection, apparently caused this case of "buffer's belly."

After a colostomy and antibiotics, the patient soon recovered. For those who must use the devil buffers in their work and are inclined to use the handle as a paunch rest, Kron has a word of advice: "Just hold the handle normally with your hands," he says. "It may be harder, but...."—Bill Lawren

Doctor's orders: Keep your belly off the buffing machine

CONTINUUM

VISIONARY FINGERS

Perhaps the most complicated aspect of building a better robot is learning how to endow the automaton with useful and flexible vision. One way to circumvent that problem, according to mechanical engineer Michael McCarthy of the University of California at Irvine, is to improve the robot's sense of touch so that it can negotiate tasks in much the same way that blind people use touch to help them negotiate the world around them.

To demonstrate this notion, McCarthy and researcher Scott Leaver have built a series of computer-controlled robot fingers that can be used individually or in combinations of two or more to make up a working hand. The fingers, which weigh only 12 ounces each, can detect contact with an object, then use built-in force sensors to calculate the object's weight and surface rigidity. Each finger can be individually programmed, says Leaver, which makes it possible for "each hand to be configured to meet the needs of the particular task it is designed for, adding or subtracting fingers as needed."

Once they're perfected, McCarthy thinks the fingers will replace less flexible hands on industrial robots and be used for making repairs in space and in underwater environments. In addition, they could be designed for use by human amputees. He even envisions the fingers as forerunners of what he calls "a robotic system that amplifies human movement." Does this foreshadow bionic limbs, or even a $6 million man? Perhaps, concedes McCarthy, who says he can imagine "a walking machine that you put on like a suit of armor, a robot soldier suit, say, or a diver's suit that moves as you move but can lift something twice as heavy."—Bill Lawren

"The world is not run by thought, nor by imagination, but by opinion."
—Elizabeth Drew

DVORAK DOUBTS

To rev up your word processing, how about the Dvorak keyboard, the one with the rearranged keys? It has been shown to improve typing efficiency up to 50 percent, and it has grown in popularity. More than 100,000 U.S. users were claimed for 1985, compared with 2,000 users ten years earlier.

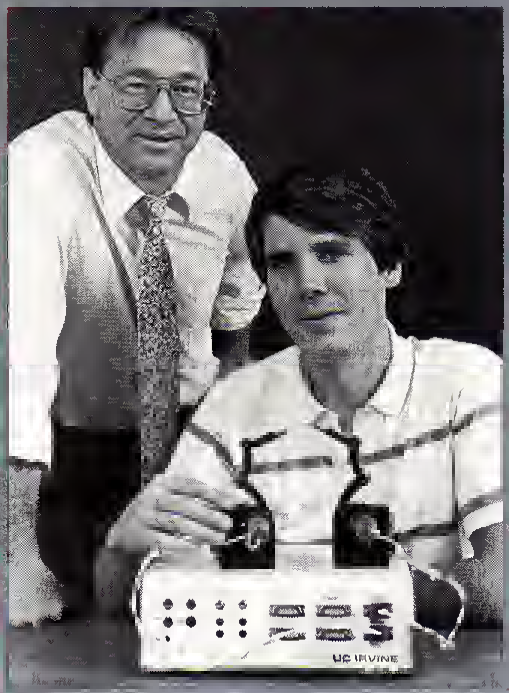
But is the increasingly popular keyboard really a shortcut to higher productivity? California ergonomist Kathleen Potosnak of the Koffler Group in San Diego, consultants on office productivity, decided to find out. Since the keyboard was patented by August Dvorak in 1936, more than 30 studies have tried to nail down exactly how much improvement can be expected from it. Potosnak decided to reexamine these figures.

The truth, she found, is that it has never been convincingly demonstrated that the revised layout in practice adds appreciably to typing speed. Moreover, many of the studies using real typists were unscientific and unreliable. The claim that Oregon state government operators had recently improved by 60 percent with Dvoraks also proved unfounded.

A computer simulation by Donald Norman and Diane Fisher of the University of California at San Diego found that a typist who could manage 56 words a minute on a standard QWERTY keyboard would, after a period of retraining, barely improve to 58 words a minute on a Dvorak keyboard.

Taking into account all the uncertainties and costs of changing over, Dvoraks are simply not worth the trouble, Potosnak concludes. Or as her colleague Richard Koffler puts it more bluntly, "Unless you eat, breathe and sleep typing, it won't make a big difference."—Anthony Liversidge

"We know only that the human mind, like the universe itself, contains the seeds of many worlds."
—Loren Eiseley



Michael McCarthy and Scott Leaver have their fingers on the future—a mechanical suit of armor stronger than Arnold Schwarzenegger

ARTICLE

From the sense of infinity to visitations from beyond, scientists have traced the mystical experience to the brain

TRANSCENDING SCIENCE

BY DENNIS STACY

It had been a frustrating day. At the office, he'd lost a week's worth of writing when his computer crashed. Then his boss called him in to say his work was boring, redundant, and disorganized. At home his daughter was sobbing because her room was infested with bees. One bee flew out, then a second and a third. He killed them all only after the fourth one stung his ear. Finally, his mother called and asked for a ride to the hairdresser. When he tried explaining why he couldn't do so, she called him a self-centered bum.

In the past he might have called his shrink, fixed a cocktail, or taken a pill. But now he simply put on his helmet. He flipped a switch and sat back calmly as fingers of energy massaged his brain. In seconds he rose above his body, through the stucco ceiling, and into orbit around the earth. He landed at a resort in the Bahamas, had a couple of tequila sunrises, and went for a leisurely walk along a sun-drenched beach. He reentered his body easily through a thicket of stars, switched off the helmet, and felt an utter calm.

This scene may seem unrealistic, but in fact a helmet for inducing mystical states already exists as a prototype in the lab. From déjà vus to alien encounters to out-of-body experiences such as the one above, this magnetic cap supposedly does it all.

What's more, this extraordinary helmet, now being used in experiments at Canada's Laurentian University of Sudbury, lies at the center of a vigorous debate. On one side are traditional theologians and parapsychologists who claim that the mystical experience or ME is

PAINTING BY CLAYTON ANDERSON

actually the perception of a force outside the bounds of everyday reality. On the other side are nuts-and-bolts scientists who say the ME is induced by the brain.

Some say they have traced MEs to particularly deep dream states; others to the nether land between wakefulness and sleep. Still others contend that the ME is rooted in the temporal lobes, two lumps of gray matter buried beneath the major hemispheres of the brain. And they now suggest: even in perfectly healthy people the lobes may be put into action by subtle stimuli, from the magnetic flux of a helmet to the vibrations of the earth.

Reports of mystical encounters, of course, go back to the beginning of recorded time. To the Greeks, for instance, what we now call epilepsy was known as the "sacred disease" because its mental and physical paroxysms were thought to be curses from the gods. And the story of Paul, Christianity's foremost missionary, embodies the mystical experience in its most classic form. Formerly Saul of Tarsus, Paul was in the habit of persecuting Christians until, while on the road to Damascus, he glimpsed a light from heaven. Blinded for three days, deprived of food and water, Paul emerged from the experience born again. Following his conversion Paul engaged in a spasm of epistolary explanations, authoring his famous letters to Christian communities in Rome and throughout the world.

Because the mystical experience has kept pace with the times, however, modern-day psychologists and neurophysiologists do not usually focus on traditional religious fare, including encounters with angels or visions of God. Instead, they follow what they say are the Space Age versions of these experiences: the out-of-body experience (OBE), in which the mind seems to separate from the body; the near-death experience (NDE), in which heaven is glimpsed as a brilliant light at the end of a tunnel; and the UFO abduction experience, in which people claim they have been kidnapped by aliens, which examine them with medical probes and steal their eggs and sperm. In fact, a survey conducted by sociologist Andrew Greeley of the University of Arizona, working with Chicago's National Opinion Research Center, revealed that MEs have been reported by 43 percent of American adults.

Why has mysticism remained such a persistent part of our culture despite the existence of science to explain so much of the unknown? The ME is pervasive, says Michael A. Persinger, head of the neuroscience lab at Laurentian University of Sudbury in Ontario, because it evolved right along with the human brain. "As the human cortex grew," he suggests, "we developed the ability to anticipate events in the real world. But that ability was a two-edged sword. It gave us the power to plan for the future, but it also forced us to "anticipate the inevitability of death." Our evolutionary response to that anxiety, he says, was a survival strategy—the ability to transcend our woes and, with the help of the ME, enter another mental plane.

Persinger has even proposed a physiological mechanism by which the ME occurs. "When the sense of self is threatened," he explains, "circuits in the brain generate local electrical discharges. Primed, temporal lobe receptor molecules begin to react easily with messenger chemicals in the brain. The message these chemicals send? A feeling of suspension in space and time. Persinger says: 'The sense of infinity makes the self feel immortal, and the fear of extinction goes away.'

THE MYSTIC BRAIN

The first modern connection between transcendence and the brain was made by British physician John Hughlings Jackson, head of England's National Hospital for Nervous Disorders. Around the turn of the century, while performing autopsies on epileptics, Jackson noticed their temporal lobes were different from those of people without the disease. In a flash of insight, he attributed these people's seizures and dreamy states to increased electrical activity in the temporal lobes. Soon he had identified other temporal lobe traits, including feelings of dissociation and alienation, as well as the twin phenomena of deja vu (in which one believes one has gone through the same experience before) and *jamais vu* (in which a familiar environment seems completely strange).

"By stimulating the lobes with our helmet, we had achieved a widening and deepening effect. After several sessions it took little to trigger the mystical state of mind."

It was American surgeon Wilder Penfield, however, who first induced full-blown visions of the sort Saint Paul reportedly experienced. Working at the Neurological Institute of Montreal back in 1933, Penfield was bent on eradicating epilepsy by excising it from the brain. His immediate goal: tracing particular feelings and functions to precise regions within the lobes. To perform this feat, he put his epileptic patients under local anesthesia. While they were still conscious, he opened their scalps and exposed their brains. Then he instructed them to report any thoughts or feelings as the experiment progressed. Using a wire charged with a 60 volt direct current, he found he could elicit vivid memories with a mere prick of his probe. Indeed, pricking the same spot evoked recollection of the same memory time and again.

Soon he found that depending upon the point of stimulation, much more than mere memories poured forth. He could evoke a crescendo of visual, auditory, and olfactory hallucinations; feelings of sadness or fear, and sensations of detachment from the environment and the self. Penfield could even play strange music in the minds of his subjects or cause them to see homunculi, malevolent figures threatening attack.

By the late Seventies, in fact, the relationship between the ME and the temporal lobes had become increasingly clear. Working at the University of Witwatersrand in South Africa, psychiatrist Vernon Neppe established a correlation between the temporal lobes and supposedly paranormal experiences, including the sensation of unseen presences and reports of OBEs. Using known symptoms of temporal lobe epilepsy drawn from the literature, Neppe compared a group of people reporting paranormal experiences with a control group not reporting such experiences. His finding? People who claimed the experiences reported an average of six temporal lobe symptoms all told, while those in the control group reported none.

Indeed, by the time the Eighties rolled around, many neuroscientists accepted the temporal lobes as the secular temple of the soul. Persinger sums it up best: If the brain was viewed as a bulbous, three-pound frog, the temporal lobes were the haunches on which it sat, poised for a leap. These haunches contained our sense of self, along with our perceived relation to space and time. They were obviously intimately involved with dreaming, the sensation of movement—particularly spinning and floating—and olfactory input. And what's more, they contained two smaller, deeply buried structures—the hippocampus, known as the "gateway to memory," and the amygdala, seat of our passions and fears.

So when Persinger decided to investigate reports of unexplained phenomena, he (like a few other scientists interested in the field) couldn't help but consider the role of the temporal lobes. A wiry, tightly wound man with thick-lensed reading glasses on the bridge of his Roman nose, the professor now has a few specks of salt in his pepper-black hair. But he clearly remembers the day he read a potboiler on the paranormal while still in his teens. "Most of the mysteries the author mentioned," Persinger recalls, "were patently preposterous. But I remember one thing—reports by stargazers of strange

lights on the surface of the moon—that could theoretically be verified.

Hoping to do just that, Persinger wrote to the Mount Palomar Observatory to ask about the lunar lights. To his surprise, he received a lengthy reply. "They explained that the lights were due to gaseous emissions," Persinger recalls. "But what impressed me was that a scientist would take the time to encourage someone interested in the unexplained."

LIGHTS IN THE SKY

His curiosity sparked, Persinger pursued graduate degrees in both psychology and geophysics, took his current job in the remote Canadian outpost of Sudbury, and proceeded to search for mysteries on which he could focus his particular expertise. Not having any luminous phenomena to investigate firsthand, he finally turned his attention to reports of UFOs. Struck by their physical similarity to earthquake lights—ghostly globules of luminosity that seem to precede or accompany earth tremors—Persinger formulated what he calls his "tectonic strain theory of UFO generation." In essence, he postulated that UFOs are actually the lights generated days to weeks before the quake. He went on to demonstrate a correlation between UFO reports and activity along earthquake fault lines.

Cognizant of the need for geological expertise, Persinger did much of his work with geophysicist John S. Derr of the U.S. Geological Survey in Denver. Derr supports the correlations but notes that the mechanism for the manufacture of earthquake lights has yet to be identified. One possibility, he adds, "is a phenomenon called exoelectron emission," in which electrons from breaking rocks excite the surrounding air. But how do these electrons create strange lights in the sky?

"Very good question," Derr grudges. "Nobody knows. The problem with earthquake lights is, how do you arrive at the quantity of electrons needed? How do you liberate them at the surface? And how do you focus them into a sphere?"

Despite such questions, Persinger has taken his notions further still. Working with Gyslaine LaFreniere, his wife, he argued that not only UFOs but a panoply of so-called paranormal phenomena—including poltergeists, psychokinesis, and OBEs—were related to magnetic forces high in the atmosphere and deep within the earth. It was one thing to explain away UFOs as earthquake lights. But now Persinger was saying that magnetic energy was actually inducing MEs via people's temporal lobes—the most electrically sensitive region of the brain.

To bolster his theory, he first decided to replicate the original study done by Neppe himself. Working with 500 first-year psychology students, he showed that those who most frequently reported paranormal experiences were often highly emotional. High emotions, he knew, were considered a sign of temporal lobe sensitivity. In the process, he did another study as well. Using the literature as his guide, he set out to compile a comprehensive inventory of temporal lobe traits.

What he found suggests that all human brains lie along a continuum of temporal lobe sensitivity, with clinical epileptics occupying only one extreme of the spectrum. Those he calls "temporal lobe sensitives" may be open to the ME without being clinically ill. "These people tend to be creative, intuitive, and occupied with philosophical and aesthetic issues," he says. On the downside, he adds, they "may show marked performance anxiety, with wide ranges of emotion and a tendency toward tension and compulsive thinking. During periods of personal stress, they may be prone to paranoia." But they make excellent hypnotic subjects—and they tend to have MEs.

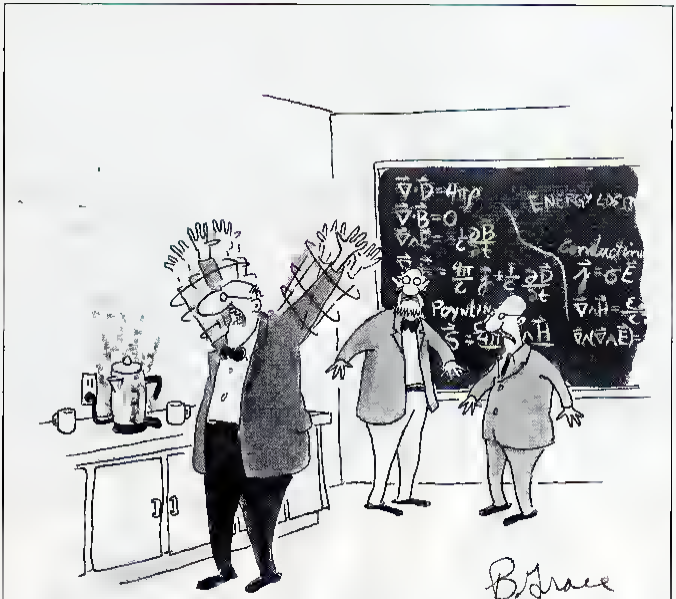
The beauty of Persinger's theory, of course, is that it accounts for an otherwise bewildering variety of paranormal experiences, including classic OBEs, NDEs, UFO abductions—even a visitation from God. In fact, the theory has allowed Persinger to define the ME in a new way. It is, he says, "any event that involves a widening of emotional meaning, such that things not typically considered significant would now be considered meaningful. After an ME, a person may even view himself in relationship to a larger entity—wholeness if he's a mathematician, or God if he's a Christian.

"Moreover," adds Persinger, "the experience will be perceived as extremely real, because those functions of the temporal lobe that are recruited are the same ones that assign meaning and significance to experience in the first place."

THE MAGIC HAT

To prove the validity of his notions, Persinger has done the extraordinary. He has designed a helmet that literally induces MEs. The invention came out of his desire to stimulate the temporal lobes so he could study the phenomenon more closely in the lab. Without surgically opening the skull as Penfield did, however, stimulating the temporal lobes was a difficult feat. The solution materialized in the form of an electromagnetic relaxation device sold openly on the Canadian market. The device generated a wavering magnetic signal that, as luck would have it, matched brain wave activity in the temporal lobes.

Persinger made crude solenoids (components that transmit a magnetic field) by wrapping copper wire around ten-penny nails. Then he attached the solenoids to the relaxer. To eliminate the possibility that the nails would prick his subjects, he mounted the entire apparatus on a motorcycle helmet from a local auto-supply store. Finally, to help the

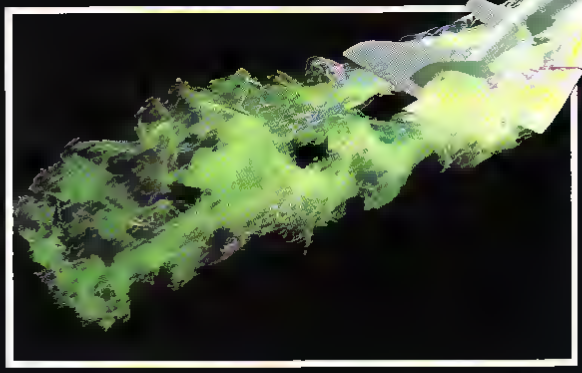


"Oh, my God! Call an electrician."

CONTINUED ON PAGE 114

SILVERBIRD

BY JOHN W ANDERSON



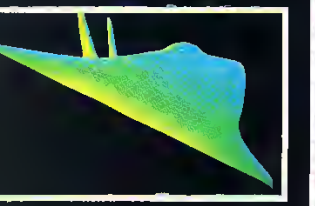
When most of us think of the space race, we think of the competition between the superpowers—the United States and Russia. Although West Germany doesn't immediately pop to mind, it just might become the first country with a viable aerospaceplane

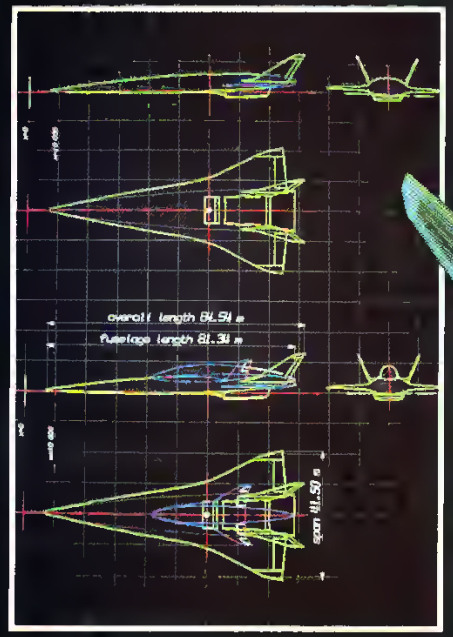
At the November 1987 Space Technology, Commerce, and Communications Conference in Houston, Udo Pollvogt made a presentation on the West German spaceplane, known as the Sanger Pollvogt is the president of MBB-ERNO USA Inc.—a subsidiary of Messerschmitt-Bolkow-Blohm, developer of the West German plane

Pollvogt's audience, consisting of space scientists and policymakers, took the idea of a spaceplane very seriously The United States, for example, spent close to $1 million each day in 1988 to build the X-30—the National Aerospace Plane In his February 1986 State of the Union address, Ronald Reagan referred to the X-30 as the new "Orient Express" because flight time between New York and Hong Kong aboard such a craft would be about two hours—that's flying at 25 times

PHOTOGRAPHS BY HENNER PREFI

Wind tunnel tests can simulate conditions caused at hypersonic speeds (page 63). Computer-generated designs can analyze the Sänger's structure (these pages).





the speed of sound. (The Defense Advanced Research Projects Agency plans to flight-test two X-30 experimental spaceplanes sometime in the mid-Nineties.)

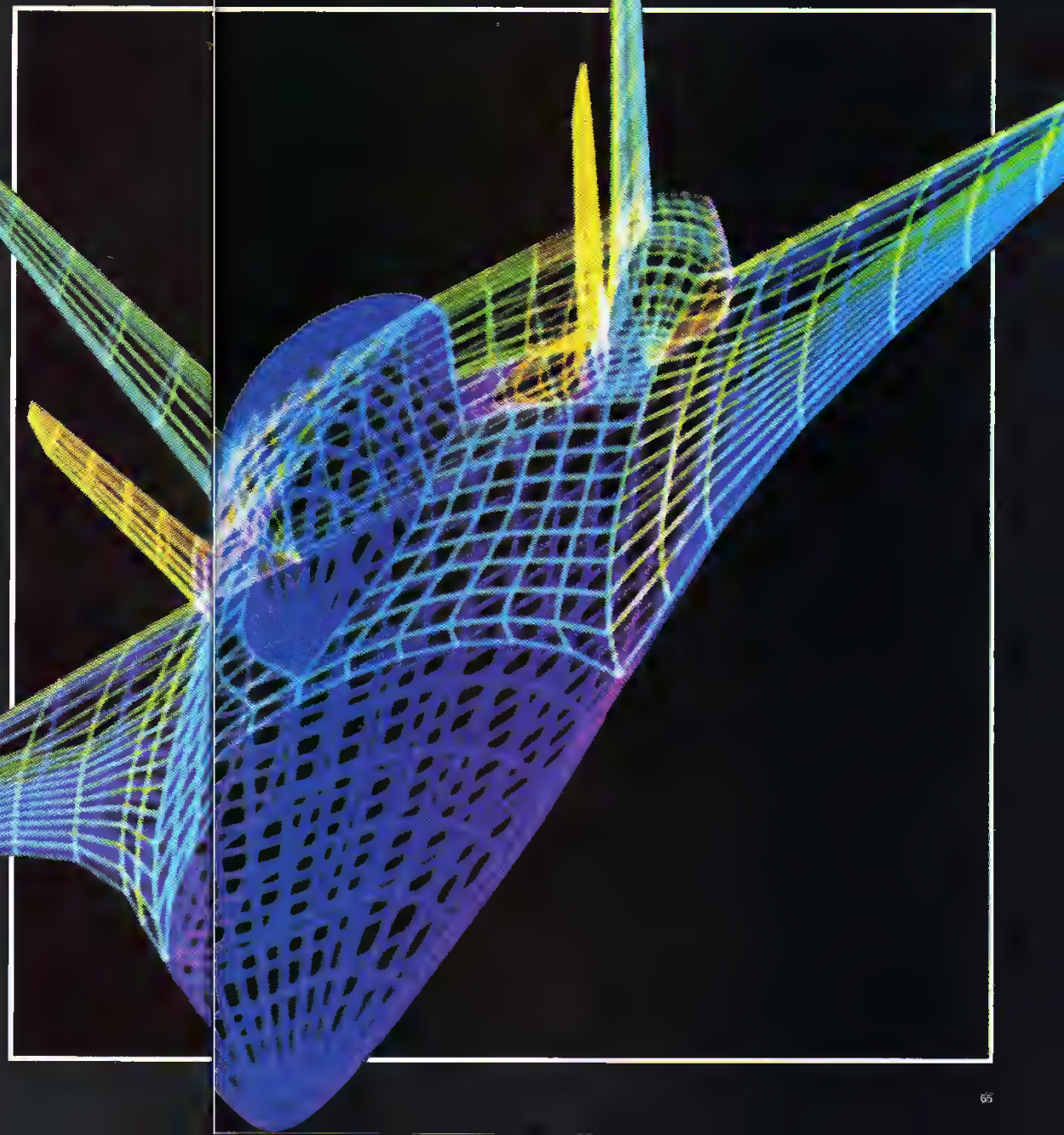
The Sänger, which is West Germany's answer to the X-30, should be less expensive than its American counterpart. As both countries' aerospaceplanes are still in the initial research stage, no one is willing to estimate eventual costs. The Sänger, unlike the X-30, will "require no major technical breakthrough," according to Ernst Hogenauer, who oversees the spaceplane project at MBB in West Germany.

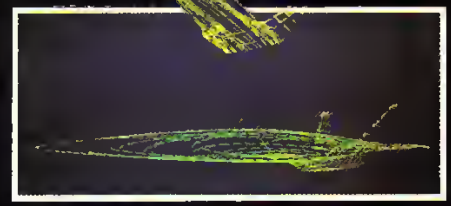
Costs for the Sänger will be limited by using "partly available technologies," such as turboramjet engines—the marriage of turbojets, found on most commercial airliners, and ramjets, the simpler aircraft engines.

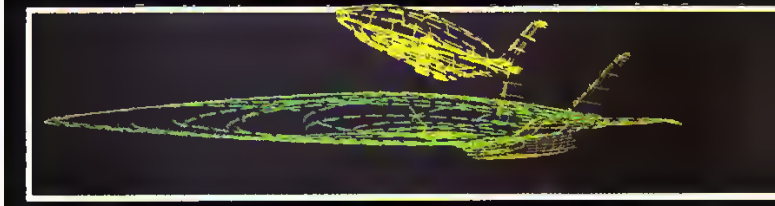
The X-30 will incur higher costs by incorporating newer designs and technology, including scramjets—engines that will kick in after the aerospaceplane reaches Mach 4. It will have a maximum speed of Mach 25. To obtain such high speeds, aerospaceplanes will use hydrogen fuel instead of hydrocarbon fuel, today's conventional aircraft propellant.

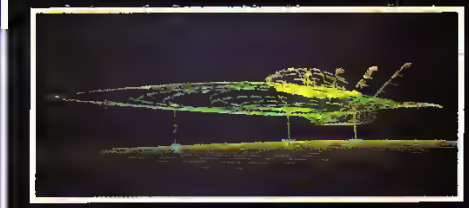
Although the Sänger won't travel as fast, nor be as technically advanced, as the American X-30, it's very pragmatic. The spaceplane is so basic that it's designed without windows. "Why even go to space if you can't look out the window?" yelled one attendee at the end of Pollvogt's speech, causing the audience to laugh. Pollvogt responded, "Because it's cheaper." In sharp contrast to a space shuttle like the *Challenger*, the Sänger will transport payloads into space at an estimated rate of hundreds, not thousands, of dollars per pound. The Sänger will take off and land horizontally on any conventional commercial or military airport runway, lowering operational costs by doing away with the extensive ground crews and equipment needed for shuttle launches. The Germans estimate that the Sänger will be ready to fly within the first decade of the twenty-first century.

Comprising two sections, the Sänger is about the size of a Boeing 747. The first stage of the craft, designed to carry





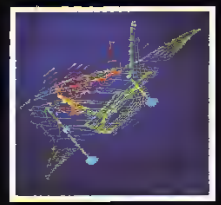




Three-dimensional computer images can assist engineers in altering and manipulating the spaceplane's design features. The images here illustrate separation of the Horus.

250 passengers, will travel at almost five times the speed of sound. The second stage, which will go into space, is known as the hypersonic orbital upper stage, or HORUS. Carried piggyback style aboard the hypersonic plane, HORUS will separate from stage one at an altitude of 31 kilometers and at a speed of Mach 7. Once deployed from the carrier, this second stage will enter low Earth orbit with its own rocket propulsion system to escape our planet's gravity.

Depending on the mission, HORUS will be manned by a crew of two to twelve people and will carry two to four tons of payload. In place of



HORUS, the Sänger can also launch a second stage known as the cargo upper stage, or CARGUS. This unmanned stage will allow the Germans to place up to 15 tons of payload in low Earth orbit. The cargo stage will not return to Earth.

The West German government, according to Polivogt, is providing ample funding for the Sänger's initial research and technology development. For additional financing, the Germans intend to turn to the European Space Agency (ESA)—a consortium of 13 countries currently sponsoring the Ariane rocket program. The agency has already launched more than a dozen satellites, including *Giotto*, the space probe sent to meet Halley's comet in 1986.

The Germans were the first to conceive of a spaceplane. In the early Forties Eugen Albert Sänger claimed this unique aircraft would travel at ten times the speed of sound. He believed that the "plane would be propelled by interstellar matter collected through photon ramjets." In 1929 Sänger wrote in his personal diary that his aerospaceplane would one day become a reality for his country. "My Silverbird will fly," he wrote at the time. Almost six decades later West Germany stands ready to make his dream a reality.

FICTION

Dr Entropy is beginning to intrude on Rachel Wirtham's life—and Rachel is beginning to think this may not be so bad

ON THE EDGE

BY SHARON N. FARBER

Blue. When she stands balanced as on a tightrope and looks below her, everything is blue. Strange and awful winds whipping her hair before her eyes, she turns cautiously to stare down the other way. Again, everything is blue—cold blue ocean reaching up into the endless sky. The air is crisp and dry. Far above, the blue sky fades into a pure black, dotted with alien constellations.

PAINTING BY MARVIN MATTELSON

"Excuse me, Dr Wirtham. I beg your pardon," said Dr Raj with his lilting Indian accent, as half a dozen books fell onto the counter beside her head. "Oh. I am so sorry."

"No problem," Rachel yawned, brushing away a *Manual of Medical Therapeutics*. "I just dozed off. What's up?"

Raj, leaning precipitously above her, kept reaching for the *Physicians' Desk Reference*. "There is a patient who was given phenothiazines by his friends."

Some friends.

"Yes, and he took them to relax himself, and now his head is bent like this, and his eyes cannot move." He twisted his own head ceilingward in demonstration.

Rachel ran her hands through her hair, trying to return it to some semblance of order. Acute dystonic reaction. Fifty of Benadryl.

Her colleague stopped reaching for the shelf. "*Fifty* milligrams?"

"Works like a charm. Or one milligram of Cogentin."

"Thank you. It is amazing how you remember all these dosages."

"Not really. Sherlock Holmes said your mind is like an attic, with only so much storage space. Well, when I was younger I knew the geologic eras, the fifty muscles in the human arm, and who penciled and inked the first eighty issues of The Fantastic Four. Now all I know is how much penicillin in the butt you get for syphilis and how much for the clap."

"Ah," said Bill the charge nurse. "The romance of emergency medicine."

Yawning, Rachel stood draping her stethoscope around her neck. Things seemed too quiet. Midnight, and only one patient in the emergency room? She walked out to the waiting room. A large cockroach scurried past, raising her sneakered foot; she paused. "No way. Never kill anything that will leave a stain on your shoe."

Aside from the usual drunk or two sleeping it off and a chronic schizophrenic they allowed to hide behind the soda machine, the room was silent. Ants and roaches had gathered about a spilled can of cola.

"Enjoy the quiet while it lasts, Doc," called the receptionist from her iron-barred cubbyhole.

Rachel swung open the door to the outside, immediately hearing the sound of the rain. Water was pouring from the sky, casting halos about the streetlamps. Light-streaked torrents ran down the incline. The doctor had a momentary vision of the rain forming a moat about the old hospital on the hill, turning it into one of those mysterious castles from the comic books, a place of hidden treasures, vaulted halls, treacherous dungeons, ghosts would stalk the halls and maidens' tears merge with the rain.

She smiled. "Turkeys don't fly in the rain." All over town, potential patients were staying inside, out of trouble. It was too wet for brawls or muggings. People would treat their own minor ailments, and even those with true medical emergencies would try to wait out the storm.

She took a step outside, letting the wind whip her graying midnight hair, smelling the acrid odors of the wet street. Suddenly Rachel had a flashback to her dream, understanding now what had seemed so strange. Despite the endless vistas of ocean fading into the horizon that had been all wrong, there had been no smell of salt and sea.

Far off she heard the first soft wail of an ambulance, taking the winding roads, its siren fading in and out like a jazz vocalist, while the rain gushed into the street and beat staccato on the car hoods.

"Hey, Doc!" someone yelled, behind her. "Multiple crunch coming in!"

"The doctor had a momentary vision of the rain forming a moat about the old hospital on the hill, turning it into one of those mysterious comic-book castles, a place of hidden treasures."

After a few seconds, when she did not reply, the voice came again. "Three cars! At least one dead! Shit, what a night."

She sighed, letting the door swing shut, enclosing her inside.

"Yeah, yeah. I'll be there."

She's flying, flying uphill, paralleling the blue flat as a sheet below her. Suddenly she reaches the crest and is flying straight into space, and the blue beneath her recedes down the other way, over the edge she heads into the stars.

"And then I realized it," she said, reaching to the center of the table and pulling a lump of sugar from the china cruet set. Everything at the Empress Tea Garden was elegant. The wild-blackberry crepe cooling on her plate was garnished with carved orange and lemon slices. "I was dreaming about a square planet—a cube in outer space." She held up the sugar lump as if it were exhibit A. "Like the Bizarro world."

She looked expectantly at her breakfast companion. He was her age, in that brief and timeless moment when vitamins, exercise, and lotion hold one poised before the quantum leap from youth to middle age. He had a square jaw, wireframe glasses, and a cheap yellow running suit unzipped to show a Greenpeace T-shirt. He sat there a spoon heaping with yogurt and honey granola poised before his mouth.

"The *Bizarros*," she repeated. "You know. The Bizarros were these imperfect copies of Superman who did everything backward and talked funny. 'Bad am good to us!' I dreamed that I was living on a box-shaped planet just like theirs. Isn't that too much?"

Rachel . . ."

She tossed the cube onto her uneaten crepe. "Christ, Kent, didn't you read comic books when you were a kid?"

"Rachel, three people died last night."

"Yeah?"

His jaw dropped slightly and he lowered the spoon.

"Well, for God's sake," she said angrily. "What'd you expect? They were drunk—all the drivers—and driving like assholes in a storm. The Coast Highway's bad enough in good weather."

"They *died*, Rachel. They might not have if Las Pulgas had a trauma center."

"You mean, if it hadn't been just me and some camel jockey in that shit excuse for an ER?"

"Exactly! That's exactly what I mean." Exchanging his spoon for a Cross pen, he flipped open a steno notebook. "With proper facilities and a decent county hospital, they'd be alive right now. Right?"

"I won't say that. You can't quote me on jack. Kent." She laughed once. "You know I did save the dirtball driving the pickup. Homemade tattoos are pathognomonic for sociopath, and he was tattoo city. He was turning blue. I didn't wait for the X ray, just stuck a needle in his chest. Blam!"

She waved her hands. "Guy had a tension pneumothorax from busted ribs. With these little hands I pulled him back from the edge of death. Couple of months, he'll be able to get drunk and do it all again." Leaning back, she popped the sugar cube into her mouth and grinned.

"Maybe next time he can run into a school bus, right?" She began to chuckle uncontrollably.

It is dark, with flickers of light reflecting off the bars on the tellers' windows and the corners of the desks. The quiet bank smells dry and summery, like new money.

Pausing before the vault door, a caped figure raises a gun and fires. The huge circle of metal dissolves, turning into colored mist, while below it a row of intricate wire-sculpture orchids springs into existence. The mist gradually clears, and the view into the vault is unobstructed. Coins glowing silver, piled deep, like water in a swimming pool. You could leap in, dive, and kick back to the surface, coins sparkling in your hair as the dark night flowed onward.

Pages 70 and 71: Painting by Marvin Mattelson for the cover of Blood Run *by Leah Ruth Robinson (New American Library).*

With the return of hot weather came the return of standard chaos to the emergency room at Las Pulgas County Hospital. Dr. Wirtham sat at the counter, small and unimportant in her green scrub suit. Given the proper makeup and a rinse to take the gray out of her hair, she might have looked foreign and mysterious. As it was, she looked chronically weary.

'Ma'am' said a woman leaning over the counter and pointing to one of the children clustered about her. 'Ma'am, my son here . . .'

'Ask a nurse.' Rachel snapped at the woman, not looking up as she scribbled a history and physical. She paused to stare at her work. 'Shit. I can't even read this.' she muttered. The patient's complaint was equally indecipherable. He seemed all right, but what if she had overlooked something? She remembered reading an old comic book with Superman vowing to expose himself to gold kryptonite, forever losing his powers, if he ever caused anyone harm.

'Rachel?'

She gazed up. 'Kent. What are you doing here? Paper cut?'

'Sir . . .' said the charge nurse, approaching with tubes of blood and urine for the out box. 'Registration is outside . . .'

'It's okay, Bill.' Rachel tossed the chart down. 'This is my pal, Kent Randolph. He's the ace star cub reporter for the *Las Pulgas Daily Journal*.'

'Have you given any thought to my question?'

'Oh, God!' Bill cried. 'Has he proposed?' He did a quick bump and grind.

'Buzz off.' growled Rachel, grabbing Kent by the elbow and ushering him toward the waiting room.

'Well?' he asked.

'You know how hard it is to get work in California, especially right on the coast,' she whispered. 'Every doctor in the damn country wants to come here. And now you. Mr. Front-page Farrell, you want me to sing for your little expose and lose my job—for what? For these people?'

She propelled him into the doorway. 'Take a good look. Scoop. The only sober person in the whole waiting room is that old lady there, who comes in twice a week with heart failure because she doesn't take the lousy medicine we give her for free. Whoops. I beg your pardon! *That* guy hasn't been drinking or fighting either. No, he's got endocarditis, infected a heart valve by shooting dope. He needs at least six weeks of intravenous antibiotics, but every time he starts feeling okay he signs a.m.a., then comes back when he's sicker'n shit again.' She slammed the door shut.

'What happened to your human decency?' Kent asked her, his jaw muscles rippling over clenched teeth.

She made a show of searching her pockets. 'Beats me. Hey, look! Want a Life Saver?'

It was, as always, broad daylight when she returned home, exchanging her dirty scrub suit for a clean pair. The top was blue, with a deep neckline, the little print below reading PROPERTY OF UCSF.

Too hyper to sleep, she went out onto the porch. The ocean crashed angrily below, and everything smelled of salt and seaweed and mold. Off to the left some children were climbing the rocks, gathering tiny crabs trapped in puddles. Far to the right she could see surfers paddling toward the breakers. She slumped into the lounge, opening up an old comic book entitled *The Geek*, about a hip mannequin brought to life in 1960's San Francisco. When Rachel had sold her comics collection to fund her medical education, the buyer had refused to take the two issues of *The Geek*.

Certain really bad comics are valuable, he'd said. The same way some of the great stuff, like *Magnus Robot Fighter*, is practically worthless. Anything with bondage or girls in prison sells like hot cakes. And you know those old *Lois Lane* comics everyone threw away 'cause they were so dumb? Well, now they're rare and worth a mint. But you can keep *The Geek*. I'd have more luck reselling *Richie Rich*.

> *She slumped into the lounge, opening an old comic book called The Geek, about a hip mannequin brought to life in 1960's San Francisco. Bored by the rackety plot, she tossed the comic.*

Quickly bored by the rackety plot and idealistic sentiments, she tossed the comic down, picking up the *Las Pulgas Daily Journal* instead. Kent's column ran on the editorial page, with a story about an illegal immigrant with pneumonia who'd delayed going to the hospital for fear of being caught and deported. Rachel had heard about the case—ER day shift had intubated the woman and shipped her directly to intensive care, where the police grabbed her family as they kept watch. Bill had described it to Rachel quite graphically, complete with screaming babies and pleading parents, but his rendition had come across as situation comedy rather than pathos.

The column ended with another impassioned plea for the mayor and the board of supervisors to improve health care for the indigent. She threw the newspaper on top of *The Geek*.

Now, if this were a comic, she muttered, 'Kent could dress up in a cape and fights and do some real sleuthing. The mayor would be involved in some conspiracy to give all migrant workers pneumonia, and in the last panel, about to shoot our hero, he'd fall into a vat of diplococci and drown.' She tipped the lounge chair back to almost horizontal, closed her eyes and let the distant crashing of the waves lull her to sleep.

'Great galaxies! It's the Board of Superheroes!'

'Indeed it is, citizen,' replies the mighty muscled man in yellow, emerging from the shadows to confront the derelict. 'Did you see anything suspicious?'

'Yeah, someone ran thataway!'

'Thank you, you may have helped us capture a bank robber and well-known fiend!' Clapping the derelict heartily on the shoulder, the man in yellow looks over his shoulder and calls. 'This way, fellas!'

He runs into the night-blackened alley. The derelict watches, muttering the heroes' names as they pass. 'The mighty Boar! Bald Eagle! Superbman! The Abbreviator, Tiny Terror to Crime! All my former heroes, together again! And they thanked me!' Looking down with disgust at his brown paper bag, he snarls. Then standing up straight, he tosses the bottle against the wall and strides off proudly as Mulligan Brothers dry sherry shatters on the bricks.

Inside the alley, the Boar holds up his hand to stop the others. 'Look! This back wall has been vaporized!'

'What's that beside it?' asks Flyboy, the Eagle's young companion.

His mentor scratches his scalp. 'It looks like the five-foot shelf of classics!'

The Boar bends down to confirm it. 'You're right, it's the Harvard Collection *of Great Books! This proves Dr. Entropy has been here—we've found the spoor of the chaos gun!'*

'Huh?'

'It's simple, lad,' answers the Abbreviator, himself a scientist who has used his knowledge of non-Newtonian physics to shrink himself, fight crime and tour the little planets that orbit nuclei. 'You've heard of conservation of order? Well, every time Dr. Entropy fires the chaos gun and disrupts things, the displaced order forms something wonderful!' He shakes his tiny head. 'What a fiendish device! Once she actually made a silk purse from a sow's ear!'

The Boar shakes his fist deeper into the alley. 'We've got you surrounded, you doctor of disorder!'

In reply a bolt of azure light streams outward, turning the building behind them into an ancient ruin, a stone temple of gods forgotten millennia before the first human history was recorded. To compensate, the ground before them becomes a perfectly ordered rose garden.

'Aiee!' screams the Abbreviator as the

thorn of an American beauty materializes beside him skewering his thorax.

The Bald Eagle snatches him off the thorn. "No, little pal! Don't let it be true!"

"It is," Superbman says, gently taking the body from the Eagle and placing it in a shoe box the Man of Style has found in the rubble. "My superb hearing reveals no heartbeat! But we shall bury him in the backyard at our headquarters, and we shall avenge him!"

The heroes unconsciously strike determined poses from their shelter in the shadow of the ancient temple. "This is odd," whispers the Boar. "I've fought Dr Entropy how many times? Fifteen—"

"Sixteen," corrects his friend, who also has a superb memory.

"And no one's ever been killed before!" He clenches his jaw angrily. "I've been too decent about it! Okay, Dr Entropy, no more Mr. Nice Guy!" he screams, heading for the back of the alley.

"Wait!"

His friends spring after him. The blue light bursts forth again, turning the Boar's clothes into old rags with wonderfully embroidered edges, but he continues running. A mound of garbage beside him becomes tiny leaping gazelles. The chaos bolt hits Superbman, covering his perfect physique with swamp debris. Paving stones below the Bald Eagle and his ward come alive and begin squealing and running, propelling the pair into a pit of lukewarm bittersweet chocolate, while beside them all appears a table with a ten-course Szechuan banquet.

"Help! Fire!" calls Flyboy. Superbman, washing himself off quickly with jasmine tea and patting dry with napkins, pulls them out, then licks the chocolate from his fingers. He hopes that the Boar will be all right. Superbman knows of the evil Dr. Entropy, whose father had been a respected scientist, inventor of the chaos star drive. Dr. Entropy had for no good reason blamed his accidental death on the mighty Boar and had perverted the chaos drive into a horrible weapon, using what might have been a boon for humanity only for evil and self-gain.

The Boar rushes onward, unstoppable like the powerful forest beast for which he is named. He comes upon a crouched, black-caped figure, surrounded by heavy bags of money, who is leveling a pistol at him. He catches up a garbage can lid, and it takes the bolt of light, becoming a circle of yesterday's newspapers. Tossing it aside, where it knocks over a Ming vase painted with plum blossoms, the Boar grasps the chaos gun, crushing it to a fine powder.

Then he lifts the cloaked figure, dangling it over the pavement. "Now! I've never hit you before, Dr. Entropy, but—"

The hood falls back, revealing the criminal's face. "No, please don't hit!" he pleads. "I've just had extensive dental work!" The Boar drops him, standing over him incredulously. "Who are you? Where'd you get that gun? And where is she? Where is Dr. Entropy?"

"I had the weirdest dream last night," Rachel said. "There were like superheroes in it."

"Was it erotic?" asked Jack, the doctor sharing her shift. They were gathered by the Mr. Coffee during the predawn slump, when even the roads are quiet, when cortisol levels are lowest and the human body least able to handle stress. They were dressed identically in soft green scrubs, the loose tops and pajama pants resembling medical judo gis. "You and some hunk from Krypton, right? Or, hey, how about Plastic Man?"

"Or Batman and Robin," leered Bill. "They're *my* favorites."

"Come on. Didn't you ever think how easy things would be if we lived in the universe where comic books take place?"

"No," said Jack. "Can't say I ever did. Okay, who's gonna do the pelvic?"

"Not another. Are we having a half-price sale for PID?" Rachel grimaced. "As seen on channel seventeen. Women, do you have pain occasionally *down there*? Do you have a purulent discharge that would gag a maggot? Are you bored and listless, with nothing else to do this slow Tuesday night? Why not come to the scenic Las Pulgas County Hospital and Cockroach Motel for a fun-packed pelvic examination—?"

"With a cold plastic speculum," Jack added in a deep announcer's voice. "—and best, it's *free*!"

"Act now," Bill the charge nurse finished, "and we'll throw in two million units of intramuscular benzathine penicillin! Doctors are standing by. Honestly, gang, you're nowhere near the record. That was when the cops decided to clean up the Stroll one night. Every hooker in town had nowhere to go, so they came to the ER for a checkup."

"Sounds like a job for Johnny Quick," said Rachel. They flipped for it and she lost. After the exam she took a swab to the emergency room lab. This was a tiny room with a laundry hamper, a stack of bedpans, outdated bottles of Gram's stain reagent, and a microscope. It was a far cry from any laboratory in a comic book. She tried to mentally dress it up with bubbling retorts, grinning skeletons and a madly arcing Jacob's ladder. "And now, with my microscopic vision, I will see the very fabric of the universe—"

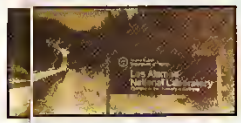
The wet prep of the discharge showed a few clue cells and a triangular trichomonad, waving its single flagellum gamely. "She's got wigglers."

Did they have trich in the world of superheroes? she wondered. Surely not. Surely people who could fly to the stars without spaceships, people who could become invincible or incredibly strong, who could see the future or eat

"Of course it's only a temporary solution."

CONTINUED ON PAGE 116

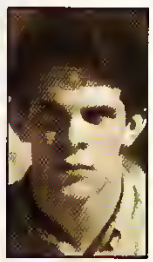
LOS ALAMOS WHIZ KIDS



Four-wheel-drive pickups have replaced hot rods. VCRs have usurped jukeboxes, and calculators have taken over from slide rules. But teenagers living in Los Alamos, New Mexico, still seem caught in the eerie twilight of the Cold War: not quite Ike but a long way from *glasnost*. Four decades ago physicist J. Robert Oppenheimer and the U.S. government selected the area for its primitive isolation. Here they built

BY NOLAN HESTER

PHOTOGRAPHS BY DAVID MICHAEL KENNEDY



the first atomic bombs in breathtaking privacy. Today the town and its neighbor Los Alamos National Laboratory remain remote, hiding 25 miles up a twisted road from the populous Rio Grande Valley. Classified work on mainline nuclear weapons continues, and under the aegis of the Strategic Defense Initiative (SDI), or star wars, lab scientists are creating space weapons for the next century.

The children of Los Alamos, raised in the hometown of the bomb, remain sheltered from the fallout of modern times. Among the nation's smartest kids, they often display an innocence not seen since the days of *Leave It to Beaver*. Many adults try to shield—some say cut off—their kids from life off "the Hill," as locals refer to Los Alamos. To their credit, a few parents push their kids into a wider world. But most want their children to stay close. Here, in a town that designs bombs, parents say that life is safe, secure, predictable. Their silent oath for their children: Strive and ye shall be rewarded; for everything is under control.

Parents may design state-of-the-art nuclear weapons, but for many kids, their parents might just as well be plumbers. Yes, they say, their parents work at the lab. "Nuclear something," they mumble when asked exactly what their parents do. Like teenagers everywhere, what matters most to them is Friday night, not some future Armageddon. When Los Alamos kids want to make the scene, they head down to the town library. It stays open until nine PM—late for this isolated town of 18,000. "Everyone goes to the library. There's nothing else to do," complains eighteen-year-old senior Ngeci Bowman. "Life is weird here."

The perks of a well-heeled suburb are everywhere: a public golf course and riding stables, paved bicycle paths and Olympic-size swimming pools. A downhill ski area rises at the town's edge. Serious crimes are rare. Mothers leave their children playing unsupervised outside. There is no bad part of town, no wrong side of the tracks. Students say the schools are good—in fact, superb. The town's setting rivals many national parks. 10,000-foot mountains leap from the town's backyard, and 100-mile vistas crowd the remaining horizon. At night the town's lights shimmer across the desert like a mirage. But in daylight Los Alamos remains a bit unreal.

The downtown projects all the permanence of a tent city. A paltry few fast-food joints stake down the edges, at the center stands only the county government building. Stores are scarce, side streets sparse. The only sign of life comes from Los Alamos High, which sits where downtown meets the main road to the lab. A deep canyon separates downtown and the residential areas from the lab. Except for that dark canyon, it's hard to find the center of Los Alamos. As Marty Daly, a Santa Fe lawyer who grew up in Los Alamos, says, "It's like a suburb to a city, except there's no city." And the lab makes Los Alamos like no suburb on Earth. Some 2,800 scientists and 5,000 support staff work at the lab, which could be mistaken for a college campus. Parents with Ph.D.'s are common—two thirds of Los Alamos's college-bound students come from families with graduate degrees.

Many kids accept their parents' weapons work, though some dream of a time without nuclear arms. Few say they regret growing up in Los Alamos. "It gave me a taste of the future before most people," says James Graebner, a playwright and 1968 Los Alamos High graduate. "The future is more mathematical and has more computers. Los Alamos is the future." Today's students seem to envision a future of only more school, good jobs and eventually adult lives much like their parents'. Some kids hope to be physicists and engineers. Occasionally a few talk of becoming doctors and ministers. Kids here grow up believing their futures will unfold like orderly science experiments. Known inputs will yield predictable results. Their ambitious faith is not at all surprising.

> *"The debate over SDI has given Los Alamos teenagers a rare glimpse of life beyond the lab. Some wonder if the lab's work is as logical and noble as they've been told."*

The pressure to succeed starts early. Graebner remembers a friend had to cite an equation each morning before breakfast. Phil Barck, a school district performance evaluator, says, "Parents often can't accept that their kid is just normal." So many students, he adds, make a religion of grades. "This is not by design of the school district," he says, "but there's not much else to do up here, so the students do get involved with academics."

Obsessions come easily in Los Alamos. Parents stay late at the lab, and their children turn school into a full-time job. Without malls, under-twenty-one clubs, or other hangouts, high-school kids throw themselves into band, student council, honor society, karate, and debate club with a vengeance.

At Los Alamos High School the fast track is the only track for most of the students. Advanced-placement college-level courses are prevalent, and this year one out of 14 seniors earned a perfect 4.0 grade point average (GPA). The school of 1,200 students consistently produces more than its share of National Merit Scholars—19 this year. One year the school had 34. Roughly 20 percent of the school's seniors routinely win college academic scholarships. About two thirds of the seniors go to college, compared with about half of seniors nationally. Last year the school's college-bound students scored 70 points above the national mean for the Scholastic Aptitude Test. And with science all around, the school has no gender gap. The physics and advanced-calculus classes have nearly as many girls as boys.

Picking out the brilliant students in the school hallways isn't easy. A few classic coneheads, guys with thick glasses and dorky clothes, lugging two backpacks full of books, scurry by. But most of Los Alamos's whiz kids look, well, normal. From earnest student council members to the occasional punk rocker, being smart is no big deal. To stand out here takes more than brilliance. Most of the kids know it; few parents let them forget it.

"What math are you in?" is often the first question asked when Los Alamos students meet one another. Out of 340 students in last year's senior class, 90 took calculus. Some, like Bowman, plan careers in physics. Many others want to be journalists, social workers, or English teachers. Why do they take calculus? "A lot of parents think that science and math are the only real professions," says Bowman. "The kids here are really pressured to go into sciences." Now a freshman at Yale, Bowman found the competition in high school so pervasive that she shied away from making friends with math and science students. "All were potential rivals, so Bowman sought out art students.

Before the grading system was changed a few years ago, a knot of straight-A seniors would tie for first in the class. Now the school gives extra points for A's in advanced-placement courses. The change fueled an even greater scramble for first place. "There's an incredible amount of competition for grades," says John Calanni, a senior who moved to Los Alamos from Houston three years ago. Calanni has a 3.98 GPA, but he does not even rank in the top tenth of his graduating class.

The upside to this fiercely competitive atmosphere, says district evaluator Barck, is that the competition inspires many average students to do much better than predicted by their aptitude test scores. Some students from outside Los Alamos even seek the challenges found here. Joti Rodar transferred to Los Alamos High

Previous pages, from top to bottom: senior John Calanni; Tina Clark, who wants to be a journalist; physics major David Nix; and senior Valerie Vigil. Background: the south face of spectacular Tolavi Mesa.

from Pojoaque, which lies 25 miles down the hill. She found her Pojoaque classmates complacent. At Los Alamos, she says, not only are the students more motivated, but the teachers and classes are much better—and harder. At Pojoaque Rodar would have been valedictorian. At Los Alamos, she says, "I'll be lucky to be in the top ten percent, and my grades didn't drop that much." Despite that and the daily commute, she's glad to have made the switch.

Senior Tina Clark also likes the academic pressure. "We get used to having smart people around. It's just ingrained in you that you're supposed to do well," she says. "We all feel like it's our job to get A's all the way through high school. We kind of pressure ourselves."

According to a number of kids, however, a lot of problems stem from living in Los Alamos's perfect world. The less than brilliant, for instance, are beset with insecurities, and the isolation breeds naiveté about the "real" world. The elitist attitude that pervades Los Alamos causes many kids to look down on anyone with a lower IQ, interested in activities like sports, or brought up in a culture different from the one on the Hill. And apparently even the city of reason cannot overcome the emotional undertow of being a teenager. Driven to do better than their peers, many students study until three or four A.M., then get up at seven A.M. for school. To be perfect—that's the goal. But a friend of Calanni's suffered a nervous breakdown just before finals and spent three days in the hospital. Calanni himself tried to keep pace until he realized he "felt just awful all the time." Given the competition, "it's really tough for the average students here," says James Goetzinger, the high school's assistant principal. "You end up in the lower fourth of your class. Some wrongly decide that they're good enough only for 'easy' state colleges, or they skip college entirely."

The outside world can seem far away in Los Alamos. While students often find college easy compared with high school, Goetzinger says, some students have a little bit of trouble adjusting to the real world. They have been isolated. There's a little bit of naiveté about crime. They just don't believe there are people out there who are going to pick their pockets or rape them or everything in between." Calanni thinks his classmates are 'sheltered.' Everyday life here is not quite as rigorous as in Houston. What is a big problem for a kid here would be minor in Houston," he says. "A lost boyfriend is monumental. If they saw some of the problems other people had—poverty, crime—they might open their eyes." Because many students take nothing but advanced-level classes, Goetzinger says, they may not understand or help students different from themselves. "There are some socioeconomic differences between students who live on the Hill and those who live in the valley," he adds.

Like most teenagers, however, Los Alamos's best and brightest hate for people to think of them as nervous, sheltered nerds. "I think of myself as kind of balanced," Clark says. "I worry as much about what I'm going to do on the weekend as how I'm going to do on a test on Wednesday." Weekend nights for well-behaved Los Alamos teenagers might begin at the Sonic burger stand or the Pizza Hut, followed by a flick at the single movie theater, topped off by board games or watching something on the VCR at a friend's house. Some cruise by the Ashley Ponde community center to check out the dances that most kids avoid.

Teenagers seeking more excitement head for the mountains to hike, drink, smoke, and blast their car stereos. Graebner believes the mountains, not the lab, leave the biggest mark on the children of Los Alamos. "The mountains were freedom. The mountains were sex. The mountains were getting drunk, and that's why everyone has a romantic attachment to the mountains," says Graebner. "We grew up wedded to the landscape." The roads to pull-offs like Dead Dog, Bottom's Up, and the Dome demand four-wheel drive, so police cars seldom bother to bump their way up. After a night of partying, some kids have trouble bumping their way back down. A few have rolled their four-wheelers on the dangerous hairpin turns that thread the cliffs, though none have died.

High-school students guess that about three quarters of their classmates drink, and marijuana remains the illegal drug of choice. LSD also is back in fashion after a hiatus in the Seventies. While kids here have more money to buy drugs, most say that Los Alamos has no worse a drug problem than anywhere else. And like everywhere else, the kids who abuse drugs can be geniuses or dropouts. Russ Shinn, a Los Alamos school district substance abuse counselor, says, "It's pretty much an equal opportunity destroyer." Because of the lab's generous insurance policy, kids with drug problems often are sent away to rehabilitation centers.

Scott Sanders, eighteen, went to a rehab center after being busted for marijuana. He didn't like it and fought to get out. When he returned to school, however, Sanders resisted the school's aftercare program. He says school counselors didn't understand his problems either. He dropped out of school last spring and eventually hopes to become a drummer in a rock band. A big fan of Megadeth, Metallica, and harder rocking stuff, Sanders says he avoids Los Alamos's whiz kids. "They don't know what the real world is," he says bitterly. "I can't wait to get out. Everyone here is so smart. That's their pride and joy, and they just don't want us around."

Mara Beverwyk, who graduated last spring, grew up in a 100-year-old adobe home in Velarde, 35 miles away from the lab, in the largely Hispanic Española Valley. "The attitude in Los Alamos is totally smug," says the freshman at Harvard. "They take pride in their isolation." A Los Alamos view of Beverwyk's hometown came in a common student question: "Since you're blond, do you ever get raped in Española?" She shakes her head in disgust. Sure, she says, the Española Valley has its share of drinking, unemployment, and family abuse, but Los Alamos is no shining example of family virtue. "Perfect kids, perfect families—you hear that all the time about Los Alamos," she says. Española is a rough-and-tumble town. Los Alamos is more aloof and upper-class neglect.' For her, life is better off the Hill—'It's looser and more open." But she credits Los Alamos's tough schools and mountain beauty for inspiring her to study biology at Harvard. Good science, good English, and good teachers are common at Los Alamos High, she says. "It's definitely not just physics."

Valerie Vigil disagrees with other students who think Los Alamos is dull or that the parents and students are smug. A straight-A student who hopes to study biological sciences or law, she says, "I like it here. There's a lot of curiosity and myths, but it's just a town. Some people think it's a very exclusive, snobby type of community and that everybody has a 4.0 grade point average and everyone's father works at the lab and has a Ph.D. It simply is not true. Los Alamos is friendly, she says, being Hispanic has never caused her problems, even though Hispanics are rare in town.

After college and graduate school, Vigil might like to return to the Southwest, maybe even to the lab to work as a full-fledged scientist doing things like she did last summer—mapping the human brain. Working side by side with Los Alamos National Laboratory scientists, the seventeen-year-old senior measured magnetic fields within the brain. By comparing different fields, the lab hopes eventually to find the roots of speech.

In a school where kids excel in all subjects, where everyone reveres brains and spends weekends studying, Tony Newlin is a jock. The six-foot-three Newlin plays basketball, fly-fishes for trout, or explores the nearby mountains by foot and with his Jeep. "I hardly work at my grades at all," says Newlin, who still maintains a 4.0 GPA. His nonchalance is deliberate.

"Some kids get grounded if they take a B home" says the seventeen-year-old senior. "People in other places have a lot more fun," he adds. "The parents here are so busy working that they neglect their children. A lot of people are workaholics." It hurts the kids and sends them into the mountains for nighttime parties of booze and drugs. "There are a lot of lonely kids in Los Alamos."

Determined to help, Newlin dropped astronomy in favor of sociology. After school he wants to become a minister. In the meantime he helps Youth Working for Youth, an antidrug group that tries to keep kids out of trouble by sponsoring dances. The dances crowded two years ago, fell out of favor for a while, but "they're picking up again," says Newlin. The town's resistance to change, however, frustrates Newlin. Many parents, for example, frown on competitive sports. They fear it steals their children away from studying, explains Newlin, who has played varsity ball for two years. "A coach here has virtually no respect from the community," he says. "The classes get new textbooks every year, but a broken rim won't get fixed for weeks." It's simply not a priority item for the supersmart.

Los Alamos is, of course, elite. The parents know it, the kids know it. Playwright Graebner remembers vividly when President Kennedy came to his school while visiting the lab. Thanks to Los Alamos's tight security, the Secret Service agents fell back, and Kennedy mixed freely with the schoolchildren crowding around. "He made us feel like we were the cutting line in the defense of the free world," Graebner recalls. "We were the special community—no one was going to deny that."

Outsiders don't really understand these things, say kids in Los Alamos. They ask dumb questions like, "Do you really glow in the dark?" Insiders know that nuclear energy and weapons are just bread and butter and the inescapable backdrop. Even rebellious teens seldom hurl their anger at nuclear targets. Like the local pine forests, the lab stands so close to life's center here that few people can see it clearly. Awakening, when it comes, if it comes, arrives when kids leave the Hill.

Like their parents, most kids believe that deterrence, through an up-to-date nuclear arsenal, remains America's best bet to keep the peace. Physics major David Nix, eighteen, admits that he's sometimes bothered by how much money the lab spends on weapons research ($576 million in 1987). But, he adds, "when I look at the international scene, I see the need for it. I also begin to understand what the work at Los Alamos has done to strengthen the position of the United States."

The children of Los Alamos, however, faithfully mirror the debate that has split the adult scientific community over SDI, which now accounts for a fifth of the lab's $887 million annual budget. "Not one of my friends thinks it's going to work," says Calanni Bowman, complains that SDI has forced too many scientists to choose between basic research and weapons work. "The government always equates science with bombs," she says. "Los Alamos is primarily a good research laboratory, but the stuff with star wars is really corrupting the place."

Can it work? If it did, would it push both sides toward a first-strike defense? Was the X-ray laser—the germ of President Reagan's first star wars speech—oversold? The adult debate over SDI has given Los Alamos teens a rare glimpse of life beyond the lab. For the first time, many students are wondering if the lab's work is as logical and noble as they have been told. Maybe, they say, everything isn't under control. Jason Puckett, a seventeen-year-old senior, captures the dilemma that confronts many Los Alamos kids. He doesn't think SDI makes sense, yet he knows that it provides jobs for most of his friends' parents. "It's hard to say I don't like it and live in a town that furthers it," he says, noting that his father works at the lab, though not on SDI. "It's something I fight with. I guess they're doing what they feel is best." ∞

ARTICLE

An intrepid psychologist joins his subjects as they explore the realm called hallucination

LONG DAY'S JOURNEY INTO FRIGHT

BY RONALD K. SIEGEL

The magnetic field surrounding James Tilly Matthews compressed, cracking his body as if it were a lobster. Strange images invaded his brain. *Someone is playing the Air Loom again,* thought Matthews. The Air Loom was the world's first influencing machine. It resembled a church organ so large that it had to be operated by a team of seven men and women, all technicians highly skilled in advanced pneumatic chemistry and electricity. They sat at huge desks crammed with levers, pumps, and tubes connected to a series of giant windmill-like structures. Nothing actually touched Matthews—he never even knew where the machine was kept—yet its invisible threads could control him like a puppet. A physician who said that Matthews was hallucinating had him locked up in a London mental hospital. After all, it was 1810, and something like the Air Loom was beyond anyone's imagination.

By 1988, however, the marvels of high technology had made influencing machines more feasible. So when Ralph Tolman (not his real name), a physicist working with a supersecret Silicon Valley lab, called to tell me all about them, I listened. Tolman said he was controlled by the newest model: the personal satellite, launched by a rival company to follow him around and drive him insane. The satellite, he claimed, was transmitting detailed pictures in color and stereo *directly into his brain.* The transmissions could target him in daylight, inside a car, even in his sleep.

I invited Tolman to my labs at UCLA's Neuropsychiatric Institute, not as a patient but as a colleague. Together we would investigate his influencing machine. I wanted to stop Tolman's machine almost as much as he did, but first I had to understand how it worked. Rather than make a clinical judgment that he was having hallucinations, or false perceptions, I gave him credit for a valid experience, then explored that experience with him.

I treated Tolman's claims in the same experimental way I have handled the experiences reported by dozens of other people who claimed to see things no one else could verify. I began by asking him to describe his perceptions with words and pictures, to share the sensations recorded by his mind's eyes, ears, and many other senses. Then I tried to identify the root of his perceptions by studying the conditions under which they occurred. Working with Tolman in my lab, I carefully induced the stressful, isolating conditions that tended to summon his satellite from the void. As his hallucination progressed, I even measured physical and psychological changes with a host of sensitive machines and tests.

Using this technique, I studied many subjects, re-creating the ambience of prison cells,

PAINTING BY H. R. GIGER

mental wards and isolated desert and Arctic locales. My methods were fruitful. Not only had I begun to chart the psychological ebbs and flows of hallucination, I even came up with intricate analogies to understand hallucinations in a whole new light.

But ultimately this was not enough. My objective approach left me outside the phenomenon itself. If I were ever to grasp the essence of the experience, I knew, I would have to accompany my subjects to the spectral sites where their visions occurred. I followed them down dark alleys as black holes engulfed them and Buddhas commandeered their fates. And like other scientists who have had to *live through* something to understand it, I eventually started exploring my subject directly—by inducing my patients' hallucinations in myself. Starting with the night when an incubus sat on my chest and pinned me to the bed, I began an odyssey to the land of waking dreams, where hallucination is king.

There's no better place to start my story than with Tolman himself. Sitting calmly in my lab, the physicist described the onset of his visions, beginning with a buzzing in his ears and a tingling in his skin. Tolman had jumped to the conclusion that the satellite was scanning him with lasers and microwaves. Small, luminous objects, he reported, would dart through his visual field. Then came a series of lights, pulsating with bluish colors.

To reproduce the experience and study it all at once, I asked Tolman to sit inside a dark, soundproof laboratory chamber and report on the lights as they appeared. So that I could measure the speed with which these lights flashed on and off, I asked him to manipulate a dial that controlled a flashing red light, a real one. As he worked the dial, the red light pulsed in unison with the blue light in his mind, allowing me to measure its frequency in the lab. The lights, I soon learned, pulsated at eight cycles per second, a frequency that other investigators have found can excite visual pathways and generate geometric patterns. And as far as I could tell, that's what had happened to Tolman, too.

As he sat in my lab, he saw the lights quickly arrange themselves into symmetrical geometric forms. His sketches of these images—nearly identical to paintings made by other subjects on psychedelic drugs—resembled futuristic skyscrapers tumbling about in a great earthquake. And soon these vivid drawings gave rise to mental images much more horrific and complex. Parading in front of his eyes, Tolman told me, were ghastly scenes with so much blood, gore and torture, so many impaled children and festering corpses, that he became physically ill.

To provide my "colleague" with some relief, I covered the dark room with a copper shielding that I told him would block all lasers and microwaves. With the shield in place, his visions stopped. Later, when I told him I'd removed the shield—I had not—the disturbing images returned.

Now I knew the truth. Tolman was hallucinating. Why? A battery of tests indicated he was under a great deal of stress and was suffering from high blood pressure, which created the buzzing, tingling sensations. This I knew, caused the panic and anxiety, the bluish lights and bloody scenes. The horrific images I determined after interviewing Tolman, were from *El Topo*, a Mexican film that had greatly disturbed him when he had seen it several months before.

As an expert in the study of hallucinations, I knew that Tolman's brain was responding in its own idiosyncratic way to a simple trigger: the high blood pressure induced by incredible job-related stress. By eliminating the high blood pressure, I knew I could stop the hallucinations. And I did. Antihyperfensive medication corrected the problem. Tolman's nightmarish visions were gone, and the stress that fed on it diminished as well. He was able to function well without even the need for traditional psychotherapy. Thanks to our work together, Tolman's satellite never bothered him again, but to this day, he believes that it was real.

"The satellite, he claimed, was transmitting detailed pictures in living color and stereo directly into his brain. The transmissions could target him in his sleep, even inside a car."

The same was true for several other subjects who also claimed satellites were following them and projecting visions into their brains. One person ran and hid in the basement. Another went to church and prayed. Yet another sat on his roof and cursed at the sky.

In fact, I found, if hallucinations appear real enough, anyone can be fooled. After all, hallucinations can have all the sensory qualities of real perceptions, including sight, sound, taste, smell, and touch. They appear to be just as concrete, vivid and "out there" as real events.

They do not come from such things as satellites or Air Looms, however, but rather from the enchanted loom of the brain. Indeed, despite the variety of human personalities, my laboratory studies showed me that all hallucinations have the same basic structure. They consist of previously stored memories or fantasy images woven together and projected onto the mind's eye. Furthermore, these scenes are usually accompanied by a pattern of simple geometric forms. Both the complex scenes and the simple geometrics move in the same direction and with the same speed.

As I reviewed these characteristics, well documented in my own subjects and in the literature at large, I realized that both the geometrics and the scenes had to be rooted in the same corridor of the brain. Undoubtedly, the brain used the same mechanism in producing both the shapes and the images.

But how? It was while working with people like Tolman that I found a simple analogy to illustrate this mechanism at work. Picture a man in his living room. He is standing at a closed window opposite the fireplace and looking out at the dark of night. As the fire starts to burn, the images of the objects in the room behind him can be seen reflected dimly in the window. As more logs burn and the fire in the fireplace illuminates the room, the man now sees a vivid reflection of himself and the contents of the room, which appear to be outside the window. Now apply this scene to hallucinations. The window is the window of our senses as they take in the world. The fire is the electrical excitation perpetually alive in the brain. When the fire is stifled, the man sees very little. But when the fire burns brightly, the glass reflects the furniture—his memories, dreams, and fantasies—in the rooms of his mind. Finally, some people step right through the window, like Alice going through the looking glass, and behave as though the images were real.

With the help of this analogy, I also came to understand how hallucinations could be caused not by too much stimulation, as in Tolman's case, but by too little. For instance, the illumination in the room can be reduced so that normally unnoticed images from the brain become visible.

I saw this phenomenon in action when I asked research subjects to lie down in a dark room and close their eyes. Many reported seeing bluish lights or checkerboard designs, patterns I attribute to phosphenes—the luminous patches that appear on the inside of the eyelid when the retina is excited. Others reported daydreamlike scenes, which often had a washed-out appearance and were rarely mistaken for the real thing.

But in the right environment these images turn into believable hallucinations. Part of my evidence comes from literature—it's well-known, for instance, that high fever promotes perceptions so compellingly real that patients rise out of bed to walk and talk with hallucinatory visitors. The overwhelming proof, however, came when, in the dead of night, I had a hallucination myself.

ALTERED STATS

No one is certain what an altered state is, but most researchers agree it is not just a Hollywood movie—or the state of California. One who should know: UCLA psychopharmacologist Ronald K. Siegel, who consulted on the film *Altered States*. According to Siegel, an altered state of consciousnass (ASC) occurs when an individual clearly feels a qualitative shift in mental functioning. It puts you in a new realm, with changed perceptions, emotions, and thinking—and can be induced by anything from a daydream to a near-death experience. Whether produced by trance, hypnosis, dreams, or ecstasy, ASCs have much in common with intoxication from drugs.

The following questionnaire helps us to explora our basic beliefs about ASCs. Siegal hopas to find out from it how a relatively random group of peopla feel about ASCs and just how varied and common such states realiy are. Even if you have never taken an intoxicant or think you've nevar had an ASC, filling out the questionnaire may be illuminating. When *Omni* publishes Siegel's data in a tuture issue, readers will be able to look at their own questionnaires (please make a copy to keep!) and see how their answers fit in with those of the entire group.

1. ASCs are (circle one)
   a. natural b. unnatural
2. ASCs taka place inside tha brain
   a. yes b. no
3. ASCs are ways to leave the body
   a. yes b. no
4. ASCs are gateways to separata realities
   a. yes b. no
5. Have you ever had an ASC?
   a. yes b. no
6. Circle all the ways in which you have achieved ASCs
   a. sex
   b. drugs
   c. exercise or sports
   d. meditation
   e. religious rituals
   f. listening to music
   g. other (specify) _____
7. Circle all the effects you saek from ASCs
   a. excitement or thrills
   b. enhanced imagery with eyes closed or open
   c. feelings ot floating or flying
   d. deaply felt emotions
   e. new thoughts and ideas
   f. transcending space and time
   g. sensa ot sacrednass
   h. other (specify) _____
8. As a child, did you have an imaginary playmate?
   a. yes b. no
9. As a child, you deliberately tried to get dizzy by (circle all that apply)
   a. twirling or spinning
   b. swinging
   c. hyperventilation
   d. snitting paint, glue, etc.
10. You repeated this behavior
    a. often b. sometimes
    c. rarely d. never
11. As a child, you enjoyed (circle all that apply)
    a. faver delirium
    b. laughing gas at the dentist's
    c. lucid dreams
    d. vivid nightmares
12. Indicate your favorite type of amusement park ride (check one)

	As a child	Now
carousel	___	___
Ferris wheel	___	___
roller coaster	___	___
Tilt-A-Whirl	___	___
fun house	___	___

13. Your first experience with unconsciousness was from
    a. fainting
    b. sedation for surgery
    c. alcohol blackout
    d. accidental knockout
    e. other (specify) _____
14. Your tirst drug intoxication was at aga ___ and was from (circle ona)
    a. alcohol
    b. prescription medicine
    c. tobacco
    d. marijuana
    e. PCP (angel dust)
    f. paint, glue, gasoline, etc.
    g. caffeine
    h. other (specify) _____
15. Your tirst drug intoxication was
    a. pleasant b. unpleasant
    c. neither pleasant nor unpleasant
16. You repeated this drug experience
    a. often b. sometimes
    c. rarely d. never
17. Please attach a separate piace of paper listing each nonmedical drug you have used, your age at the time of first use, and the approximate number of times of use.
16. Have you ever hallucinated?
    a. yes b. no
19. It so, did you ever have difficulty distinguishing between raal and hallucinatory events?
    a. yes b. no
20. Have you ever had a daydream that seemed raal?
    a. yes b. no
21. If so, it was generally
    a. pleasant b. unpleasant
    c. neither pleasant nor unpleasant
22. The pursuit ot ASCs is as unstoppable as the drives for food, drink, or sex.
    a. yes b. no
23. Using drugs to produce ASCs is a basic human behavior that should be controlled, not suppressed.
    a. yes b. no
24. If drugs capable of producing ASCs were pertectly safa and legal, you would take them
    a. often b. sometimes
    c. rarely d. never
25. We should devalop ideal drugs that will avoid problems ot drug abuse yet allow for the pursuit of ASCs.
    a. yes b. no
    c. no. We should develop sater nondrug methods for having ASCs.
26. Your ideal ASC drug would be a
    a. stimulant b. sedative
    c. tranquilizer d. painkiller
    e. psychedalic
    f. other (specify) _____
27. In the future there will be over-the-counter ASC drugs that are as harmlass as the toods we eat and as halpful as tha madicines we taka.
    a. yes b. no
28. In the future there will be special establishments where anyone can expenence ASCs without drugs.
    a. yes b. no

PERSONAL DATA

Male ☐ Femala ☐

Age _____

Highest educational level
a. high school b. vocational school
c. college d. graduate school

Occupation _____

Total household income _____

City of residence _____

Ethnic or cultural background
a. black b. white c. Asian
d. Hispanic e. othar _____

Do you observe any personal, religious, or medical dietary restrictions?
a. yes b. no

If yes, please explain _____

Are you obese?
a. yes b. no

Do you gamble excessively?
a. yes b. no

How many hours par weak do you watch television? _____

Circle the descriptions that apply to either of your parents
a. alcoholic
b. racreational drug users
c. addicted to prescription drugs
d. addicted to nonmadical drugs
e. apileptic
t. suffered from migraine

Have you ever had an ASC?
a. yes b. no

Now, I'm a good sleeper. I usually fall asleep when my head hits the pillow and don't wake up until the alarm rings. One cold winter night, however, I was awakened by the sound of my bedroom door opening. I was on my side and able to see the clock. It was 4:20 AM. I heard footsteps approaching my bed, then heavy breathing. There seemed to be a murky presence in the room. I tried to throw off the covers and get up, but I was pinned to the bed by a weight on my chest. The more I struggled, the more I was unable to move. My heart was pounding. I struggled to breathe.

The presence got closer, and I caught a whiff of a dusty odor. A shadow fell on the clock. Something touched my neck and arm. A voice whispered in my ear in a strange language that sounded like English spoken backward. It didn't make any sense. Then the voice stopped, the presence left the room, and the intense pressure on my chest eased. It was 4:30 AM. I got up and checked the house. There was nothing there.

I had been visited by an incubus, a type of nightmare once believed to be caused by a female monster or spirit that sat upon the dreamer. This was the stuff of children's night terrors, but I was a grown-up, a university professor, a psychologist. How could this happen?

As I reviewed the literature, I found the answer was already known. Researchers have found that the incubus sensation occurs in a state of sleep paralysis, when REM (rapid eye movement associated with dreams) intrudes in periods when you have just been aroused from sleep. The brain cannot instantaneously switch from dreaming to a waking state, and the dream extends into the waking period. The brain circuits activated during dreams then send signals—an image of the incubus, for instance—to the cerebral cortex, where they are processed as if they came from the outside world.

But understanding has several levels. Now that I'd had a hallucination of my own, I knew that intellectual, physiological explanations would never provide me with the gestalt of the experience. With one hallucination behind me, I was ready for more. So I contacted another explorer—Dr. John Lilly, the controversial scientist best known for his work with dolphins. One of Lilly's most publicized hobbies was using a sensory-deprivation flotation tank to see, of all things, extraterrestrials (E.T.s). Lilly insists that while in the tank, he has communicated with E.T.s, beings from deep space that are sending messages directly into his brain. According to Lilly, I had only to float in his tank for a few hours—a boost from the hallucinogen ketamine might help—and I'd hear the messages for myself.

I didn't need much coaxing. Responding to the offer of a session in his tank, I rushed from my lab at UCLA and drove north to Lilly's ranch in the remote hills of Malibu. Ever since I was a little boy, I had wanted to meet an E.T. Now I could do something about it. I could float inside a tank, waiting for THEM to carry me away.

The tank was the size and shape of a large coffin. The ten inches of water within was heated to a soothing 93°F and contained enough Epsom salts to keep my body bobbing near the surface. My mouth, nose, and eyes were above the water, and although it was pitch-black, I could sense the ceiling of the tank only inches from my face. At first, thoughts of suffocation made me uneasy. But after many hours of floating, I relaxed.

Warm and calm, I finally felt that I was starting to separate from my body—I even sensed my "mind" hovering slightly above my physical self. It was in this disembodied position that Lilly had instructed me to await the E.T.s. Indeed, nakedness was not enough. I had to shed my corporeal form, freeing my mind from all bodily sensations in order to receive the visitors. It might take most of a day, Lilly had informed me. But what's a day, even a wet one, when you have wished for a close encounter all your life?

"In the distance a tiny pearl materialized. As I got closer, I saw the 'pearl' was a tiny Buddha—not the Hindus' sacred Buddha but a cartoon version that looked more like the Pillsbury Doughboy."

I tried to ignore the pulsating lights and geometric patterns when they started to appear. I brushed aside images of the scenic drive to Malibu along the Pacific Coast Highway and flashes of people I had met at the ranch. I was waiting for something more: an alien.

Then a surge of power, like afterburners lighting, my tank boosted me into a sea of nothingness. This was the stage Lilly had told me, at which he encountered the beings. And I could see that I would have an encounter as well. In the distance, a tiny pink pearl materialized. As I got closer, I saw that the pearl was a miniature Buddha—not the sacred Buddha of the Hindus but an animated cartoon version that looked more like the Pillsbury Doughboy. The Buddha was naked except for an oversize pair of Mickey Mouse ears. He was holding a pink balloon that read I AM THEM. The Buddha started laughing at me, holding his sides as they expanded with each new chortle and gasp. Then, with a magician's flip of the hand, he produced a shiny golden needle from behind his ear and poked himself in the navel, exploding in a burst of thunderous white light.

I coughed and vomited salt water. With a quick thrust of my arms, I pushed the escape hatch open and climbed out of the tank into the cool evening air. Apparently, I had rotated onto my side during the float, and my face had slipped beneath the surface. I returned to the ranch house, showered, and then looked for Lilly. We compared our experiences. Lilly's E.T.s were certainly different from my Buddhist prankster. But I knew that both were products of the same brain mechanism. Very simply, they were stored visual images comprising elements from memories and fantasies now projected onto the mind's eye. The isolation tank had enabled me to see these images.

Lilly, on the other hand, would not accept this analysis. His belief in the reality of his E.T.s was unshakable. He not only believed in the existence of the beings, he also allowed them to control a good deal of his everyday thinking outside the tank, much as Ralph Tolman had been controlled by his satellite.

My work in Lilly's tank proved most valuable, not only because it made me privy to yet another form of hallucination but also because it enabled me to truly understand one of my next subjects—Harry Balise. Harry said he'd seen a long line of historical figures—from Socrates to Joan of Arc to Buddha—in a skid-row hotel room in Los Angeles. He sat and talked with them for three weeks—until his supply of crack ran out—then he returned to his wife and children.

At home Harry described the visions to his family. He claimed that the prophets had given him the power to levitate objects, and he proved it by causing pieces of tissue paper to float in his cupped hands. His children accepted the story, practiced the tricks, and soon reported that they, too, could levitate small bits of paper just like Daddy.

Harry's wife called me because she knew I was a cocaine expert as well as an adviser to the Southern California Skeptics—a group of scientists who investigate claims of the paranormal. Could I tell her, she asked, whether Harry was full of divine power or Peruvian flake? To find out, I arranged for Harry to demonstrate his skills in a lab at UCLA. After several missed appointments, he arrived but refused to show me any of his stuff.

"I'm as real and knowledgeable as Buddha," announced Harry, "and I don't have to show off."

"I've met Buddha," I declared matter-of-factly. It was, after all, true.

Harry was surprised. "Where?"

"In Malibu, a few weeks ago. I learned a lot from the experience."

"Like what?" Harry was challenging me.

I was prepared. I asked him for a dollar

CONTINUED ON PAGE 148

OFFICE OF THE FUTURE

DESK JOCKEYS

Personal computers, laptops, modems, voice and electronic mail, portable faxes, cellular mobile phones: The office machines of the future have arrived and are on a roll.

To get a move on the competition, today's executive can call the shots from the limo, jet, yacht—even a motor home like the 32-foot Fleetwood Southwind shown at left. Contact: (703) 620-6003. Price: $59,500.

THE MAC IN THE BACK

For high performance on the highway, the Apple Macintosh II is perfect for science, engineering, and desktop-publishing applications. Includes keyboard, color monitor, video card, mouse, and 1M RAM. Price: $6,496.

IN KEY

Panasonic's KX-W1500 word processor (above) makes work a personal affair. This 22-pound private secretary offers a nine-inch display and a 58,000-word memory. Price: $899.95. Below: Equipped with a Kenwood AM/FM stereo, RCA TV, and electronic bar, a limousine most serene—the Ultra. Contact Bob Thomas Ford, Inc., (203) 281-7500. Price: about $53,000.

TWO FOR THE ROAD

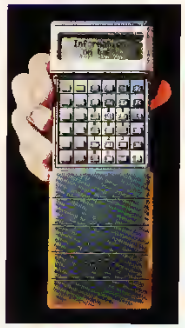
A portable word processor with just the right touch for jet-set executives: the Smith Corona PWP 40. Price: $599. Another real eye-catcher, Casio's new pocket-size LCD TV-400 (below) lets you take the show on the road. Price: $229.95.

FLY ME

Battery operable and ready to take off is NEC's firm flyweight, the ProSpeed 286 computer. Weighing 14 pounds, this laptop has an expandable 1M RAM. Sure to be a moving experience for the chairman of any keyboard. Price: not available.

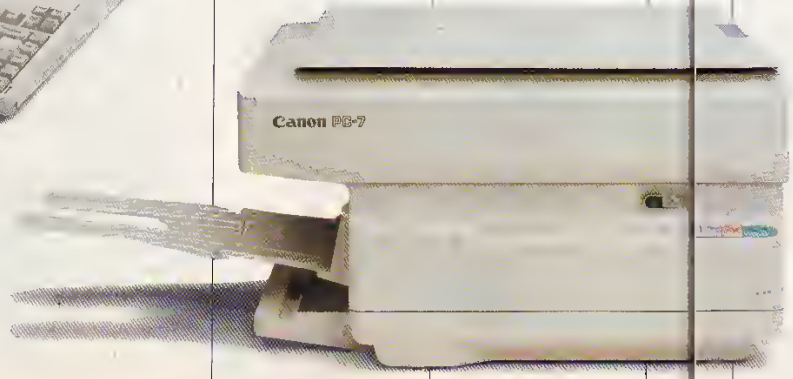
THE JET SET

The handiest computer diary to cross anyone's palm, Psion's 32K Organiser II (right) is capable of holding 2,000 entries and can link with almost any PC. It uses a single nine-volt battery. Contact (203) 274-7521. Price: $249.99. Left: Life at the top in the Falcon 900 jet. Contact FalconJet, Teterboro Airport, NJ 07608. Price: $20 million.



SUPER DUPER

The newest personal copier from Canon, the PC-7 (below), zooms to your rescue, able to reduce or increase the size of any image from 70 to 122 percent in a single bound. The PC-7 has automatic exposure—it needs no adjusting to turn out a perfect copy. It holds up to 100 sheets of paper, and it comes with a single-sheet manual feeder. Price: $2,093.



BABY BLUE

Big Blue's little personal computer, the IBM PC Convertible III (above), provides the mobile hacker with a battery-operable movable feast with 256 bite-size kilobytes. It features dual 3.5-inch drives and a backlit Supertwist screen. Its static RAM capability retains the cursor to the spot you left it in before the computer was shut off. And of course, it's IBM compatible. Price: $1,695.

THE WET SET

With its 3.5-inch disk drive, 70,000-word dictionary, and letter-quality printer, the Brother WP I word processor makes a great officemate while you enjoy the motion of the ocean. Price: $1,195. Starboard: Even without the office add-ons, this 82-foot Broward yacht is a seasoned veteran that's worth its salt. Price: $2.5 million.

FICTION

What would you do if a long-lost friend returned as a giant bird? Invite her in, of course

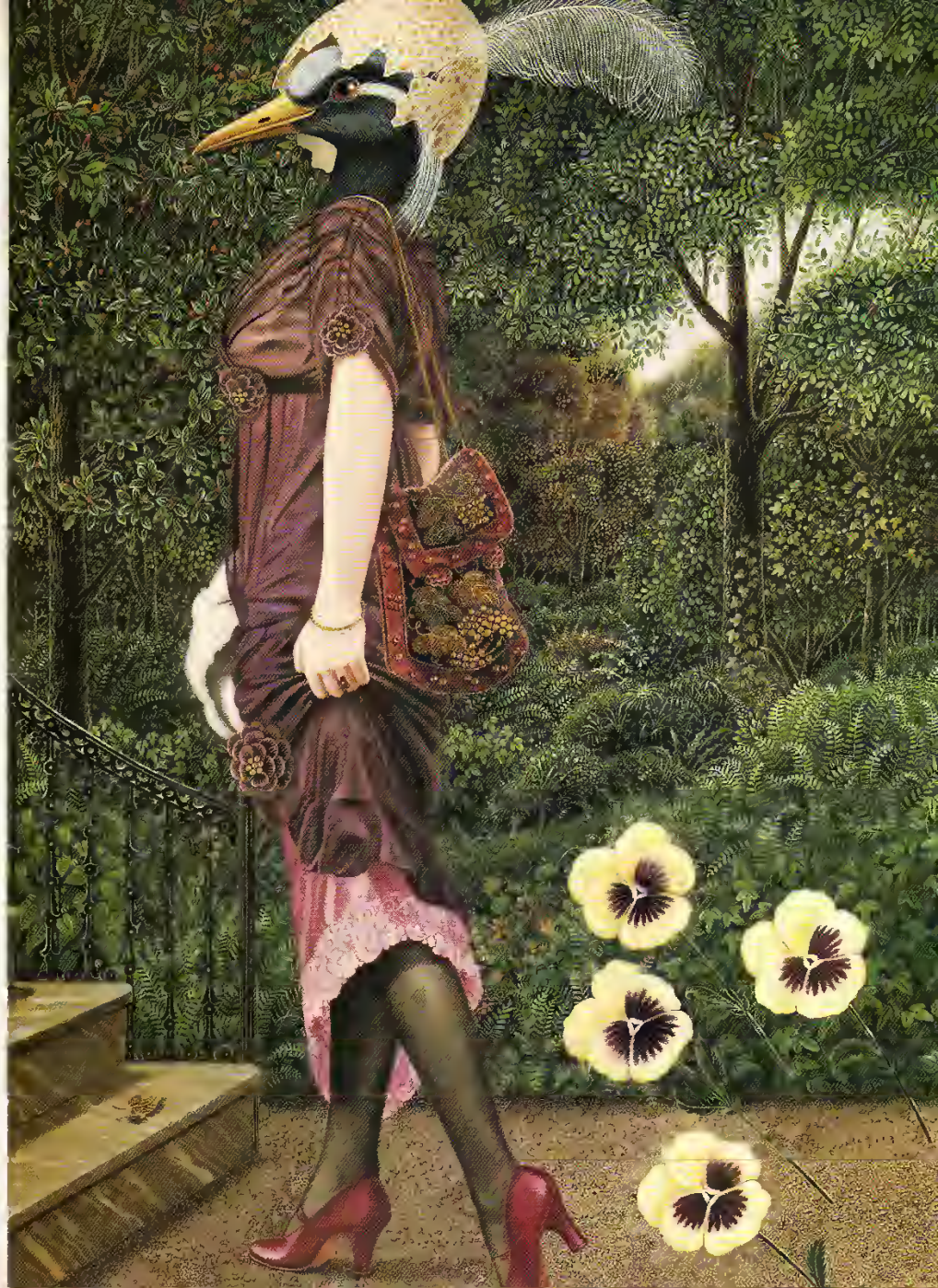
FLEDGED

BY CAROL EMSHWILLER

TWO A M

You could feel the spray You could taste salt Sand Grit in your teeth Wind blowing miniature squalls across my toddy I had the sliding glass door open on purpose And talk about the

PAINTINGS BY GERVASIO GALLARDO



'brightness of midnight'—everything wonderfully luminous: waves luminous black foam luminous white; when (and you'd have thought the door wasn't open that far), when somersaulting at least twice landing on the far side of the room, water spraying, feathers flying . . . something big, that's all I knew at first, suddenly something big and birdish.

Then it untangled itself from itself, from its gray and white and black, and I saw it was a winged woman, huge wings, naked woman, but not at all the sort you'd expect would be flying around in seabird colors. Short and plump. I guessed about sixty. I brought her a beach towel to cover herself with and then pushed her into the bathroom, where I thought she'd do the least damage, and started trying to dry her wings with the blow-dryer. A hopeless task. Afterward I noticed there were wet streaks down the hall along the walls and even all across the ceiling. I was put out by the whole thing. I've been told I'm a fussy man, but I was having a party the very next night and I was put out. I don't like to make trouble myself or messes for others to clean up. I'd never be found having been blown, all wet and soggy, into someone else's living room. I'd have taken precautions. It was just like a woman, I thought, not to have listened to the weather report, to be caught out, no clothes on, though I didn't give a damn about that. I certainly wasn't interested any longer in a woman, my own age, winged, naked, or not. Certainly not interested in chubby little gray ones with unkempt hair and ragged fingernails. And I found I resented the fact that she wasn't young and beautiful. I could see that in myself. I resented that she wasn't at all what you'd expect in a flying woman, especially not one with such large, white, black-tipped wings. I was thinking she ought at least to be built like a dancer. Maybe small but well-shaped breasts, maybe short-cropped black hair or, better yet, black feathers, little ones curling round her face in a kind of cap, and a nice ring of black around her eyes. I've seen that on some birds. I'd have liked that. But no matter her age and that she looked as she looked, and even though she'd dripped all over my floors and rugs, not to mention what she'd done to the ceilings, I didn't have the heart to shoo her back out onto the deck, though that was my first thought.

Her lips were blue with cold and she was, even still, out of breath. Her feathers stuck out in all directions. I couldn't bring myself to push her back into the storm, but I was worried about what else she would mess up when I let her out of the bathroom and she started swinging those wings of hers around. I had a lot of valuable art books and some pretty good prints on the walls, and then there was my party. I had to have everything nice for that, but she couldn't stay in there all night. I couldn't do that to her.

Strange though she was, part bird, she reminded me of my cat Pasht. I don't even know why. I keep that old cat. Came to me the same way, out of a storm, not so unlike this one, and been with me ever since, and I don't like cats . . . and birds even less. I did like calling, "Pasht, Pasht" out the window, knowing the neighbors had no idea why I'd named her that. Perhaps if I looked up some other ancient goddess name for this gull, I'd like her better. (Is there a gull goddess? I doubt it.) But then I thought I'd not do that. I certainly didn't want an old lady hanging around. Not one like this. She looked as though, if one could ever clean her up to that extent, she'd be the sort who'd be wearing medium heels and a flowery dress and maybe do her best to keep anybody from discovering her wings. But it was only her body that looked like that. Her face . . . the look in her eyes . . . that was entirely different.

She wasn't but half dry when I let her out of the bathroom and took her into the kitchen for hot milk and toast. (I'd thought of eggs first, but that seemed insensitive. As it turned out, I needn't have worried.)

> *"Her lips were blue and she was out of breath. Her feathers stuck out in all directions. I couldn't bring myself to push her back into the storm, but I worried what she'd mess up."*

All the time I was getting her the snack, I kept having this funny feeling that I'd known her from somewhere, the way she sat on the edge of her chair, leaning forward—she had to, of course, because of the wings, but still it seemed a familiar pose, as though I'd known someone who sat like that all the time, poised for some leap up that never came. Now her legs were crossed, rather primly, I thought, under the circumstances, and it wasn't the best pose for her. And they looked terrible, all black and blue. Her circulation must be awful. I knew that wasn't so unusual in a woman her age, but hers were the worst I'd ever seen. And her toenails! Black! And obviously hadn't been cut in ages. She'd been letting herself go. I wondered if she was depressed, and then I thought, *Well, with those things on her back, who wouldn't be?*

I watched her closely, though I pretended not to, and I couldn't get over how all her gestures seemed so familiar. I'd known that way of holding a cup, handle facing away from her as though other people's germs—left-handed people *and* right-handed people—as though the only safe place to drink from was opposite the handle. Except that sort of thing didn't fit with the look of her eyes. I thought, *of* her eyes, not *in* her eyes, because you couldn't see *in*. I'd never seen eyes like that on a person. Close set. Wild. Fish-wild, actually. All surface. And then there was the way she swallowed her toast. I'd never seen a person do that before.

"Coo," she said, finishing her hot milk. "Oh, coo."

Color had come back to her cheeks, but her eyes were still . . . well, in spite of the cooing, she looked like somebody who'd tear the wings off wrens for fun. I wondered if she had.

Lots of birds fly up from South America this season, but I don't know much Spanish, and I get it mixed up with Italian. And there certainly wasn't a Spanish or Italian look about her. I tried, though. "*Parlate espagnol? Italiano? . . . Oder deutsch?*" I tried all the languages I had smatterings of. I was thinking she might look familiar because I'd met her on one of the business trips I used to take. She responded . . . or, rather, sort of responded only to my bad French. "D'ou venez-vous?" I asked, in polite form. "Où allez-vous?"

"Ici, ici, ici," she said, like a bird would say it. I wasn't even sure it *was* French. Perhaps it was only "Tu ti, tu" or maybe she meant "tea."

My empathy for wild things is practically nil, though I don't consider myself a cruel person. My Pasht, for instance, has her special cushions and the best cat food I can get. I often cook up a batch of liver as much for her as for myself. I think that's the reason she's lived so long in such good shape. And the same goes for me. I take the same good care of myself. You'd never guess my age any more than you'd guess Pasht's. I don't take care of her like this because I love her so much. It's just a matter of pride to have a sleek and handsome animal. She matches me. We go our independent ways, but there's mutual respect. But what was happening now was . . . I don't know, all wrong. It's odd to say, but I didn't feel philosophically ready to tackle this sort of thing, especially not right before a party. I couldn't cope. How could I have once known a bird-person when I had never heard of such a thing?

It wasn't until the next morning (I was in that half-awake state they always say is the most creative) that I knew who she reminded me of—who she, maybe, was, though I wondered how in the world that could be.

I had put her to bed in the guest room. First taken out everything breakable, including the pictures off the walls, floor lamp, night table, mirror, and so forth. Took the quilt off the bed and left her a good warm blanket. Shut the door and braced

it with a chair so she'd not get out without me knowing, and left her to find her own way of sleeping as best she could with those cumbersome things on her back.

Then I went to bed myself, and it was only toward morning, half awake, that I knew or thought I knew (though I wondered, was I making it all up out of some kind of guilt or fear or remorse, but I'd simply done what I had to do and under the guidance, actually, of a psychologist), I thought that she resembled, to a remarkable degree, my first wife. I hadn't seen her for twenty years. (I was alone again now, after a short second marriage.) She would have aged more or less this much—if I wasn't imagining the whole thing. But *if* this was true, then I'd have to speak to her in no uncertain terms. After all, we'd gone our separate ways long ago, and she was not, by any means, a stray cat. Her size alone precluded that. I take her in. This time, though, I'd have the sense to talk to her in English. (Why had I not thought to do that before?) This would not do, feathers all over the place, the smell of the sea permeating everything. I would not tolerate her imposing herself uninvited, and so forth, throwing herself in by the back door in the middle of the night. And those ridiculous encumbrances! How could anyone live like that? I'd help. I've always been willing to help when help was really needed. I'd pay to have them removed, should it come to that—and I really felt it *should* come to that—I'd help out in that way, but she couldn't stay. I had just, not so long ago, found myself—it that's the way to put it—I needed my own space. The house is small. Living–dining area smaller even than the deck.

It was early, but I found it impossible to sleep anymore. The storm was past. I swept the feathers out into the sunshine, where they blew away. There were an awful lot of them. I wondered if she was sick, or maybe molting, though perhaps it was just due to the storm.

After I cleaned up, I took care to put away the breakables in the rest of the house. Party or not, this had to be done. Sculpture off its pedestal and into a corner, my best pictures into the closet, room divider up against the wall. I worried about the bookcase and the books. Also about the shelf of dishes (Mother's old china) hanging on the far wall in the kitchen. I'm a six-foot man, and I'd have trouble knocking them over even if I tried, but she . . . who could tell?

As soon as I heard sounds from the guest room, I opened the door. She sat naked again, in the middle of the bed, her wings stretched partly up and partly out behind her at the angles that cormorants hold theirs to dry. Even half folded like that, they touched the ceiling. Her feathers still looked ragged, her hair was still a mess, but she looked a lot better than she had the night before. "Hawk," she said. Rather disagreeably. I thought.

It was Julia all right, you couldn't mistake her, but really sort of magnificent. Wings even larger than I'd remembered. Nose quite grand. No wonder I'd not recognized her at first. And, actually, she did look older than she should have, though perhaps only worn down. Perhaps the stresses of twice-yearly migrations. The cold of the upper air. The outdoor life. They say being in the sun ages one, and her face did look chapped and weathered. And of course those awful legs and feet (she'd had varicose veins years ago before I'd left her, but nothing like this). Her hands, too, had suffered. The rough perches, no doubt, and cold water. No hope of keeping even one or two decent fingernails, I suppose. *She* had suffered. I knew I wasn't entirely blameless in that myself. No wonder her eyes were blank and black.

But then, suddenly, I was wondering where was Pasht! I hadn't seen her all morning. That wasn't unusual, but I worried just the same. The question of eggs (and bacon!) for breakfast took on significance, so I had them and it turned out they were fine with her, but then I remembered she'd always liked them. And chickens. Fish. Raw clams. I decided, however, that I wouldn't be cowed by any of this and that it was time for a serious talk. "What about my cat?" I asked, though that wasn't what I'd meant to take up first. What I needed to know was how long she thought she was going to stay, especially since I was having my party that night. *My God,* I thought, *what will I do with her?*

> *"Looking straight at me, she picked up three slices of bacon and swallowed them in one gulp. I didn't know whether it was a warning or a statement about what had happened to Pasht."*

Looking straight at me, she picked up three slices of bacon and swallowed them all at the same time in one gulp. I didn't know whether to take it as a warning to myself or a statement about what had maybe happened to Pasht. And then she did just what I'd been worried she'd do: got up, turned around, and—it didn't seem on purpose, just the turning around—knocked every single dish off the shelves across the room. "Hawk," she said—I could tell she wasn't sorry—"hawk," with the self-confidence of a gull and a look of either all understanding or of no understanding whatsoever. I couldn't tell which. "Hawk, haw, haw."

"Laugh away," I said, "but you'll have to get rid of those things by this evening."

I didn't have the slightest idea how this could happen. It looked as if it would be quite an amputation. And of course it takes time to find the right doctor. I wouldn't want just anybody, any more than I would take Pasht to just any veterinarian. But then I had the idea that I'd make it a costume party. It was hard to think that anyone wouldn't notice even so, but I'd keep the lights low, I'd hurry and call everyone right away and tell them that I'd just thought of it and they didn't have to come in costume, but it would be nice if they could manage something because there was someone coming to the party who had a great one.

The only way to dress her would be in scarves and veils or towels. Nothing else would fit around her wings. Of course there were sheets. If I could find some white ones she could be an angel. Except there wasn't anything about her that was angelic. It turned out I didn't have white sheets anyway. Then I thought of a sort of Renaissance avenging angel, my dark gray sheets, Harlequin mask, yellow bathrobe cord. I did have a white silk scarf—two, in fact. I could use both. I worked so hard on her costume I never did get a chance to fix one for myself.

Strange how they accepted her, how she seemed to fit right in in spite of her occasional squawks. Her laugh wasn't that much louder than some others, and she had that glazed-eyed, not-understanding, not-really-listening look most everybody had as the evening went on. And people liked her. I don't know why. (But then, people had always liked Julia.) Perhaps because she said so little. (She'd always said little.) Actually she said nothing. Absolutely nothing. Laughed in the wrong places as well as the right ones. And I couldn't believe how little they seemed to notice or care about the wings. My sheets and wrappings hadn't done much to disguise that they were real, huge, factual wings that fluffed out when she laughed. But they *did* notice—on some level, anyway—because the conversation went from aviaries to omelets, from guano to condors, the demise of, or rather, the last few (it's strange how that always happens—how one manages to mention what seems unmentionable), through Lindbergh, budgies, passenger pigeons. Gulls strangely—or perhaps not so strangely—weren't mentioned at all.

And she! Laughed a lot, said "clock" and "rack" and "gack," "cheek," "cheek," "eat," "ork," "currr . . ." but they were enough. Ate more than her share. Drank. No, it was I who drank, and as I watched her, I became more and more fascinated. I admired her in spite of myself. How grand she had become. She had achieved a strange sort of dignity.

CONTINUED ON PAGE 160

The French discoverer of the AIDS virus tells of his "friendly" rivalry with American Robert Gallo and previews what's ahead in the battle against the world's most intelligent pathogen

INTERVIEW

LUC MONTAGNIER

People regard him as a magician and phone him in the middle of the night begging for help. Out of necessity he has had to build a wall around himself, instructing his secretaries to steer people to clinics and doctors working directly with patients. "Even so, I find them waiting on my doorstep when I get to work at seven in the morning," says Luc Montagnier, who discovered the virus that causes AIDS.

AIDS is a disease of civilization, the French biochemist says, a disease of the city. Yet he thinks the virus itself is old, so old it might well have appeared earlier in history to wipe out previous civilizations. Since then, the virus has been biding its time in isolated populations, masking its existence behind other fatal diseases—until the cofactors of modern life united to spur it into an epidemic. These cofactors, weakening the immune system, include sexual promiscuity, industrial pollution, drug use, and the mingling of people into a world culture. "The whole world is married to one another," says Montagnier. "The globalization of culture has globalized our germs."

Analysis of a sliver of tissue from the swollen lymph nodes of a homosexual man admitted to La Pitié Salpêtrière Hospital in Paris led Montagnier, the director of the viral oncology unit at Paris's Pasteur Institute, to isolate the virus in early 1983. Quickly publishing his findings in the journal *Science* that May, he would spend the next year battling to convince his colleagues that AIDS was caused by a virus—and by *this* virus in particular.

His major opponent in the United States was Robert Gallo of the National Cancer Institute in Bethesda, Maryland. Gallo held that a member of the leukemia-producing family of retroviruses that *he* had discovered caused AIDS. Montagnier agreed that they were dealing with a retrovirus—a virus whose genetic ma-

PHOTOGRAPH BY HENNER PREFI

terial is made of RNA—but he kept telling Gallo that the AIDS virus and his leukemia viruses had opposite effects. Instead of causing cells to multiply uncontrollably, as did the leukemia viruses, the AIDS virus killed them.

At this stage in their careers, Montagnier and Gallo were friendly rivals in the same research. Twice in 1983 the French investigator sent samples of the new virus to his American colleague. Montagnier was dumbfounded when in April 1984, at a Washington press conference called by the U.S. secretary of health and human services, Gallo announced his discovery of the AIDS virus. He christened it HTLV-3, the third in his series of T-cell leukemia viruses.

Scientists quickly confirmed that Gallo's virus was virtually identical to Montagnier's. Gallo's claims to have worked independently of the French laboratory were further compromised when he "accidentally" published Montagnier's photographs of the virus in a *Science* article announcing his findings. Montagnier was outraged when the U.S. patent for the AIDS blood test, which he had applied for in 1983, was awarded a year and a half later—to Robert Gallo. "I was furious," says Montagnier, who ended up suing Gallo and the U.S. government.

The two parties settled out of court in 1987. As announced at the White House by President Ronald Reagan and French prime minister Jacques Chirac, royalties on the AIDS blood test will be split between the two countries. Most of the money will go to a foundation for AIDS research. Montagnier and Gallo will henceforth be known officially as codiscoverers of the virus. The dispute over what to call the virus was resolved by another independent commission, which settled on *human immunodeficiency virus*, or HIV. Two major strains of the AIDS virus are now recognized: HIV-1, which has infected millions of people in the United States and the rest of the world, and HIV-2, a West African strain Montagnier discovered in 1986.

The American press has branded Montagnier as patrician and aloof. This may be the case when he's speaking English, but at the Pasteur Institute he is witty and outspoken. Among his staid colleagues Montagnier stands out as a scrappy figure freely acknowledging all the motives behind his research. "I'm a self-made man," he says. "In my aggressivity I'm really half American."

The grandson of peasants and the only child of an accountant, Montagnier was born in the Loire valley in 1932. After studying natural sciences at the local university in Poitiers, he got his medical degree in Paris and then left France for four years to work in labs in England and Scotland. At the virus research unit of the Medical Research Council (MRC) at Carshalton, south of London, and at MRC's Institute of Virology in Glasgow, Scotland, the young biochemist made the initial discoveries that allowed him to return home and work his way up to an appointment at the Pasteur Institute.

Montagnier's early work focused on cancer. His idée fixe was that certain cancers are caused by viruses. The first to show how single-stranded RNA viruses replicate by making a double helix, he then invented a technique for multiplying cancerous cells in agar. This is now standard lab procedure. And he isolated the messenger RNA of interferon—proteins that stimulate immune cell activity—which led to its eventual cloning. One day Pasteur Vaccines, an affiliate of the Pasteur Institute, asked him to look at a strange organism (the AIDS virus) that might be contaminating its blood supply. This was originally supposed to be only one among many ongoing experiments, but Montagnier now spends 100 percent of his time working on AIDS.

Walking past a statue of the institute's founder and around the house where Louis Pasteur lived and is now buried, one comes to the low brick building identified as the virus laboratory. Montagnier's office lies at the top of the stairs, where he presides over a long corridor of rooms overflowing with equipment and experiments in progress.

"For a year we worked completely on our own, with almost no one understanding the importance of our findings. Gallo didn't believe me then, which put him squarely in the enemy camp."

A short, energetic man in a rumpled suit and tie, Montagnier ascribes his small stature to malnutrition during World War II. The experience made him conscious of his health and the cofactors that he thinks are so crucial in depressing the immune system of AIDS patients. When he and interviewer Thomas Bass went to lunch at Le Récamier, a restaurant popular with writers in the Saint-Germain quarter of Paris, Montagnier refused to eat on the terrace. He drives an air-conditioned car and lives outside the central city. Walking the streets of Paris—filled with diesel fumes and asbestos flaking off the brake shoes of cars—is to him a risky business. Once inside the restaurant, however, Montagnier ate with gusto. He discoursed happily in French to Bass on the epidemic he thinks will soon be ended, if not by a vaccine, then by changes in human behavior.

Montagnier is currently attacking AIDS on all fronts. Working to develop a vaccine, he's also testing 200 chemicals each week as potential drug therapies. And he's doing research on the virus itself, in the hopes of outsmarting what he considers the world's most intelligent pathogen. This activity counters a lot of pressure for him to move out of the lab and into the public spotlight. "The last thing I want to be is someone revered for a short time and then forgotten," says Montagnier. "I want to stay in the race."

Omni: Why did you become a scientist?

Montagnier: My father's hobby was science. When the weather was good he went fishing. When it was bad he tinkered in the basement making electrical batteries and things. My earliest memories are of my father doing his Sunday experiments. When the war arrived in 1940, there was no more Sunday science. Originally I wanted to be an atomic physicist. But when I saw how many people were killed by the bomb in Hiroshima in 1945, I said, "That's enough atomic energy for me." I was never good in math, so I couldn't have become a physicist anyway. By the time I was fourteen I had become an amateur chemist, making nitroglycerin in our basement laboratory. Then I turned to medicine and biology, thinking they might give me more concrete answers to my questions.

Omni: You were trained as a medical doctor. Why did you switch to research?

Montagnier: I knew right away I'd make a bad doctor. I'm not altruistic enough, and I don't like being around sick people all day. I wanted to do research related to human biology, but in France there was no training in this area outside of medical school. My parents were opposed to my doing something as risky as becoming a researcher. Their dream was for me to become the village doctor, make a lot of money, and live in a big house.

Omni: From the start, what drew you to cancer research?

Montagnier: There are two kinds of scientists: the explorers who set out to discover new territories—either an islet or an entire continent—and those who occupy these territories and build structures on them. Both types of scientists are necessary, but clearly at the beginning of my career I wanted to be one of the former—an explorer, an adventurer. What interested me were the great enigmas in biology. One of these is cancer. On a more personal level, I saw my grandfather die of colon cancer. It lasted seven years, and he wasted away little by little. I was fifteen when he died, and I keenly remember how much he suffered.

Omni: Why, then, study viruses?

Montagnier: There was no way at the time to attack the cancer problem directly. So I began working on viruses, which were

easier to understand. This led to what I consider one of my major contributions—the discovery of how RNA viruses manage to replicate. How can a virus containing only a single strand of RNA reproduce itself? Our goal was to discover the famous double helix, made this time out of two-stranded viral RNA rather than DNA. I was the first to observe this in England in 1963.

There is an element of luck in scientific research, but you have to put yourself in the way of being lucky. I had humble beginnings in a provincial school. Then at the Sorbonne I had the misfortune to fall on a scientifically mediocre professor. Because of this I had to go abroad to launch my scientific career. In leaving France I made a lot of enemies in the academic community. I'm a solitary figure, an individualist who doesn't like to follow the lead of other people.

I was lucky enough to fall on a good laboratory that, my discovery of RNA double helixes actually helped destroy, as I'd completed its principal objective [and the lab group was disbanded]. After working for three years in London, at the age of thirty-one I was surrounded by a glow of success. But before returning to Paris, I went farther north to Glasgow, where my research began in earnest. In Scotland I began to look at animal oncogenic [cancer-producing] viruses that I hoped to find in humans. Once again I played the role of the outsider who arrives to notice things that have been there all along but that no one has seen. Working in Glasgow with Ian MacPherson and using an observation made by Kingsley Sanders in my London lab, I discovered how to grow cancerous cells in agar. This allowed me to return to France and apply my new technique to the search for cancer-producing viruses in humans. It's an idée fixe of mine that certain cancers are caused by viruses.

The second goal of my work at the time had to do with learning *how* these viruses replicate, and this naturally included the retroviruses. I failed in this search because I set out with the wrong model. We now know that retroviruses replicate by [hijacking a cell's] DNA, but I was wrongly looking only at their RNA. Nonetheless, I found some interesting things along the way, including double helixes of RNA that exist in normal cells having nothing to do with viruses.

I was also working on interferon, and in the early Seventies I and colleagues Jacqueline and Edward DeMaeyer were the first to isolate its messenger RNA. My experiment showed how you could extract the messenger RNA from the cells of a chicken and introduce them into a mouse. Because interferon is species specific, the mouse would start producing chicken interferon. Our findings eventually led to the cloning of messenger RNA. I would have liked to have been the first to have done it, but, alas, I was not. It required a lot of money I didn't have. This happens a lot in France. We make discoveries that we have neither the means nor the will to perfect, so others benefit from them.

Omni: The American press describes you as proud and ambitious to the point of arrogance. Are you proud of that?

Montagnier: It depends on the day. When you're climbing a mountain, the last thing you want to do is look behind you and say 'Oh, my, it's too high. What am I doing up here?' I realize I'm a long way from the top—in fact, there is no summit! In science there are always new problems. If it weren't AIDS it would be something else. I'm a gambler out for the big killing. Like a roulette player at the table, I'm addicted to getting results out of my laboratory. Last week everyone was away at a conference. With no one in Paris doing experiments, I got very nervous, like a junkie suffering withdrawal symptoms.

Omni: You've said many times, 'I have lots of enemies.'

Montagnier: I probably do! In France we're very egalitarian, so if you get out ahead of the pack, they shoot at you. I'm a target. This comes not only from my scientific success but also from my success in the media, which is something new for a scientist in France. From the start, AIDS has been a show-business disease. The press and media have been fascinated by it. People are making major discoveries in other domains, but they receive none of the attention accorded to AIDS, while I'm being barraged with invitations to appear on TV around the world.

Omni: To set the record straight, did you discover the AIDS virus?

Montagnier: There's no debate about this point. The argument with Robert Gallo had to do with proving causality. Did the virus I discovered cause the disease? I don't think Gallo disputes that we were the first to isolate the virus and publish our findings in May 1983. All he has ever claimed is that he isolated the virus at roughly the same time. He wasn't able, however, to characterize it. Before the press conference we were informed by Gallo. I remember well the day he came to my office in April 1984. He sat at this table, in the chair you're sitting in now, and told us he had discovered the virus that causes AIDS, which he was calling HTLV-3. It was obvious his virus was close, if not identical, to ours. My reaction was altogether positive. He was confirming our work. Afterward the debate became polemical, but my first reaction was, 'Good, I'm pleased Gallo has rediscovered what we've already found.'

Omni: Even though he was said to claim all the credit for himself and co-workers?

Montagnier: We both contributed to the discovery of the virus. The difference between science and religion is that in science everyone has to agree on rational

"Well, which is it? Does it defy gravity, or does it cause hallucinations?"

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"NASA stands ready to respond to any bona fide physical evidence of UFOs presented by credible sources"

ANTI-MATTER

UFO UPDATE

Question: Which government agency investigates physical evidence from UFOs? Answer: NASA.

"We stand ready to respond to any bona fide physical evidence from credible sources," says David Williamson, NASA's special assistant for policy integration and its point man on UFOs. That has been the policy, but NASA has not been terribly busy at it. In fact, they have analyzed only a few items, all of which proved to be as ordinary as the bottom of a cola bottle; one item sent in turned out to be just that.

"We never found anything nonterrestrial," says Williamson, "anything that was so extraordinarily different, or anything unavailable on Earth."

NASA got involved in the UFO business in 1977, when Frank Press, the science adviser to President Carter, asked the agency to take over all the UFO mail pouring in to the White House. Press also wondered whether NASA shouldn't investigate any new findings on the subject since the last official investigation in 1969.

Richard Henry, now a professor of astronomy at Johns Hopkins University, has recently provided a behind-the-scenes look at just how NASA handled this sensitive request. Henry knows, because back then he worked in the Office of Space Science, the NASA branch that made the decision. Henry recalls that it was David Williamson, assistant for special projects, who eventually drafted the NASA reply to Frank Press's request.

In an early memo Williamson had weighed NASA's options. If NASA refused, there would be charges of a cover-up. But any NASA commitment to some review of the phenomenon, Williamson realized, would not satisfy the believers if the results were negative or the critics if the results were positive. Besides, such a task might place considerable demands on NASA manpower and finances. The final proposal: NASA would not "establish a research activity in this area," yet it would analyze any hard evidence on UFOs offered to it.

Is NASA's ambivalent attitude part of an organized cover-up? Henry doesn't think so. "I think it's just that officials at NASA had other, more important things to do," he says.

Williamson explains the reason behind the final decision this way. "NASA didn't try to figure out whether UFOs *should* be studied," he says, "but whether they *could* be studied at all." NASA decided that they could not. But if physical evidence comes in from credible people, then it should be NASA's responsibility to look it over. "There must be someplace," Williamson explains, "where an analysis of such material can be trusted."

Williamson's knowledge and open-mindedness on the subject puzzle people. It turns out, however, that back in the winter of 1952–53, Williamson, while on night guard duty at Fort Leonard Wood, Missouri, saw a white light cross his line of sight, stop, and then suddenly zip away, "almost like in a cartoon." He was later grilled on his sighting by "Intelligence types." One admitted that radar had picked up the same object. And to this day Williamson says, the sighting is listed as "unidentified."—*PATRICK HUYGHE*

FIRST COMMUNION

Just about everyone now knows of writer Whitley Strieber's nighttime encounters with small entities and UFOs from his best seller *Communion*. "Very much like Strieber's experience, but largely unmentioned," notes researcher Dennis Stillings, is what a world-renowned psychologist encountered some 60 years earlier in Switzerland and recounted in his autobiography *Memories, Dreams, Reflections*.

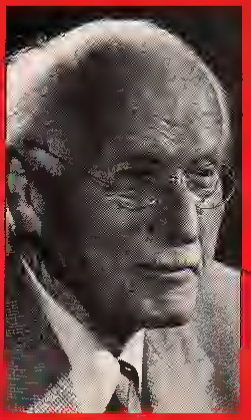
The psychologist was Carl Jung. One night in the spring of 1924 he woke up hearing noises outside his secluded home in Bollingen. He looked out the window and saw no one, so he returned to bed and went back to sleep. But once more Jung said he heard footsteps, talk, laughter, and music and had "the visual image of several hundred dark-clad figures. He thought they might be boys in their Sunday clothes. He got up again and saw a "deathly still moonlit night." Said Jung, "I felt obliged to consider the possibility of its reality."

Years later, in October 1958, Jung dreamed of two gleaming discs "flying directly toward me." One came within four or five hundred yards. When Jung awoke, he thought, *We always think that the UFOs are projections of ours. Now it turns out that we are their projections.*

All this led Stillings, a Jungian scholar in Minnesota, to wonder if Jung had believed in extraterrestrial craft manned by intelligent beings. So he contacted Marie-Louise von Franz, a colleague who had worked with Jung for 40 years. "The answer," says Stillings, "was a definitive and straightforward no."—Patrick Huyghe

"He was part of my dreams—but then I was part of his dream too."

—Lewis Carroll



INVISIBLE CLOCK

Can a woman be haunted by an invisible clock? That was the question facing Peter Eastham, a British parapsychologist, when he began investigating the case of a woman who reported hearing a mysterious ticking all over her house. Her son even recorded the noise in the kitchen and played it back to horologists (people skilled in the measurement of time) who concluded that it was a poor-quality alarm clock around 60 years old.

When the woman moved to another home, the same incessant ticking followed her there as well. It sounded, she later told Eastham, like a clock she'd owned as a child during the blitz of World War II. She'd later given the clock to a repairman who closed his shop without finishing the job. In fact, consulting with a medium, she was told that "a gray old man who liked clocks" was trying to communicate with her.

Confused, the woman finally wrote a letter to London's Society for Psychical Research. Since he lived nearby, Eastham, of Lewes in East Sussex, was assigned to the case. He soon learned that the woman could "tune in to" the ticking when she stood by her bookshelves. "I interviewed her extensively," he says. "She seemed quite normal. She had no psychic experiences. But she did remember that her jilted ex-lover had said something about a future time when she'd hear a ticking clock."

Investigating further, Eastham installed a high-quality cassette recorder near the bookshelves. Then he sent his recording to a specialist who made insect films. After listening, the filmmaker guessed that the ticking was caused by

Trogium pulsatorium a species of book louse no bigger than a pinhead

When the woman questioned whether such a tiny creature could make that loud a noise Eastham slapped a wicker place mat on the kitchen table "We couldn't believe our eyes he reports "when several of the insects then fell out

According to Eastham, a British Museum expert later confirmed the identity of the lice The experience he adds provides a lesson "Never jump to a paranormal conclusion when a normal one will do Ivor Smullen

[illegible]

Are you itching to ask your long-dead grandfather a question—and get an answer? Want to contact a disembodied spirit who lived thousands of years ago? Now you can according to astrologer and Spiritualist minister Zolar

"Spiritualism is the ability of a material person to contact an immaterial existence " Zolar explains Some people are born with a higher potential for it than others but anyone can develop the ability to do this

The keys to contacting the dead, he points out in *Zolar s Book of the Spirits* (Prentice-Hall Press) include meditation "to energize the psychic body" and breathing exercises " to assist in entering the trance state When Spiritualism first became a popular practice in the nineteenth century Zolar explains devotees formed "home circles —séances held at regular places and times That he emphasizes, is still one of the most effective ways to communicate with spirits "If you keep meeting, you will definitely get some manifestations, perhaps messages in the form of rapping or table tapping

Philosopher Paul Kurtz who heads CSICOP (Committee for the Scientific Investigation of Claims of the Paranormal), is rather dubious that *anyone* can talk with the dead "By the 1920 s Spiritualists had been largely discredited as frauds—the Fox sisters [Spiritualists in the mid-1800's who supposedly received taps from beyond] finally admitted for example that they created raps by cracking their toe knuckles against wooden floors " he says " Until self proclaimed powers are corroborated by independent observers, I would be very skeptical about so-called communication with departed spirits "

—Sherry Baker

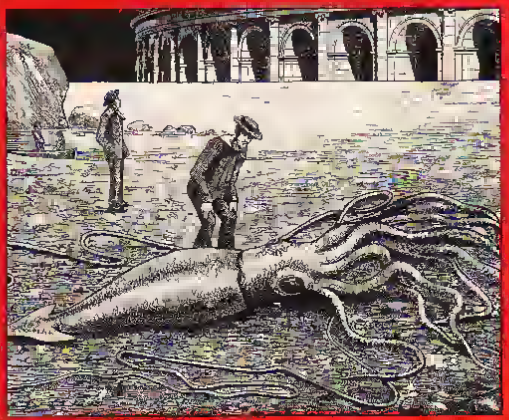
[illegible]

Earth s mountains jungles and oceans could be home to a vast array of undiscovered creatures—ranging from medium-size lizards snakes, and birds to pygmy elephants, two-hundred-foot-long squid and wild Neanderthal men That at least is the opinion of zoologist Bernard Heuvelmans, who has put together a list, backed up with 25 000 references, that describes more than 100 mysterious animals not yet recognized by science

Heuvelmans who heads the International Society of Cryptozoology says there is evidence that some of the strange creatures on his list are flesh-and-blood animals—including footprints belonging to Sasquatch and an African "dragon," photos of a gigantic African snake and the Loch Ness monster, and a whole specimen of what appears to be a Neanderthal shot a few decades ago in Vietnam " This material is still controversial, Heuvelmans admits, and it is considered insufficient or inconclusive by some zoologists "

Anthropologist Frank Poirier of Ohio State University says that the list shows that cryptozoologists are interested in a variety of as-yet-undiscovered animal species and not just famous "monsters like Nessie and Bigfoot "As an anthropologist, I find it quite impossible that Neanderthals have survived into modern times " he says "But some of the animals Heuvelmans has listed probably do exist Others may have become extinct in historical times and others are probably just myths It s foolish for anyone to think there could not be new species of animals to discover since last year a previously unknown primate was found in highly populated Madagascar

—Sherry Baker



FEMALE JESUS

Could Jesus Christ have been a woman? That's a distinct possibility, according to British biochemist Anthony Harris, who is formerly of Trinity College in Dublin Ireland and Kings College in London His evidence he says lies in records dating back to the Inquisition

According to the records, Harris explains Cathar relics found in the preceptory of Villeneuve France included a hinged casket shaped like a woman's head Reportedly within the casket were two pieces of a female skull labeled CAPUT LVIII (head 58) The Cathari had claimed to possess Christ's flesh and blood, and as far as Harris is concerned, Caput LVIII was the skull

To support his unusual thesis Harris points out that the Jewish historian Josephus reportedly once said that Christ was a mere five feet tall Other reports from history suggest that Jesus was slightly built and did not have a beard Furthermore the Messiah was intensely emotional and bled easily In fact, Harris says Luke reported that during Jesus agony in the garden of Gethsemane, "his sweat was as if it were great drops of blood falling to the ground "

To bolster his point of view Harris has even written a book called *The Sacred Virgin and the Holy Whore* (Sphere Books, London) In it he claims that Jesus—whom he calls Yeshu, a variation on Jesus Hebrew name—suffered from Turner's syndrome a form of degeneration of the gonads (the organs that produce sex cells) This is caused by the partial or complete absence of one of the X chromosomes Women with this condition are short with wide chests but have undeveloped breasts and overgrowths of small blood vessels in the skin An absence of menstrual bleeding is another symptom

In her agony in Gethsemane says Harris Yeshu literally sweated blood Because she knew she was about to be arrested and crucified her capillaries burst under intense blood pressure while the powerful beating of her heart and her high adrenaline levels combined to cause blood to flow

When Yeshu was born " Harris concludes 'Mary knew no female redeemer would be taken seriously So she entered her child as a boy in the census When Luke reported that the child was circumcised it was to prove that Yeshu was both Jewish and male Yeshu herself had to act like a boy or else give up her mother's dream of saving so many defenseless people And the Jewish temple priests were so misogynistic that Yeshu had to be disguised as a man to enter the teaching area of the synagogue '

Harris's theory, of course, has been challenged by more than a few For instance, skeptics say, the imprint on the shroud of Turin shows a muscular, six-foot-tall man

But Harris counters that the shroud of Turin was a fake conceived by popes to impress the laity and the clergy As for the notion that Jesus would never have perpetrated such a hoax on the people Harris says "Disciples believed Jesus to be male, so why should they have been disabused? The central truth was not the gender but the message '

If it's physical evidence he wants, however that may be difficult to find The allegedly female skull Harris says "was stolen It has since vanished from history and today probably lies in the Vatican '—Ivor Smullen

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"Waiting and hoping are the whole of life, and as soon as a dream is realized it is destroyed "

—Gian-Carlo Menotti

"And she understood that the hour had come to herself "

—Georges Bernanos

'Philosophy has succeeded, not without a struggle, in freeing itself from its obsession with the soul, only to find itself landed with something still more mysterious and captivating, the fact of man's bodiliness '

—Friedrich Nietzsche

' there is time still time (for those who can groan/to sing,/for those who can sing to heal themselves "

—Galway Kinnell

TRANSCENDING

CONTINUED FROM PAGE 60

forces penetrate deep within the brain. one of Persinger's graduate students wrote a computer program that literally changed the magnetic field's shape. The helmet was then hooked up to a computer, which directed the firing of the magnets in a carefully timed way. "This controlled pattern," Persinger explains, "generated a magnetic vortex that reached the site of the temporal lobes."

The first thing Persinger set out to do with his helmet was to study the claims of UFO abductees. To participate in this study, subjects who had never reported a close encounter wore the helmet while its magnetic vortex massaged their brains. As the helmet whirred, Persinger told them to imagine they were emerging from a woods and could see a light in the sky. (He had actually set up a pulsing overhead light in the lab.) Then he asked them to free-associate, giving vent to the images pouring into their brains.

Unbelievably, these ordinary subjects began spinning stories chock-full of the details repeatedly reported by professed abductees. From gray-skinned, slit-mouthed aliens to blue beams of light to horrific reports of medical probes, the scenarios were the same.

But how could Persinger be sure his subjects were not simply regurgitating the popular myth of extraterrestrial visitors portrayed in innumerable movies, books, articles, and *Star Trek* reruns? "The critical factor," says Persinger, "is that we weren't looking only at the details of the reported experience but also at whether the experience was reported in the presence of the *magnetic field*. The control group also had lights flashing in their faces, but they were not exposed to the magnetic field. The question was: Could we influence the content of the imagery? What we found was very convincing. More temporal lobe themes and images show up in the narratives of those exposed to the field."

Persinger used the same approach to study other forms of the ME, from the sense of a foreign presence to déjà vu. Time and again he found that subjects donning the helmet were much more likely to have a mystical experience. And from one person to the next, the details in a given category of experience were almost without exception the same.

"The brain is like any closed system," Persinger now observes, "in that the area utilizing the most energy at any given time is the one that controls behavior. So it seems only reasonable that if the temporal lobes are being stimulated, then temporal lobe behavior will emerge."

What surprised Persinger most, however, was the discovery that his subjects found the experiments so pleasurable that they kept coming back for more. "By stimulating the temporal lobes," Persinger says, "we had achieved a widening and deepening of the emotion they associated with the experimental experience." In fact, after several sessions, Persinger found it took little to send them aloft—subtle visual cues, background music, even the presence of a cross could trigger the mystical state of mind.

Persinger attributes this phenomenon to "a kind of kindling effect in the temporal lobes themselves. In the classic epileptic seizure," he explains, "an electrical discharge takes place at a particular focal point. Because temporal lobe neurons are so sensitive, that single lightning stroke soon spreads into an energetic storm. Temporal lobe sensitivity also explains why, even in the normal brain, the ability to have an ME can be learned. Repeated minibolts [from the helmet, for instance, or a mantra] actually alter the biochemical structure of the neurons until sending them down the ME pathway requires almost no stimulation at all."

RECONSTRUCTING REALITY

Despite the evidence, not everyone studying the field agrees that MEs are generated by the temporal lobes. Psychologist Sue Blackmore, now at the brain and perception laboratory at the University of Bristol in England, developed an alternative theory after experiencing an OBE of her own.

She recalls the experience well. While still a college student at Oxford in the early Seventies, Blackmore had a late-night session with a Ouija board. Then she retired to a room with friends and smoked some hash. Fatigued, eyes closed, sitting cross legged on the floor, Blackmore suddenly found herself whizzing along a tree-lined road. (Blackmore notes that this street had the same tunnellike characteristics as the passageways of light reported in UFO abductions and NDEs.) "It seemed as real," Blackmore remembers, "as it would have had I looked at it with my eyes open."

Someone then asked Blackmore where she was, and to her surprise, she responded, "I'm on the ceiling." Eyes closed, she seemed to see the entire room from a bird's eye view. Her body was still sitting on the floor below. Her mouth was moving. But her consciousness floated on high. Just by willing it, Blackmore found she could also pass through the roof of the building, where she saw chimneys and red tiles. (They later turned out to be gray.) Blackmore flew away in the open air, first to Paris, then to New York and South America. Over the Mediterranean she saw a star-shaped island with 100 trees that "seemed to me then, as now, more like somebody's *idea* of an island rather than an island as it would appear to a real observer." Twice she returned to the room,

on one occasion expanding her own "body" until it burst through the walls and out into space. After almost three hours of disembodied travel, she found herself back in her body, looking out through her eyes on the real world as before.

A temporal lobe model of the OBE, Blackmore believes, does not even begin to explain the complexity of the experience described above. "It doesn't explain why the OBE sometimes occurs alone and sometimes takes place as part of the near-death experience," she says. Nor does it explain why it usually seems to occur late at night, under decreased-stimulus conditions. You don't normally have temporal lobe seizures lying in bed at night, but you do have OBEs.

Blackmore also says the temporal lobe model fails to explain why ME images almost always hit the viewer head-on. "Why," she wonders, "doesn't the brain, the observing consciousness, look to the right or the left?" Her own hypothesis is based on the way we continually reconstruct and model reality in the brain itself. "The important question is, Why does anything seem real?" she says. "I suggest the brain takes the best model it has at any point in time and calls this reality. When we go to sleep, our everyday perception of reality starts to break down, and other models may take over. For example, they may come from memory."

And as in some dreams, this new model of reality is often "seen" from the bird's, rather than the worm's, point of view. "Interestingly," Blackmore says, "we've found that people who report OBEs tend to recall their dreams from the head-on vantage point. My theory of reality modeling can explain that, and I'm not sure the temporal lobe one can."

Other researchers, however, think Blackmore's theory is too narrow as well. "There are four classical variations of the OBE, of which Blackmore's experience is only one," says William Braud, senior research associate at the Mind Science Foundation of San Antonio. "In some OBEs, for instance, consciousness clothes itself as a mobile sphere of light. Other times consciousness has no specific location in space at all." Not only does Blackmore's theory fail to account for these OBEs, he adds, it may not even account for her own flight. "If you're simply constructing a body image to make sense of the world again," Braud wonders, "why would it include the wandering to far-off places and back again?"

ATTACKS IN THE NIGHT

Other researchers have tried to explain mystical encounters in terms of the dream state as well. Psychologist David Hufford, for instance, is studying the terrifying realm of nocturnal assault, in which sleepers say they are attacked by terrifying humanlike forms. Given this focus, one almost expects dark shadows to eclipse the windows of Hufford's office at the Milton S. Hershey Medical Center, deep in the heart of Pennsylvania chocolate country. Instead, a late-summer sun slants through the shades, illuminating the usual professorial clutter—helter-skelter piles of paper and wall-to-wall books. When Hufford stands, he exhibits the height of a basketball player, though the impression is countered by a standard-issue academic beard. Hufford, in fact, is that rarest of academic players: a folklorist-cum-behavioral scientist who actually gets paid to analyze belief systems.

Hufford made his biggest splash not long ago with the publication of *The Terror That Comes in the Night*, a widely recognized landmark study of reports of nocturnal assault from around the world. He had spent four years in Newfoundland teaching courses on accounts of supernatural evil and doing doctoral research on local beliefs. As part of his research, he was studying a local tradition known as the "old hag." As part of this tradition, subjects reported waking up paralyzed with fear at the sight of a threatening humanlike entity in the room. This entity often took the form of a wrinkled old woman—the old hag. About 20 percent of his subjects reported this ex-

perience and Hufford soon equated the old hag with the aswang of the Filipinos and Ephialtes of the ancient Greeks, among others.

What struck Hufford most was the remarkable consistency of the event. "Modern medical students," he says, "reported the same range of details as Eskimos and Filipinos did."

Finally convinced, therefore, that the experience was not a cultural artifact, Hufford began casting about for a theory of his own. He settled on the phenomenon of sleep paralysis as the explanation. During an episode of sleep paralysis, the waking state and the dream state virtually merge. Victims achieve conscious awareness but are unable to initiate voluntary movement, becoming easy prey for dream images like the old hag.

MYSTIC DOUBT

There are, of course, many objections to such hard-and-fast interpretations of the ME. "Even if the temporal lobe model or some other theory does turn out to be correct," says psychologist Keith Harary, who did the seminal work on the out-of-body experience back in the Seventies, "all it means is that the brain and the body are doing the same thing during the experience. You still haven't explained why people are having the experience itself."

Marcello Truzzi, head of the Anomalies Research Center in Ypsilanti, Michigan, adds, "These theories ignore the body of external evidence indicating that some of these mystical experiences really did occur. Whether that evidence is adequate or not, it is not taken into account."

And Michael Grosso, a philosopher at Jersey City State College and author of the book *The Final Choice*, says that explaining the whole spectrum of mystical experience in terms of a single physiological factor such as temporal lobe sensitivity is just wrong. For instance, he says, "to account for multiple witnesses of a single UFO by saying they all had simultaneous seizures is ridiculous. Moreover, there are many ways to interpret possible connections between neurological disturbances and MEs. One explanation is that temporal lobe sensitivity might predispose someone to detect external forces such as telepathic influence."

Grosso adds that "there are too many kinds of MEs to lump them together. You would have to have very solid grounds to draw a connection between Saint Paul's conversion on the road to Damascus and someone's modern-day UFO experience. Even if you could draw the connection, you can only speculate that Paul experienced unusual temporal lobe activity during his conversion."

Many theologians agree. In a recent questionnaire, Dr. Ben Johnson, parish priest of Salem Lutheran Church in St. Cloud, Minnesota, asked 2,000 members of 13 Protestant congregations about their involvement with MEs. More than 600, slightly above 30 percent, admitted to an ME. Johnson agrees that some, if not many, experiences can be attributed to wishful thinking and projection. Still, he finds it odd when his Lutheran parishioners awake in the middle of the night and find a vision of the Virgin Mary standing at the foot of their bed. Cultural conditioning and any subsequent programming seem to fly out the bedroom window in such instances, he declares. "My own understanding of psychiatry and psychology," says Johnson, "is that they will match data to the assumption that there is nothing outside of ourselves, no matter what the data."

The stance of theologians like Johnson seems legitimate to nuts-and-bolts scientists like Hufford as well. In the wake of his book, Hufford explains, he received a letter from a New Mexico attorney suffering from nocturnal assaults. "I remember he liked the book," says Hufford, "and thought I was on the right track. He even agreed with my physiological explanation that the experience could be a form of sleep paralysis. But he was still convinced that the experience was absolutely real, that the old hag, or whatever it might be, could get at him only when he was in a state of paralysis. As far as he was concerned, my investigation stopped where his began. Any scientist who reduces a mystical experience to a physiological explanation runs the same risk—the risk of leaving the most challenging part of a puzzle unexplained."

Persinger, for his part, is used to running risks. After word of his temporal lobe model of the ME leaked out, fundamentalist protesters stood outside his second-floor office intoning passages from the Bible. Physical threats against his person were made and almost carried out. But Persinger's answer to these protesters remains firm: Even if there are real, other-dimensional wonders out there, he says, there must be a physical mechanism by which their voices come through. "And," he adds, "even if there are no aliens, no gods, no old hags, our human need to escape the mundane dictates that we conjure them—be it from the temporal lobes or the astral plane."

And as David Griffin, professor of the philosophy of religion at the Claremont School of Theology in California, points out, the human mind might do both. "Daniel Koshland, a microbiologist at the University of California, Berkeley," Griffin says, "has recently shown that bacteria seem to have a crude sort of memory and can make decisions based on that memory. If the lowest form of life has this ability, then the complex society of one hundred billion brain cells—what we call the mind—must have it as well." With that ability, the mind becomes partly self-determining, capable of generating images that may in fact be real.

"It was my understanding that squirrels got their own nuts."

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metal surely such people would not suffer from *Trichomonas*

She flourished the slide glaring evilly at the laundry hamper Then she heard a crash and a scream

Turning off the microscope she strode across the hall where Jack had been preparing to sew up a laceration

The sterile tray had been knocked over and the floor was slippery with Betadine Jack and a nurse a small gray woman, were backed up against the wall Jack with his gloved hands up Rachel couldn't tell if he was trying to maintain sterility or to surrender A thin young man with stringy hair and a number of homemade tattoos was holding a gun on them

'You tryin' to kill me, man?' he was saying He swung about to include the new comer under the rubric of the pistol

'Do you mind?' Rachel asked 'I'm *trying* to see a patient

"A sick little baby," she added for the sociopath's benefit as he glared at her 'And if she starts crying, we'll *never* get any peace '

'He's tryin fo kill me Look' He pointed the gun muzzle at his forearm where a deep wound was outlined by iodine prep

'Ooh that's nasty Needs stitches '

I was trying to get the glass fragments out ' Jack said

'Shut up, man!'

Rachel shook her head sympathetically He must need something for pain

The sociopath's face lit up 'I'm allergic to codeine, man I need Demerol'

Rachel nodded to the nurse Go get seventy-five of Demerol Let me see this

She gloved up 'I need a new suture set Well, give me your arm," she added annoyed 'And get that out of my face so I can work How'd you do this?'

'Got mad and slugged a window," he said proudly letting her recleanse the skin Jack began to edge for the door

Oh, look there's the glass I can get it—" She grabbed the tweezers, saying, 'Here pull the skin back a little I see it I've almost got it.

As the sociopath retracted for her, the gun on the gurney behind him the police burst in 'Cancel the Demerol' said Rachel 'Turkey I should sew you up without lidocaine '

' That was crazy' Kent said He'd waited until her shift was over and then dragged her out for breakfast this time fo a diner on the wharf They watched fishing boats setting out into the fog as they ate hotcakes and home fries "Things like this wouldn't happen if the emergency room was adequately staffed

"Then I'd have to be crazy all alone Where's the fun in that?'

He put down his coffee 'Why the hell did you do it?'

She shrugged "Off the record? I dunno The asshole was annoying me'

"I think—shit! I think you enjoyed the whole damn thing That's why you won't help me You like chaos in the ER '

'Maybe'

He sighed 'Okay let's do something on the record Why'd you become a doctor? He clicked out his pen point

'You mean the inspirational stuff I told med school admissions about how I wanted to alleviate suffering work in a free clinic for migrant workers and maybe even join the Peace Corps? Well, it's all bullshit Sure I said all that once I think I even believed it But you want to know why I *really* became a doctor?

He nodded 'Your public awaits

'When I was a freshman in college they ran the old *Flash Gordon* serial one episode every Wednesday after the Bergman films Every week Flash and Dale and Zarkov would get captured by some bizarro mutant types and then be dragged in front of, say, the king of the Frogmen

' 'Ooh what do we have here? asks the king 'What a wonderful heroic man Flash is Throw him in the pit and make him shovel radioactive lizards Then he leers at Dale 'Ooh what a gorgeous pure lady Toss her into my harem I'll be there soon ' Finally he gets to Zarkov 'Ooh, Dr Zarkov, you're such a fine scientist Put him in a nice air-conditioned lab, boys, and give him everything he wants That's why I decided to go to med school."

He slammed his notebook shut "You know, you're crazy"

She's on the porch, looking out at the ocean; behind her is another ocean, slanting off in the opposite direction Her condominium is built on the very edge of the planet Two seas wash its foundations Her robotic butler enters "Madam, there is a gentleman at the door! He is unarmed, and my sensors reveal no superabilities!"

"Show him in," she says, fingering a small blaster she keeps in the pocket of her dressing gown Should she fire, the robe will be ruined These things are unavoidable

"Dr Hugo Mayhem," announces the robot, retiring to a corner The newcomer is a tall man with a hawk nose, slightly crazed eyes, and hair and beard sadly in need of a trim He wears blue jeans, an Irish knit sweater, and hiking boots When he speaks, it is with an Oxonian accent

"Dr Entropy?"

"You have the advantage, sir!"

'We met, I believe, at a Corrupt Geniuses League function! The funeral for poor Hans!"

"You do seem familiar "

Striding to the edge of the porch, Mayhem glances down 'Such an amazing planet! I have often wondered how they kept it from eroding back to a spherical shape and how its gravity could keep the oceans flat! I should have guessed they were painted on!"

She nods "The dry air does annoy one's sinuses, and I tire of having to create water by nuclear fusion each time I wish a bath but I would not trade this condominium for any other fortress on any other planet!"

"Just so," he agrees "Now I daresay this is why I appear familiar!" He points up at the sky Looking past his finger, she notices the constellation

"Why, it's you!"

He sighs ruefully "What do you get for the man who has everything? My friends rearranged the stars for my birthday! Unfortunately, they moved Fomalhaut into a low-rent region, with the Gamma Egregians for their closest neighbors! There's a large price on my head as a result!"

He begins to look about nervously She changes the subject "What brings you here, Dr Mayhem?"

"Oh, the usual! I was fleeing for my life and decided to stop for lunch at Rick's Café Terrestriale!" he says, naming a famous restaurant in the capital city of the square planet

She nods ' Rick's one-third human he has the best Earth cuisine this side of Alpha Centauri!"

"Ahh, the broccoli and squid with Sirian sauce but I digress! Whilst there I overheard some-heroic sorts at the next table! They were discussing Dr Entropy whom they described as a renegade priestess of the Cult of Chaos and a sworn foe of humanity! It seems that when she disappeared, she gave her chaos gun to a lackey!"

'Severance pay when I retired!'

"He unfortunately appears to have used it to kill the Abbreviator!'

She gasps in amazement They stand a minute in silence, then she sighs "For an obnoxious, uptight little twit, he wasn't too bad!"

He puts a sympathetic hand upon her shoulder "The Abbreviator's friends have sworn to avenge his death upon Dr Entropy, following her if need be to the ends of the universe!"

She shrugs 'Well, so much for retirement! The Boer will find me, he has uncanny forest senses! Plus I had to go and leave a clue, didn't I?"

' Oh, not a clew!"

"Yes, I really did!" She shakes her head ruefully, thinking how closely she has conformed to the unwritten rules of su-

pervillainry. "I wrote, 'I'm going where it's less hip!'"

Her visitor frowns. "Naturally, sooner or later he's bound to realize this can only refer to the squarest planet in the universe! I'm afraid you blew it, Dr Entropy! It's only a matter of time before you receive a visit from the mighty Boar! (Such an aptly named character!)"

She pauses in her misery. "Hey, watch what you say about my archfoe!"

They paged her in the cafeteria and she ran all the way back to the emergency room. Bill was bent over an unconscious patient, trying to find a viable vein in an arm decorated with old needle tracks. "Two bullets to the squash," he called. "Vitals are stable. Should we call in neurosurgery?"

Blood was dripping onto the floor from the turban of bandages and the room already stank of unwashed feet and Mulligan Brothers rosé. "Not yet." Rachel muttered. "What happened?"

"Family says he comes home tonight," a paramedic began, "and he tells them his friends shot him two times in the head."

"Some friends."

"Then he goes, 'I'm done for!' and falls down, so they call us."

"Let's get portable skull X rays, and preop bloods." Taking a deep breath, she added, "Check the EtOH level, too," stealing a glance at the clock. Everyday about eight PM, the ER changed its smell from blood and urine and old disinfectant to cheap beer and cheaper wine. The odor seemed to linger until she smelled it constantly, even when she wasn't at work, and the thought of taking a drink made her stomach churn.

Rachel did a quick neuro check. The patient was lethargic, but his brain stem and motor functions seemed intact. She held her breath while staring into his eyes with her ophthalmoscope, then leaned back, finally unveiling his head. There was a small scalp laceration, still oozing blood, but that was all. "Two bullets?" Where the hell were they?

Later, after seeing three more drunks, two bellyaches, and a sore throat, things had quieted down enough for her to go to midnight supper. She was not surprised to find Kent in the cafeteria, waiting like some predatory animal.

"Lemme tell you about this case," she said. "Guy stumbles home, says he's been shot, then keels over. I'm in a panic. do you know how brain looks after a thirty-eight? Only this guy's fine. I keep looking for bullets on the X rays, and there aren't any. I spent five hundred of the taxpayers' dollars on this guy, and he's just dead drunk from too much table wine."

Kent said, "Look. We're almost to the point where we can force a hearing. We just need one person from the inside to testify that the place is a pit. You could do it, Rachel. Tell the board of supervisors how it's understaffed, underequipped, how you wouldn't take your maiden aunt's poodle there. And I know you despise poodles."

"Christ, why me? I'm no idealistic lover of humanity."

Kent took off his glasses and rubbed his eyes. "You're my best bet, *Doctor*. Because you're not from some med school in a country I can't even pronounce, and you don't work ER just for a down payment on a Mercedes, and you don't look like an ad for Cocaine User's Profile. *Last accomplishment saving a life. Favorite snow. Andean flake.*" He looked at her suspiciously. "Do you have anything you can wear besides scrub suits?"

"I have formal scrubs. Let me sleep on it." She smiled winningly, thinking it was time to retreat. "Have I told you about these strange dreams I've been having?"

"Dreams? What's next, astrology and biorhythms?" He flinched, seeing his star witness dissolving into just another trendy Las Pulgas yuppie.

Rachel shrugs. It is, after all, a dream. They go to her room, and Dr Entropy insists on a tour of the apartment, meanwhile describing her own condo on the edge of the cuboid planet.

"Of course not. You know me, I don't believe in anything. It's just, they're so weird. . . ." She tried to describe the dreams: first the glimpses of the cube-shaped planet, then the superbattle, and finally the mad scientists who just stood and chatted.

"I mean, you always knew the heroes must hang out and party together, sort of like old-time movie stars going to Picktair. Honey, let's cruise over to Doom Patrol headquarters and see what's cooking!"

"I guess it makes sense villains would be chummy, too." She picked at her unnameable casserole. "My all-time favorite story was *Flash* number 123. That's where the 1961 Flash meets another Flash who'd starred in the 1940s *Flash* comic book. They concluded that when Gardner Fox, the Golden Age *Flash* writer, had thought he was dreaming, his mind was actually tapping into events in a parallel dimension. God, it was great!"

Wait a minute. Are you trying to tell me that you're getting news from another world, where superheroes exist?" He leaned away from her.

"You ought to move there," she told him, annoyance masking her face. "Crusading reporters are probably all the rage. You could go into your secret lab and invent a superserum."

"Not me. I flunked chemistry."

"Yeah, you're more the magic word type. Like Billy Batson saying SHAZAM. Let's see—" She began to giggle, then said in a resonant voice, "When Kent Randolph, heroic boy reporter for the *Daily Journal*, says the magic word 'WARP,' he is mystically imbued with the exposé abilities of Woodward and Bernstein, the popularity of Ann Landers, the wit of Royko, and the power of the Pulitzer prize!"

Kent laughed also. "And how about you? Let's see, a doctor would need the idealism of Schweitzer, the diagnostic acumen of Ben Casey—"

"The sheer humanity of W. C. Fields."

Kent leaned across the table. "Okay, Wonder Doc. How about starting your quest for truth, justice, and the American way by helping me?"

She shook her head. "Sorry, physicians aren't superhero material. Research scientists, wealthy playboys, reporters. Those are the folks who become masked sentinels of justice. Doctors just turn into maniacal world conquerors. Dr Doom, Dr Psycho, the Brainwave."

He looked astonished. "But medicine is so . . . so respectable. It seems made for heroics!"

"Well, yeah, there were a few." She began to tick them off on the fingers of one hand. "Dr Strange. He was a money-grubbing alcoholic surgeon before changing his profession to sorcery. Dr Mid-Nite. He quit medicine to become a sensationalist writer. Thor. He was so obnoxious that the gods of Asgard took away his memory and sent him to medical school as a punishment. He's the only one who stayed in practice—until all his patients left because he was always off fighting mystic menaces during office hours."

Pushing back her chair, she stood. "Excuse me. I've been here too long. I can hear the suffering calling to me from the ER. And you know what they're saying?" She paused at the tray rack. "They're saying, 'Hey, Doc, got a beer?'"

Kent smiled perfunctorily at her joke until she was gone, then began shredding a napkin. "Dr. Worthless."

"I hear you're looking for me!"

The Boar spins about. He never expected to find Dr Entropy sitting in his living room. Merely thinking of the consequences of his secret identity having been discovered makes his heart race.

"How did you know?" he asks, pulling his mask back snug. "Uh . . . how'd you know I'd be visiting my friend Willard Wasp, the crusading reporter?"

"Just luck! Lucky I noticed that you two are the same height, have the same eyes and chin."

"Lots of people look alike!"

He approaches cautiously. She holds up empty, ungloved hands.

"Sit down, hero! I come in peace!" Waiting until he has complied, she continues. "I understand you're looking for me! I'm really sorry about the Abbreviator, but you can't blame me, I was two galaxies away at the time! I've retired, turned over a new leaf!"

"I've heard that one before!" the Boar says bitterly. "Mad scientist pretends to reform, becomes your best friend. You give him your unlisted phone number or a signal calculator. Next thing you know, it's pow! Your secret weakness, or a piece of your long-lost planet, right in the gut!"

"You know me better then that! Have I ever lied to you?"

He scratches his head. "No, Dr. Entropy, you haven't—and you're better in that regard than my airhead girlfriend."

"Admit it, Boar, we've had some good times! Remember when I brought all the statues at the Metropolis Museum of Modern Art to life?"

He starts laughing. "And the knight was chasing the police cars..."

"Or the time you caught me at the auto show—honest, I was only checking out the new models—and I transformed the Buicks into dinosaurs?"

"Do you know the mess they made?"

"Be thankful they were herbivores! Come on—I just want to sit in my nice quiet condo and work on my memoirs or maybe a unified field theorem!"

"Why should I believe you?"

"Look, let me tell you my origin story! I'm a doctor! I'd invented a ray to cure cancer and psoriasis, the prototype of the chaos gun! But I needed a power source—pure radium! My colleagues thought me crazy! I couldn't get a grant, and I'd already used up my life's savings building the ray!

"So I thought I'd borrow the radium! You know, once they saw it work, they'd forgive me the theft and let me mass produce the thing! What a boon to a suffering humanity!

'Only when I went to borrow the radium, I needed help, so I hired these bumbling idiots from the Planet of People With No Vowels in Their Names! The next thing I know, you're there trashing my lackeys, I've turned your Boarmobile into rotten haddock, and I'm a wanted criminal! So what else could I do? I didn't have a job anymore—I had to keep robbing stuff!'

The Boar sighs. "Have you learned your lesson?"

'Yes! Never again will I hire anyone from the Planet of People With No Vowels in Their Names. No seriously, I didn't want to be a villain, I just wanted to help! Now I just want to be left alone!"

The Boar rises, holding out a hand. "You've been a good archfoe. Remember the time we teamed up to defeat Nowhere Man and his Invisible Army? We did swell—until they were defeated and you changed my boots to peanut butter!"

"Consider it a prophylactic double cross," she laughs. "I knew you'd seen me stealing the ether batteries, an offense committed after our truce, and you were probably going to sock me away in jail for that!"

'You're right," he smiles. "Well, I promise I'll help! I'll put in a good word, and the judge'll probably give you a reduced sentence!"

"No way," she snarls. "Okay, I asked..." and she throws a small chaos grenade at him as he lunges for her. She's over the couch and heading for the door, but he's blocking it. Meanwhile, his stylish young-professional living room turns into a student hovel, albeit with pure gold brick and board shelving, and the Barry Manilow song on the stereo becomes a catchy tune by the Dead Kennedys. The curtains are now spun crystal.

'You're trapped," he says.

'Never!" She bolts into the kitchen, locking the door and shoving a chair against it, then looks about quickly for weaponry. If only she'd built a new chaos gun. But then, she hadn't intended to fight.

She pauses, furious at the turn of events. She is caught in a typical bachelor's kitchen, with cookery and spices good for any contingency but a pile of dishes in the sink and Lean Cuisine packets in the freezer. Cockroaches are lunching in the dirty dishes. She tosses a small chaos grenade into the sink, the cockroeches turn to slime, but the dishes become Wedgwood china, embellished with azure silhouette roaches.

"Hope he likes blue," she says, reaching into the refrigerator. She cracks open a Diet Pepsi and thinks.

All she has to work from is a collection of upscale cooking equipment. That will be enough. Quickly she rewires the Cuisinart, attaches a corkscrew and a set of Ginsu knives, then grounds it with a wooden salad bowl. She can hear the Boar banging against the door, he is hesitant to demolish his own apartment and, besides, thinks her trapped and helpless. Turning the handle of the cheese greter, she watches space and time warp before her and prepares to step through.

Rachel was exhausted. She'd spent at least an hour wrestling with a man who'd been beaten up by some friends ("What's with friends in this town?") He was encephalopathic from head trauma, unable to understand that he was in a hospital. Not even truly conscious, he'd screamed and thrashed and destroyed a set of leather restraints before forty-five milligrams of Valium had calmed him down.

"Enough to kill a small horse," the charge nurse had remarked as they'd finally quieted the man enough to get the CT head scan.

"Unless the horse also had alcoholic cross-tolerance," she replied.

After that and the usual other pleasures of an emergency room on a warm Saturday night when the moon is full and paychecks recently cashed she returned home. Her clothing smelled of blood and vomit and wine. She showered, changed into a fresh scrub suit (with Centralcity General Hospital's initials prominent on the pockets), and contemplated throwing her dirty sneakers into the ocean. "Probably kill all the fish and cause a red tide," she realized, and tossed them on the back porch. Lying on the couch, she closed her eyes and

...sees Dr. Entropy emerge from the kitchen. "It's okay, I come in peace!"

Rachel sits up and stretches. "I've seen you before..."

"On TV, right? I think Dan Rather covers the superbattles very well—Cronkite always seemed faintly disapproving! I hated thinking Cronkite didn't like me!"

'This is crazy." Rachel clutches her hair. "I'll wake up in a minute.'

Her cloaked visitor is examining her outfit. "CGH. Let me guess! Captain Green something or other! Green's the most popular color motif for superheroes, I hope you realize that!"

"Huh?"

Dr. Entropy points to the initials.

"These are scrubs. Stolen from Centralcity General Hospital."

"They certainly look more comfortable than what I'm wearing!" Dr. Entropy is clad in skintight black leotards, with red belt, gloves, and boots, a black cape, and goggles. "You're a doctor and a thief? We have a lot in common! In fact, we even look a bit alike.'

She takes off her goggles and shakes out her hair. They could be twins, except that Dr. Entropy is in better shape from her life on the run and has a more stylish haircut. "Who are you?"

"Rachel Wirtham, M.D."

Dr. Entropy sinks into the bentwood rocker. "Oy! So am I! What gives?" She rocks pensively, the chair scraping over the end of her cape.

'I think I understand." Rachel explains about parallel worlds, and Flash number 123, and her own dreams.

"Makes sense," says Dr. Entropy. As a doctor, she understands all about things like quantum physics and alternate realities. Medical education on her world is a bit more general than that on Rachel's. "I've never traveled to another dimension before, though my archfoe the Boar does it fairly regularly! I understand he's a Boar in every dimension he's visited!"

'I've met a few people like that.'

Dr. Entropy smiles. "A new world! Well, show me the sights!"

Rachel shrugs. It is, after all, simply a dream. They go to her room for jackets, and Dr. Entropy insists on a tour of the apartment, meanwhile describing her own beachfront home, the condominium on the edge of the cuboid planet. Rachel finds herself longing for such a home so far from Earth and Earthlings. She lends Dr. Entropy her extra trench coat—the coastal fog is quite dense today—and they set off down Maginot Boulevard to tour Las Pulgas. 'Must be a lot different from your universe, right? I mean, diseases, social unrest, no air cars..."

"Oh no, it's just like my world!'

Rachel walks a few minutes in silence. "But—you guys live in space. Every cheap thug has a solar-powered air car. Serums give invulnerability, and soft drinks make you stretch. And you say nothing's different?"

Dr. Entropy sighs. 'Unfortunately! All you say is true! Our physical laws must be slightly different from yours! For instance, I think your light beams travel faster, and your sound waves slower!"

Rachel nods. She'd always wondered how superheroes could converse while dodging laser beams.

"I suspect human physiology must be different as well! We don't have posttraumatic encephalopathy, like that patient you told me about! When we're knocked out, we just wake up, say 'Great galaxies, I feel awful,' and start fighting again!'

"Not even any retrograde amnesia?"

What's that?"

Rachel imagines a world without concussions, probably without dementia pugilistica as well. Otherwise, with the frequency with which they were struck on the head, every superhero would soon be within a chronic care facility.

'I've got an idea,' Dr. Entropy says. She pulls Rachel behind some trees, taking out a small device rather like a suction cup with a calculator attached to it.

'This is a memory transducer, the latest thing in villainry! Let's say you've been cornered and are about to be struck dead by a meteor or the platen of a giant typewriter! The MT already contains most of your memories! You just clap it to your head momentarily, to get it up-to-date, then toss it at a bird or a passerby! Presto, he becomes you and escapes. Lucky these things are covered under the Fifth Amendment, otherwise we'd be in trouble every time we're caught with one!"

Rachel looks suspiciously at her visitor. Working at a public hospital, she is used to criminals, but they are usually sociopaths and small-time hoods, whose criminal behavior is limited to the petty, violent, and unimaginative. She has never met a renegade genius before, especially one who looks just like her.

'Trust me! If we both hold it simultaneously, the MT will merely act as a conduit for memories!"

"What the hell, it's just a dream," Rachel says. They both hold the device. Memories flood Rachel's mind. She sees childhood, medical school, battles, retirement on the square planet, everything.

Suddenly she understands, without the sense of sudden understanding. There is no 'Eureka!", no light bulb going on inside her head. She just understands, in a quiet way, as if she'd done so all her life.

Dr. Entropy has fled a world of superficial blacks and whites, with an underlying ambiguity. Why have the benefits of an advanced science (and a science so radically different from Rachel's that any moderately brilliant person can be a polymath, inventing supersauces in the ubiquitous basement labs) not filtered down to the populace?

Dr. Entropy suspects that it is the work of a mysterious group of savants, the Committee, who understand that cheap solar power, miraculous wonder drugs, routine reanimation, and ready space travel would destroy the status quo, and so they suppress such advances. Those who refuse to play by their rules, who want to push back the frontiers of forbidden knowledge, are labeled as mad scientists, becoming fugitives.

"So you aren't really malignant and amoral and power crazy?" Rachel asks. "Like I am?"

Her new friend laughs politely but seems disturbed. "What an awful Earth you live on! Everything is so unclear, so much room for improvement."

'Now you're talking like... whoops, let's go back." They have climbed the hills almost to the hospital, and Rachel can see the hospital's neurosurgeon leaning against a car, talking to someone who, from only his back, she recognizes as Kent. In Dr. Entropy's universe, the mechanics of recognition are more complex, she'd never be able to tell him just from his back. Glasses or a wig could utterly disguise a person.

"What's wrong?" asks Dr. Entropy.

"I don't want to run into Kent.

"Your friend from the newspaper? You must be proud to know such an important person!"

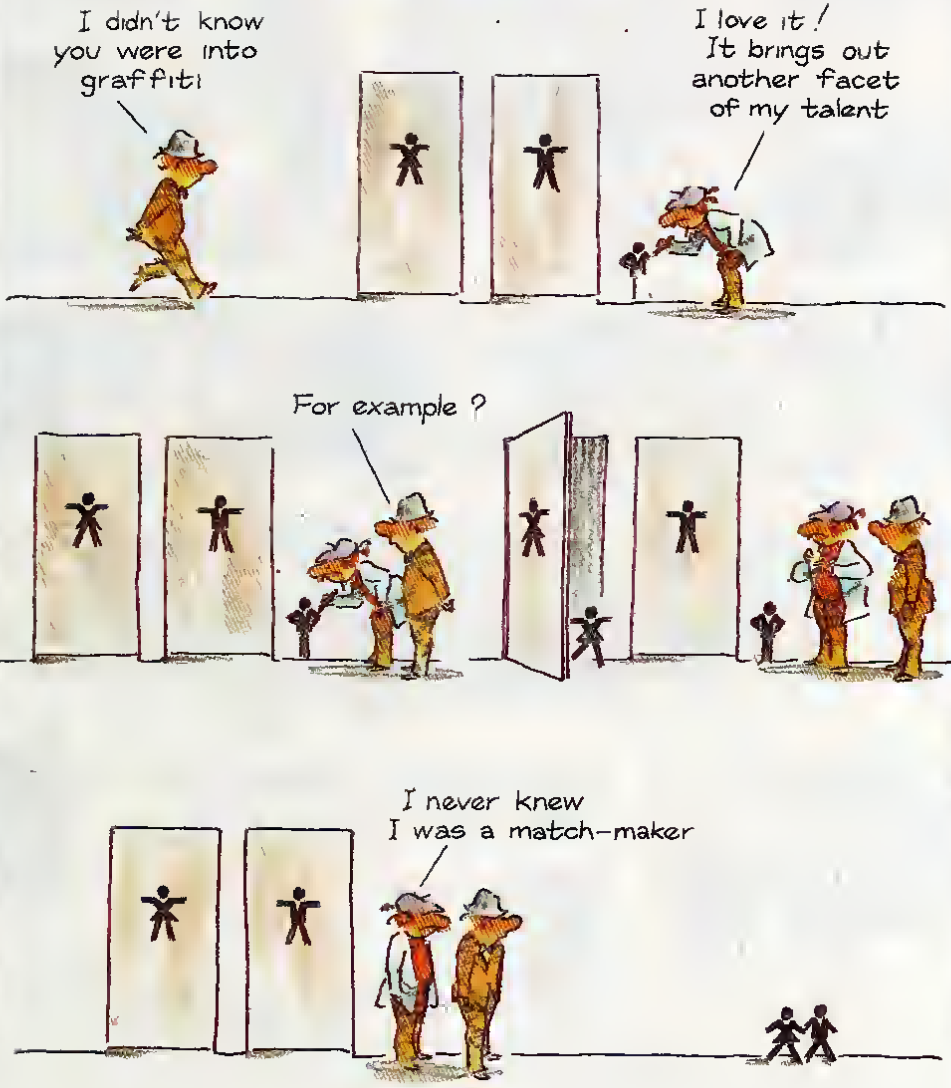
She laughs. "Newsmen aren't such a big deal on this world."

"You mean you don't even have dolls of famous reporters?"

For once, Rachel is speechless. They return to her home, and Rachel lies back down. She is surprised to find the couch

> "She ran downhill to the beach, hair flying behind her like a cape, stethoscope banging against her chest. Next it was up the stairs. She ran into the kitchen, flinging open the door."

The Artist



empty; she expected to see herself dreaming on it

Dr Entropy hangs up the coat redonning her cape and goggles 'It's been long enough, the Boar shouldn't still be watching his kitchen!'

They shake hands, the doctor in her greens, the villainess in her cloak

'If I were you,' Dr Entropy says "I'd help Kent!'

'That's because in your world there are definite heroes and villains

"Sometimes a stranger sees things more clearly!'

'Nice meeting you," says Rachel 'But I need some restful sleep if I'm to survive work tonight.'

Rachel was finding it hard to concentrate She tried to keep her mind on the task of the moment—cleaning and repairing a long jagged thumb laceration—but her thoughts kept returning to her dream and the other world A world of heroes of villains, of excitement and chaos Bill dumped some more sterile saline in the tin 'Thanks.' She sponged it over the laceration Someone was shrieking loudly in a nearby room

'Nice plastics job,' Bill remarked

"Yeah." The compliment didn't seem important tonight She shrugged, the stethoscope draped over her shoulders was starting to feel heavy

"Be much longer?"

No

Good They're stacked up knee-deep in the waiting room, and Raj is talking to Medic Three from Buena Mota They're bringing in a code.'

'Doesn't matter By the time a cardiac arrest could arrive from Buena Mota, miles away up the Coast Highway, resuscitation was an academic exercise

"And that lady in room four? I think she's going to deliver ' A high-pitched scream punctuated his comment 'OBs coming in " He sighed melodramatically "It's chaos tonight Utter chaos!"

Rachel paused, looked up grinned "Chaos! I thrive on it " She wished she had Dr Entropy's chaos gun What would happen if she sprayed the ER with its beam? Somehow she imagined things could only look better Maybe everything would dissolve—patients, staff the old stone building itself Just a pile of rubble springing up beside it, a crystaline garden She went back to the thumb It was slow work but she was determined to do a perfect job Not that it really mattered how pretty the old man's thumb looked—he'd just cut it again on another broken bottle—but the job tonight seemed to demand some pretense of attentiveness She had four stitches to go

"Ahem

Looking up, she found the hospital's young neurosurgeon standing there come straight from surgery He wore a paper cap and booties with his scrubs and a mask still hung from his neck its

tie threatening to catch fire from his cigarette "Thought you'd want to know. Alcoholic you all saw yesterday."

"The one who we poured Valium in, like a sink?"

"Yep. Took him to surgery last night. Evacuated a subdural. Clot was getting pretty large. Probably saved his life." He looked vaguely pleased at their collaborative effort. "Thought you'd like to know."

"Gee, thanks, masked man."

He started to leave, then added, "Saw you and your friend this afternoon. Looked just like you."

"Huh?"

"Wears weird boots and gloves though. Relative?"

Rachel stared at him, eyes wide. He stubbed his cigarette in an emesis basin. "Back to the wars."

She kept staring after him.

After a minute, the patient said, "Doc? Hey, Doc?"

She looked down at him. "Buddy, what's the nature of reality?"

"Ha. You tell me."

She stood, stripping off her gloves. "I think I know a place where it's easier to figure out." Heading for the ambulance entrance, she passed the room where Dr. Raj was asking the woman in labor to please not scream so loudly.

"Hey, Raj," she called. "Finish sewing up my thumb, okay?"

She paused at the nurses' station. "Beep whoever's on second call." Then it was out the door, into the crisp night air. Somewhere far off she heard a siren and some dogs barking. Stars shone above the hills, and she could smell the ocean. What if the chaos ray were large enough to cover an entire town, a county? Gone the tenements, the boring housing tracts, the derelicts, and the sturdy conformists. What silvery artful objects might spring up in their place? She ran downhill, all the way to the beach, hair flying behind her like a cape, stethoscope banging against her chest. Next it was up the stairs, two at a time, and into the apartment. She switched on the light and ran to the kitchen, flinging open the door.

It is dark inside, the dark of deep space with unblinking ruby and emerald stars. There is a vortex of agate, twirling mist, and Dr. Entropy steps from it. Rachel steps forward to meet her.

"You'll need this!" Dr. Entropy hands her a gun belt and holster, then slips out of her cape and drapes it about Rachel's shoulders.

"Thanks!" In turn, Rachel gives over her stethoscope and a slip of paper. They shake hands.

"One thing," Dr. Entropy says. "Don't try to swim in the oceans. They're just painted on."

Rachel nods, stepping into the mist. Dr. Entropy closes the kitchen door behind her, then goes to the phone, dialing the number on the slip of paper. "Hello, Kent? About that hearing..." ∞

INTERVIEW

CONTINUED FROM PAGE 106

grounds. For a fact to be a fact, it has to be reproducible. Miracles, by definition, are not reproducible. So if we were capable of isolating the virus that causes AIDS, it's not surprising that others could do it as well. For a long time Gallo rejected the idea that this was a new virus, completely different from the leukemia-producing virus he'd discovered. He was finally forced to admit that we had something new, not simply a variant of HTLV.

Omni: What was Gallo's contribution?

Montagnier: He found a way to grow the virus in continuous cell cultures. We developed a similar technique at the same time, but our cell lines were less productive than his. Later we found one equally as good, but in the beginning his line was better. This was important for developing a sensitive AIDS blood test. We also owe to him the idea that AIDS was caused by a retrovirus.

Omni: Is it possible that Gallo's cell lines might have become contaminated with your virus, which would explain why he reproduced it so faithfully?

Montagnier: These accusations were once made by the Pasteur Institute. And Gallo himself did not exclude this possibility, although he could argue that he also had an independent isolate from a Haitian patient, different from ours. But let me give you another example. When he was trying to isolate the second AIDS virus, HIV-2, Max Essex at Harvard apparently contaminated his cultures with a virus from monkeys. What he called HTLV-4, using Gallo's terminology, was actually a monkey virus. This happens quite often in labs where scientists usually cultivate their cells in CO_2 incubators. This technique makes it impossible to keep infected cell lines completely isolated. While the gas is entering the incubator, microaerosols of virus could escape. After some bad experiences, I rejected the CO_2 technique for isolating viruses. We use a system of gas-filled bottles that are completely closed to the atmosphere.

Omni: Because of his ability to mass-produce the virus, Robert Gallo has been called the Henry Ford of AIDS research.

Montagnier: Gallo is not someone who has merely perfected other people's discoveries. Many important findings have come from his laboratory, things like interleukin-2, the growth factor that allowed us to isolate the AIDS virus. He generates a lot of creativity. He's not merely Henry Ford, a biological mechanic. Gallo and I have worked together in the past, and we'll probably do so again. The unhappy period that he and I lived through was distorted way out of proportion by the press and by the politics of the disease. There was terrible pressure in the United States for an American to be the first to discover the virus, while France was relatively disinterested. For a year we worked completely on our own, with almost no one understanding the importance of our findings. Gallo didn't believe me at the time, which put him in the enemy camp, but I have many rivals closer to home. In the end, Gallo and I have the same enemies, which makes us allies.

Omni: What was your reaction to the political pressures surrounding AIDS research in the United States?

Montagnier: I was particularly furious that our patent for the blood test was ignored until Gallo's was accepted. Scientists in the U.S. are exposed to high pressure to produce results, and it sometimes warps their sense of ethics. Scientists have even faked their experiments to look like winners, and not only in the U.S. The best way to avoid this is to have several currents of thought and different countries working on the same problems.

Omni: Were you surprised by the nature of American science?

Montagnier: No. I really don't object in the least to the aggressivity of the Americans. I object to the passivity of the French, who met my work with incomprehension and indifference. Thanks to this research, France could be making breakthroughs in biotechnology, but my country is letting the opportunity slip through its fingers. There's a sort of disequilibrium between our scientific abilities and their industrial applications. This, not the pushiness of the Americans, is what frustrates me.

Omni: Have you ever thought of moving to the United States?

Montagnier: I'm not opposed to the idea, but even if I did, I'd remain very French in my sense of measure, logic, and love of good food. I was born in the Loire valley, where people live reasonable, ordered lives. My school was called the Lycée René Descartes, and Descartes himself was born twenty miles away. Because of this Cartesian influence, the French are endowed with good sense. Alas, the U.S. is not very Cartesian.

People think the Pasteur Institute is rich and that I, its incarnation, must also be endowed with all the funds and equipment I want. This is not the case, and if the situation ever became impossible in France, I wouldn't hesitate to move. I want to keep working! I know what has to be done to conquer AIDS. I'm not doing this for personal gain. If it were only money I was after, I could exploit my renown and live off the fame of my past research. Quite the contrary. I live a hard life, with no vacations, short nights, and long days that are filled with thousands of things I don't have to do but I feel I should do. If I can do my work in France, I'll stay here. Otherwise I'll go elsewhere. I'm too young to be embalmed under glass.

Omni: Were you pleased with the agreement that you and Gallo signed in 1987?

Montagnier: Yes. I thought from the start

there had to be a compromise No one should be made to look as if he were losing face The only solution was to split the royalty money fifty-fifty and establish a foundation for spending it I was probably happier about the settlement than Gallo, because it was my idea Many people thought I could have done better but I don't think so The affair caused a lot of ill will, and AIDS is too important for the problem to have remained unsolved It was giving certain scientists—and science itself—a bad name Not to have fought would have created a bad precedent, signaling that one can get away with anything in science which isn't true

Omni: Are you under a gag order that prevents you from talking about the details of the accord?

Montagnier: It's not exactly a gag order, although it's stated in the agreement that no one will reopen the scientific argument. There were actually two agreements a legal accord between the American government and the Pasteur Institute, and a scientific accord between Gallo and me, which was published in *Nature* The scientific agreement took a lot of work and we finished the task only a few days after [President] Reagan and [Prime Minister Jacques] Chirac announced the legal settlement I flew to Frankfurt and met Gallo at the Intercontinental Hotel on his fiftieth birthday I took him a bottle of cognac, but Gallo said he wouldn't drink it until we were finished We worked right up to the last minute before I left to catch my plane So I never did get a drink of that cognac

Now Gallo and I are getting along well We respect each other This often happens to people who've fought a lot They finish with a better understanding of each other Gallo and I were friends to begin with, and we've ended by being friends again I bear no grudge against him My rancor is reserved for the people who are still trying to get in the way of my research I have a reputation for being an imperialist, an expansionist, because I ask for a lot of money But this is what it takes to do research on AIDS AIDS is not an affair that's going to last fifty years It's going to be settled in ten years, and if you want to put the package together you can't drag your feet

Omni: Do you deserve a Nobel prize for discovering the AIDS virus?

Montagnier: It's not for me to say The Nobel committee might want to give the prize to the discoverer of the vaccine, although it was the discovery of the virus itself that allowed for its detection in blood and the development of public health measures that can limit the epidemic even without a vaccine The contribution of the American team is also important so I doubt the prize will go to only one of the virus's codiscoverers If someone develops a miracle drug against AIDS that, too, would merit a Nobel prize It has already been five years since the virus was discovered AIDS is a terrible malady and I don't want to suggest that scientists are reaping their honors at other people's expense I haven't changed because of my notoriety, but there's tremendous pressure from the media and the public who think of us as a cross between magicians and movie stars

Omni: Tell me about the research program you've recently launched

Montagnier: This year, for the first time, we're getting substantial money from the European community But research on AIDS involves more than conquering the disease Many industrial spinoffs will fall to pharmaceutical companies and biotechnology firms Cetus, a San Francisco firm, has developed a machine that allows us to multiply a cell's DNA thousands of times over The technique, called gene amplification, is crucial for a virus like AIDS, which can lie hidden in the lymphocytes and macrophages [immune cells that engulf invaders], unexpressed and undetected The only way to reveal its presence is to find the DNA of the virus But gene amplification is not only important for AIDS, it will be useful for detecting all sorts of genetic maladies Cetus could sell thousands of machines and make a fortune from its invention

"I'm addicted to getting results out of my laboratory. Last week everyone was away at a conference, and I got very nervous—like a junkie suffering from withdrawal."

Omni: What's the AIDS virus's origin?

Montagnier: Man had his origins in Africa, so it's natural that a virus associated with him should also have originated in Africa The prototype virus has probably been in man for a long time We know this from looking at its evolution in different species of monkeys There is a virus of green monkeys, a virus of mangabeys, a virus of baboons and mandrills But all these viruses have the same basic properties as the human virus They recognize [lock-and-key style] the same sequences on the [immune system's] T4 white blood cells The AIDS virus may be as old as the evolution of primates, because the viruses diverged with the different species themselves

Although Africa is the likely source of AIDS, one could debate the point for hours First you have to disassociate the virus from the epidemic The epidemic is undoubtedly new But is the virus old in humans, or did it develop after a passage from monkeys to humans?

One could imagine a scenario in which the virus lay hidden for generations behind other diseases that killed people at a relatively young age If so, what explains its sudden emergence in Africa and America? If AIDS is of African origin, why didn't it come to Europe before the U.S.? Historically we've been much more closely linked to Africa There was the American slave trade, but apparently the slaves—at least those surviving the crossing—didn't have AIDS The virus seems to have come to Europe from the U.S. It might even have reached Africa via the same route There are other hypotheses concerning the origin of AIDS such as "the American hypothesis." The traffic in blood might have caused the epidemic An isolated population in South America could have been the focus of a natural infection that was amplified by the sale of blood products to the U.S.

Omni: Why do you think the virus is old?

Montagnier: We're boarding a train that's already in motion New species aren't being created We're seeing the old ones evolve The AIDS virus's complexity shows that it has undergone an arduous process of selection With nine genes, it's the most complex retrovirus known to man [Retroviruses have three basic genes HIV has at least six more regulatory genes.]

We find the virus now in many species of monkeys—a whole family of viruses But it seems to have reached a state of biological equilibrium that keeps it from being pathogenic in mammals in the wild It's hard to know for sure, since a monkey can die with no one seeing it, but the virus appears not to be lethal for green monkeys and mangabeys

It's not the virus that has changed its basic configuration over the years but the behavior of its host The conditions of civilization have created the epidemic Of this I'm absolutely convinced We're a civilization of blood of blood transfusions This practice has existed for only a little over half a century, and then came the so-called sexual revolution We've created one world environment for our germs The globalization of culture has globalized our parasites You could say that AIDS is a disease of the Boeing 747 The big jets are its vector, and without them there would be no AIDS epidemic

Omni: Do you think that monkeys passed the virus to humans?

Montagnier: This seems to be the case with the second AIDS virus, HIV-2, whose epicenter lies in West Africa That human AIDS comes from two different viruses is abnormal HIV-2 so closely resembles one monkey virus that it could have been passed accidentally from monkeys to humans But no one has found a monkey virus resembling HIV-1, with the excep-

tion of one study that seems to have found it in two chimpanzees. Green monkeys are innocent of giving AIDS to humans. This might be true of all monkeys, at least for HIV-1. Green monkeys are also innocent of giving us HIV-2, although other species, such as the macaque and the mangabey, might be implicated.

Omni: So where does HIV-1 come from?

Montagnier: Man. It's a classical notion in virology that a change in species makes a virus pathogenic. This is also true of viruses that move into a different population of the same species. Perhaps an ancient strain of AIDS, tolerated by an isolated African or American population, later escaped from this state of biological equilibrium to infect the world at large. A study supports this theory. In some villages of eastern Zaire, where the disease is pandemic, the percentage of people seropositive, or testing positive for AIDS antibodies, hasn't changed in ten years.

Omni: Why in the United States did the virus first attack homosexual men?

Montagnier: The AIDS virus plays the role of a lion hunting a troop of gazelles. It will bring down only the weakest among them. Likewise the virus will kill children and adults with immune systems less strong than the others. The immune system of homosexuals is already depressed. The virus searches for favorable terrain in which to establish itself. It creates an epidemic in territory already prepared by the cofactors that homosexuality generates. Not only the establishment of the virus but also its transmission is aided by these cofactors.

Whether in the developed world or in Africa, AIDS is a disease of the big cities. City living has created the kind of promiscuity that allows for the virus to spread. Other cofactors are generated by city living. Environmental pollution can also depress the immune system. The fact that someone becomes seropositive for AIDS might itself be associated with cofactors. It's not easy to become seropositive. Recent discoveries have shown that the virus can exist in a latent state, unexpressed until it eventually breaks through our immune defenses. One can be infected without showing any signs of antibodies, which means more people have the AIDS virus, in its latent form, than the official statistics indicate.

Omni: Have you been to Africa?

Montagnier: I've visited the Pasteur Institute in the Central African Republic, one of the poorest countries in Africa, and Tanzania. My limited experience in Africa has already taught me a lot. Sexual promiscuity is high, especially among the young. Everything needed for transmitting AIDS is found in an African hospital, where conditions are unimaginable.

Omni: Why is AIDS transmitted heterosexually in Africa?

Montagnier: Other cofactors are at work, including frequent genital ulceration and infections of women. Also female circumcision, clitoridectomy, favors infection by the virus and its transmission.

Omni: What are the differences between the two AIDS viruses?

Montagnier: HIV-2 is found in the old Portuguese colonies of Africa. The virus seems to have originated in Guinea Bissau and spread to the Cape Verde islands. We first isolated HIV-2 from African patients dying of AIDS in a Lisbon hospital. So it was clear from the start that HIV-2 caused a disease as fatal as HIV-1. The two viruses provoke the same neurological disorders. But there's tremendous variability within each group of viruses, differences both in genetic variability and in their pathogenicity [killing power]. Certain strains of each are more virulent than others.

Omni: How do you define a virus?

Montagnier: It's a parasite that can't exist without a cell. You might compare it to the cassette in your tape recorder. Without a machine to play it back, the virus is useless. Viruses are biological objects, but they're not living objects. All the genes in a cell are integrated into the proper functioning of that cell. But there is always the danger that a gene could escape from this integration and replicate itself rather than the DNA of the cell. This fragment wants to protect itself from dying, so it surrounds itself with a few supplementary genes [within the virus] and the protective proteins. These let it be inserted back into the machine that's going to read it. This is a virus.

"The globalization of culture has globalized our parasites. AIDS is a disease of the Boeing 747. The big jets are its vector, and without them there would be no AIDS epidemic."

Omni: What distinguishes the AIDS retrovirus from other viruses?

Montagnier: Retroviruses are probably ancient genes that have broken away from the cell. They're primitive molecules trying to return home. Home in this case is the DNA of the chromosomes. While other viruses have developed a more independent existence, retroviruses have preserved the memory of their origins. A lot of retroviruses cause cancer in animals, and I suspected they might also cause cancer in humans. I thought I'd discovered one, a retrovirus that produces breast cancer, when my research was interrupted to begin working on AIDS.

Omni: Why do you describe the AIDS virus as intelligent?

Montagnier: It has a tremendous capacity for genetic variation. It plays roulette all the time, and it keeps only the good numbers. All retroviruses are highly variable because their enzymes have an intrinsic capacity to make lots of mistakes. But what's surprising about the AIDS virus is its ability to fully exploit this capacity. It leads a double life. Part of the time it has a vegetative, larval existence, like a cat that sleeps all the time—and when a virus sleeps, it doesn't mutate. But it also has a nocturnal life, when it wakes up and starts changing itself to resist the immune system.

The AIDS virus might have been vegetating for thousands and thousands of years until it found the civilization that spurred it into action. It's not impossible that social conditions analogous to our own provoked AIDS epidemics in the past. Promiscuous civilizations, with a lot of sexual contacts and changing of partners, could have ended in epidemics that killed a good part of the population. This could explain why all the world's great religions prohibit adultery. If I were a devil creating a malicious virus to be introduced that would cause the most problems possible for the human race, the virus I'd create would be AIDS. Knowing man's capacity for making vaccines, this is the virus that has found the Achilles' heel of our immune system.

Omni: Can the AIDS virus be transmitted vertically in the genes that parents pass on to their children?

Montagnier: So far there's no evidence that the disease can be transmitted genetically among humans. But Michael Martin and colleagues at the NIH [National Institutes of Health] have done a remarkable experiment showing that AIDS can be passed transgenetically among mice. After genes of the virus are introduced into the ovum, all cells derived from this egg are infected. The baby mice have the AIDS virus throughout their bodies, and they die within thirty days. The virus normally seeks out two targets: macrophages and lymphocytes. The mice die of an infection in macrophages.

Omni: Why is it that macrophages have become a hot topic in AIDS research only recently?

Montagnier: It's in part the fault of my laboratory. I'm afraid. AIDS is essentially a disease of lymphocytes. So that's naturally where we began looking for it. When you separate lymphocytes from macrophages, it's easy to lose the latter. We knew how to culture lymphocytes, but only two or three years ago did we learn how to culture the virus in macrophages. Gallo's lab deserves credit for this discovery. That the virus develops in macrophages is crucial to explaining the neurological symptoms of AIDS [macrophages operate in the brain]. Infected

macrophages secrete substances that poison the immune system. Lymphocytes die immediately after they're infected; infected macrophages continue working as the reservoir of the virus.

Omni: The AIDS virus mutates so fast that doctors report cases of people dying from a different strain than the one that originally infected them.

Montagnier: Because the polymerase [an enzyme] of the AIDS virus makes ten thousand times more errors than a normal cell, it has ten thousand times the possible number of mutations. The tropism [attraction] of the virus for the macrophages might depend on one specific mutation. You must also realize that someone with AIDS is infected not with one virus but a mélange of different viruses—a virus soup with all of them helping one another out. This is a very dangerous situation because it can evolve in whatever direction it wants. For this reason I describe the virus as "intelligent". It "knows" the need for genetic diversity in assuring its survival.

Omni: Does this chameleonlike quality of the virus make it impossible to find a vaccine against AIDS?

Montagnier: We're changing our ideas about what's required for developing a vaccine. Initially we thought it could be made from the protein envelope of the virus, which varies the most. We also wanted to keep in mind the virus's highly selective attraction for T4 lymphocyte cells, a tropism that's probably relatively stable. But antibodies made against the envelope don't offer sufficient protection.

We're now looking at proteins inside the virus to introduce what we call cellular immunity. We have fewer paths to follow but one of them might be good. It's a gamble, but the discovery of a vaccine isn't essential to ending the epidemic. If the AIDS epidemic has its origins in the nature of our civilization, one can halt the epidemic by modifying this civilization through public health measures and education. Admittedly, this is a slow process that could take a lot longer than developing a vaccine. These changes can't be forced on us, as they were in the past, by social taboos and religion. There's no going backward. But people have begun to redefine the idea of love, and this could be quite fruitful.

Omni: What do you think of Daniel Zagury at Pierre and Marie Curie University, who's currently testing an AIDS vaccine on himself and fifty volunteers in Zaire?

Montagnier: I could make a joke about chimpanzees being rarer than humans. Zagury has had interesting results on himself, but he's well aware that he still doesn't have a vaccine. He wouldn't dare inject himself with the virus to prove that he's immune. The bad news is that no level of immunity you induce in an animal is sufficient to protect it from the disease. The same is true of human beings. But maybe our test conditions are too severe. We inject the virus directly into the blood, but the natural route for transmission is sexual, where the doses are much weaker. We could find a vaccine that suffices for this kind of transmission, but it's going to be hard to prove it works.

Omni: Would you ever inoculate yourself with an experimental drug?

Montagnier: Without a doubt. I often give blood in the laboratory. Knowing that the risks were minimal, if I had to inject myself with something, I wouldn't hesitate to experiment on myself.

Omni: Do you treat AIDS patients?

Montagnier: I sometimes visit AIDS patients in Pasteur Hospital if we're running tests on them. People in the final stages of the disease resemble terminal cancer patients. Our progress in treating AIDS-opportunistic infections has led to our seeing a lot more people dying of the AIDS virus itself. It's agonizing to see someone wither away to a skeleton, and it pushes me to work harder on experimental treatments. I have no choice but to try everything possible. People have put their confidence in me. It might be misplaced, but they're waiting for me to do something.

"If I were a devil creating a malicious virus to cause the most problems for the human race, the virus would be AIDS. The virus has found the Achilles' heel of the immune system."

Omni: The Centers for Disease Control [CDC] predict that AIDS has a fatality rate of nearly one hundred percent.

Montagnier: AIDS does not inevitably lead to death, especially if you suppress the cofactors that support the disease. It's very important to tell this to people who are infected. Psychological factors are critical in supporting immune function. If you suppress this psychological support by telling someone he's condemned to die, your words alone will have condemned him. It simply isn't true that the virus is one hundred percent fatal. If you lead a normal life—sleep regularly at night, avoid alcohol, coffee and tobacco—your immune system could perhaps resist the disease for ten or fifteen years. By then we might have found an effective therapy. Furthermore, the CDC statistics are biased. They're based on a single homosexual population [San Francisco], with a lot of cofactors aiding the disease. The same thing may be true of young men and women now being infected. AIDS is not only a disease of the big city; it's also a disease that strikes a certain sector of the population—journalists, television personalities, artists, singers, actors, people who lead a certain kind of life. And this is no accident.

Omni: Were you ever warned against working on AIDS for fear of jeopardizing the reputation of the Pasteur Institute?

Montagnier: This didn't stop me for a second. I began working on AIDS because an affiliate of the Pasteur Institute was manufacturing an antihepatitis B vaccine from human plasma, and the scientific director wanted to know if his blood supply could be contaminated. Guaranteeing the safety of our vaccines got me interested in the problem. When it became known what I was working on, people at the institute began to talk. 'What's Montagnier doing looking at a disease of homosexuals and other marginal people? This is bad for fund-raising.' I was discouraged and demoralized by this reaction, but it didn't stop my going ahead, because I found the research itself exciting. I'm not a homosexual, and it was irrelevant to me whether I was researching a disease of homosexuals, drug addicts, Hindus, or whatever. Many scientists have an irrational fear of AIDS. The Pasteur Institute recently built some new laboratories, and they didn't give me one. I suspect this is because the other scientists were afraid of having the virus inside their building.

Omni: What are the differences between the U.S. and France in handling AIDS?

Montagnier: AIDS is an enormous problem in the U.S., where it's the number one public health issue. This is not yet true in France, even if it is the European country with the most cases. The French are a Latin people who take their sexuality lightly. No one dies of sex, it's just not possible. Everyone assumes that if the Pasteur Institute is working on the problem, it will be solved in short order.

Omni: Albert Camus said that plagues and wars always take people by surprise. Were you surprised by AIDS?

Montagnier: I would have to say yes. But epidemiologists have known for a long time that we're vulnerable to new epidemics. The same civilization that created the AIDS epidemic could create others, with infectious agents even more virulent. We haven't exhausted all the germs in our tissue capable of being transmitted by sexual relations. The greatest danger lies in nonconventional viruses that produce no immune reaction. They resist sterilization and all known drugs. Our civilization is in the process of selecting the successful germs of the future—those capable of escaping detection by the immune system. We already know that some brain diseases are caused by such agents. If any time remains for me after AIDS, this is what I hope to work on next. ∞

HOW TO HAVE A MYSTICAL EXPERIENCE

ARTICLE BY KEITH HARARY

TAKE A STEP OUT OF THE ORDINARY AND SHIFT INTO MYSTIC GEAR WITH THESE TWELVE MIND-EXPANDING EXERCISES FOR THE COMING YEAR

ILLUSTRATIONS BY STEVE HANKS

Mystical experiences are not necessarily extraordinary events that happen only to extraordinary people such as dedicated meditators or peyote eaters. You may deliberately induce a mystical state by paying attention to subtle feelings and ideas lying just beneath the layers of everyday awareness. That is what mystics and gurus have been telling people for thousands of years. Quite simply, begin to notice—in a nonjudgmental way—how you talk about your life, rationalize your behavior, explain the world around you. By shifting your awareness from mundane concerns and temporarily suspending your "belief systems," you may be more ready to experience life from the vantage point of the sage. You may even feel connected to something greater than yourself. Your rigid concept of time will probably dissolve into a sense of timelessness, blurring the distinctions between past, present, and future.

To achieve a subtle shift in perspective and induce a mystical experience without dramatically altering your way of life, you may find it helpful to practice the following exercises. Proceed at your own pace, practice when you're sober, feel emotionally relaxed, and at a time when you won't be interrupted. Warning: Because these exercises are designed to challenge the sense you have of yourself and of reality, we recommend that you check with your doctor if you feel uncertain about your ability to handle them. If you have a history of psychiatric problems, consult your therapist or psychiatrist. You may terminate any exercise whenever you like and complete it later. Even though these exercises are intended to be practiced alone, you may adapt them for small groups. Some exercises are designed to be practiced during the holiday season, a time when you usually feel more open to other people and more willing to look at your life from a new point of view. At the end of these exercises, the late mythologist Joseph Campbell talks about the impoverishment of living without a connection to the mystical realm.

EXERCISE 1 IMAGINE

Objective: To understand who you've become (your identity) by pretending your memories are merely a product of your imagination. To ask yourself: Is there a more basic and immutable part of my identity beneath the superficial roles I assume? Is there some aspect of my life—a particular experience or another person—that is impossible to imagine as an illusion?

Setting: Choose a place where you're completely alone for a couple of hours. (You also may practice this exercise if you're alone among a group of strangers—on an airplane or in a movie theater.)

INSTRUCTIONS

1. Sit in a comfortable chair, close your eyes, and take a deep breath. As you continue to breathe slowly, let your life pass before you: childhood events, adolescent experiences, major life accomplishments or mistakes, memories of family members and friends. Don't become analytical about past relationships or get stuck on particular experiences. Just let your impressions come and go. How does it feel to be the person you've become?

2. Take another deep breath. As you exhale, concentrate on how alone you are at this moment. Pay attention to your physical environment and your body's sensations. Continue to breathe slowly.

3. Now imagine that your present situation and immediate surroundings represent the whole of reality.

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Everything you remember about the world and your life, the people and events in it, is imaginary. In fact you've just come into existence in the past few moments. If you are surrounded by strangers imagine that they are also experiencing their lives as an illusion.

Benefits: With regular practice you may begin to experience everyday reality in a different way—not as boring, habitual, or conflicted. You may feel freer to consider more satisfying careers, start creative projects, or ask potentially threatening questions like, What do I want out of life? Ask yourself who you might be if all you remember about your life is an illusion.

you first visited this place as a child. Let go of your adult perspective. Concentrate on your worldview as a child. What questions were important to you at that time? Maybe you felt misunderstood and secretly wished for a wise grown-up friend to answer your questions.

2. Focus on your childhood feelings until you identify feelings you had as a child that you've continued to experience as an adult.

3. Now imagine that time does not exist and that you can communicate directly with your childhood self. Exchange viewpoints with each other. As the adult share with the child what the adult now knows about life as the child tell the adult about the child's aspirations, desires, and goals—things the adult may have forgotten.

4. Complete this exercise by giving a present to the child. Ask the child what he or she would like—a toy or a trip to the zoo or an amusement park.

Benefits: The child's insights may help soften the hardened or jaded parts of your adult personality. The adult point of view may help resolve conflicted childhood feelings. You also may experience sensations of timelessness, as though you somehow exist simultaneously as a child and an adult. Some of the distinction between past and present may begin dissolving.

> THE CHILD'S INSIGHTS MAY HELP SOFTEN THE JADED PARTS OF YOUR ADULT PERSONALITY. THE ADULT MAY BE ABLE TO SOOTHE THE CHILD'S PAIN.

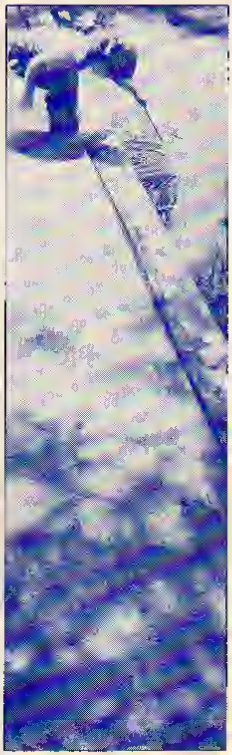
EXERCISE 2 THE GHOST OF CHRISTMAS PAST

Objective: To transcend the restrictions imposed by our limited concept of time and to communicate with the child you once were.

Setting: Choose a spot that was important to you as a child during the holiday season—a church, an attic room, or possibly the home of a favorite relative.

INSTRUCTIONS

1. Take a few moments to remember how you felt when



EXERCISE 3 BACK TO THE FUTURE

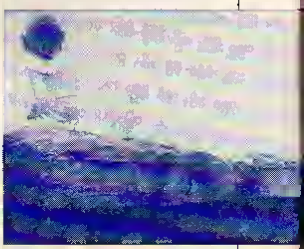
Objective: To transcend the restrictions imposed by our limited concept of time and connect with whom you'll become in the future.

Setting: Return to the location you chose to practice Exercise 2. For this exercise, however, you must contract with yourself to go back to this place at some point in the future. The exact date may be left open, or you may want to specify a particular time, say, on New Year's Eve in five years. You may use this spot anytime as psychologically sacred ground, a place to reflect on your present life from the vantage point of the future.

INSTRUCTIONS

1. Take a few moments to think about your current problems. Are you dissatisfied with your job? Unhappy in a relationship? Afraid to try something new? Don't analyze your problems—just let them float by you.

2. Now imagine you're at this spot in the future, reviewing your present concerns with the experience you've gained in the intervening years. Ask your future self to talk to you about your current problems.



Benefits: If you feel frustrated about your present situation, the insights you receive from your future self may help alleviate some of your tension or unhappiness, you will be less likely to feel stuck because you're willing to look at your life from a future perspective. You also may experience sensations of timelessness, which may begin to loosen your rigid concept of time.

EXERCISE 4 SILENT NIGHTS

Objective To spend a weekend in silence.

Setting Stay at home, go camping, or rent a cabin near a lake or forest—far away from civilization. If you choose to remain at home, don't watch television or listen to the radio.

INSTRUCTIONS

1. Set aside an entire weekend, preferably during the holiday season, to be silent. Don't talk to anyone.

2. To avoid embarrassing situations, explain your plans to a friend and ask your confidant to be your interpreter.

3. If you remain at home and need to go out, don't cross the street to avoid meeting a friend. If necessary, your interpreter will explain what is happening. Don't use a pen and paper to write messages.

Benefits Self-imposed silence will allow you to feel both the joys and restrictions of verbal communication. You'll probably experience a flood of emotions varying from frustration to euphoria because you will be completely alone with your thoughts and feelings. Notice the way people respond to you when they realize you "cannot" talk.

EXERCISE 5 PERCHANCE TO DREAM

Objective To induce a mystical experience by depriving yourself of sleep. (Warning: You must be stable both physically and psychologically to practice this exercise. If you have any reservations, check with your doctor.)

Setting Home.

INSTRUCTIONS

1. Remain awake for at least 24 hours. To conserve your energy, don't engage in strenuous physical activity.

2. Use the time when you would be asleep to write letters or Christmas cards or to prepare new dishes for holiday meals. If you choose activities you enjoy, your attention will be diverted from thinking about the sleep you are missing.

3. After a couple of hours, find a comfortable place to sit and look directly at an illuminated watch or clock that has a second hand. Dim the lights and then watch the clock for a while.

4. Take a deep breath and think of a significant event that you're really looking forward to. Estimate the number of days before the event happens. Then count the hours, minutes, and seconds before this event occurs. Take another deep breath. Watch the second hand sweep around the clock—seconds quickly add up to minutes, and the minutes add up to hours.

Benefits Sleep deprivation often induces a sense of intense objectivity, as though you were observing your experiences from a distance. When you see yourself in such a way, you may feel free to question your identity or the roles you play in a nonthreatening manner.

Sleep deprivation also may induce déjà vu experiences in which unfamiliar situations seem oddly familiar. But there's no rational explanation for your feelings. If you experience deja vu during sleep deprivation, don't try to figure out why the experience seems familiar. Imagine that you've really been 'here' at another time. Indulge yourself in the fantasy and see what happens.

When you watch time in the way you have done in this exercise, you may begin to appreciate its subjective quality and realize that our perception of time is largely based on cultural traditions. As the hours pass, your sense of time may begin to change. Your internal focus of attention affects your subjective experience of time.

EXERCISE 6 GRAND CENTRAL

Objective To understand the ways in which you are simultaneously radically different from and very similar to other people.

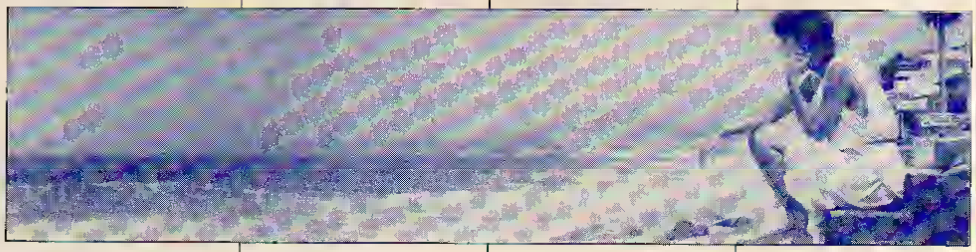
Setting Pick a crowded location such as a busy airport, bus terminal, or train station. Spend a day sitting in one place observing people come and go during the holiday season. If you don't have the time or patience to sit for a day, try to spend a couple of hours watching the crowds pass by.

INSTRUCTIONS

1. Notice the stationary objects in your environment—benches, vending machines, newsstands, restaurants, coffeehouses.

2. Watch the moving crowd and the coming and going of buses, trains, airplanes, taxicabs. After an hour you'll probably begin to notice patterns of motion and activity that at first seemed to move in a random way.

3. As you watch the people, consider the possibility that no one around you perceives reality in the exact same way. Pick out a stranger and compare your reality to his reality. Don't dwell on the superficial differences between you such



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as physical appearance, racial identity, and cultural background, but consider how differently the two of you perceive the world. Your belief—I share the same reality with this stranger—may be an illusion. Ask yourself, for example, if you have any way of knowing if the two of you perceive the color red the same way.

4. Relax, take a deep breath, and turn your attention back to your general surroundings. Now consider what you have in common with the people you're watching. You're all alive during this moment in human history; your lives have crossed paths even if at a comfortable distance.

Benefits: It takes only an unexpected shift in circumstances—a terrorist attack, an earthquake, a fire—to tighten the loose connections that bind you to the people around you. In such circumstances many individual differences can quickly disappear, and people see what they have in common with one another. But you do not have to share a traumatic experience to induce a sense of camaraderie. Picture yourself and the strangers you're watching as a single group, one entity moving without individual perceptions. You probably will feel closer to the people around you. At the same time, when you consider the possibility that your perception of reality is unique, you may get a dramatic clue to your own identity. Ask yourself: *If I'm alone in the way I perceive reality, what do my perceptions tell me about who I am?* Repeat this question to yourself until its meaning sinks in.

EXERCISE 7
SINGULAR SENSATION

Objective: To experience all of reality as unified and not as a collection of disparate objects.

Setting: Choose any ordinary surrounding—your favorite chair at home, a park bench, a beach. Make sure you feel relaxed.

INSTRUCTIONS

1. Focus on some common object in your immediate environment, such as a candy dish, a seashell, a leaf. Make certain that the object is close to you.

2. Take a deep breath and concentrate on the object until it's all you see or think about. As you exhale, consider the fact that a candy dish, for example, is just a receptacle. Depending on its function, it could be an incense burner or an ashtray.

3. Imagine what its structure might be like on the molecular or quantum level. If you and the object are composed of the same basic particles, perhaps you are not as different from the object as you imagined.

Benefits: Mystics claim that all reality is unified. It might be helpful to experience reality, if only for a few fleeting moments, from this alternate perspective.

EXERCISE 8
THE DAILY NEWS

Objective: To achieve a sense of identity with the rest of humanity.

Setting: Living room.

INSTRUCTIONS

1. Spend at least two weeks avoiding contact with television news, newspapers, or magazines. Even though you will hear bits of news or see an occasional headline, you probably will begin to feel disconnected from events in the world.

2. After two weeks, choose an evening to watch the 11 PM news. Turn off all the lights. Sit far enough away from the TV so you maintain a sense of distance and objectivity. Turn off the sound on the television. Your goal: to concentrate on the images, not on the commentators' interpretations.

3. Watch the facial expressions of the male and female anchors who report the day's events. Are their facial expressions appropriate in light of the images they present? Do they smile as they introduce stories accompanied by violent images or tragic scenes? How much of the news is upbeat? How much is an accounting of the day's misfortunes around the world? Pay particular attention to the sequence of news stories and to the commercials that are interspersed between the various reports.

4. Continue this exercise on a nightly basis for about ten days, sitting in the dark, watching the news with the sound turned off. You may interrupt your periods of silent observation with additional news blackouts to help

you maintain objectivity and a sense of distance

Benefits Ask yourself how your view of the world and your understanding of human nature are influenced by regular exposure to these images Don't judge the motives of the reporters but imagine you're an alien from another planet observing human behavior for the first time What are you learning?

4 If you feel comfortable merging with a domestic animal, then try to merge with an animal at the zoo

Benefits As the boundaries between you and the animal dissolve, you may feel as if you've really traded places with a member of another species, as though a part of you has become the animal—this is the height of subjective merging You may

YOU MAY FEEL AS IF YOU'VE REALLY TRADED PLACES WITH A MEMBER OF ANOTHER SPECIES—AS THOUGH SOME PART OF YOU HAS BECOME THE ANIMAL

EXERCISE 9 TRADING PLACES

Objective To trade places mentally with a dog, cat canary, or animal in the zoo

Setting Home or the zoo

INSTRUCTIONS

1 Relax and sit in front of the animal so that you can easily look into each other's eyes Make sure the animal feels secure with you

2 Take a deep breath As you slowly exhale look into the animal's eyes and imagine that a part of your awareness is being transmitted through your breath into the animal's mind Watch the animal breathe and imagine that a part of its awareness is being transmitted into your mind

3 Continue looking directly into the animal's eyes until you can feel your consciousness merge with the animal's consciousness

begin to feel more compassion for other species You'll also probably recognize some of the artificial differences between the human and animal worlds

EXERCISE 10 BIG SKY

Objective To help you reflect on your past year and prepare for the year to come

Setting Find a comfortable spot where you can see the sky on New Year's Eve (If you are not familiar with the constellations familiarize yourself with the night sky, see page 144)

INSTRUCTIONS

1 At midnight relax and look up at the constellations Remember that people have viewed these same constellations for millions of years and that these same constellations will be visible long after you have died Consider that people around the world can watch the same star patterns

2 As you watch the sky review your past year, and imagine what the new year will be like

3 Continue to watch the constellations and think about some distant place you would like to visit Ask yourself how these same constellations would look

above that location Imagine that you're already there in that place, looking up at the same pattern of stars Now you're back home, looking at those stars Continue drifting back and forth between locales until you're in both locations at the same time

Benefits The grandeur and immensity of the night sky will probably induce a sense of wonder at the world and a serene acceptance of your place in it, a prerequisite for any positive changes you may want to make in your life As you travel back and forth between locales, the limitations of space and time seem less important You may look ahead ten years without worrying about whether you'll be satisfied with your life—you've already begun to accept your past and what that makes you. You're now open to influencing your future in a positive way

EXERCISE 11 A ROOM WITH A VIEW

Objective To induce a sense of objectivity about your life and a feeling of connectedness to the rest of the cosmos

Setting A quiet, dark, and secluded spot from which you can clearly observe the constellations

INSTRUCTIONS

1 Stand with your head turned slightly upward, your legs slightly apart, and your hands at your sides. Take a deep breath and concentrate on a particular star in your favorite constellation.

2 Imagine the star as a point of consciousness in space, as though the center of your forehead and the star were connected by invisible lines of force.

3 When you feel connected to the star, imagine that you are a constellation composed of individual stars located at different points all over your body.

4 Take another deep breath, and as you exhale, imagine that your body is dissolving Only the stars marking out your overall shape remain

5 As you continue slowly inhaling and exhaling, imagine that the stars marking out your shape mirror the posi-

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tions of the stars in the constellation you are viewing—as if the constellation is a reflection of yourself. With a little more imagination, you may become a reflection of the constellation. Alternately, imagine that you're on Earth looking up at the constellation and that you're in space looking back at Earth.

Benefits. By developing the ability to let go of your physical form and look back at your life on Earth, you may begin to look at your life from an objective distance, reducing stress and gaining insights into your place in the universe. Seen from space, your life may seem insignificant in relation to the rest of the cosmos, but remember: You're connected to some larger reality, represented by the constellation. Everyday experience then may seem to take on much greater significant to you.

EXERCISE 12
URBAN RENEWAL

Objective. To experience the relationship between your personal life and the lives of people in the past and the future.

Setting. The demolition site of a condemned building, followed by the site of a building under construction.

INSTRUCTIONS

1. Position yourself at a safe distance from the demolition site and observe the building as it is being slowly torn down.

2. Imagine how permanent the building must have seemed to the people who once lived there. Pay attention to the relationship between the different floors and rooms. Don't they seem close to one another once the outer walls are gone? Think about all the people who have lived in the building, their worldviews, occupations, even the activities and conversations carried on in the building.

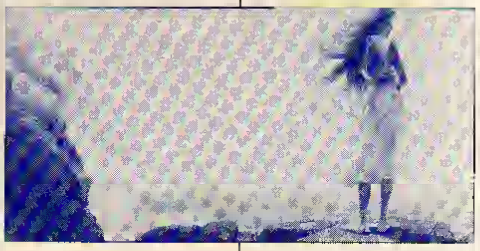
3. Go immediately to visit the site of a building that is currently under construction. Consider that the workers are not merely constructing another structure but are creating a reality for those who will live or work in the new building. Who will live here? What will they say to one another?

4. Make an agreement with yourself to explore the interior of the new building once it is completed. When you explore the finished building, imagine that you really are leaving a mental trace of your own experiences there for future generations to think about.

Benefits. By experiencing some of the ways in which even the most seemingly constant aspects of your environment may be only a temporary part of a particular time in history, you may feel less confined by your assumptions about everyday reality or the immediate worldviews of those around you. By realizing that nothing is permanent, you may also be more willing to risk making positive changes in your life.

ROAD TO SOMEWHERE

These exercises are like seeds you plant and eagerly wait to sprout. Some of these exercises may not affect you; others probably will. There is no guarantee you will have a mystical experience. But if you practice them, you probably will become aware of feelings, thoughts, and questions about your place in the universe—the subtle stuff we daily ignore or are not even conscious of. You cannot change what you will not accept or even look at about yourself—and that willingness to scrutinize yourself is the peephole to an altered state of consciousness, a mystical view of life.



THUS SPAKE ZOROASTER: AN INTERVIEW WITH JOSEPH CAMPBELL

Feeling connected to the world is, as Keith Harary points out in "How to Have a Mystical Experience," sometimes a matter of changing our perceptions. Mythologist Joseph Campbell, who died last year, understood the value of mystical experiences. He spent a lifetime studying the myths that have nurtured the human imagination and have given us a sense of the mystical in everyday life. In books such as *The Hero with a Thousand Faces* and *The Masks of God*, Campbell explored the meaning of mythology—why the same themes occur in cultures throughout the world and how they formed the basis for both Eastern and Western religions. He was greatly concerned about the breakdown of myth in the modern world, and in the following excerpt from an interview with *Omni* senior editor Jane Bosveld, conducted before his death, Campbell explained how the religions of the West have contributed to that demise and what individuals can do to rebuild a strong, unifying mythology.

Omni: Why is mythology important?

Campbell: To me the most important fact about mythology is that it remains the same. All the myths and religions of the world share common themes that keep coming back time and time again and form the spiritual ground from which all human life must move. I see mythology serving several functions. One function is the pedagogical, guiding the human being through the inevitable stages of the human lifetime, which have been the same since the Paleolithic caves. These are the dependency of childhood and then the movement from that at the crisis of adolescence to the responsibilities of adulthood. It's a total transformation of psychology that has to take place; that's what the initiation rites were concerned with as well as those that help us deal with death.

Omni: Do you think the myths are working now?

Campbell: No, they're not working at all. We don't have any, I mean, the ones that we have—Christianity, Judaism, and Islam—are out of date, they don't function in the modern world.

Omni: Where does Buddhism fit in?

Campbell: Buddhism is something else. Buddhism has to do with the inward life, and it amalgamates very easily with the local pedagogical myths. For example, in Japan Buddhism and Shintoism are together; in China Buddhism and Taoism go together. Buddhism has to do not so much with the total life pedagogy as with the ultimate inward disengagement and then reengagement, to find your inner place. It's a spiritually oriented rather than a culturally oriented tradition.

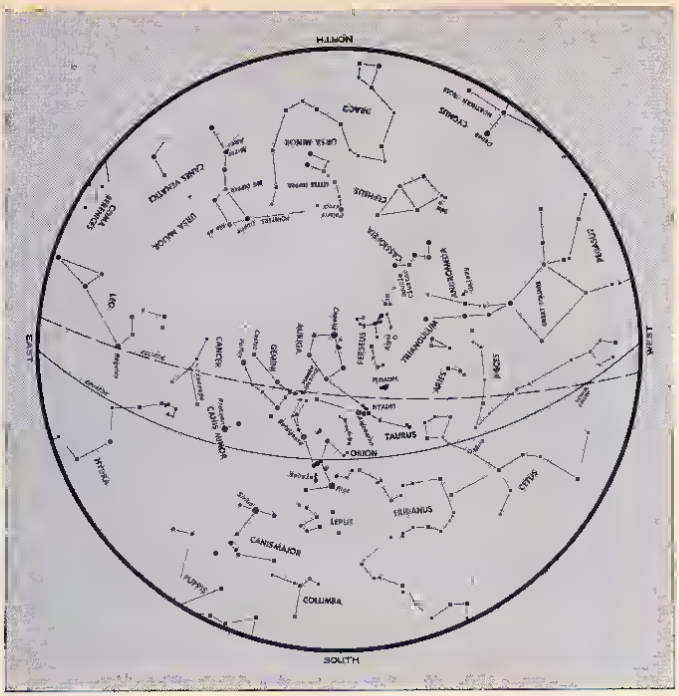
Omni: Does that form a firmer mythological base for an individual?

Campbell: Well, Buddhism believes that life is sorrowful and that the release from sorrow is nirvana. Nirvana is the disengagement of one's total commitment from the transitory aspects of life to the permanent ground within the self. What we learn from the Orient is the inward sense of the religious life which has been forgotten in our traditions. We're way over on the go-and-help-your-neighbor side.

Omni: How did that come about in the West?

Campbell: How can I say this easily? Most of the mythologies of the world have to deal with putting the individual in accord with nature—with his nature, with the nature of the society, putting the society in accord with the nature of the universe; all of that, the harmonization. In the Near East, however, about the first millennium B.C. there came Zoroaster and this is the transformation that I think underlies the whole thing. Zoroaster saw two creators, a creator of light and truth and a creator of darkness and deception. Ahura Mazda created a good world. Ahriman filled it with evil. You have a fall—a fall in the very nature of the universe—and so you don't put yourself in accord with nature, you correct it. And that's where we got off. The Bible inherits that: we have the fall in the Bible. And also the notion of the Jews as somehow exceptional and apart from everybody else, and everybody else is simply goyim and indifferent to God. Christianity takes it over, and Islam takes it over. So instead of accord with nature, you have this choosing of righteousness and the right—ethics—and also the desacralization [the divestment of supernatural qualities] of the universe, which is

BEING IN TOUCH WITH MYTH AND MYSTICISM, ACCORDING TO JOSEPH CAMPBELL, IS WHAT BINDS US TO THE EARTH AND TO ONE ANOTHER.



no longer seen as holy. The only holy thing is Israel; the only holy thing is the Christian community; the only holy thing is Islam. And so everything depends on the society. Puritanism went even further and cut out all the rituals, and then all you had was ethics and one group saying they're better than another, you worship God in your way, we worship God in His. The world is disenchanted, and the rituals that effect a deep transformation are lost.

We no longer believe in a mystical transcendent ground, which is an important feature in all mythologies. When we speak about the ultimate mystery, it neither *is* nor *is not*; it goes beyond all categories of speech. When you've got a God who says "I'm it," he's not transparent to transcendence; he stops you there. So you aren't transparent to transcendence either. You can't say, as the Hindus say, "Thou art it." Both are closed off. Also, God has been named, and we have a book by Him, and we know all about it. No mystery! It's gone! So after that, we don't have a mythologically grounded sense of the mystical.

Every mythology grew up within a bounded horizon and was addressed to a certain people, a certain society. What is the society now to which mythology must be addressed? The society of the globe. And if you want to see how the mythologies that we've inherited are working, look at Lebanon and Beirut today. The three major religions of the West knocking each other to pieces there. They are so ethnically bound that it's a menace. It really is. It's a horrible, horrible thing. The future, if there's going to be one, has to be a dissolution of those three systems and an opening up of the horizons to the planet.

Omni: What do you mean by that?

Campbell: You have to realize that your society is not that of your small religious community, or even big religious community, but of the people of the world.

Omni: But how do you get people to think of themselves as part of a larger global community?

Campbell: The only thing that can do it, because people listen to their clergy, is for the clergy to begin talking about humanity instead of their own little sect and instead of saying, "We have it," say, "It is through us, through our religion, that we realize that *all* people have it. And what they have is as follows . . ." and then talk about the spiritual implications rather than the historical limitations of their tradition.

Omni: But there are individuals who do have some sense of that in the world. How did they arrive at that even though it's not inherent in the culture?

Campbell: Well, I arrived at it by reading something that wasn't just sectarian in its treatment of the spiritual. I did comparative historical studies—comparative literature, comparative religions, comparative mythologies—and traveled around a bit and saw that one song is being sung in many different languages. That's what one finds out. But few people get out of the bondage of their cultural environment. Very few. It's amazing. **OMNI**

SPACE

CONTINUED FROM PAGE 24

Taylor in the ET business. But even if private industry jumps all over the idea, it's doubtful that NASA's plans for the ET will be abandoned, especially since the privatization program does not include tanks from military flights. An application considered early in the shuttle program proposed that tanks be converted to components of a space station.

Making a tank livable, however, would require considerable amounts of EVA, NASA's acronym for extravehicular activity. Astronauts would need, for example, to deactivate and remove the ET's pyrotechnic tumble valve, now used to set the tank spinning to ensure proper breakup after jettison. In addition, the ET comes equipped with a Range Safety System, a means of destroying the tank upon command. Currently, the shuttle has no method for unlocking the device once it is armed, so wiring modifications would have to be made to use the ET in orbit.

NASA is also considering other uses for recycled ETs that would require far less EVA. For example, astronomers and engineers have already devised plans to use a modified ET to house a large Gamma Ray Imaging Telescope that could fly in the early Nineties. Another plan is to turn ETs into orbiting service stations, which could convert solar energy into fuel for other spacecraft. And by melting down ETs in a solar furnace, the aluminum could be forged into construction materials including relatively cheap radiation shielding for long-term space habitation and interplanetary travel. In addition, by attaching a cargo carrier to the huge tanks, NASA could have a cost-efficient orbiting Mack truck, capable of transporting bulky payloads such as space construction materials. **DO**

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STARS

CONTINUED FROM PAGE 28

is lighter than nitrogen), forming a slick several feet thick. Cosmic rays zapping this ethane could easily transform it into more complex organic compounds.

Delitsky and co-worker W. Reid Thompson have developed the notion that Triton's landscape could thus be one of the few in our solar system that are coated, like Earth's, with complex organic compounds. Once such organics existed, the various compounds could have formed layers of sludge that would sink or float, depending on their makeup. As researchers suggested in 1987 in the journal *Icarus*, "Perhaps *Voyager 2*, turning its cameras on Triton in 1989, will see plains of white and colored organic deposits and, maybe, the glint of a distant sun reflected off a calm nitrogen sea."

Because most recent Earth-based observations hint that Triton's atmosphere is clouding over, the success of *Voyager 2*'s viewing may be out of NASA's control. Researchers think that the sort of chemistry that transforms the hydrocarbons in Triton's surface brew could also be creating high-altitude layers of organic dust to form a haze—the same way that photochemical smog forms above earthly cities. Some planetary scientists fear that *Voyager 2*'s flyby may be clouded out—a replay of the troubles met during its 1981 and *Voyager 1*'s 1980 Saturn encounters. Then the two probes failed to get a clear picture of Saturn's largest moon, Titan.

On the other hand, Triton's atmospheric haze may be the result of something akin to a spring thaw. The combination of orbital geometry and counterrevolution of the moon appears to make for great seasonal weather swings, and some spots in Triton's northern hemisphere are now getting their strongest dose of sunlight in 600 years. Under the right conditions, says Delitsky, the long-frozen slushes of nitrogen and methane could warm up every six centuries to a balmy −280°F—enough to drive gases skyward and speed the creation of haze.

If the weather's clear next August, the 1,797-pound *Voyager* that lifted off from marshy Cape Canaveral in August 1977 might get another glimpse of "swampland"—the slushy surface of Triton. But if the haze looks too thick, scientists may guide their probe's camera to the back side of Neptune instead.

Triton represents a slow-motion demonstration of the kinds of chemical reactions that happened throughout the solar system soon after its formation. Says Delitsky: "We have nitrogen here on Earth, yet we have to go three billion miles out in space to get a handle on what went on when our atmosphere was first forming." This makes Triton a kind of planetary deep freeze that allows scientists, in a sense, to look back in time. ∞

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CONTINUED FROM PAGE 42

director of the National Institute on Alcohol Abuse and Alcoholism (NIAA). To remove alcoholism from the disease constellation would certainly darken the future for federally funded research in the field. And it could sound the death knell for medical control of treatment centers, insurance protection, Medicare, and other financial support systems.

The "series of decisions, judgments, and choices that a person makes that coalesce into alcoholism" is what Fingarette thinks should be studied. He believes it's possible for alcoholics to learn partial abstinence.

"Free will," counters Begleiter, "is, in fact, present in many, many diseases." For a hypertensive, taking salt is free will. A diabetic who eats sugar against a doctor's advice is exercising free will. "Just because there's a behavioral component doesn't make it less of a disease," he maintains. Begleiter argues that the evidence for alcoholism as a disease is "incontrovertible. If you walk around my institution's alcohol ward—or any institution's—and talk to the patients, it will take you only half an hour to convince yourself that it's a disease. There are those who abuse alcohol and those who are alcoholics. There are many different kinds of behavior." In the future the NIAA's Tabakoff foresees research where, as in cancer, subtypes of alcoholism will be clearly identified, each with distinct causes and treatments.

"I prefer to view alcoholism as a vulnerability," says Shirley Y. Hill, director of the Alcoholism and Genetics Research Program at the University of Pittsburgh's Western Psychiatric Institute and Clinic. "It's not bad behavior," she hastens to add, "but behavior is involved. Calling it a disease, though, misplaces the etiology." Hill's own work helps support the claim for a genetic predisposition to alcoholism. By identifying genetic markers on chromosome 4 that appear linked with a possible gene for susceptibility to alcoholism, she has provided more evidence for biological determinants rather than, say, lack of willpower.

Nevertheless, she has reservations about the disease concept and thinks the responsibility should fall squarely on the problem drinker's shoulders. She prefers to save the word *disease* for conditions where "even if you do everything right, you'll still get a disease." And she worries that calling alcoholism a disease may lead some alcoholics to "seek medical treatment for the consequences of their alcoholism when they should be seeing a professional psychotherapist."

The answer to the question is not an easy one. Like alcoholism itself, the arguments are complex and varied—and can have dangerous consequences. ◻◻

LONG DAY'S JOURNEY

CONTINUED FROM PAGE 90

bill, which I crumpled into a ball and placed in my open hand. As I wrinkled my face in concentration, the bill started to rise about six inches above my hand. I let it hover just in front of Harry's eyes, then float slowly to my other hand. I handed the bill back.

The device I used for this effect, available in magic stores for $10, is known as the 'floating dollar bill.' It can be used with any dollar bill at all. Harry had never seen the trick, and he accepted my explanation that Buddha gave me the power. Now it was Harry's turn. He tore the dollar into tiny pieces, placed them in his hands, and stared. The tremor in his hands caused the pieces to jiggle, but they weren't flying the way he claimed.

Next he pointed to my coffee cup and announced that it was moving several feet across the table. He pointed to my pencil and said it was starting to roll off the desk. Then he wiggled his finger at my bookcase and said it was falling. Harry ignored my physical measurements, which proved the objects were stationary. Nothing I said could change his perception. Harry was truly hallucinating.

Harry's hallucinations were caused by cocaine. Sensations of motion in the corners of the visual field are common cocaine hallucinations. Tapping this effect, Harry focused on specific objects, then provided an elaborate and grandiose explanation. He was so awake and alert that he felt his perceptions *must* be real. He was readily fooled, and his conviction remained strong even months after the intoxication. This intense belief had convinced Harry's family that his visions—and their own acts of levitation—were real. They were all suffering from folie a deux, a rare delusional disorder that is shared among family members.

In a sense, the Balise family was lucky because they hallucinated only when they deliberately tried to levitate objects. Imagine walking along the sidewalk when a giant black hole suddenly starts chasing you! It happened to an obese and likable young man I'll call Rudy.

Rudy reported that the black hole would appear once or twice a month in the most unexpected places: on the street, in the park, once even popping out of a newspaper. And Rudy would run to the nearest police station or hospital for help. The police laughed, and the doctors gave him tranquilizers.

When Rudy showed up at my office, he was shaking. The hole, he cried, was waiting for him just outside the front door. We sneaked out a side door, and I drove him home. He returned for several weeks of tests and observations by the institute staff, but no one could find anything wrong with him. Because he didn't have a black hole experience at the institute, I

decided to keep Rudy company for a few weeks after he left. I hoped I would be with him when the hole reappeared.

Rudy made his living playing pool in local bars, and I spent many nights watching him hustle the customers. It was 1:00 A.M. when we left a west-side bar and started walking to Rudy's apartment. His pockets bulging with cash. A drizzle was falling. I heard Rudy gasp and turned to see his face freeze in horror.

"It's here!" he whispered, and bolted down the street. I ran with him for a block before I decided to look over my shoulder, half expecting to see a mugger after Rudy's cash. The street was deserted.

I grabbed Rudy. "Rudy! Stop and look at it." I forced him to turn around.

He became catatonic, stiffening like a statue. I kept yelling his name and asking him to describe what he was seeing. After five minutes he could talk again. The black hole was now gone, he panted, but he had seen it clearly for the first time: a giant funnel about 16 feet in diameter. The outside of the funnel was covered with a black lacework, while the inside was lined with geometrically arranged girders. There was a bright light in the very center of the hole.

I recognized Rudy's black hole as one of the hallucinatory geometric forms first described by University of Chicago psychologist Heinrich Kluver in 1926. Kluver found that these hallucinatory forms were common in a variety of conditions including drug intoxication. While Rudy was sober that night, he had chain-smoked ten cigarettes in the 30 minutes prior to the attack. Furthermore, Rudy had seen a similar funnel years ago when he tried LSD. I suspected that the black hole was a flashback to that trip, now triggered by the excitatory effects of nicotine.

If I was right, I should be able to reproduce the black hole by stimulating Rudy's brain in a similar way. I brought him back to the lab, where he was wired to an EEG (electroencephalograph) machine that measured his brain waves. The readings were normal. Next I turned on a photostimulator, which would bathe him in bright, pulsating light, kindling a subtle electrical fire in his brain. After a few seconds Rudy was catatonic. He was looking directly into the black hole. Looking at the EEG readouts, I could see the same pattern of excitation associated with LSD intoxication. Rudy's black hole was a flashback after all.

After further testing, I compiled a list of things that would trigger Rudy's black hole: cigarettes, coffee and flickering neon lights. It would be hard for a street hustler to avoid such things, but if he could, I assured Rudy that the black hole would disappear. If he persisted in his lifestyle, he was certain to be confronted by the hole again. Yet he needn't be afraid. These hallucinatory forms are annoying, but they are short-lived and rarely trap the person in a separate reality.

That wasn't true for Mario Navas, however, whose drug-induced hallucination swallowed him. To deal with his visions, Mario believed, he needed a gun.

On Thursday, October 7, 1982, Mario boarded Amtrak train no. 82 in Jacksonville, Florida, en route to New York. He was accompanied by his sister, her infant son, her three-year-old daughter, and a .45-caliber machine gun.

The family entered a compartment in a sleeping car. Mario went to sleep in the top bunk Thursday night and was awakened early Friday morning. The train had stopped. The window shade was moving. Fingers were reaching under the shade. The compartment door opened. There were flashes of colored lights. Someone came into the room. Mario *knew* that the intruder was an armed commando. He shot the commando. But there were others who had surrounded the train. They had automatic weapons and a helicopter. He recognized the voices of old friends: only now they were part of the commando unit. Mario hid in the top bunk, flattening himself against the wall like a frightened animal.

More commandos invaded the train. Mario heard footsteps and heavy breathing outside the compartment. He fired shots at the door and warned the commando not to shoot back. "Be careful! If you shoot, I have the machine gun at the boy's head."

On Monday, after 79 hours, he left the train. Like Dorothy returning to Kansas from Oz, Mario stepped from his commando-infested compartment into the train station at Raleigh, North Carolina. The police SWAT teams—the commandos—took him into custody. Inside the compartment were the decomposing body of his sister, with a bullet in her forehead, and the dehydrated remains of the infant. The daughter survived.

In his hallucinatory confusion, Mario had killed his sister, not a commando. While he cowered in the top bunk, the infant was dying of thirst in the berth just below him. The district attorney charged Mario, who had once done time for cocaine dealing, with murder and kidnapping. Was Mario just another paranoid coke dealer or, as the defense claimed, an insane schizophrenic who should be excused? After all, wouldn't you have to be insane to have such hallucinations? The judge appointed me to investigate.

I learned that after Mario fired the first shots, the train was halted in Raleigh. When police approached, Mario fired from the machine gun. His sleeping car was then isolated on a siding, where the three-day hostage siege took place.

In what turned out to be a great boon to my investigation, this basic information was supplemented by a set of audio tapes. Luckily for me, the police had wired Mario's compartment with sensitive mi-

crophones and tape-recorded all sounds. When I listened to these tapes, I heard gunfire, Mario yelling and screaming at the commandos, the children crying for water, and the noise from the news helicopter overhead. The microphones also picked up several distinct sounds: "chop, chop, chop . . . sniff, sniff"—the telltale sounds of cocaine use. These occurred no less than 64 times. After the sniffing, Mario's rate of speech jumped from 108 words per minute to 188.

Cocaine use was confirmed by a most unusual urine test. Mario had been so afraid to leave the top bunk that he was forced to urinate in his pants. I sent those pants to the FBI lab, which found large amounts of cocaine metabolite. But there was more to Mario's experience than coke. There were the conditions of stress: isolation, sleep deprivation, hunger, thirst, and life-threatening danger. Put all of these conditions together, and I suspected that anyone would start hallucinating. But I had to be sure. I decided to run a dangerous experiment. I myself would play the role of Mario in a reenactment of the incident.

On a Thursday I flew to Jacksonville, where I had the same steak-and-lobster dinner that Mario had eaten. I boarded Amtrak train no. 82 and allowed the police to lock me in Mario's compartment, where I would remain for the next 79 hours. I crawled into the top bunk and went to sleep with the light on, as Mario had done.

I discovered that trains are full of mechanical noises, and a loud one jerked me awake at 5:30 A.M.—the same time Mario was awakened. The train had made a stop outside Raleigh, then clunked along to the city. My compartment was vibrating so hard that the window shade, which did not fully cover the window, started to move. As I reached over to grab it, I saw a reflection of my fingers in the glass. The door was also rattling, and as the sun rose in a hall window outside the door, bursts of colored light danced through the cracks.

The train arrived in Raleigh, and the police turned off my light, leaving me in the same relative darkness that Mario had endured. My sleeping car was uncoupled from the train and moved to a siding. A generator kept the heat in my compartment at the same sweltering temperature Mario had experienced. The generator also powered a sound system that, at 10:30 A.M., started broadcasting the tape of the incident through a ventilation duct.

The first shots startled me. Then came the sirens, voices of police, more shots, and through it all, the incessant crying of the baby and the little girl. The audio quality was incredibly realistic. Then I heard the first of many repeated sounds: "sniff, sniff . . . aaah." Mario had started snorting coke. I pulled out my own vial (containing a legal cocaine substitute) and sniffed along with Mario. I would do this 64 more times throughout the experiment. It became impossible to sleep. (Without the drug, I would not have been able to reproduce the situation, including the paranoia and sleeplessness.)

I wasn't hungry, but by Saturday night my thirst was so intense I started seeing dolphins and sharks swimming on the ceiling of the compartment. The cries for water from the kids didn't help. Then, on the tape, I heard Mario slip into the bathroom and take a drink. I felt justified in taking two swallows from my emergency water bottle.

The first time I had to urinate, I did it in my pants. The next time I was using a portable urinal when, at almost the same time, I heard Mario urinating in the bathroom! Later, canisters of putrescine and cadaverine, two noxious chemicals produced by decaying flesh, were released in my compartment to mimic the smells from the corpse of Mario's sister. The smells got to me. Just as I vomited, I heard Mario vomiting! *Our bodies were in sync!* What about our brains?

> *"I thought I saw someone inside. I freaked. I threw a pillow at the door. But you can't win a pillow fight with a commando, so I clutched my portable urinal and positioned myself to throw it."*

I became irritable. I thought that the police who were assigned to help with the experiment were making too much noise. I banged on the compartment walls, screaming for them to be quiet. I found myself using Mario's words: "¡*Silencio*! ¡*Silencio*!"

I became hypervigilant. I checked out every creak and groan in the compartment. Suspicion turned to paranoia. I believed that the police were spying on me through cracks in the door. When I heard the helicopter on the tape, I really thought it was from Mario's defense team, which had discovered my secret experiment and was bent on stopping me. Then someone started banging on the window. I froze!

That isn't on the tape, I thought. Another bang on the window. Then another. *Oh, my God! Someone's really there!*

"Is that you?" I yelled to the police guard in the hall outside my compartment.

"Is that you?" he echoed.

Someone was running down the hall. Train doors opened and closed. Any minute, I expected the commandos to break into my compartment. During a previous examination, Mario had made a veiled threat against my life. The FBI had said I should take it seriously because Mario had connections to Colombian cocaine kingpins. Now it was happening. More noises. The door moved. I thought I saw someone come inside. I freaked. I threw a pillow at the door. But you can't win a pillow fight with a commando. I clutched the only weapon I had—my portable urinal—and positioned myself to throw it at the next thing that moved.

Nothing moved. After an eternity, my guard yelled, "Everything's okay." Later, when I emerged from the compartment, I learned that an Amtrak worker had heard about the experiment and wanted to check out the crazy doctor. He was the one who had banged on the window. The police stopped him before he could enter my car.

Was the doctor in the compartment crazy or just the victim of conditions conducive to hallucinations? For both Mario and myself, the hallucinations started with the misinterpretation of real stimuli (the shade moving, the door banging), which became embellished with paranoid thoughts, then images. Neither one of us had a clear window to the real world outside the train, and we were forced to construct our own versions based on limited sensory data and our own projections. The isolated conditions combined with chemical stimulation to produce another reality—one full of paranoid hallucinations—inside the compartment. I knew what was happening, but the conditions were so powerful that I couldn't stop the hallucinations from influencing my behavior. My conclusion: Under the right conditions, any brain will hallucinate.

Mario had told the police, "Don't go and believe that I'm crazy or something." That goes for the doctor as well.

EPILOGUE

James Tilly Matthews became the subject of a book by his physician, John Haslam. A copy of this 1809 book, which is now considered a classic, recently sold for $1,250.

Ralph Tolman lectured on his experiences to a UCLA psychology class. More than 90 percent of the students said they believed the satellite was real.

John Lilly wrote about the E.T.'s in his 1978 autobiography, *The Scientist*.

Rudy is still playing pool and running away from the black hole.

Mario Navas is serving a life sentence for murder. When he walks down the prison corridors, inmates make sounds like a train whistle.

Ronald K. Siegel, an experimental psychologist and psychopharmacologist at UCLA's Neuropsychiatric Institute, now refuses to travel by train. He is preparing a book based on this article.

Origami pop-ups: Defying the laws of a traditional Japanese art, plus flying tips from Chuck Yeager

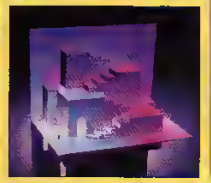
GAMES

By Scot Morris

It's beginning to look a lot like the post office's busiest time of the year. And you'd better watch out—because your mailbox will soon be jammed with all kinds of cards wishing you a happy holiday season.

In that stack of mail, however, you might happen upon an inauspicious envelope containing a simple white card. As you slowly and carefully open it, a form will begin to take shape. It could represent almost anything: your name, a cathedral, a wedding cake, a stage, like those shown below, or a model of Mount Vernon, the Taj Mahal, the White House, or even your own house.

The treasure inside the card will become completely identifiable when the card is opened to a 90° angle. Continue unfolding to a full 180° and all the columns, corners, stairways, and spires will lie gently down in their flat positions, filling every square inch of the white rectangle.



Such designs are part of a new kind of paper play called origami architecture. Masahiro Chatani, a professor of architecture at the Tokyo Institute of Technology, says he came up with the idea while teaching his children how to make New Year's greeting cards in 1981. Since then he has crafted paper versions of hundreds of buildings from the Parthenon to New York's Chrysler Building.

A recent book entitled *American Houses* (Kodansha International) includes plans for everything from a tepee and an adobe hut to a replica of Fallingwater, the Bear Run, Pennsylvania, home designed by architect Frank Lloyd Wright.

BREAKING THE RULES

Of course, origami architecture isn't really origami. In the ancient Japanese art of paper folding, you traditionally use a single, ideally square piece of paper to create frogs, birds, and other creatures. The paper is *never* cut or glued.

Chatani violates many of the origami rules. He begins with a roughly six- by eight-inch rectangle, systematically cutting the paper and folding parts of it up or down. He'll even use glue to accomplish the desired design.

The sphere shown on these pages, for example, violates all the origami rules at once. It's made from 14 separate discs, cut from separate pieces of paper, none of which are folded. And the sphere is anchored to the card base with string and glue.

Some purists believe that Chatani's work shouldn't be classified as origami, with its imposed limitations. Remove the restrictions and it's like playing tennis without a net. Call it what you will, but it isn't tennis.

More interested in its untraditional style, others don't care about such technicalities as what to call it. As early as 1983, enthusiasts in Japan began forming origami architecture clubs. And newspapers and magazines, including *Japan Architect* and the Japanese edition of *Omni*, featured articles on the paper play. Some even held contests to seek out the best new models. Chatani's work was finally introduced in America in an exhibit at New York's Cooper-Hewitt Museum in 1985.

Perhaps the enthusiasm for origami architecture derives from its originality. It has its own rules, which are elegant in their simplicity. A plan is drawn on the card using three kinds of lines. A solid line indicates where the paper should be cut, preferably with an X-acto knife and a metal ruler. Dashes indicate where the paper should be folded up and toward you, pushing the line of dashes to the bottom of the fold's valley. Along the dotted lines, fold the paper down and away from you with the dots aligned along the fold's ridge.

If you follow the instructions for the plan at right, you'll end up with "White Stage," as shown in the photo on the previous page (bottom left). But don't try it on this paper—it's too lightweight to create a stiff model. You'll get better results if you photocopy the plan on heavier paper, the best material is two-ply bristol board or lightweight cover stock. And for a better working size, you can also try enlarging the image. (The plan as printed here has been rotated 90°; the bottom of the card is at the left of our illustration.)

Chatani's origami architecture is also available in a collection of eight precut, prefolded greeting cards with envelopes printed by Japan's A.G. Industries. Send $24, plus $2.50 for shipping and handling, to Gallery 91, 91 Grand Street, New York, NY 10013.

OMNIGAMI

If origami architecture isn't really origami, origami isn't architecture, either. Chatani's models include smiling and crying faces. Flowers, animals, Japanese or English words, and geometric figures have all popped out of his white cards. He has even designed origami architecture versions of the space shuttle and of satellites, as well as the *Omni* logo.

What designs can you come up with using this paper-cutting and folding technique? We're primarily interested in those forms that take shape when a card is opened to a 90° angle, like those shown in the photos here. They start as flat rectangles and, when folded, fit into an envelope. Their plans use only the cut, valley, and ridge lines.

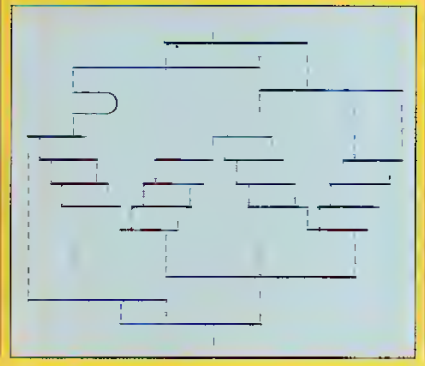
Use white paper, which shows the design off to best advantage. "I enjoy the angle, lighting, and delicate variations of a white surface," says Chatani, who will serve as a judge in this competition.

The instructions for Competition #48, however, are only guidelines. We can't very well restrict *Omni* readers to less freedom than Chatani gave himself. If you think you've got a better idea, try it. We'll allow anything—glue, tape, rubber bands, staples, even batteries. It's up to you. We'll be looking for the most creative violations, those that achieve simplicity and elegance, yet are both aesthetically pleasing and surprising.

The grand prize-winner will receive a Psion Organizer II, a computer daily diary that includes built-in alarm reminders, calendar, calculator, and appointment, phone, and address books. Retail value: $179.95. (See Psion's ad on pages 118 and 119.)

Four runners-up will each receive $50. A copy of the recently published *The Next Book of Omni Games* (New American Library) and the Gallery 91 collection of Chatani's cards will also be sent to each winner.

Include your name and address on the back of your designs, and send your entries to Omnigami, c/o *Omni*, 1965 Broadway, New York, NY 10023-5965. All entries must be received by January 15, 1989, and become the property of *Omni*. None will be returned.



GAMES

The closest some astronauts ever get to spaceflight is simulation, where the conditions of deep space are produced artificially in a lab. The closest most of us will come to even piloting a plane, playing those computer games that allow us to experience flight without leaving our armchairs. Such flight simulation software is available from Microsoft, Share Data, SubLogic, Bullseye Software, and other computer game companies. Games like *Chuck Yeager's Advanced Flight Trainer* (AFT), published by Electronic Arts, offer the thrill of flying while instructing the player in the science of aerodynamics.

When software designer Ned Lerner came up with the idea for AFT, he decided that the user had to feel more like a pilot than a navigator. To achieve a true semblance of flight, Lerner sought the guidance of an experienced pilot—General Chuck Yeager, the legendary Air Force pilot who broke the sound barrier and paved the way for a generation of astronauts.

Yeager agreed to serve as consultant if the game didn't concentrate on scenery, which a pilot like Yeager never has time to enjoy. "Besides," he says, "Edwards Air Force Base doesn't have much to look at." Instead Yeager envisioned users flying real planes and experiencing Mach-speed flight.

"AFT also teaches the characteristics of different aircraft," Yeager says. The game's choice of aircraft models, in fact, includes a simulation of the jet Yeager flew to break the sound barrier, the Bell X-1, and the general's favorite aircraft, the P-51 Mustang. There are also experimental planes and such modern jets as the F-16 and the F-18.

"The main objective of the game's design," Yeager adds, "is to give the player an opportunity to enjoy flying—as close to the real thing as possible, without the risk and without leaving the home or office." And there are no tricks or secrets involved, he points out.

The first of three instruction levels teaches such basic skills as takeoffs and landings; in the second you use the rudders, ailerons, and other external parts of the plane for advanced maneuvers; by the third level, you're learning aerobatic stunts. A simulation of Yeager, moreover, gives on-screen evaluations, but you won't see him unless you've crashed. ("I don't often see my face on the screen," Yeager says.) The player's goal, therefore, should be to avoid crashing. Seeing Yeager's image while playing AFT, after all, could be like a near-death experience.

VIDEO HITS COUNTDOWN

The following best selling video games are listed according to their compatible game system. Some newer games, of course, like Nintendo's *Metroid*, may be more popular than the lists seem to indicate.

NINTENDO

1. *Super Mario Brothers*
2. *The Legend of Zelda*
3. *Mike Tyson's Punch-Out!!*
4. *Kung Fu*
5. *Pro Wrestling*
6. *Rad Racer*
7. *Ice Hockey*
8. *R.C. Pro Am*
9. *Golf*
10. *Metroid*

ATARI

1. *Hardball*
2. *One On One Basketball*
3. *David's Midnight Magic*
4. *Food Fight*
5. *Jungle Hunt*
6. *Gato*
7. *Barnyard Blaster*
8. *Ms. Pac Man*
9. *Pac-Man*
10. *RealSports Football*

SEGA

1. *After Burner*
2. *Double Dragon*
3. *Thunder Blade*
4. *Shinobi*
5. *Out Run*
6. *Alien Syndrome*
7. *Choplifters*
8. *Great Baseball*
9. *Great Football*
10. *Great Basketball*

VIDEO REVELATIONS

The goal of Nintendo's *Super Mario Brothers* video game is to rescue the kidnapped princess. In the process, you have to overcome supernatural villains that attempt to block your progress, while racking up as many points as possible. Here's a tip for getting a quick 3,000 points: Jump on the flagpole outside each castle when the last number on the timer ends in 1, 3, or 6. The fireworks will then go off one, three, or six times, with each explosion worth 500 points.

Do you have any tips for playing specific video or computer games? Send them to Tips, c/o *Omni*, 1965 Broadway, New York, NY 10023-5965. We'll pay $25 for each one we print.

—Kevin McKinney

FLEDGED

CONTINUED FROM PAGE 100

Centered. That's what she was. What *I'd* always wanted to be, though this was the first time I really knew what it meant. And, though chubby, she had a kind of grace. Swooped herself about. Guests, like Mother's dishes, seemed swept before her, spun in and out, scattered as the feathers scattered. People picked them up end put them in their buttonholes, in their hair, or behind the ears. They were having fun. Wherever Julia was they were having fun. And there was that touch of danger. They liked that, too. Some of the guests hung so close to her, leaning forward as they spoke, looking into her half-open mouth. I *had* to keep watching, wondering was I close enough to get there in time just in case. I *had* to be near ... but for lots of reasons. It was as if I had been living someone else's life and now I was back to *the* question ... same old question as then—Did I or didn't I love her?—had to be rethought, and who would leave who, and when, and *would* one of us leave? I thought I had become whole over the last few years, but now I felt halved. Humpty-Dumpty ever since she'd come.

As I drank, warmth spread all through me, end, suddenly, I wanted her to stay. I needed for her to stay. Of course the wings would have to go, no question about that, but then *I'd* be making sacrifices, too. I already had my walls and ceilings permanently ruined, my books, Mother's dishes ... and after all, I'd lived alone for quite some time now and liked it, or thought I did until this moment.

As they left, everybody said they wanted to see her again. Everybody made me promise to bring her along to the next parties. Some went so far as to hug her good-bye. I worried what she'd do, and when some gave her a peck on the cheek, she looked at them as if she'd peck them back, but she didn't.

When the last guests had gone, I told her she could stay, though she'd have to get rid of those things, end I said how we'd both have to make compromises, which was only right, though I did understand that hers would be the greatest, physically at least, and that maybe hers had been the greatest, mentally, too, even before, from the beginning.

"Aw," she said, and "How?" and shook herself, fluffing out her feathers end looking large. "How!" But this time it didn't sound like a question, and it didn't look as if a compromise (on her part) was going to come about.

"All right," I said, "stay any way you like, but stay. I don't care. I don't even care if you ate Pasht, but I want you to know that I think you did." (Actually I *did* care. It was only just then that I realized I probably *had* loved Pasht all this time.) "But I'm willing to forgive."

"Grackle," she said. Obviously she didn't care much about forgiveness.

She went to the sliding doors, pushed them wide open, and stepped out into the dawn. I could understand her wanting to get into the fresh air, to think about it. I stepped out, too. Off on the horizon it looked stormy again, but it looked as if there would be a spectacular sunrise. I was thinking how nice it was, being with somebody sharing the rising sun. I came up behind her and put my arm around her waist.

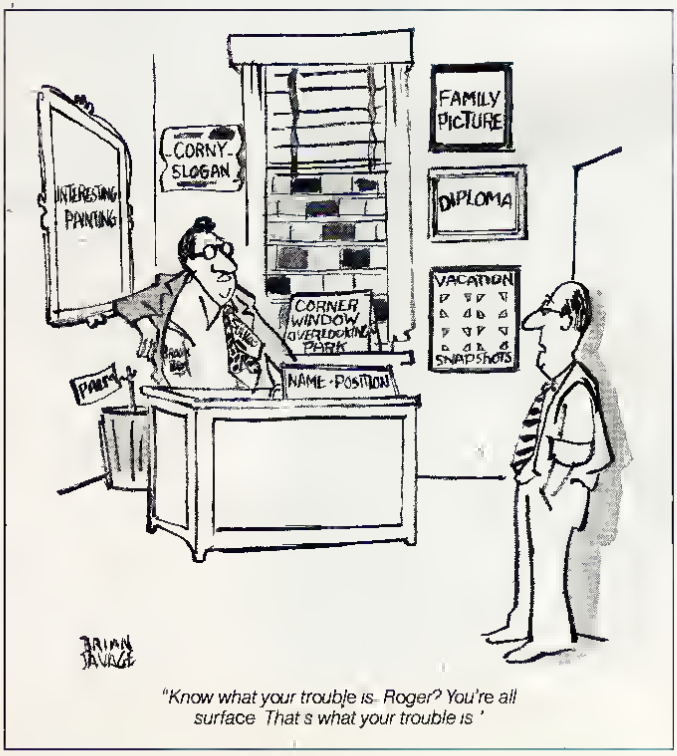
"How," she said, but again with finality. She seemed not to mind my arm around her, to hardly notice it, in fact, but she turned and looked at me with that fish-bird/bird-fish stare, and I took my arm away. I couldn't help it. And then she stretched, reached both wings and arms up as far as they'd go, and, my God, I'd not realized. I'd not understood at all. I just kept saying, "Oh, my God," over and over. I mean she could never live here. Those wings ... they'd *have* to go. There was no way a person could get around like that. There was no house (that I could afford, anyway) that could contain them. Probably no house anywhere that could. I didn't even know how she managed to sleep. And think of her getting into a car. I mean trying to. Think of getting into an airplane, for heaven's sake.

But now I could see, storm or not, she was going to leave. She was going to take off in this wind. "Stop," I said, "you'll be blown away. You'll be struck by lightning." But perhaps she had been waiting for a wind like this all along in order to take off. She kept on stretching and making practice motions with her wings. They kept looking larger and larger and sounded like sails when the ship luffs, out of control. Suddenly I didn't care how wet and cold and hungry I might be. I wanted to come along to whatever rocky cliff she must live on. Nest on. "Take me with you," I said. "Let me hang on. I can ..."

"Quack!"

Then there was a great flapping and I reached for her. I had her, for a moment, by one awful, blue-streaked leg, but there was all that wind and sound ... a great sound, and I dropped to my knees to keep from being blown off the deck. She headed out over the ocean toward the storm. I heard her "Hawk, hawk" blow back to me as she lifted into the wind.

And here I was, down ... down here with the mess of the party, more drunk than I'd meant to be, and no Pasht to talk to. I couldn't face my own house. I sat on the deck and watched the storm come, and as soon as the rain started—really started—Pasht came back, not eaten up after all, except she'd lost her tail. Of course I don't know whether Julia did that or not, but I suspect. It takes away a lot of the snaky gracefulness Pasht had, but I keep her ... I love her anyway. ∞



"Know what your trouble is, Roger? You're all surface. That's what your trouble is."

LAST WORD

By Kathy Thornock

At first the New Age was a harmless pick-me-up. Green thought she was in control, but before she knew what was happening, she had a $1,000-a-day psychic habit.

Last month civic and business leaders, sports celebrities, and movie stars converged on Malibu Beach for the opening of Hermitage USA—a cosmic theme park and halfway house for recovering New Age addicts. This secluded, yet elegant, rehabilitation center was designed by L'aura Green, the movie queen and fertilizer heiress Green recently recovered from long-term psychic dependence, having squandered her fortune in the search for the Fountain of Truth.

The publicity from Green's obsession and subsequent downfall uncovered a widespread epidemic of poverty and despair suffered by thousands of New Agers, whose lives were ruined by the high cost of raised consciousness.

'It's shameful,' asserts Green, "that here in America people are going without the basic spiritual necessities. Hermitage USA will establish that the price of enlightenment needn't be out of sight."

Hermitage USA was the major beneficiary of Billy Crystal's recent telethon "Karmic Relief." In Arkansas highly evolved bluegrass musicians staged a benefit concert billed as the "Harmonica Convergence." These contributions will defray costs, thus reducing admission fees to the rehabilitation center.

At first the New Age seemed like a harmless pick-me-up. At parties Green would do a chart or two, maybe have someone read her palm. She considered herself a casual social thinker. *I'm in control,* she told herself. *I can stop whenever I want.*

But soon L'aura Green was a hostage in the psychic jet set. She couldn't go anywhere without her healing crystals. And she found herself spending more time out of her body than in it. Unsatisfied with regular channelers, Green consulted high-priced "tunnelers," extraordinary mediums who perform a cosmic version of the conference call. Green's favorite channels Mother Cassandra, who in turn channels Sybil, for an all-inclusive high price.

Before she realized what was happening, Green was supporting a $1,000-a-day psychic habit. She believed the only nourishment she required was a holistic concoction extracted from a pregnant South American red-lipped lizard. Understandably, these supplements are very expensive.

Green's inheritance dwindled as her quest for the perfect metaphysical state continued. Psychic physicians performed aural surgery, while New Age shrinks treated her with chakra therapy.

Financially and emotionally devastated, L'aura Green suffered a psychic breakdown. Evicted from her Beverly Hills mansion, she lived briefly in a tenement owned by slum landlord Oscar de Low Rento. She then decided to "hang out" on the beach. "As a Pisces," explains Green, "I felt I needed to get in touch with my fishness."

By telling her story publicly, Green hopes to spare others the pain she endured. "Americans need a reasonably priced spiritual experience," emphasizes Green. "For years, expensive crystals and high-priced channelers have serviced only the psychic demands of the rich and famous."

But changes have begun. Ever since Green's best seller *Prophet's Profits* identified the vast potential in the middle-American market, psychic entrepreneurs have hit the streets with New Age products designed to woo the spiritual dollar from the "average" American.

In the travel world, promoters of the Supernatural Sky-Train promise sightseers a satisfying, no-frills cosmic experience. For the timid tourist, smiling gurus lead mind excursions to other galaxies, while do-it-yourselfers can refer to Fodor's new volume *Touring the Inner Universe on Less than $5 a Day.*

Next month McDonald's will be promoting McCrystals in its Happy Meals. "True, they're just salt crystals," admits marketing spokesperson George McBundle. "But our research indicates that salt is an economical substitute for quartz—as long as it doesn't get wet. Besides,' continues McBundle, 'they taste good with McFries."

For those with a more holistic outlook, Shirley MacLaine and Jack LaLanne have teamed up to produce a MacLa-LaLanne metaphysical fitness video entitled *Let's Get Metaphysical.*

This season TV networks are getting into the act with New Age programs like *Moonlighting, Name That Shaman* and *These Are Your Lives.*

Disneyland has also announced a New Age addition: NewLand. Annexing Fantasyland, it will feature such innovations as Out of Body Rides and *Star Tours II: Captain Eo Returns to Jupiter.*

Prominent Dallas psychic Urn Polaris now offers economy reincarnations. "Our inexpensive sessions review less-dramatic past lives than do the more costly versions," he explains. "For fifteen dollars you can review your life as a shoe salesman in Wichita."

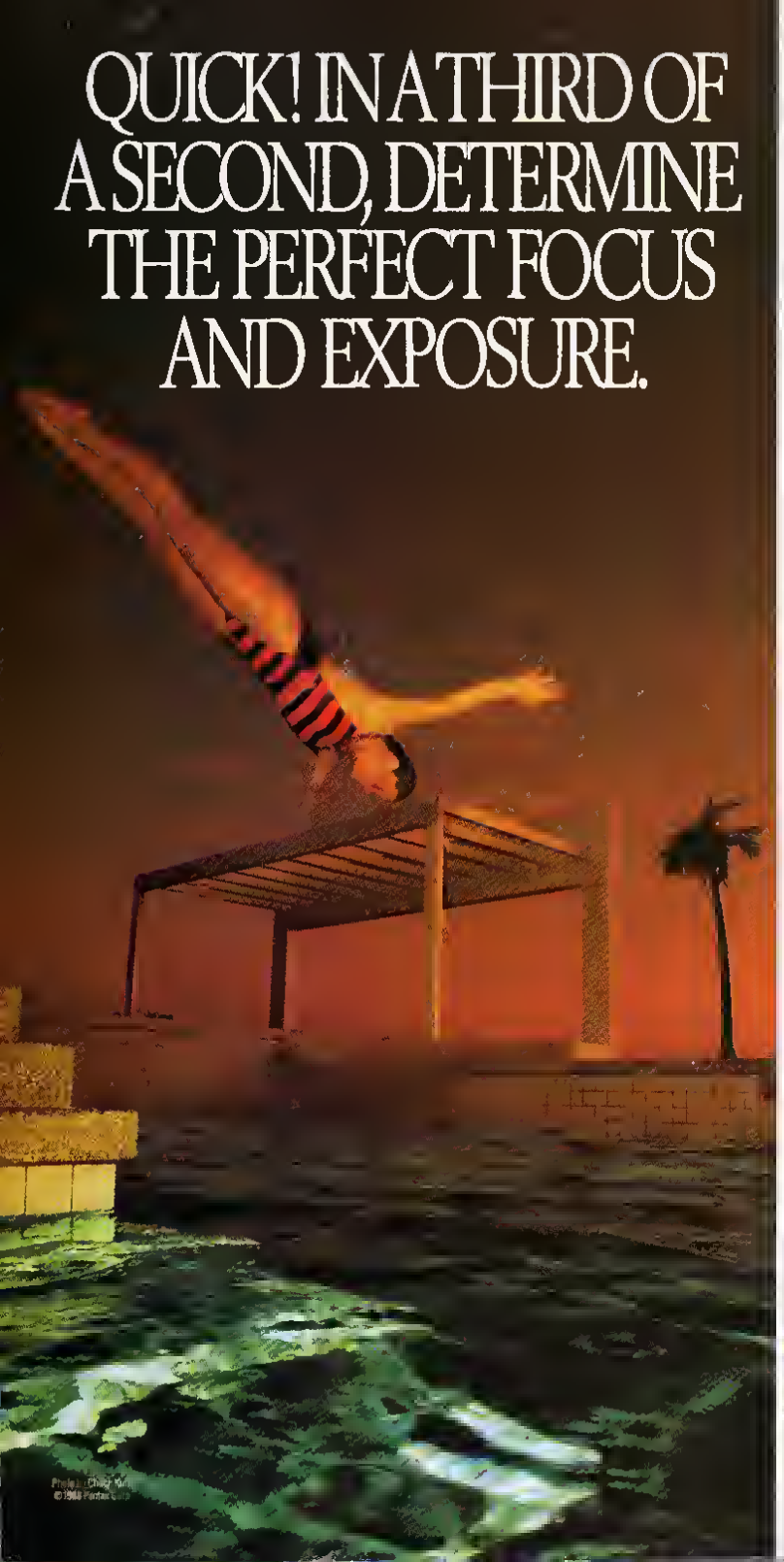
Many religious professionals are unhappy with these developments. "People these days want everything," complains one TV evangelist. "It used to be that Americans were content to be born again. Now they want to be born again and again and again."

But New Age preachers are aiming to please. Last week Jerry Feelwell made his Immortal Minority an offer they can't refuse. Feelwell promised his followers that if they send him $3 million in the next six weeks, he will be called home.

Now, that's a bargain. ∞

Kathy Thornock, who flunked out of automatic writing, now channels a comic spirit through her word processor.

QUICK! IN A THIRD OF A SECOND, DETERMINE THE PERFECT FOCUS AND EXPOSURE.



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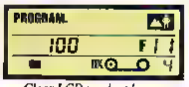

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