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OMNI

NOVEMBER 1980

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This month's striking cover was rendered by German artist Fred-Jurgen Rogner. One of Europe's most prolific artists, Rogner has illustrated more than 100 covers for various publications. His flamboyant style was the subject of a recent television show filmed in Bavaria.

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FIRST WORD

By Ben Bova

"One visitor to the Johnson Space Center said that the word celebration was wrong for Space Week, the correct word should be funeral."

Come take a look at the main entrance to the Johnson Space Center, near Houston. There a gigantic Saturn V rocket booster, all its three stages intact, sprawling on its side upon the grass like a dead, beached whale.

One feels a pang of painful recognition seeing that booster there, knowing that it was designed and built to carry astronauts to the moon, knowing that we have no hardware capable of performing that feat today and no plans to accomplish anything like it tomorrow.

That "beached" Saturn booster is an apt symbol of our languishing space program.

The Apollo project wasn't just killed, it was murdered, knifed in the back by the Know-Nothings of Washington while President Richard Nixon smiled for the cameras as he shook hands with the first returning Apollo astronauts.

No one in the U.S. space program expected that the exploration of the moon would end with *Apollo 17*, less than four years after our first lunar landing. NASA's original plans called for more extensive operations on the moon, with temporary and then permanent bases being set up on the lunar surface and a permanent space station constructed in orbit around the earth to act as a way station for the lunar explorers. A research laboratory for space scientists and a facility where industrial engineers could test new concepts in space manufacturing and chemical processing were also planned.

But the budget cutters destroyed all our post-Apollo plans. Through the whole decade of the Seventies not one of these tasks was even started. We wasted ten precious years — and more — while our nation lost prestige, economic power, political strength, and self confidence.

We are weaker today than we were on the day when *Apollo 11* touched down on the moon. We are poorer. Of all the resources available to us, we have wasted the most important one: time.

It has been more than 11 years since we first set foot on the moon. In Houston this past July the local citizens proclaimed Space Week to commemorate that famous event of July 20, 1969.

One visitor to the Johnson Space Center said that the word *celebration* was inappropriate for Space Week; the correct word should be *funeral*, as far as the U.S. space program is concerned.

But someone else went him one better. Looking at the thousands of Texans who drove through 100-plus-degree heat to see the exhibits and listen to the speakers talk about space, that observer said that we should be talking about a resurrection of the space program.

Certainly the main attraction of Houston's Space Week was the space shuttle, or the Space Transportation System, as NASA now designates it. Visitors goggled at the full-sized mockups of the shuttle: big as a DC-9, white and new-looking. Most of the speeches made during the week emphasized that the STS was the beginning of a new era in American space efforts.

Some VIP visitors were even invited to "fly" the shuttle simulator. I gave it a try, and at the point where the technicians cheerfully pointed out that I had probably ripped the wings off, I removed my hands from the controls and watched the ship's on-board computer correct my bungled reentry attempt and land the bird safely on the simulated runway.

The shuttle will take U.S. astronauts back into space. In time, the STS will carry nonastronaut passengers: engineers, technicians, construction crews, scientists. But will this really usher in a new era for the United States in space?

No. Not by itself.

The next American president, no matter who, will have the opportunity to revitalize our space program and bring about that resurrection. The first shuttle flights should start (finally!) next spring. The timing is right for a vigorous new push that will begin to bring the economic and political benefits of space to all U.S. citizens.

As a minimum, the president who takes the oath of office in January should strive for these space achievements:

(1) A testing program for the shuttle that moves as swiftly as possible into an operational Space Transportation System. We should aim at weekly launches of the operational shuttle before the new administration's term ends.

(2) Development of advanced space vehicles, including a fully reusable shuttle and a heavy launch vehicle for transporting industrial-sized payloads into orbit. These are necessary to reduce the costs of getting into space. Without them, the economic payoffs of space industries are delayed even further.

(3) A careful, unbiased assessment of the U.N. Moon Treaty, based on the economic and military realities of America's needs, not on the desire to curry dubious favor with other nations.

(4) Development of a "space tug" that can move payloads from low Earth orbits to higher altitudes, such as the geosynchronous orbit. The shuttle, as now designed, cannot attain the higher orbits.

(5) Construction of a permanent space station, in which men and women who are not astronauts can live and work for indefinitely long periods of time.

(6) Detailed studies of lunar mining, orbital manufacturing, solar power satellites, and the supporting systems that they will require. These studies should include field tests and experimental verification of key problem areas, in orbit or on the moon, as necessary.

A big agenda. However, these steps are requisite if we are to begin using the energy and the natural resources in space to solve human problems here on Earth.

Can we expect our next president to accomplish all these things? We should demand nothing less. ∞

CONTRIBUTORS

OMNIBUS

McAULIFFE

MARCH

SMITH

TEVIS

Two teams of physicists are racing to claim the first proton "kill." By destroying the particle, they hope to prove that quarks, which make up protons, are the ultimate building blocks of atoms. The scene of the "crime" will be a hole deep below the earth's crust. Only here can scientists trace the delicate paths of protons without atmospheric interference. In "Protons Are Not Forever" (page 44) *Robert March* outlines the historic event. "After twenty years of doing physics with big accelerators, it will be fun to get free of the red tape of working in laboratories. Does the fierce rivalry between the two teams of physicists bother him? He's already switched sides once and claims in any case that the premise is too earth-shaking to leave to a single experiment. Rivalry keeps everyone sharp." March, a physics professor at the University of Wisconsin, is a two-time winner of the American Institute of Physics award for science writing.

The healing powers of electricity hold an age-old fascination and a personal one for *Omni* biomedical editor *Kathleen McAuliffe*. Ironically, a closet interest in Victoriana led her to the frontiers of medical science. "At the turn of the century," McAuliffe says, "Victorians believed that so powerful a force of nature as electricity must also be a potent remedy. When I read about a Columbia-Presbyterian doctor who was using electricity to heal bone fractures, my curiosity was immediately piqued." After contacting him, McAuliffe learned that the Victorians' faith in electrical cures was not wholly unfounded. Turn to "I Sing the Body Electric" (page 70) and find out why electricity is revolutionizing medicine.

What effect does this U.S. election have on jobs, inflation, and the gross national product? Data Resources International, commissioned by *Omni*, has projected an economic forecast for the next four years based on the Democratic and Republican platforms. Senior editor *Dick Teresi* interprets the results, beginning on page 100.

"Nebula" (page 92) is a pictorial taken from top science writer *Timothy Ferris*'s latest book, *Galaxies*, published this fall by Sierra Club Books. Astronomers from around the world have provided spectacular images of celestial clouds and star dust for this exclusive peek at the cosmos. Ferris won the 1978 American Institute of Physics journalism award and is a professor of English at Brooklyn College, New York.

What will *Voyager 1* and *Voyager 2* see as they pass Saturn and its moons? *Charles Kohlhase*, mission design manager of the Voyager project, and *James F. Blinn*, a computer graphics specialist at the Jet Propulsion Laboratory, have prepared a series of stunning simulations that take us to Saturn's environs in advance of the real flybys. Meticulous calculation and expert interpretation furnish our readers accurate scenes of Saturn and its moons as they would appear to an observer traveling with the Voyager spacecraft. Get aboard on page 64.

This month's Earth column, "Atomic Vets" (page 14), reveals a national shame. In the 1940s and 1950s military personnel were exposed to radiation from nuclear tests. Since then these soldiers have experienced a rate of cancer higher than the national average. The Veterans Administration refuses to acknowledge any connection between the nuclear tests and what has happened to these servicemen. *Eleanor Smith* was moved to write about the problem after hearing Orville Kelly, founder of the National Association of Atomic Veterans, speak in San Francisco last fall. She was enormously impressed that these "former patriots" were now "angry with the government for its complete indifference to their plight." Smith has been a member of Friends of the Earth for four years and is managing editor of that organization's newsmagazine.

Walter Tevis, whose short story "Out of Luck" begins on page 52, is probably best known for his novels *The Hustler* and *The Man Who Fell to Earth*. Tevis will have a short-story collection out in January called *Far from Home*. He is now working on a screenplay based on his novel *Mockingbird*.

Awards update: *George R. R. Martin* won the 1980 Hugo science-fiction award for two *Omni* contributions: the short story "The Way of Cross and Dragon" and the novelette "Sandkings."

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NOVEMBER

LETTERS

COMMUNICATIONS

Inner Mounting Flame

Joel Davis wrote with real understanding [Continuum, August 1980] about the role of the scientist, citing the example of Dr. David Johnston, a U.S. Geological Survey volcanologist who perished May 18 when Mount St. Helens exploded.

As David sought to understand and explain the flame that glowed within the mountain, Joel sought to understand and explain the flame that glowed in David.

As David's parents, we feel Joel understood very well, and we thank him.

Thomas and Alice Johnston
Oak Lawn, Ill.

Joel Davis's "Death in the Cascades" captured the true essence of being a scientist. As an archaeologist, often subjecting myself to the wilds of nature, I feel close to David Johnston in his question-asking game. If I were in his position, I would have been at the Coldwater II observation post on the north face of Mount St. Helens.

William G. Johnson
North Miami, Fla.

Common Ancestors

Regarding "Blow to the Creation Myth" [Continuum, August 1980], I do not doubt the accuracy of the research done by Drs. Elizabeth Bruce and Francisco Ayala, but I must take issue with their conclusions.

Having found that certain primates, among them humans, are "about equally different genetically," the scientists suggest that four species "came from a common ancestor." Very interesting, but this by no means supports their conclusion, any more than finding four blue houses in one town "suggests" that all were painted with paint from the same very large can. All four may have been painted by the same person, who mixed identical batches of paint.

None of this "reconfirms evolution," nor is it a "blow to the creation myth." I will admit, and gladly, that it does indeed indicate a common source. See what you think of John 1:3 in regard to all this.

Michael May
Newington, Conn.

Red Carpet to Space?

Having just read Craig Covault's "Universe Red" [August 1980], I am pained to think that during the next few years, when colonization is possible, we may have to hitch a ride with the Russians. We are rapidly falling behind in the space race and something needs to be done.

Therefore, I am sending reprints of Mr. Covault's article to my state senators. With *Omni*'s help, we just may be saved from the big wipeout and get pointed toward the unknown again.

Steven Johnston
Mexico, Mo.

Prime-time Preachers

Thank you for "Airwave Apostles" by Timothy Bay [August 1980].

Many people today are so concerned about international unrest and the threat of communism that they do not perceive an internal threat to America: organized fundamentalist religion. Because TV evangelists command so much wealth and power, they might easily sway votes in elections and influence people and policy in government.

Communism would certainly be rough to live under, but so would a government and country run by fundamentalist evangelists.

M. Eugene Rector
Garland, Tex.

Enlarged Heads

While it is exciting to see *Omni* carry a story about the extrapolation of our basic research to human thinking, there is a small point in "Brain Exercise" [Continuum, September 1980] that I would like to correct. We have speculated that what we learn regarding muscle-cell enlargement by exercise may be related to the enlargement of nerve cells when they are subjected to an enriched environment. Enlargement of nerve cells of animals placed in an enriched environment has been described by other researchers. But the presence of larger nerve cells does not mean that the brain itself becomes larger as stated in your article. Because the adult brain is confined in the skull, usage

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FORUM

In which the readers editors and correspondents discuss topics arising out of Omni *and theories and speculation of general interest are brought forth The views published are not necessarily those of the editors Letters for publication should be mailed to* Omni *Forum* Omni *Magazine 909 Third Avenue New York NY 10022*

Space Platform

Regarding Daniel S Greenberg s Platform for Progress [July 1980] American citizens have the right to know what science policies they will be voting for this month and hereafter The next president of the United States will have to confront these very issues and how they are handled will undoubtedly determine the course this nation will take for many years ahead I believe it is vitally important that the United States maintain whatever technological lead it has been able to gain in science

We must be careful that shortsighted federal policies do not undermine that lead which is now happening in the space and aviation fields The retrenchment of our national space program which has developed over the past decade, has resulted in a serious threat to our economic well being our national defense and our role as world leader in space technology and aeronautics It is absolutely essential that our space activities be increased through well-managed programs instituted by private industries as well as by the federal and state governments

For this to be accomplished, certain incentives must be provided Government restrictions should be minimized and regulations simplified to allow easier entry of private enterprise into space programs

An expanded space program based generally on NASAs five-year plan should be established including additional funding for several programs cut by the Carter Administration

I see the need for

- An intensified effort to achieve routine operational use of the space shuttle
- A more adequate fleet of shuttle orbiters than has been planned by the Carter Administration to ensure meeting national and international needs without costly delays
- Establishment of a permanent U S presence in space through planning and design of a general-purpose orbiting space station to work with and be serviced by the space shuttle
- Establishment of an operational LANDSAT-type system for Earth resources surveys
- Continuation and amplification of satellite-power-system evaluation (including evaluation of possible manufacture from nonterrestrial materials) in order to determine the practical desirability of collecting solar energy in space and safely transmitting it to Earth
- Proper support of a long-term program to explore the solar system with unmanned probes such as the Galileo mission to Jupiter the Venus Orbiting Imaging Radar and Halley s Comet flyby missions
- Full support for scientific study of the universe through the operation of large optical telescopes and other specialized scientific satellites
- Active research on large space structures and other technological advances needed to form a substantial national space industrialization capability within the foreseeable future

Burt Rutan s Vari-Eze daring solutions

Finally, the knowledge we gain the technology we develop and the scientists and engineers who make these advances possible will form the core of a technological renaissance in the United States leading to a more vigorous economy a more secure nation and a more peaceful world

John Anderson
U S House of Representatives
Washington D C

A World of Difference

Many thanks for all your help in avoiding cancellation of the Galileo project by the Senate Budget Committee We also are grateful for the help you ve been giving to the Planetary Society including the publication of my little piece in Continuum in the September issue of *Omni* You were kind enough to send me a check for the piece however I think it would not be right for me to accept it and so I am returning it as an enclosure with this letter I wonder whether you would consider using this $1 000 as a contribution to a larger donation that *Omni* might make to the Planetary Society This is a fairly critical moment in our finances—the direct-mail campaign is just beginning—and your contribution makes a world of difference to the society

Carl Sagan
Cornell University
Ithaca N Y

Avis Rara

My impression from "Rare Bird [July 1980] was that Burt Rutan is an aeronautical genius who with finesse solves problems in aerodynamics stability and control Yet I find it difficult to believe that Rutan is singularly responsible for solving the problems encountered with the F 4 Also the idea that "push-and-pull" engines are a marvelous innovation is poppycock Ever see a Cessna 337? However aside from the wide eyed gee whiz attitude that Anthony Wolff presents Rutan *is* a noteworthy phenomenon

CONTINUED ON PAGE 132

ATOMIC VETERANS

EARTH

By Eleanor Smith

On April 3, 1978, Louis Benne, chief pilot and manager of flight operations for Sperry Phoenix, passed a routine physical examination. On May 1, four weeks later, the much-decorated Air Force veteran was hospitalized, experiencing extreme pain. Black-and-blue marks appeared all over his body. His arms swelled up to twice their normal size. Bleeding began through the mouth and nose—and then internally.

Ten days later Benne lay hemorrhaging from a cancer in his bone cells. The night before his death, Benne revealed that in 1951 he had witnessed a series of U.S. government nuclear tests on the tiny Pacific island of Eniwetok.

"A lot of people were concerned about the roentgens that we would be exposed to on these atomic shots," Benne recalled. "The Army told us not to worry because five roentgens a month is nothing. So they said they would make it ten. Then they said ten is nothing. Well, the funny thing is, the wind shifted and everyone got ten to fifteen roentgens. So they had to up the roentgens to twenty. It was a big joke."

Benne's widow doesn't think it's very funny. She has since learned that her husband was in charge of the aircraft that flew unmanned through the blasts' mushroom clouds, collecting air samples. His duties included flying these planes between tests to check out the equipment. Benne and the other pilots wore no protective clothing. They wore film badges to measure their radiation exposure, but they were never informed of the dosages they'd received. After her husband died, Dorothy Benne applied to the Veterans Administration (VA) for service-connected death benefits; however, her application was turned down.

As of February 1980, more than 490 "atomic veterans," their wives, or their widows have filed claims with the VA for disability or death benefits. The VA has denied all but ten of them.

Between 1945 and 1962 the United States conducted 235 atmospheric nuclear weapons tests, primarily in the Marshall Islands and other islands in the Pacific and at the Nevada test site. More than 250,000 U.S. military personnel were ordered to witness these tests as part of a massive behavioral experimentation program. Further instances of duty-related exposure to radiation occurred when 2,000 U.S. military personnel were ordered to clean up radioactive debris in Hiroshima and Nagasaki and when 3,000 men were marched into the fallout area of the Shot Smoky atomic-bomb blast in Nevada.

Legally, the deck is stacked against the vet. The burden of proof is on the serviceman to establish a connection between his participation in nuclear tests and his current medical problem. But the Defense Nuclear Agency holds all medical records, film-badge readings and data on the possible fallout of each test. That agency still considers this information classified, refusing to turn it over to the veterans. Furthermore, the VA usually regards health problems as service-connected only if they arise within one year of discharge. This policy ignores symptoms that often do not appear until many years later. Cancers, known to be related to radiation exposure, may not be diagnosed for 20 to 40 years after exposure to a carcinogen.

The VA also assumes that soldier participation in nuclear tests has had little impact on human health and well-being. But Tom Saffer, national coordinator of the National Association of Atomic Veterans, has done his own investigation of the marines who served with him in Nevada during the 1957 bomb test Shotput. Of the 12 he's located, 3 are dead, 4 have cancer and 4 have multisystemic problems. "Only one is healthy," he says.

Statistically, a large percentage of the bomb-witnessing servicemen have been afflicted with physiological dysfunctions or disease. Most have some kind of cancer, particularly leukemia, myeloma (cancer of the bone marrow), melanoma (skin cancer), and cancer of the bladder, stomach, or pancreas. Degenerative bone and muscle diseases and neurological disorders have been diagnosed. Some vets develop sterility and blindness. The specter of radiation poisoning may even have reached into the next generation. Several vets report mental retardation and

CONTINUED ON PAGE 138

Slabs of concrete in Nevada desert bear silent witness to nuclear tests on man-made structures

SPERM HAZARD

LIFE

By Dr. Bernard Dixon

In their book *Women and the Crisis in Sex Hormones* (Bantam, 1978) the Seamans, Barbara and Gideon, suggest that the development of the most scientific form of contraception—the pill—reflected male dominance. Massive numbers of females, they assert, have accepted a drug that profoundly alters their body chemistry. The pharmaceutical industry never would have attempted to do the same to males. Men never would have tolerated such metabolic manipulation. So when the inevitable side effects emerged, they could be attributed to male chauvinism.

The Seamans' analysis, however, ignores other potent factors that contributed to this outcome. Adjusting the female-hormone balance *appeared* to be a much easier challenge than developing a drug to inactivate or destroy spermatozoa. Scientifically, it seemed a simpler job. But research was under way on both approaches. That's why some 12,000 Chinese men have now voluntarily tried the male oral contraceptive, gossypol, just as thousands of Puerto Rican women took the original birth control pill 20 years ago.

As for the dangerous side effects of the pill, any permanent or semipermanent manipulation of the human body carries some risks. In fact, recent studies indicate that the pill may be far safer than an increasingly popular male technique of fertility control: vasectomy.

According to several research reports, this apparently ideal method of contraception may hasten the process of atherosclerosis (hardening of the arteries). The danger is sufficiently worrying for the National Institutes of Health to have awarded three contracts for comprehensive surveys of vasectomy's supposed disruptive aftereffects.

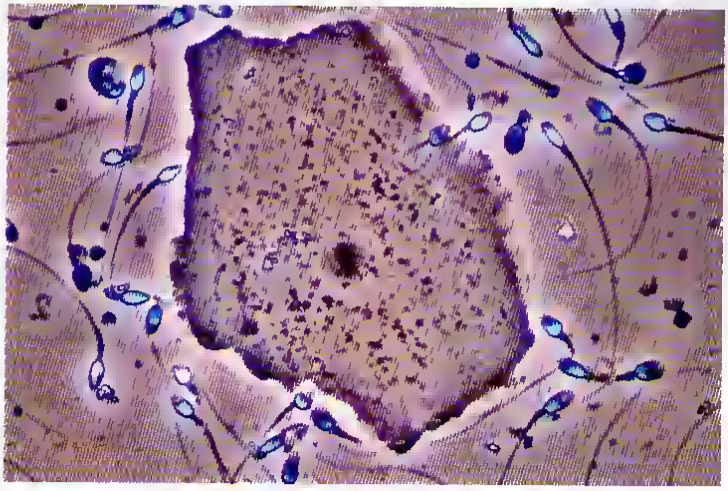
Dr. Nancy Alexander and her colleagues at the Oregon Regional Primate Research Center in Beaverton, Oregon, conducted the research that has fueled these anxieties. Two years ago they discovered that about 50 percent of men who had undergone vasectomy developed antibodies against their own spermatozoa. Tying the vas deferens apparently does not always shut off the supply of unwanted sperm completely. Some sperm—or their breakdown products—leak into the bloodstream. There they behave like foreign invaders such as bacteria, provoking the production of antibodies.

That is not the end of the story. Dr. Alexander's research group has found that vasectomized monkeys (which also produce antibodies against sperm) are much more likely than nonvasectomized monkeys to develop atherosclerosis. This first became apparent in animals fed a diet rich in cholesterol. Now it seems that the same thing happens in animals given food low in fat and lacking cholesterol entirely. One experiment on rhesus monkeys showed that seven out of ten vasectomized animals developed atherosclerosis in a major artery (the thoracic aorta). None of the eight "controls" suffered the same damage.

Unlike earlier investigations, the Oregon report provides a plausible explanation for what is happening. The arterial thickenings in vasectomized monkeys contain immunoglobulin—the very material out of which antibodies are made. When spermatozoa spill out into the bloodstream, they appear to stimulate the manufacture of antibodies. These attack and attach themselves to the sperm fragments, which in turn bind to the wall of the blood vessel. This damages the wall and accelerates atherosclerosis.

In a recent report in *Immunology Today*, Dr. Thomas Wegmann, from the University of Alberta, advocates that physicians exert "a good deal of caution" in recommending further vasectomies until we know more about the effects of this operation in man. Unfortunately, the results of human studies are likely to duplicate what has already been observed in our closest relative—the rhesus monkey. The physiology and anatomy are very similar, so we might expect the same adverse reaction to what is, after all, a seemingly tiny manipulation. And no one could have anticipated this effect any more than one could have foreseen the blood-clotting problems that accompanied earlier types of oral contraception.

Males everywhere will anxiously await the results of those three surveys. ∞



Sperm are the culprits. Even after a vasectomy, some leak into the bloodstream and clog arteries.

ELECTION TIME

SPACE

By David C. Webb

The U.S. space program is governed by politics. It was created and nurtured by politics. It has declined through politics. It will continue, for better or worse, through politics. Yet the pro-space constituency remains unable to grasp and act on this most basic aspect of space exploitation.

Perhaps the broad diversity of space issues themselves makes it inevitable that advocacy groups divide according to their special interests. Specialists in planetary exploration, remote sensing, communication satellites, and so forth pursue their own goals, without realizing that they must show the politicians a united front. Or perhaps it is because space has been dominated by scientists and engineers who are notoriously apolitical.

Whatever the reasons, the steady decline of the U.S. space program over the past decade makes it plain that the pro-space constituency has not grasped the message so well understood by other special-interest groups. *For an idea to succeed today, it must be sold to government as well as to the people.*

There are signs that this situation may finally be changing. Charles M. Chafer, vice president of the Institute for the Social Science Study of Space, writing recently in the first issue of the institute's newsletter, Space and Society, notes the new political orientation of some groups (such as the L5 Society), successful efforts to increase membership by mass marketing (National Space Institute), initiatives in private financing of space research (Space Studies Institute, Space Foundation) and in space exploration (Viking Fund), the registration of the first political action committee (Campaign for Space PAC), and the first efforts of several organizations to coordinate their educational activities.

He ends his analysis by stating: "While it is too early to judge the effectiveness of this emerging issue network ... national space policy in time may well reflect the input of an entirely new category of political actor—the pro-space citizen advocates."

It is up to us to ensure that national space policy reflects our views. The general election this year provides us with an immediate opportunity to voice our opinions at the ballot box. (To help in this process, the table on the following pages lists the votes of House members on five space-related bills that came before Congress in the past two years. It proved impossible to prepare a similar table for the Senate, for these bills were dealt with by voice vote only in that body—an indication, perhaps, that these matters are considered unimportant.)

This election also provides our only opportunity to register an opinion on President Carter's space policy (which calls for more of the same) and to decide whether any other candidate offers a better alternative. The Republican party's platform mentions only the military aspect of space—in a subparagraph, with one line calling for "more military and civilian exploration." Ronald Reagan did not discuss the subject in any policy speech. The independent John Anderson, as page 12 of this magazine reflects, prepared a broad statement on space policy and its positive economic effects. All candidates called for additional funds for the shuttle program.

The ballot box, however, is only one of the tools we must learn to use, and not the most sophisticated. Between elections, we must begin to use the techniques so successfully developed by other interest groups to keep their causes alive. We must learn where, when, and how to bring pressure to bear, build the organization to do it, spotlight those politicians who help or hinder the cause, and work for their election or defeat at the polls; and above all, cooperate for the good of the whole, knowing that united we can affect the political process, that divided we shall certainly fail.

There is much to learn and unlearn about the workings of the legislative process. While talking to one of the most supportive and respected members of Congress, I was shocked to discover that he had never even heard the name of one of our most active space organizations. That is the reality we must live with, owing to our own political inaction.

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The State of the Union address unites the powers that really control the U.S. space program

SORRY, SIGMUND

MIND

By Philip Hilts

Talk isn't cheap, at least not when the person listening is a therapist. So-called talk therapies are expensive, time-consuming procedures. And studies are showing they seem to be of extremely limited value. Only certain kinds of people with mild forms of mental trouble appear to get much benefit from psychological chitchat.

Given their choice, therapists will pick the type of patient who will give them the greatest chance of success; they'll avoid the more troubled cases whom they can't cure so easily, according to a new study by Georgianna Shick and Anthony DeVino, of Fordham University. Therapists like to treat YAVIS—young, attractive, verbal, intelligent, and successful people. Such individuals are the most likely to cure themselves without treatment, and therefore they're the easiest patients for therapists to achieve positive results with.

This study points up a growing trend in psychology today. Therapists are working more and more on mild difficulties of life that wouldn't have called for any treatment at all in the recent past. They are abandoning severe psychological problems to the appropriate doctors and pharmacologists whose treatments seem to work far better. Freud and his disciples claimed that therapists could cure severe disturbances. But the evidence against talk therapy today is too great. Now many therapists have retreated to higher ground, because their treatment simply doesn't do much for the severely troubled.

The traditional role of therapists was first shaken by the discovery and widespread use of mentally active drugs in the 1950s. As tranquilizers and antipsychotics came into increasing use, mental-institution populations dropped from 560,000 in 1956 to fewer than 200,000 currently. Therapists used to lock people away on highly subjective diagnoses. Now biology—the very thing Freud wished to avoid—has supplanted therapy as the hope of seriously disturbed people.

What is left for the traditional therapists to treat are mild anxieties, shyness, reactions to normal life crises, and other gentle dislocations. In this limited area and among those YAVIS clients who can afford what is probably unnecessary help, therapists have notched a record of success.

But now even this small purview is being threatened. Morris Parloff, a chief of research at the National Institute of Mental Health, has surveyed and analyzed 475 studies that examine the effectiveness of psychotherapy. Parloff found some evidence of positive effects emerging from talk therapies for a small number of people. He also determined that:

- It doesn't matter what kind of psychotherapy is applied—and there are now more than 250 kinds for the gourmand to choose from. They all work equally well.
- The therapist's experience has no significant effect on successful treatment. Neophytes do as well as august psychiatric sages.
- The length of treatment has little apparent benefit for the patient.
- Patients tend to overestimate the amount they've been helped. Adjustments at work or school improve much less than do the patient's feelings about himself.
- The effects of treatment don't last. Two years after therapy concludes, half the beneficial effect has been lost.

Finally and most damagingly, studies have found that psychotherapy can do harm as well as good. It is likely that 10 percent of the patients treated by therapists end up in worse shape.

Admittedly, many of the studies done so far are small, and their results are more suggestive than conclusive. But the existing evidence paints a pessimistic picture, while the federal government gears up for its authoritative three-year study of therapy's effectiveness, which will begin this fall.

The 475 studies examined by Parloff appear to support the findings of a puckish experiment done at the All-India Institute of Mental Health, in Bangalore. Half of the patients were entrusted to Western-trained psychiatrists and half to native Ayurvedic faith healers. After five years of work the competition was a draw, partial improvement of about the same magnitude on both sides.

The only difference: The witch doctors sent their patients home a bit sooner.

THE ARTS

By Gregory Miller

A few passengers sit idly reading. One or two drift to sleep on a hot New York afternoon. Business men stride into the terminal, out of rented sedans, into waiting executive jets. Most passengers ignore the four large, gray pedestals that ring the center of La Guardia Airport's Marine Air Terminal.

Atop each pedestal sits a mute television set. Suddenly one of the monitors comes alive with static. A couple of travelers notice this happening, while the rest sit absorbed in their thoughts. The static gives way to images, one monitor invoking another until all four are active.

The four monitors now begin a gentle visual dance, passing the images across or around the circle, echoing and leading one another. They drift in and out of synch, appearing to have a prearranged meeting and then wander off again on their own. The screens show views of a building in pastel colors; the pictures fade into darkness, followed thereafter by slightly different images of the same brilliant facade angled at 45 degrees.

The windows of the building capture shafts of sunlight colored alternately red, green and blue. Ethereal voices sound through the speakers in each cabinet, forming shifting consonant chords creating an airy, timeless ambience.

The piece described here is called "2 Fifth Avenue," after the building whose image dominates the screen. It is an installation for airports created by British musician/electronics wizard Brian Eno, who positioned it at La Guardia this summer. The music emanating from the speakers is from Eno's *Music for Airports* album and could be classified as ambient music. The video aspect is one of Eno's first excursions into the phosphorescent medium, and it is also ambient. Eno's plan is to make the audio/video event blend into the environment like a scent.

"When I go into an airport," Eno said one sultry evening in his Manhattan quarters, "I always find myself buying some magazine that I really don't want to read and sitting there getting fed up and feeling nervy and so on. I am put into the position of having to search and scan and dig, trying to occupy myself all the time.

"In an airport you have this captive group of people who don't really have options, so you can create a place where you can introduce some sort of meditative calm for a while. I guess what I want to do with this piece is give you the feeling of being alone again. Most of us spend nearly all our time with others. And we forget we're always tailoring ourselves for others, always adapting and modifying our behavior. It means that parts of us don't surface because there are no social situations that demand time. I guess I'm looking for some feeling of luscious silence, a feeling of solitariness."

"2 Fifth Avenue" activated itself by timers—from 7 to 8 and 9 to 10 A.M. and from 4 to 5 and 6 to 7 PM—to coincide with the terminal's peak hours. Short breaks in the hour-long performance allowed the tape to rewind.

Reactions to the installation were mixed, ranging from enraptured enthusiasm to impatience and total nonchalance. Airline and terminal workers were generally not impressed. "It sounds like funeral music," one commented. "It's gotta be some kind of experiment," said another.

But Eno was resolute in his plan to bring "meditative calm" into the terminal. "Soon after the monitors go on, you start to realize that nothing's going to happen," he explained. "It lets you off the hook in a way. You know you can just sit there and look around and drift back to it whenever you want. So your approach to it is quite different from reading a magazine, where you're put in the position of having to search and concentrate all the time."

Since the mid-Seventies, when Brian Eno—synthesizer player and amateur musical technologue—quit the British rock and roll band Roxy Music, he has waged a campaign against the tyranny of narrative or linear form and hierarchy in musical structure. Specifically, he rejects such classical holdovers as the ABA form and leading tone in music.

In the last few years Eno has given a series of lectures on this trend away from hierarchy in fashion, military tactics, sports and video. He has written several articles, including one on compositional

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Eno on video: The master of programmed randomness brings meditative calm into airports

THE ARTS

By Jeff Rovin

Present-day scientists have this much in common with Galileo They endure a host of highly visible detractors And while modern science and invention are not castigated before an Inquisition as severe as that of Pope Urban VIII the hosing waters of a Jane Fonda or Senator William Proxmire do manage to short-circuit a nuclear plant here, drown a NASA probe there But today as in the seventeenth century the sea of antiscientific rhetoric is more turgid than deep now as then the ruffian out-pourings must ebb and part before the raised staff of cool, common sense

There is no public figure more eager—or fitting—to lift this rod in defense of progress than Charlton Heston A film headliner for more than 30 years the Illinois-born actor has lent his imposing presence to such diverse screen characterizations as Cardinal Richelieu the Norman knight Chrysagon in *The War Lord*, Andrew Jackson, and Mark Antony But no less important is what these roles have given Heston the chance to research religion and science, to study the lessons of history, and to plumb the riches of world culture

What Heston has gleaned from the centuries is not encouraging The popular dogma—that we are evolving into kinder wiser more humane and tolerant beings—I don't think is true,' Heston asserts "Man's abstract worth may be enormous but he is not a highly educable animal This is my basic malaise While I will always have infinite faith in the extraordinary individual group man is helpless pliable there are too many blithering idiots

Many of Heston's films have reflected his disenchantment with mankind, none more so than such science-fiction pictures as *Planet of the Apes* (1968) and two of its sequels *The Omega Man* (1971) and *Soylent Green* (1973)

This year he has made *The Awakening* in which he stars as a professor of Egyptology who unearths a long-hidden pharaonic tomb and must discover whether his ensuing misfortunes are supernatural or psychological Though *The Awakening* is not a condemnation of society per se it does reflect Heston's disbelief in the fashionable space-chariot theories of Erich von Däniken and in such occult phenomena as reincarnation

Heston ponders the big question Did the Soviet Sputnik *create the U S space program?*

The relative literacy of Heston's science-fiction work derives not only from his films thematic sophistication be it satiric or grimly admonishing, but also from the affection that Heston has for the genre A confessed "print freak" the actor has been a votary of science fiction and fantasy for most of his life In his youth he read the works of Jules Verne as well as *Weird Tales* and religiously followed the comic-strip escapades of Buck Rogers and Flash Gordon He patronized all of the early science-fiction films from the serials to such features as *Things to Come* and *Frankenstein* (" which scared the butt off me "), and later became especially fond of Ray Bradbury's works

"It's a poorly kept secret that " Heston declares, 'compared to what Bradbury and others have written, the majority of filmed science fiction has been awful One reason for this is that filmmaking is a terribly expensive art form. The imagination holds no rein on it but if you're going to photograph something you've got to build it That means you've got to borrow money from someone and then you get bureaucrats making choices for you They understandably want a return on their investment and feel that the most dependable way to accomplish this is by amazing an audience The film you end up with then, is like the circus or grand opera neither of which has a lot of characterization Indeed most of the science-fiction films being made today are called space operas—an appropriate term They are gigantic operas, even down to the Wagneresque music the characters being reduced to one of two stereotypes tourists or fugitives

Now you can argue that you don't need spectacle in science fiction, and this is true But not everyone understands this which is why you have films like *The Black Hole* where there's no real story and nothing to act Most writers and directors in creating men and women from another time period be it past or future, merely

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MORE SOVIET ENCOUNTERS

UFO UPDATE

By E. Lee Speigel

Another piece of "evidence" has recently been added to the already-voluminous UFO literature. *Observations of Anomalous Atmospheric Phenomena in the USSR* was published "by decision of the Section of General Physics and Astronomy Presidium Academy of Sciences, USSR." Dated 1979, the document, a statistical analysis of 256 Soviet UFO sightings, was first received by GEPAN, France's official UFO research organization. A copy of it eventually found its way to Dr. Richard Haines, a visual-perception specialist at NASA's Ames Research Center in California. Believing the document to be significant, Dr. Haines had it translated in the Ames technical library.

The report was compiled by L. M. Gindilis, D. A. Menkov, and I. G. Petrovskaya, of the Shternberg State Astronomical Institute, the Moscow Engineering Physics Institute, and the Institute of Space Research, respectively. No additional information is offered on the background of these individuals, quite possibly because this paper was intended as an internal memorandum, not for public release. It is interesting that the authors of the Soviet document deliberately avoided the word *UFO*. "We consider the previously used term *UFO* to be less than adequate for such work, since it contains a definite interpretation of the phenomena observed."

Here are some highlights:

- The majority of incidents (76%) occurred in 1967. A sharp increase in the number of sightings that year occurred apparently in response to a Central Television broadcast in which all Soviet citizens were encouraged to report any UFO sightings.
- Of the 130 witnesses who listed their occupations, at least 66 percent had impressive qualifications: scientists (25%), pilots (11%), engineers (17%), servicemen (6%), and lab workers (7%).
- Two thirds of the cases involved multiple witnesses, with 15 percent listed as "mass observations."
- The objects described were as diverse as the people who reported them. Among the shapes observed were discs, stars, crescents, ellipses, and cigarlike objects.
- In many instances the observed UFOs demonstrated marked irregularities in their motion and velocity. Under a section of the report entitled "Flight Path of Objects," for 122 objects, "significant peculiarities were noted: abrupt course changes, hovering and maneuvering of the objects, rotation, and unusual flight paths."
- Like so many UFO reports, the majority of the Russian cases "apparently occurred silently; the rare cases when the phenomenon was accompanied by sound require special analysis."

This is the whole point of the report. The researchers come to no conclusions. They take no stand. Gindilis, Menkov, and Petrovskaya say more data are needed before definite conclusions about these "atmospheric anomalies" can be reached and that further studies should utilize all scientific specialties. "In our opinion, the Soviet and foreign data accumulated so far justify setting up such studies." This doesn't mean that the Soviet Union is actively involved in UFO research. It does show that three reasonable-sounding researchers have compiled reasonable-sounding statistics. It is interesting to note here that the statistics correlate with data collected worldwide.

Infamous jellyfish UFO over Petrozavodsk, USSR

Earlier this year the Soviet Union's official news publication *Pravda* denied rumors that the Academy of Sciences was engaged in UFO research. It is curious that a document surfaces in apparent contradiction to the *Pravda* news story. And the Soviet report is now available to the public through the Center for UFO Studies, whose director, J. Allen Hynek, says, "The fact is that *Pravda* doesn't know what the Academy of Sciences is doing. It's not just a rumor, we've got 'em red-handed."

A statistical analysis is only as good as the reliability of its raw data. In the case of the Soviet report, all the UFO observational data were supplied by Dr. Feliks Y. Zigel, professor of astronomy and cosmonautics at Moscow Aviation Institute. Dr. Zigel, you may recall, is viewed by some Western UFO skeptics as "the reigning czar" of the Soviet UFO cult (see UFO Update, July 1980). He has been criticized for having questionable credentials and heading a Soviet UFO rumor factory.

"If you look at the publications that Dr. Zigel has prepared over his career," Haines observed recently, "the great majority are good, sound, technical, well-founded scientific articles. The reader has to judge for himself what that stands for."

As one of the instructors to cosmonauts, Zigel wrote numerous articles about space and aeronautical sciences. In 1966 the Soviet magazine *Science and Religion* printed an article entitled "Telepathy: A Science of the Future" by Zigel, indicating his interest in ESP research. One other noteworthy fact about Zigel is that he steadfastly refuses to grant interviews. His fear of being grossly misquoted, at least in the United States, was well founded.

Zigel has never been so fringy as to claim personal contact with UFOs, nor has he been associated with any stories involving UFO occupants or landings. Even as early as 1967, according to a

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CONTINUUM

THE EPIDEMIC TRIGGER

Coughs and sneezes spread diseases ' wartime posters used to warn us We never doubted it Germs and viruses, we assumed, are commonly airborne, passed on by someone in the family or the office

This sounds like only common sense Yet it is not the correct explanation, as researchers first realized after tests were carried out at the Common Cold Research Unit, set up in England shortly after World War II The tests duly discredited several old wives' tales, such as that we catch cold by sitting around in damp clothes or in drafts or both But they also showed, disconcertingly that in controlled conditions people rarely catch cold from one another, no matter how intimate their relationship

Epidemics of influenza do not spread outward from a source, either Investigating such epidemics as the lethal 1918 outbreak and the briefly alarming Hong Kong flu 50 years later, Louis Weinstein (' senior statesman of infectious disease " as the *New England Journal of Medicine* described him) found them unaccountable in terms of person-to-person spread The disease appeared simultaneously all over the world, he noted, yet took days to weeks to spread relatively short distances.

Straightforward person-to-person transmission, too cannot conceivably account for such eccentric outbreaks as the Legionnaires' disease episode in Philadelphia four years ago It has been blamed on a bacterium, but no one has explained why it was so selective in its choice of a venue Even more baffling are the eruptions of epidemic neuromyasthenia in many countries One of its favorite targets is hospitals No surprise in that—except that it is commonly the nurses and doctors who collapse with tremors and twitches, aches and nausee while the patients remain immune

When George Bernard Shaw denounced the germ theory of disease as a modern superstition it was assumed he was joking Yet 50 years later Dr T P Magill, in his presidential address to the American Association of Immunologists echoed him Medical science has not explained infections, he claimed, it has merely substituted "microbes" for "evil spirits " More recently there has been another echo in Dr Lewis Thomas's *The Lives of a Cell* Our beliefs about the role of germs represent a 'modern kind of demonology' Dr Thomas complains he goes on to say that our fears are "paranoid delusions on a societal scale '

But if person-to-person germ transmission is not the way by which infections are spread, what is the explanation? Hans Zinsser put forward one possibility in his pioneering *Rats, Lice and History* half a century ago Some epidemics, he observed, notably the sleeping sickness that came with the flu toward the end of World War I, have displayed features curiously similar to the dancing manias of the later Middle Ages Could it be, Zinsser wondered, that such outbreaks were the consequence of some interaction, an as-yet-unexplained biological relationship, among the microbe the environment, and man?

People in crowds heve often been seen to acquire a kind of corporate identity in which they appear to be taken over by some control It is analogous to (and perhaps an evolutionary throwback to) the force that directs the manifold activities of ants in a nest or orchestrates the movement of starlings in flocks In his stimulating *Tuning In to Nature*, Philip S Callahan, protessor of entomology at the University of Florida, provides valuable clues to the part played by pheromones in insect communication His findings suggest the possibility that pheromones may turn out to provide a human communication system, too

Ten years ago the Harvard psychologist Martha McLintock reported the results of research that confirmed the reality of a phenomenon noted by Mary McCarthy in *The Group* that women in close-knit communities tend to menstruate at the same time Pheromones may be responsible for transmitting the information, and some process of the kind that gives people in crowds their common identity does the rest If so, this offers the prospect of an explanation for epidemics Germs and viruses should not be regarded as hostile invaders More often they are the equivalent of urban guerrillas behaving as respectable citizens until given the pheromone signal

This could explain the existence of virulent pathogens in the bodies of healthy people It could also account for the immunity of Max von Pettenkofer and his colleagues when they swallowed a teeming culture of cholera bacilli to disprove Robert Koch's work on the 'real ' cause of the disease The bacilli went through them all right but resulted only in mild diarrhea The bacilli had not received their signal, so they did not take up arms

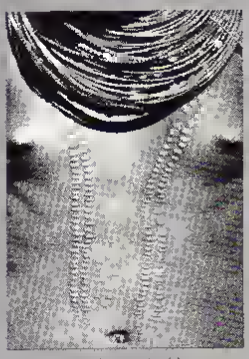
But what gives the signal? And why? Those are questions we have not begun to answer —*BRIAN INGLIS*

CONTINUUM

TRAUMATIC TALLNESS

Childhood trauma has been blamed for a variety of physical and psychological ills in later life But it seems that early trauma may have an interesting side effect tallness

For ten years anthropologists John W M Whiting and Thomas K Landauer have been documenting their hypothesis that tallness is a response to childhood trauma Landauer and Whiting have found that societies that stress infants by such practices as piercing little bodies scarring their skin or molding their heads produce male adults who average 2 5 inches taller than males in societies that don t engage in such practices



Scarring by the lanky Masai may contribute to their height

To correlate this unusual finding with American data, the two anthropologists compared growth records of babies in the United States punctured by vaccination before the age of two with those who weren't An average 2 5-inch advantage in male height was found for the punctured group

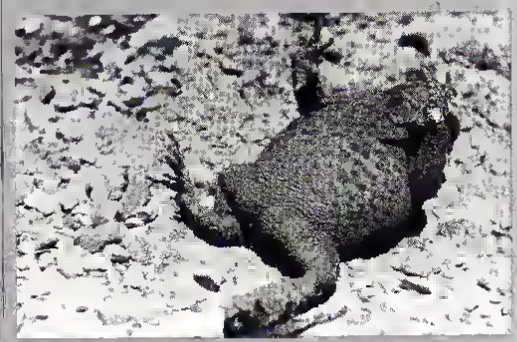
Landauer and Whiting also found that babies born in hospitals and separated from their mothers in the American way tend to grow taller than babies not born in hospitals and left in their mothers arms

"Taken together, the anthropologists conclude "the evidence leaves little room for doubt that early stress leads to accelerated growth "—Ralph Keyes

DEATH ON MARS

The question of life on Mars is far from settled In June 1980 *Omni* reported that U S scientists had seen color changes in the Martian rocks around the Viking probe that might be due to biological activity Now the Soviet Union has added another piece to the puzzle

Working with data supplied by both the Soviet and the American landers, exobiologists at the Space Biology Laboratory of Moscow University re-created a Martian environment on Earth They covered the floor of an airtight chamber with fine sand and lava, pumped out most of the atmosphere, and sent the rest swirling in artificial storms Temperatures inside the chamber fluctuated between +20° and −60° centigrade under a pelting of x-ray and ultraviolet radiation



Death in the Martian atmosphere One small leap for a frog

Into this man-made Mars, the researchers introduced various forms of Earth life Birds and mammals expired in a few seconds Turtles survived for 6 hours frogs and toads up to 25 hours Several species of insects lasted for weeks Oats, rye and beans sprouted and grew but couldn t reproduce

Many of the lowest orders of life however adapted easily to the harsh conditions Fungi, lichens, algae and mosses developed and multiplied at a normal rate

Though this experiment doesn't prove that there is life on Mars it does show that life—carbon based life as we know it—is *possible* on Mars And there are further implications

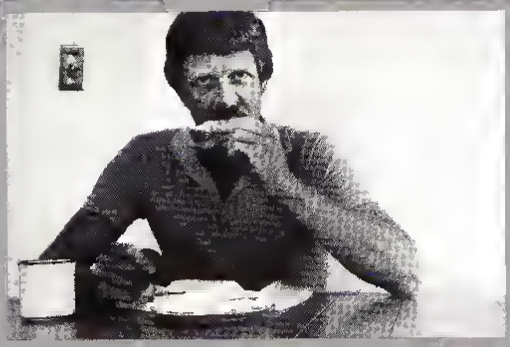
Simply by selecting adaptable Earth organisms, we have the means to terra form" our neighbor In the future this means we might establish a habitable ecology on Mars —Nick Engler

BROWN FAT

Medical researchers in California believe they know how humans can increase their brown fat, that 'magical' tissue that keeps people thin as a rail.

The brownish cells received attention recently when British, Canadian and U.S. scientists revealed studies indicating that people with more brown fat can eat bigger portions and yet not gain weight. That's because brown fat—unlike conventional white fat—burns calories, white fat merely stores them.

The brown-fat cells make up only 1 percent of body weight and are located between the shoulders, in the neck and around the kidneys. But experts say they may act like engines, burning up excess calories.



Brown fat lets you gorge on cookies and bologna and stay thin

Dr. Joseph Teague, of the Harbor University of California Los Angeles Medical Center, says that certain foods seem to increase the amount of brown fat by activating a bodily hormone. If so, he said, the hormone can be given to obese patients who could lose weight without consuming less food.

'Patients always tell us things like 'My brother-in-law can eat as much as he wants and not gain weight while I just look at food and get fat.'' Dr. Teague said. 'Part of our work suggests some people *can* eat as much as they want and not gain weight.'

Such ideas have been known to scientists for more than 100 years, but the reasons have only lately become clearer. In the recent experiments, rats were fed identical portions of a typical human diet—bologna and chocolate chip cookies. Some rats consumed 50 percent more calories than needed for weight gain and still stayed thin. Autopsies showed they had more brown fat.

Teague said his team, headed by Dr. George Bray, will not disclose the identity of the foods that produce brown fat until the research is published in a medical journal. Bray's research portends a new diet for the best-seller list. —Stuart Diamond

'Science has nothing to be ashamed of, even in the ruins of Nagasaki.'
—Jacob Bronowski

Nothing splendid has ever been achieved except by those who dared believe that something inside them was superior to circumstance.'
—Bruce Barton

ACOUSTIC LEVITATION

NASA scientists have succeeded in using sound waves to levitate pellets of glass or metal. Object: a new free-floating manufacturing process to be used for making ultra-high-quality optical goods in space.

In a process called acoustic levitation—to be tested aboard the space shuttle—researchers at NASA's Marshall Space Flight Center are using the sonic force created by 160-decibel sound waves to free-float material. A vibrator directs high-frequency sound waves against a reflector, and the waves bounce back and forth between the vibrator and the reflector to create an energy well. The whole device is housed inside a small industrial furnace.

After the furnace is turned on, a premix of metallic or glass components is injected into the energy well where it remains suspended and containerless through melting, mixing and solidification cycles.

Walls of containers can contaminate material heated to a high temperature and so create defects in glasses that can degrade their quality,' says William A. Oran, of the Marshall space processing division, which is helping to develop the levitator for a space shuttle experiment involving advanced optical glass.

NASA gets a lift from sound

Marshall scientists think that acoustic levitation not only will revolutionize the way materials are processed in space but might ultimately result in improved products for use on Earth.

"We are looking for new forms of glass. If we can eliminate impurities in fiber optics, we can make ultra-pure lightwave guides. Also, we might be able to make an all-purpose camera lens that would reduce chromatic aberrations and do away with the need for compensating lenses,' says Edwin Ethridge, a visiting scientist at Marshall. —Phyllis Wollman

CONTINUUM

RHINO SLAUGHTER

The rhinoceros has roamed the earth for 60 million years—a species longevity equal to that of the cockroach. But the rhino's chances of survival into the near future are dangerously slim. Ninety percent of the world's rhinos have been wiped out in the past ten years by man's vagaries, and in some countries—Uganda, Ethiopia, and Zaire—the rhino is probably extinct.

Taking full advantage of the political unrest and lawlessness in many African countries, poachers armed with automatic weapons are slaughtering rhinos for their large and prominent horns. Rick Wherehouser, a field researcher for the World Wildlife Fund, says: "In Ugandan and Kenyan national parks I saw rhino carcasses, with their horns sawed off, smoldering in the sun. It's a prevalent sight in just about all African parks."

In some markets, particularly those of the Middle East, where such macho symbols as walking sticks or dagger handles can sell for $15,000, rhino horns are sold for $300 an ounce. The horn itself, nothing more than a compacted mass of hair and gelatin, is believed to have remarkable aphrodisiac and medicinal properties. Its popularity as an aphrodisiac is attributed to a strong folklore, its phallic shape, and observations that rhinos are locked in copulation for at least 45 minutes. Ground into a fine powder, rhinoceros horn is also sold and used as a medicine, mostly in the Far East.

Game wardens and rangers use aircraft and sophisticated equipment to fight a running battle against the poachers, but because the stakes are high and the game easy to win, law enforcement does little good. Tracking down the rhinos themselves is not difficult, since they wander alone through the bush and often have a favorite spot where they defecate.

The World Wildlife Fund and other zoological preservation societies are involved in an all-out effort to save the rhinos. As a last-ditch consideration, there's even talk of dehorning the remaining rhino population.

—Caroline Rob

After 60 million years of surly but successful existence, rhinos face imminent extinction by poachers lusting after their horns.

"The great truths are too important to be new."
—W. Somerset Maugham

SILICON FALLOUT

Silicon is the element on which the new alchemists have etched the microelectronics revolution, but silicon-laced fallout from Mount St. Helens in Washington has short-circuited the Portland, Oregon, area's burgeoning electronics industry.

Ash fall last spring forced the temporary shutdown of some electronic-component manufacturing facilities, including ones at Intel Corporation and Tektronix, Inc., because officials feared that clean rooms might be contaminated. Just one speck of dust in a clean-room manufacturing environment can ruin an entire microelectronic circuit.

Air filters in vent systems were changed, access to buildings was limited, and dust-collecting mats were installed in entryways to thwart any errant silica.

Outdoor automated bank tellers were also temporarily closed while the cement-dust-like fallout swirled through Portland. "The manufacturer told us to close them because he was afraid ash might short the circuit boards and cause fires," says Lowell Brisbin, vice-president of cashiers at U.S. National Bank of Oregon.

With the mountain quiet and business back to normal, there appears to be only one high-technology casualty blamed on the St. Helens volcano. National Semiconductor Corporation has canceled plans to build a silicon-water-fabricating plant near Portland in Vancouver, Washington.

"Difficulties in recruiting people, not tears of contaminated clean rooms, caused the plant to be scratched," says National Semiconductor's Michael Ayers.

Mount St. Helens silica zapped local electronics clean rooms.

The plant was scheduled to employ two thousand persons within the next two years." Ayers notes

"With the uncertainty surrounding the volcano," he explains, "we were just having too much difficulty attracting people to the area."—Craig Zarley

"Sometimes one concludes that the real challenge of energy conservation is not to do it, but rather to believe that it can be done."

—Daniel Yergin

SPACE DRIVE

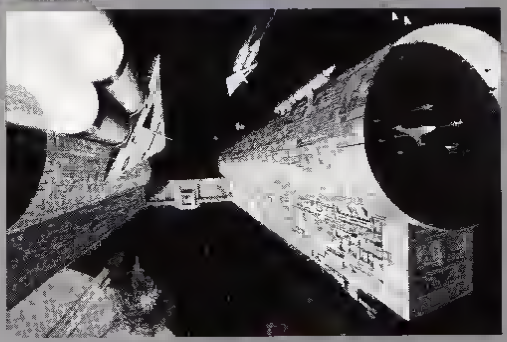
Monoatomic hydrogen has long been known to science-fiction fans. Theoretically, tremendous power could be gained by making single atoms of hydrogen and then allowing them to recombine into the H_2 molecules that are the natural form of this element. Now scientists at Amsterdam University, in the Netherlands, have really made some of this exotic kind of matter.

Professor Isaac Silvera's group generated H atoms—the easy part—but then prevented them from instantly recombining by holding them within a strong magnetic field, in a helium-lined vessel, at less than one degree above absolute zero. Under these conditions, monoatomic hydrogen can become a superfluid, it has no friction and can flow freely across any surface, even uphill.

This breakthrough, however, does not mean that H-powered spacecraft are being readied on the drawing board. The difficulties of storing such a fuel are much too great to make this a realistic proposition right now. But Dr. Silvera already foresees several practical applications for monoatomic hydrogen.

One is to construct a hydrogen maser, which could be used to investigate energy changes in atoms. Another is to investigate the state of matter inside neutron stars, where, as with monoatomic hydrogen at near-zero temperatures, the wavelengths of particles become so long that discrete atoms can no longer be distinguished from one another. Study of the ultrasmall may help us to understand the densest objects known in the realm of astronomy.

—Bernard Dixon



Hydrogen in its unnatural, unpaired state may power future spaceships and help unlock secrets of atoms and neutron stars

Canadian dentists have found a handy way to relieve toothaches—ice rubbed on an acupuncture point beside the forefinger

We have never been able to get a first-rate psychiatrist, psychologist, or sociologist to winter over in Antarctica not one of them has been man enough to leave the comforts of his wife's bed."

—An official of the National Science Foundation, reporting on the problems of polar exploration in Science *magazine*

HOKU POINT

Canadian researchers have found a strange new way for toothache sufferers to cool their pain away until they can get to a dentist. Dr. Ron Melzack of McGill University in Montreal reports that in a recent study 80 percent of the patients who rubbed a piece of ice on an acupuncture point on the back of the hand reduced their pain by as much as 50 percent.

Called the Hoku point, the spot is located on the back of the hand about an inch from the web between the thumb and forefinger.

Acupuncturists place needles in the Hoku point to stop toothache pain, but Dr. Melzack said rubbing ice on the spot works nearly as well as the needles do.

An acupuncturist might want to quote Robert Frost on the Canadian technique. Needles, he'd say, work well, but ice is also nice and would suffice."—Allan Maurer

"There is no democracy in physics. We can't say that some second-rate guy has as much right to an opinion as Fermi."

—Luis Alvarez

CONTINUUM

MOKELE-MBEMBE

Cryptozoologist Roy Mackal calls it one of the 20 "best bets" on his list of mythical animals that may in fact be real. The natives of the People's Republic of the Congo call it *mokele mbembe*.

Whatever you want to call it, it's a weird-looking creature: a body the size of a hippo, feet like an elephant's with claws, a long skinny neck about the width of a man's arm or larger, a man's thigh, a long tail, and something that looks like a long roosterlike comb on its head.

Gradually, Mackal feels, he is edging closer to the animal behind the myth. The University of Chicago biochemist and biologist recently visited a swamp beside the Congo River where a month of searching and interviewing turned up no trace of the creature but did get him an interview with a native who claimed to have seen the creature.

In 1959, Mackal was told, natives killed and ate one of three *mokele-mbembes* that were ruining the fishing in a local lake, Lake Tele. "Then, the story goes," Mackal says, "they all died from eating the animal."

He is convinced there is some truth to the tale, not just because of the one eyewitness report but because there are written records going back to 1776 of European explorers having spotted a similar creature and because the legend of this animal has been found among various Congo cultures, pygmy and nonpygmy.

Mackal himself believes the creature at least *did* exist, although he fears it now may be extinct and suspects that, whatever it was, it might have been a sauropod, a distant dinosaurlike relative of the African crocodile. Still, he hasn't given up pursuit and plans to launch another expedition next year to hunt it down.

—Douglas Colligan

The molombo plant (above) is the mokele-mbembe's favorite food

BOMB DETECTORS

Concerned about the growing number of terrorist bombings, the U.S. government is moving toward requiring tiny coded tags in commercial explosives to trace the devices to their place and date of purchase—and, it is hoped, to the buyer.

A Baltimore man was convicted last year in the bombing murder of his nephew when the tagged explosives yielded the manufacturer's name, the date, and the place of purchase.

The tiny tracers, called taggants, are usually hard plastic that can survive an explosion. Some resemble multicolored sandwiches; all contain a computer code. In Taggant research began about 15 years ago but has gained impetus as terrorism has increased. About 45 companies and scientific groups now work in the field. One goal is make sure the tags don't detonate the explosives prematurely. Another centers on unexploded

As bombings grow more frequent, officials may begin using taggants, coded tags that survive blasts, to trace terrorists

about two years such tags will probably be placed in all commercial dynamite, which comprises a third of all explosives, said W. David Williams, of the federal Bureau of Alcohol, Tobacco, and Firearms. Tags in other explosives will follow, he said. The tags will add an estimated 10 percent to the price of explosives.

In 1978, 45,000 kilograms of explosives were reported stolen or missing in the United States. There were 2,000 bombings, causing 69 deaths, 707 injuries, and $20 million in property damage. Few bombers are caught bombs, devising taggants that emit a vapor that can be detected as a terrorist walks through an airport security gate with nonmetal explosives in his suitcase.

"This sort of thing holds tremendous promise in helping to curb a worldwide problem," said Representative Morris K. Udall, who oversees the Office of Technology Assessment. Although home-made and non-American bombs won't have tags, most terrorists use commercially available explosives, and the use of taggants is expected to spread worldwide. —S.D.

3-D PHOTOGRAPHY

A company called Nimslo Technology, of Atlanta, Georgia, claims it will win the race to market the world's first economical and easy-to-operate system of three-dimensional photography. It is aimed at the general snapshot-shooting public.

Timex Corporation, which mass-produced the first cameras for Polaroid, is now under contract to turn out Nimslo cameras for next summer's market. Meanwhile Nimslo is setting up its special 3-D printing machines at photographic developing centers so that drug and photo stores can send out customers' film.

Jerry Nims, chairman of Nimslo, told *Omni*: No one before has come up with a fully automatic camera that takes a clear, precise three-D image in color on a flat print that you can simply hold in your hand. The history of photography is dotted with 3-D breakthroughs, but these made little impact on amateur photography because they involved heavy equipment, expensive films, applications of gooey gels, or gimmicky devices such as red-and-green glasses, stereoscopic viewfinders, and special projectors.

The Nimslo camera, which will sell for about $200, is of about the same size and weight as a conventional 35mm single-lens reflex and uses standard 35mm color negative film. What makes it a 3-D camera are four matched optical-glass lenses placed about a centimeter apart, which expose four simultaneous images onto two double frames of film inside.

Nims explains the processing this way: 'The printer's computer processes information from four frames of film and puts it into one three-D image, much the way the brain converts many images from both eyes into one solid image.' — C.R.

The Nimslo camera: four lenses, two frames, and a computer produce economical photos in 3-D, without two-tone glasses.

'The development of hydro power in the desert of North Africa awaits only the introduction of water.'

— Statement in Nuclear News

'There is virtually nothing that has come from molecular biology that can be of any value to human living in the conventional sense of what is good, and quite tremendous possibilities of evil.'

— Sir Frank Macfarlane Burnet, in The Lancet, *January 1966*

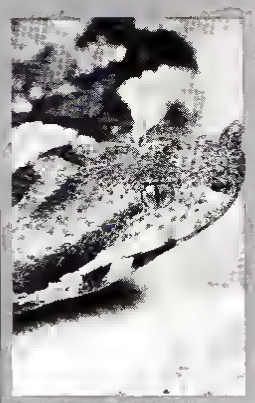
SERPENTINE SEX

An unusual new taxonomic tool is aiding biologists in classifying snakes: genitalia. Ranging from quite plain to very ornate (with flounces, branches, and other adornments), snakes' penises provide a valuable clue to their taxonomic groupings, New York University biologist Herndon G. Dowling says.

Male snakes are extremely well equipped. They possess two penises (called hemipenes). Only one is used at a time.

Having two penises allows a male snake to approach its chosen mate from either side, ensuring consummation of its biological intent: injecting sperm into the female and fertilizing her eggs.

The hemipenes are decorated with a rich array of ruffles, spines, calices (outer whorls), or papillae (small, nipplelike projections). Evolutionally older snakes—such as the primitive python and boid—have especially fancy genitalia and branched, Y-shaped sperm ducts (sulci).



Snakes have two penises, both tastefully decorated.

The more advanced the snake, Dowling says, the less elaborate its penile decoration and the less branched its sulcus.

But penis considerations aren't enough, Dowling declares. Conventional markers—like morphology and biochemical analysis—are still necessary to confirm a snake's taxonomic I.D. — Lisa Levinson

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"God has infinite time to give us: but how did He give it? In one immense tract of lazy millenniums? No. He cut it up into a neat succession of new mornings.

— Ralph Waldo Emerson

CONTINUUM

BUILDING A SMARTER RAT

In experiments that have far reaching implications, scientists are proving that rats in a stimulating environment are smarter than rats that live unchanging or passive lives

Researchers at the University of California's Lawrence Berkeley Laboratory have found that the cerebral cortex—the outer brain layer responsible for intelligence—grows 5 to 7 percent as a result of continual mental activity

One recent experiment found that rats that must learn maze patterns to obtain food and water have more gray matter (cerebral cortex) than rats merely given their food In another experiment, a rat playing in a cage with ladders wooden blocks exercise wheels, and other toys grew more intelligent than its brother in a barren cage

"Interestingly we found no brain changes from passive activities, such as watching slides television or active rats nearby," said Edward L Bennett, a biochemist who conducted the experiments with psychologist Mark R Rosenzweig at Berkeley

Scientific studies of brain changes due to experience date from the eighteenth century, but evidence is just beginning to be collected Scientists are weighing the rats' cerebral cortexes, which—unlike those in humans—are not convoluted and so are easier to cut away during dissection

Bennett added that mental stimulation increases brain size more than social stimulation does Being around other animals is not as important Changes in brain size were possible even if the stimulation had begun later in life

While cautioning against extrapolating the rat experiments to humans, Bennett said, "Our biases are that it applies —S D

MALIGNED SQUID

The giant squid, with tentacles as long as a telephone pole and eyes the size of basketballs, is actually rather shy and not the vicious attacker of ships that is portrayed in science fiction In fact, the large cephalopods try hard to stay out of the way of whales, which eat them whole

California studies show that rats that have a more stimulating life-style grow much smarter than their bored fellows

A mythical giant squid prepares to enjoy a Homo sapiens appetizer The ferocious reputation, scientists say, is richly undeserved

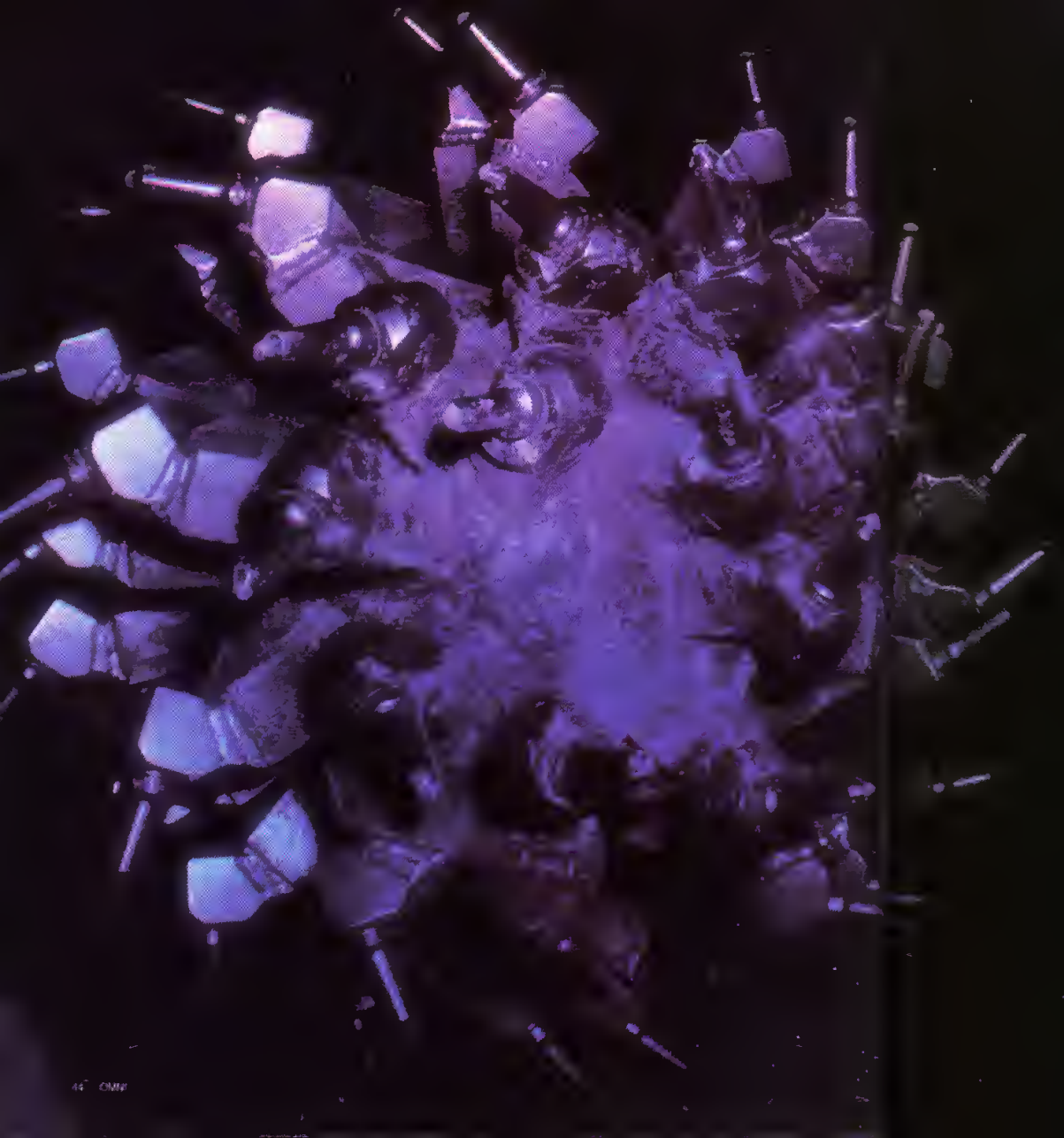
These observations were made by the Smithsonian Institution following interest that accompanied the discovery of a dead eight-meter-long giant squid on a Plum Island Massachusetts, beach, some months ago It was the first such beaching of a giant squid in 20 years anywhere in U S waters

While small squid (30 centimeters or less in length) are harvested throughout the world for food, sightings of live giant squid, which can reach 21 meters, are extremely rare These animals, whose scientific name is *Architeuthis*, live 200 to 400 meters beneath the ocean surface and usually come up only when dead or dying

"We have a tremendous number of unanswered questions," Clyde Roper, the Smithsonian's squid expert, says But scientists who have examined dead giant squids conclude they are not as heavily muscled as smaller squids nor can they swim as strongly Some experts theorize that *Architeuthis* s reputation for aggression comes from literary extrapolation of the behavior of its more diminutive cousins

One of them, two to three meters long, inhabits the Pacific coast of South America and has been known to gobble boat oars

But giant squid are often victims One, 12 meters long, was found intact in the stomach of a sperm whale The 70-ton whales love to eat giant squid, "one of the most maligned sea creatures " the Smithsonian says —S D



Why a particle's death may unlock the final secrets of matter

PROTONS ARE NOT FOREVER

BY ROBERT MARCH

A diamond is, of course, not really forever. Diamond cutters do menage to make a living. Likewise, the myth of the indestructible atom went up in smoke with the birth of nuclear physics. Since then our faith that all this stuff around us is here to stay has rested on the principal components of atoms—electrons, protons, and neutrons.

Now it seems our faith may once again have been misplaced. A daring group of theoretical physicists has issued a warning. Matter—what you and I and this magazine are made of—may be quite capable of vanishing before our eyes. The invincible electron remains a fundamental particle, but the protons and neutrons locked up in atomic nuclei might very well be mortal.

You needn't lose a single night's sleep over this. At most, your body might lose two or three subatomic particles in your lifetime, and you have plenty to spare. All the matter created since the dawn of time, save for one part in 10^{20}—a flyspeck out of a mountain—is still here.

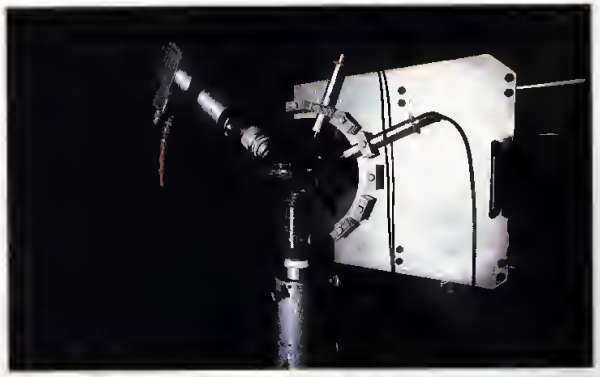
What has excited physicists is the prospect of actually witnessing the unprovoked "suicide" of a proton or neutron. The promised rewards are incalculable. It would be a giant step toward a unified field theory, a single law combining all the forces of nature, which Einstein sought in vain during his last 30 years.

And that's not all. A success

Deep beneath Lake Erie, a mechanical mole carves a hole where scientists will look for proton decay

PHOTOGRAPHS BY DAN McCOY

What has excited physicists is the prospect of witnessing the unprovoked "suicide" of a single proton



could finally identify the ultimate building blocks of matter and explain why our universe contains an unequal mixture of matter and antimatter. This is particularly puzzling since, in every atomic reaction we know, matter cannot be created without its antimatter equivalent. For example, when a proton is born, so is an antiproton. But the new force may do something no other can: convert matter to antimatter, allowing the particle to annihilate itself, releasing nearly all the energy stored in its mass.

To brand all this as wild speculation is an understatement; it rests on more iffy assumptions than most science fiction. Still it is backed by last year's Nobel laureates in physics, Sheldon L. Glashow, Abdus Salam, and Steven Weinberg.

The theory assures us that the half-life of a proton-neutron is at least 10^{30} years. When you remember that the universe is only about 10 billion—or 10^{10}—years old, 10^{30} is, for all practical purposes, forever. So it's out of the question to wait for large chunks of matter to disappear.

But there's another way to look at that 10^{30}-year half-life. If you watch 10^{30} protons—equal to about 1.5 tons of hydrogen—for a year, you have something like a fifty-fifty chance of seeing one die.

The world's most sensitive eye, a photomultiplier tube (left), will be used to detect the feeble light radiated during proton decay. Even a single photon will register and be amplified thousands of times inside the glass envelope. A test bed (above) is used to determine the light sensitivity and other properties of the photomultiplier tubes.

The theory leaves a hefty margin for error; nobody would believe it on the basis of a single example. The ultimate proof will require watching hundreds, or even thousands, of tons. In addition, the tests must be conducted deep underground to escape the hail of cosmic rays. In this way the needle of proton decay will not be lost in a gigantic haystack of false signals.

To get an idea of what these researchers are looking for, consider just one way a proton might die. It breaks up into a positron (to carry off its electrical charge—*some* things remain eternal) and two gamma rays. The positron, in a world of ordinary matter, will meet an electron and be annihilated, producing more gamma rays. One proton and one electron are gone forever. The resultant radiation, though tiny, should be detectable.

Three experiments have been launched in the United States, and another is under way in India, led by a Japanese group of investigators. Still others are now on the drawing boards. In the American tests the working material is water—the only substance both cheap enough to obtain in vast quantities yet transparent enough to pass the feeble flashes of light that come from the passage of radiation through matter.

This light will be seen by the world's most sensitive eyes—large vacuum tubes known as photomultipliers. These transform the puniest of light signals—a single photon—into an electrical pulse strong enough to fire a computer circuit.

It will take 100 or more pulses for a computer to reconstruct a picture of what is happening in the water. Even then the picture will be hazy and indistinct—rather like a snapshot badly out of focus. The designers of these experiments are gambling that the pictures will be just sharp enough to distinguish the decay of a proton or neutron from all the other expected things (and any unexpected ones) that can make flashes of light in a large tub of water.

The designers bank on the fact that the particles emerging from a dying proton or neutron can't travel far. In a meter or two the particles lose their energy through collisions with atoms in the water. A small fraction of this energy—about one part in 10,000—emerges in a particularly useful form: ordinary light produced by the Cerenkov process. This is the source of the eerie blue glow seen in photographs of nuclear-reactor cores.

The nice thing about Cerenkov light is that it is not emitted equally in all directions. Instead it is confined to a narrow cone centered on the particle's path. The pattern it forms on the phototubes tells which way the particle was headed, and its brightness is a measure of the particle's energy.

This information is crucial because it lets us distinguish Cerenkov light from cosmic ray flashes. Even deep underground, there are tens of millions of cosmic ray flashes each year. (Above ground, the number is in the trillions, and the task is hopeless.)

One modest effort involves upgrading a detector in the Homestake gold mine, about two kilometers below Lead, South Dakota. It was built by Ken Lande, of the University of Pennsylvania, and forms a hollow shield around the celebrated tank car of cleaning fluid that Ray Davis, of Brookhaven National Laboratory, uses to search for neutrinos from the sun's core.

Though Lande's detector contains nearly 800 tons of water, it is too crude to register more than a small fraction of the proton or neutron decays that take place inside it. He hopes that the optimistic predictions will be borne out and that the half-life really is not much more than 10^{30} years.

There is already a hint that this may be the case. That Japanese team, working with a 150-ton detector in the Kolar gold fields in India, believes it has observed two examples of proton disintegration. This evidence is too scant to convince even the scientists who found it. But if the Japanese detector could record even two proton deaths, the American detectors should be

able to see hundreds or thousands each year. This would end any doubt that matter is unstable.

None is better suited for this challenge than the monster taking shape in a Morton Salt mine 30 kilometers east of Cleveland. It is the brainchild of the two grand old men of this business: Frederick Reines, of the University of California at Irvine, and Maurice Goldhaber, recently retired as director of Brookhaven National Laboratory. In the 1950s they teamed up for the last serious search for proton instability using a modest sample of a few hundred kilograms. Without any theory to substantiate their conclusions, a larger effort would have been considered an exercise in futility.

But exercises in futility have long been Reines's stock-in-trade. After all, it was he who first detected the neutrino—the elusive particle that can sweep through the earth with only a minuscule chance of revealing its presence by hitting something.

This summer and fall a mechanical mole capable of unearthing hundreds of tons of rock salt each day has been carving a hole for Reines 600 meters below the dunes of Ohio's Lake Erie shore. When it is finished, he will have a swimming pool 24 meters long, 18 meters wide, and 21 meters deep, big enough to hold 9.5 million liters—more than 10,000 tons—of the purest water the Culligan man knows how to deliver. It must be pure to enable the 2,000 or so tubes lining the pool's walls to see all the way through. In this immense pool Reines can see a proton die, even if it lives almost 10^{33} years. If the more desired estimates prove true, he will see enough examples to win over the most stubborn skeptic.

Only slightly more modest are the plans of David Cline, of the University of Wisconsin, and Harvard's Carlo Rubbia. They have commandeered the fabled Silver King mine, beneath the Wasatch Mountains at Park City, Utah. There they will mount the biggest experiment that can be put in the mine without blasting rock (which is much more expensive than grinding salt with a mole). Their swimming pool is a concrete box about ten meters on a side, enclosing 1,000 tons of water. Ordinary particle counters on the top and sides will tag entering cosmic rays and tell the computer to ignore them.

To save on the cost of phototubes and avoid relying on the purity of water, Cline and Rubbia will hang 400 "eyes" on a lattice throughout the pool. A strong signal should be detected by a few tubes close to the spot where the proton disintegrates. Though the signal will be more powerful than in Reines's experiment, it may also prove more difficult to interpret.

The rivalry between these groups has an ironic twist. Both are drawn from the ranks of maverick physicists who like to gamble on long shots. One member of the Reines team said, "We all drink together at scientific meetings after the establishment types have gone to bed."

The competition reached a peak in the summer and fall of 1979, as each team in turn made its case before seemingly endless rounds of committee meetings in Washington, D.C. In the end the Department of Energy gave both the go-ahead: the stakes were too high to rely on a single experiment.

All this will set the American taxpayer back some $3 million or $4 million—the cost of a modest satellite launch, or about the cost of two hours of the Vietnam War.

European physicists are behind in the game because circumstances have forced them to take a different tack. They have two sites in highway tunnels: the busy one under Mont Blanc and a new one farther south at Fréjus, France.

Either tunnel would bury an experiment under more than 3,000 meters of solid rock. At such a depth cosmic rays are reduced to a trickle, eliminating a lot of false signals. Mont Blanc already has a suitable side gallery, and the tunnel authorities are willing to provide one at Frejus. But the difficulties of blasting rock out of a busy highway tunnel rule out anything the size of the American detectors.

"Confirmation of proton decay would offer a solution to one of the most perplexing riddles of cosmology. Why does the universe contain so much matter, with only traces of antimatter?"

To reach the 100-ton plus range, the Europeans are obliged to forsake water for some denser and more expensive medium. Two teams, one headed by French physicists and the other by Italians, have such projects on the drawing boards. Both are likely to be "sandwich" designs, alternating thin layers of some heavy material such as iron with electronic counters. The price tag for each should be in the $5 million to $10 million range.

The Japanese detector in India is similar to the European designs. These detectors give a sharper picture of the particles emerging from a proton decay than their American rivals do. If the half-life is short enough to give a reasonable signal rate, the quality of their data may outweigh any shortcomings in quantity.

These frenetic efforts stem directly from discoveries that have dramatically changed our understanding of the atom in recent years. Physicists once believed that most subatomic particles, especially the proton and neutron, were elementary, immortal and unchanging. Instead it now seems they are "atoms within atoms," each made up of three smaller particles called quarks.

Electrons, along with their neutral cousins the neutrinos, are still thought of as elementary. They belong to a second family related to quarks, called leptons.

Four particles (electron, neutrino, and two types of quark) are all one needs to make ordinary matter. They are simple objects, little more than points that carry mass. What has made the picture so confusing is that this pattern of four basic building blocks is repeated again—at least twice—with nothing changed but the particle masses. These heavier objects are terribly unstable: in less than a millionth of a second they have changed into one of the four basic ones. In our world they exist only as products of violent nuclear collisions in cosmic rays or in the beams from particle accelerators. Some of them bear peculiar names, like charmed or strange, that make them seem more exotic than they are.

In all reactions studied to date, quarks and leptons have scrupulously honored two rigid social rules. Quarks can be transformed into other quarks, and leptons into other leptons, but never the twain shall meet. And neither of them can be created or destroyed except by meeting their antimatter opposites. These are the barriers that the new theory seeks to remove.

In addition to these bricks, however, the universe needs mortar: the forces that cement particles together. In the subatomic world only three are needed. Ordinary electricity holds electrons in their orbits around nuclei. A second, "weak," force transforms one kind of quark or lepton into another, making possible nuclear beta decay and the reactions that power the sun. Finally there is the "strong" force, transmitted by the newly discovered gluons, which glue quarks together to form protons and neutrons.

The whole scheme hangs together neatly. But some of its creators see it as only one step on the way to a new world: 100 trillion times smaller still. Size for size, this world is to a proton what a proton is to us.

Those who formulated this scheme pin their hopes on a trend they have spotted in the realm of quarks and leptons. When these particles get very close together—much closer than normal—the distinctions between the three basic forces gradually become blurred. When they get close enough, the differences may vanish altogether, revealing the forces to be just different manifestations of a single master force. The Nobel Prize in 1979 was awarded for the first step: a unified picture of weak and electrical forces.

When the distinction between forces disappears, so must the distinction between particles, for particles serve only as vehicles for these forces. Quark and lepton, matter and antimatter, all should look much the same to this unified force.

To this force, a proton is mostly empty

space it comes into play only when quarks get 10^{16} times closer to one another than normal If a proton were the size of the solar system this distance would be the diameter of a pea The quarks move randomly through this space, so an encounter that close is obviously rare This is why the proton has such a long life

When two quarks collide with each other the theory has it they fuse into a peculiar temporary state of matter called a leptoquark It is a sublimely ungrateful particle Once created it reflects its origin only in the sum of the charges of the original particles On its deathbed it gladly yields to any pair of particles that satisfies this sum ignoring the tidy distinctions of quark versus lepton, matter versus antimatter So it can easily break up into a positron, plus an antiquark, which annihilates the proton's third quark, leaving the two gamma rays Matter has vanished without having encountered any antimatter

Of course, the whole argument falls apart unless quarks are small enough to get that close to one another (Remember that the force operates only at extremely short distances) This means that quarks can't have still smaller parts space itself loses its continuity at distances no more than 1,000 times shorter than a quark's diameter According to quantum mechanics and the theory of relativity space turns into a sort of discontinuous bubbly froth in this microcosmic realm This finite size is the nearest the real world can come to an imaginary geometric point

So a successful proof of the proton's mortality could end the age-old quest for the constituents of matter and send physicists off in a new direction In all likelihood their research will focus on gravity This is the force that physics began with, and the only one left out of this unified picture

In the long history of physics only two such long shots have paid off The first was Newton's law of gravity, which explained everything from the fall of an apple to the motions of the planets The second (early in this century) was Ernest Rutherford's extension of the inverse-square law of electrical force inward to the atom, in order to find the concentrated nucleus at its center Whether this new gamble will be the third to hit pay dirt can only be settled deep in those mines

If the gamble does pay off it may spell an end to the era in which physics has progressed through building bigger and more expensive particle accelerators If the new unified theory is correct nature holds no surprises beyond the world of quarks until you reach the realm of the leptoquark To gain a detailed knowledge of this ephemeral particle it is not enough to wait for the spontaneous suicide of a proton Instead leptoquarks will have to be artificially triggered, and this is far beyond the grasp of any conceivable accelerator With present technology it would take a ring of magnets as large as our galaxy to reach the required energies

A success would also be a bonanza for astrophysicists It would solve one of the more perplexing riddles of cosmology Why does the universe contain so much matter, with only traces of antimatter when all known physical processes create matter and antimatter in equal amounts?

But a leptoquark—the product of a fusion between two quarks—is exempt from this rule In the first instants of the big bang, when all the matter in the universe was concentrated into a tiny expanding fireball close encounters of quarks must have been common In these meetings more antimatter may have been converted to matter than the other way around creating the imbalance we note today Confirmation of the new theory would push back our time horizon to the earliest instant of creation

The practical implications of a force that can transform matter to antimatter are staggering We might release nearly all the energy locked up in mass, rather than the fraction of a percent converted in nuclear reactions Still, it's a long step from understanding a force to manipulating it and the theory gives no hint of how to speed the demise of a proton If that day ever comes, scientists will at last have a power source suitable for use in interstellar travel

These are high hopes indeed even the physicists preparing to test them know the deck is stacked against them But if their hopes are dashed, it will simply mean that this generation of subatomic physicists must content themselves with exploring the world of quarks Whatever lies beyond must then be left to their students and their students' students

Not a bad generation's work DO

FICTION

Just as Harold began his new life, the stranger appeared

OUT OF LUCK

BY WALTER TEVIS

It was only three months after he had left his wife and children and moved in with Janet that Janet decided she had to go to Washington for a week. Harold was devastated. He tried not to let her see it. The fiction between them was that he had left Gwen so he could grow up, change his life, and learn to paint again. But all he was certain of was that he had left Gwen to have Janet as his mistress. There were other reasons: his recovery from alcoholism, the years he had wasted his talent as an art professor, and Gwen's refusal to move to New York with him. But none of these would have been sufficient to uproot him and cause him to take a year's leave from his job if Janet had not worn peach-colored bikini panties that stretched tightly across her lovely bottom.

He spent the morning after she left cleaning up the kitchen and washing the big pot with burnt zucchini in it. Janet had made him three quarts of zucchini soup before leaving on the shuttle, along with two jars of chutney, veal stew in a blue casserole dish, and two loaves of Irish soda bread. It

PAINTING BY RENE MAGRITTE

was very international The mess in the tiny kitchen of her apartment took him two hours to clean up Then he cooked himself a breakfast of scrambled eggs and last night's mashed potatoes, fried with onions He drank two cups of coffee from Janet s Chemex Drinking the coffee he walked several times into the living room where his easel stood, and looked at the quarter done painting Each time he looked at it his heart sank He did not want to finish the painting—not *that* painting, that dumb academic abstraction But there was no other painting for him to paint right now What he wanted was Janet

Janet was a very successful folk-art dealer They had met at a museum party She was in Washington now as a consultant to the National Gallery She had said to him, "No I don t think you should come to Washington with me We need to be apart from each other for a while I m beginning to feel suffocated He had nodded sagely while his heart sank

One problem was that he distrusted folk art and Janet s interest in it, the way he distrusted Janet s fondness for her cats Janet talked to her cats a lot He was neutral about cats themselves but he felt people who talked to them were trivial And being interested in badly painted nineteenth-century portraits also seemed trivial to him now

He looked at the two gold-framed American primitives above Janet s sofa said "Horseshit!" and drew back his mug in a fantasy of throwing coffee on them both

Across from the apartment on Sixty-third Street workmen were renovating an old mansion, they had been at it three months before when Harold moved in He watched them for a minute now mixing cement in a wheelbarrow and bringing sacks of it from a truck at the corner of Madison Avenue Three workmen in white undershirts held sunlit discourse on the plywood ramp that had replaced the building s front steps Behind windows devoid of glass he could see men moving back and forth But nothing happened, nothing seemed to change in the building It was the same mess it had been before like his own spiritual growth lots of noise and movement and no change

He looked at his watch, relieved It was ten-thirty The morning was half over and he needed to go to the bank He put on a light jacket and left

As he was waiting in a crowd at the Third Avenue light he heard a voice shout, "Taxi!" and a man pushed roughly past him, right arm high and waving, onto the avenue The man was about thirty, in faded blue jeans and a sleeveless sweater A taxi squealed to a stop at the corner, and the man conferred with the driver for a moment before getting in He seemed to be quietly arrogant, preoccupied with something Harold could have kicked him in the ass He did not like the man s look of confidence He did not like his sandy uncombed hair The light changed, and the cab took off fast, up Third Avenue

Harold crossed and went into the bank He went to a table, quickly wrote out a "Cash" check for a hundred, then walked over toward the line Halfway across the lobby he stopped cold The man in the sleeveless sweater was standing in line, holding a checkbook His lips were pursed in silent whistling He was wearing the same faded blue jeans and—Harold now noticed—Adidas

He was looking idly in Harold s direction Harold averted his eyes There were at least ten other people waiting behind the man He had to have been here awhile An identical twin? A mild hallucination, making two similar people look exactly alike? Harold got in line After a while the man finished his business and left Harold cashed his check and left, stuffing five twenties into his billfold Another drain on the seven thousand he had left Michigan with He had seven thousand to live on for a year in New York with Janet while he learned to paint again to be the self

"He glanced down Park Avenue while crossing it and saw a sleeveless sweater and faded jeans, from the back, disappearing into one of the tall apartment buildings He shuddered"

supporting artist his whiskey dreams had been filled with Whiskey had left him unable to answer the telephone or open the door That had been two years ago in Michigan Whiskey had left him sitting behind closed suburban blinds at two in the afternoon reading the J C Penney catalog and waiting for Gwen to come home from work Well he had been free of whiskey for a year and a half now First the hospital then A A now New York and Janet

He walked back toward her apartment, thinking of how his entire bankroll of seven thousand could not pay Janet s rent for three months And she had taken this big New York place after two years of living in an even larger apartment in Paris On a marble-topped lingerie chest in one of the bathrooms was a snapshot of her, astride a gleaming Honda on the Boulevard des Capucines by the ironwork doorway of that apartment When that photograph was taken Harold was living in a ranch house in Michigan and was driving a Chevrolet

He glanced down Park Avenue while crossing it and saw a sleeveless sweater and faded jeans from the back, disappearing into one of the tall apartment buildings He shuddered and quickened his pace He shifted his billfold from a rear to a front pocket, picturing those pickpockets who bump you from behind and rob you while apologizing on the streets of New York His mother—his very protective mother—had told him about that twenty years before Part of him loved New York, loved its action and its anonymity along with the food and clothes and bookstores Another part of him feared it The sight of triple locks on apartment doors tended to frighten him, or of surly Puerto Ricans with well-muscled arms carrying their big noisy arrogant radios Their Kill-the-Anglo radios The slim-hipped black men frightened him, with long tight-assed trousers in pale colors half-covering expensive shoes—Italian killer shoes And there were drunks everywhere In doorways Poking studiously through garbage bins for the odd half-eaten pizza slice the usable worn shirt Possibly for emeralds and diamonds Part of him wanted to scrub up a drunk or two, with a Brillo pad, like the zucchini pot Something satisfying in that

The man in the sweater had been white clean nonmenacing Possibly European Yet Harold crossing Madison now felt chilled by the thought of him Under the chill was anger That spoiled, arrogant face! That sandy hair! He hurried back to Janet s apartment building, walked briskly up the stairs to the third floor let himself in There in the living room stood the painting He suddenly saw that it could use a sort of rectangle of pale green, like a distant field of grass right there He picked up a brush very happy to do so Outside the window the sun was shining brightly The workmen on the building across the street were busy Harold was busy

He worked for three solid hours and felt wonderful It was good work too and the painting was coming along At last

For lunch he made himself a bacon-and-tomato sandwich on toast It was simple midwestern fare and he loved it

When he had finished eating he went back into the living room sat in the black director s chair in front of the window and looked at the painting by afternoon light It looked good—just a tad spooky the way he wanted it to be It would be a good painting after all It was really working He decided to go see a movie

The movie he wanted to see was called *Out of Luck* It was a comedy from France advertised as "a hilarious sex farce" with subtitles It sounded fine for a sunny fall afternoon He walked down Madison foward the theater

There were an awful lot of youthful well-dressed people on Madison Avenue They all probably spoke French He looked in the windows of places with names like Le Relais La Bagagerie, Le Bijou He would have given ten dollars to see a J C Penney s or a plain barber shop with a red and white barber s pole

As he was crossing Park Avenue traffic snarled as usual there was suddenly the

loud *harrumphing* of a pair of outrageously noisy motorcycles and with a rush of hot air two black Hondas zoomed past him From the back the riders appeared to be a man and a woman although the sexual difference was hard to detect Each wore a spherical helmet that reflected the sun the man's helmet was red, the other green Science-fiction helmets they hurt the eyes with reflected and dazzling sunlight There was a smell of exhaust Each of the riders man and woman, was wearing a brown sleeveless sweater and blue jeans Each wore Adidas over white socks Their shirts were short-sleeved blue So had been the shirts of the man in the taxi and the man in line at Chemical Bank Harold's stomach twisted He wanted to scream

The cyclists disappeared in traffic, darting into it with insouciance tilting their black bikes first this way and then that as though merely leaning their way through the congestion of taxis and limousines and sanitation trucks

Maybe it was a fad in dress Maybe coincidence He had never noticed before how many people wore brown sleeveless sweaters Who counted such things? And everyone wore jeans He was wearing jeans himself

The movie was at Fifty-seventh and Third There was only a scattering of people in the theater since it was the middle of the afternoon The story was about a woman who was haunted by the gravelly voice of her dead lover—a younger man who had been killed in a motorcycle accident She was a gorgeous woman and went through a sequence of affairs breaking up with each new lover after the voice of her old dead one pointed out their flaws to her or distracted her while making love It really was funny Sometimes though it made Harold edgy when he thought of the young lover Janet had had before him who had disappeared from her life in some way Harold did not know about But several times he laughed loudly

And then toward the end of the movie her lover reappeared apparently not dead at all It was on a quiet Paris street She was out walking with an older man she had just slept with, going to buy some coffee when a black Honda pulled up to the curb beside her She stopped The driver pulled off his helmet Harold's heart almost stopped beating and he stared crazily There in front of him on the Cinemascope movie screen, was the huge image of a youngish man with sandy hair a brown sleeveless sweater blue shirt, Adidas The man smiled at the woman She collapsed in a dead faint

When the man on the motorcycle spoke his voice was as it had been when it was haunting her gravelly and bland Harold wanted to throw something at the screen, wanted to scream at the image "Get out of here you arrogant fucker!" But he did nothing and said nothing He stayed in his seat, waiting for the movie to end It ended with the woman getting on the dead lover's motorcycle and riding off with him He wouldn't tell her where he lived now He was going to show her

Harold watched the credits closely wanting to find the actor who had played the old lover His name in the film had been Paul But no actor was listed for the name of Paul The others were there but not Paul *What in God's name is happening?* Harold thought He left the theater and, hardly daring to look around himself on the bright street flagged down a cab and went home Could a person hallucinate a character into a movie? Was the man at the bank in fact a French movie actor? Twelve years of drinking could mess up your brain chemistry But he hadn't even had the DT's His New York psychiatrist had told him he tended to get badly regressed at times but his sanity had never been in question

In the apartment he was somehow able astonishingly to get back into the painting for a few hours He made a few changes making it spookier *He* felt spookier now and it came out onto the canvas The painting was nearly done When he stopped it was just eight o'clock in the evening The workmen across the street had finished their day hours before had packed up their tools and had gone home to Queens or wherever The building as always was unchanged, its doorways and windows gaped blankly There was a pile of rubble by the plywood entry platform where there had always been a pile of rubble

He went into the kitchen ignored the veal stew Janet had made for him and lit the oven Then he took a Hungry Man chicken pie out of the freezer ripped off the cardboard box stabbed the frozen top crust a

few times with her Sabatier, slipped it into the oven, and set the timer for forty-five minutes.

He went back into the living room, looked again at the painting. "Maybe I needed the shit scared out of me," he said aloud. But the thought of the man in the sweater chilled him. Harold went over to the hutch in the corner, opened its left door, and flipped on the little Sony TV inside. Then he walked across the big room to the dry sink and began rummaging for candy. He kept candy in various places.

He found a couple of pieces of butterscotch and began sucking on one of them. Back in the kitchen he opened the oven door a moment, enjoying the feel of hot air. His little Hungry Man pie sat inside, waiting for him.

There had been a man's voice on television for a minute or so, reciting some kind of disaster news. A California brush fire or something. There in the kitchen, Harold began to realize that the voice was familiar, gravelly. It had a slight French accent. He rushed into the living room, still holding a potholder. On the TV screen was the man in the brown sweater, saying, "... from Pasadena, California, for NBC News." Then John Chancellor came on.

Harold threw the potholder at the TV screen. "You son of a bitch!" he shouted. "You ubiquitous son of a bitch!" Then he sank into the director's chair on the edge of tears. His eyes burned.

When his pie was ready, he ate it as if it were cardboard, forcing himself to eat every bite. To keep his strength up, as his mother would have said, for the oncoming storm. For the oncoming storm.

He kept the TV off that evening and did not go out. He finished the painting by artificial light at three in the morning, took two Sominex tablets, and went to bed, frightened. He had wanted to call Janet, but hadn't. That would have been chicken. He slept without dreaming for nine hours.

It was noon when he got up from the big platform bed and stumbled into the kitchen for breakfast. He drank a cup of cold zucchini while waiting for the coffee from yesterday to heat up. He felt okay, ready for the man in the sweater whenever he might strike. The coffee boiled over, spattering the white wall with brown tears. He reached to pull the big Chemex off the burner and scalded himself. "Shit!" he said and held his burned hand under cold tapwater for half a minute.

He walked into the living room and began looking at the painting in daylight. It was really very good. Just the right feeling, the right arrangement. Scary, too. He took it from the easel, set it against a wall. Then he thought better of that. The cats might get at it. He hadn't seen the cats for a while. He looked around him. No cats. He put the painting on top of the dry sink, out of harm's way. He would put out some cat food.

From outside came the sound of a motorcycle. Or of two motorcycles. He turned, looked out the window. There was dust where the motorcycles had just been, a light cloud of it settling. On the plywood platform at the entryway to the building being renovated stood two people in brown sleeveless sweaters, blue shirts, jeans. One was holding a clipboard, and they were talking. He could not hear their voices, even though the window was open. He walked slowly to the window, placed his hands on the ledge, stared down at them. He stared at the same sandy hair, the same face. Two schoolgirls in plaid skirts walked by on their way to lunch. Behind them was a woman in a brown sleeveless sweater and blue jeans, with sandy hair. She had the same face as the man, only slightly feminine in the way the head set on the shoulders. And she walked like a woman. She walked by the two men, her twins, ignoring them.

Harold looked at his watch. Twelve-fifteen. His heart was pounding painfully. He went to the telephone and called his psychiatrist. It was lunch hour, and he might be able to reach him.

He did—for just a minute or two. Quickly he told him that he was beginning to see the same person everywhere. Even on TV and in the movies. Sometimes two or three at a time.

What do you think, Harold?" he said to the doctor. The psychiatrist's name also was Harold.

It would have to be a hallucination, wouldn't it? Or maybe coincidence.

It's not coincidence. There've been seven of them, and they are identical. Doctor *Identical*." His voice, he realized, was not hysterical. It might become that way, he thought, if the doctor should say "Interesting," as they do in the movies.

"I'm sorry that you have a hallucination," Harold the psychiatrist said. "I wish I could see you this afternoon, but I can't. In fact, I have to go now. I have a patient."

"Harold!" Harold said. "I've had a dozen sessions with you. Am I the type who hallucinates?"

"No, you aren't, Harold," the psychiatrist said. "You really don't seem to me to be like that at all. It's puzzling. Just don't drink."

"I won't, Harold," he said, and hung up.

What to do? he thought. *I can stay inside until Janet comes back. I don't have to go out for anything. Maybe it will stop on its own.*

And then he thought, *But so what? They can't hurt me. What if I see a whole bunch of them today? So what? I can ignore them.* He would get dressed and go out. What the hell. Confront the thing.

When he got outdoors, the two of them were gone from in front of the building. He looked to his right, over toward Madison. One of them was just crossing the street, walking lightly on the Adidas. There were ordinary men and women around him. Hell, *he* was ordinary enough. There were just too many of him. Like a clone. Two more

"I'll say one thing about this place. It has real atmosphere."

crossed, a man and a woman. They were holding hands. Harold decided to walk over to Fifth Avenue.

Just before the corner of Fifth there was a wastebasket with a bum poking around in it. Harold had seen this bum before, had even given him a quarter once. Fellow alcoholic. There but for the grace of God, et cetera. He fished a quarter from his pocket and gave it to the bum. "Say," Harold said on a wild impulse, "have you noticed something funny? People in brown sweaters and jeans?" He felt foolish asking. The bum was fragrant in the afternoon sun.

"Hell yes, buddy," the bum said. "Kind of light brown hair? And tennis shoes? Hell, yes, they're all over the place." He shook his head dazedly. "Can't get no money out of 'em. Tried 'em six, eight times. You got another one of those quarters?"

Harold gave him a dollar. "Get yourself a drink," he said.

The bum widened his eyes and took the money silently. He turned to go.

"Hey!" Harold said, calling him back. "Have a drink for me, will you? I don't drink myself." He held out another dollar.

"That's the ticket," the bum said carefully, as if addressing a madman. He took the bill quickly, then turned toward Fifth Avenue. "Hey," he said, "there's one of 'em," and pointed. The man in the brown sleeveless sweater went by, jogging slowly on his Adidas. The bum jammed his two dollars into a pocket and moved on.

Well, the bum had been right. Don't let them interfere with business. But it wasn't hallucination—not unless he had hallucinated the bum and the conversation along with the bum. He checked his billfold and found the two dollars were indeed gone. Where would they have gone if he had made up the bum in his unconscious? He hadn't eaten them. If he had, the game was over anyway and he was really in a straitjacket somewhere, being fed intravenously while somebody took notes. Well.

He turned at Fifth Avenue, toward the spire of the Empire State Building, and stopped cold. Most of the foot traffic on the avenue was moving uptown toward him, and every third or fourth one of them was the person in the brown sweater and the blue short-sleeved shirt. It was like an invasion from Mars. And he saw that some of the normal people—the people like himself—were staring at them from time to time. The brown-sweatered person was always calm, whistling softly, sometimes cool. The others looked flustered. Harold jammed his hands into his pockets. He felt suddenly cold. He began walking down Fifth Avenue.

He kept going for a few blocks, then on an impulse ran across the street to the Central Park side and climbed up on a park bench that faced the avenue and then from the bench onto the stone railing near the Sixtieth Street subway station. He looked "downtown," up high now so that he could see. And the farther downtown he looked, the more he saw of an array of brown sweaters, light brown in the afternoon sunlight, with pale, sandy haired heads above them. On a crazy impulse he looked down at his own clothes and was relieved to see that he was not himself wearing a brown sleeveless sweater and that his jeans were not the pale and faded kind that the person—that the multitude—was wearing.

He got down from the bench and headed across Grand Army Plaza, past people who were now about one half sandy-haired and sweatered and the other half just random people. He realized that the repeated person hadn't seemed to crowd the city any more than usual. They weren't *new*, then. If anything, they were replacing the others.

Abruptly he decided to go into the Plaza Hotel. There were two of them in the lobby, talking quietly with each other in French. He walked past them toward the Oak Bar; he would get a Perrier in there.

In the bar there were three of them sitting at the bar itself and two of them were at a table near the front. He seated himself at the bar. A man in a brown sweater turned from where he was washing glasses, wiped his hands on his jeans, came over and said, "Yes, sir?" The voice was gravelly with a slight French accent, and the face was blank.

"Perrier with lime," Harold said. When the man brought it, Harold said, "How long

I think this one's of above average intelligence. He keeps ordering cheeseburgers.

have you been tending bar here?"

"About twenty minutes," the man said and smiled.

"Where were you before?"

"Oh, here and there," the man said. "You know how it is."

Harold stared at him, feeling his own face getting red. *No, I don't know how it is!* he said in frustration.

The man started to whistle softly. He turned away.

Harold leaned over the bar and took him by the shoulder. The sweater was soft—probably cashmere. "Where do you come from? What are you doing?"

The man smiled coldly at him. "I come from the street. I'm tending bar here." He stood completely still, waiting for Harold to let go of him.

"Why are there so many of you?"

"There's only one of me," the man said.

"Only one?"

"Just one." He waited a moment. "I have to wait on that couple." He nodded his head slightly toward the end of the bar. A couple of them had come in, a male and a female as far as Harold could see in the somewhat dim light.

Harold let go of the man, got up, and went to a pay telephone on the wall. He dialed his psychiatrist. The phone rang twice, and then a male voice said, "Doctor Morse is not in this afternoon. May I take a message?" The voice was the gravelly voice. Harold hung up. He spun around and faced the bar. The man had just returned from serving drinks to the identical couple at the far end. "What in hell is your name?" he said wildly.

The man smiled. "That's for me to know and you to find out," he said.

Harold began to cry. "What's your goddamned *name*?" he said, sobbing. "My name's Harold. For Christ's sake, what's yours?"

Now that he was crying, the man looked sympathetic. He turned for a moment to the mirrored shelves behind him, took two unopened bottles of whiskey, and then set them on the bar in front of Harold. "Why don't you just take these, Harold?" he said pleasantly. "Take them home with you. It's only a few blocks from here."

"*I'm an alcoholic*," Harold replied, shocked.

"Who cares?" the man said. He got a bright-orange shopping bag from somewhere under the bar and put the bottles in it. "On the house," he said.

Harold stared at him. "What is your goddamned, fucking *name*?"

"For me to know," the man said softly. "For you to find out."

Harold took the shopping bag, pushed open the door, and went into the lobby. There was no doorman at the big doorway of the hotel, but the man in the sleeveless sweater stood there like a doorman. "Have a good day now, Harold," the man said as Harold went on his way.

Now there was no one else on the street, but the man. Everywhere. And now they all

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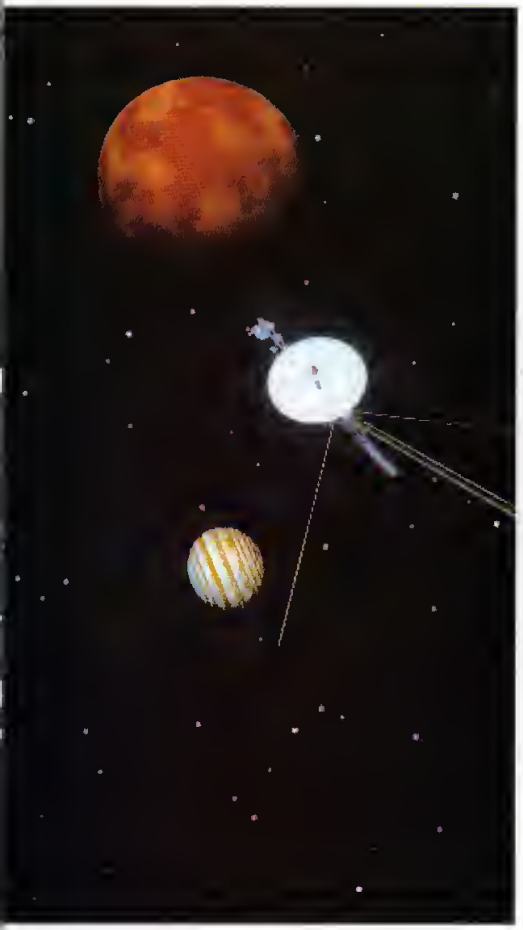
Computer graphics provide a preview of wonders to come later this month



SATURN ENCOUNTER

BY CHARLES KOHLHASE

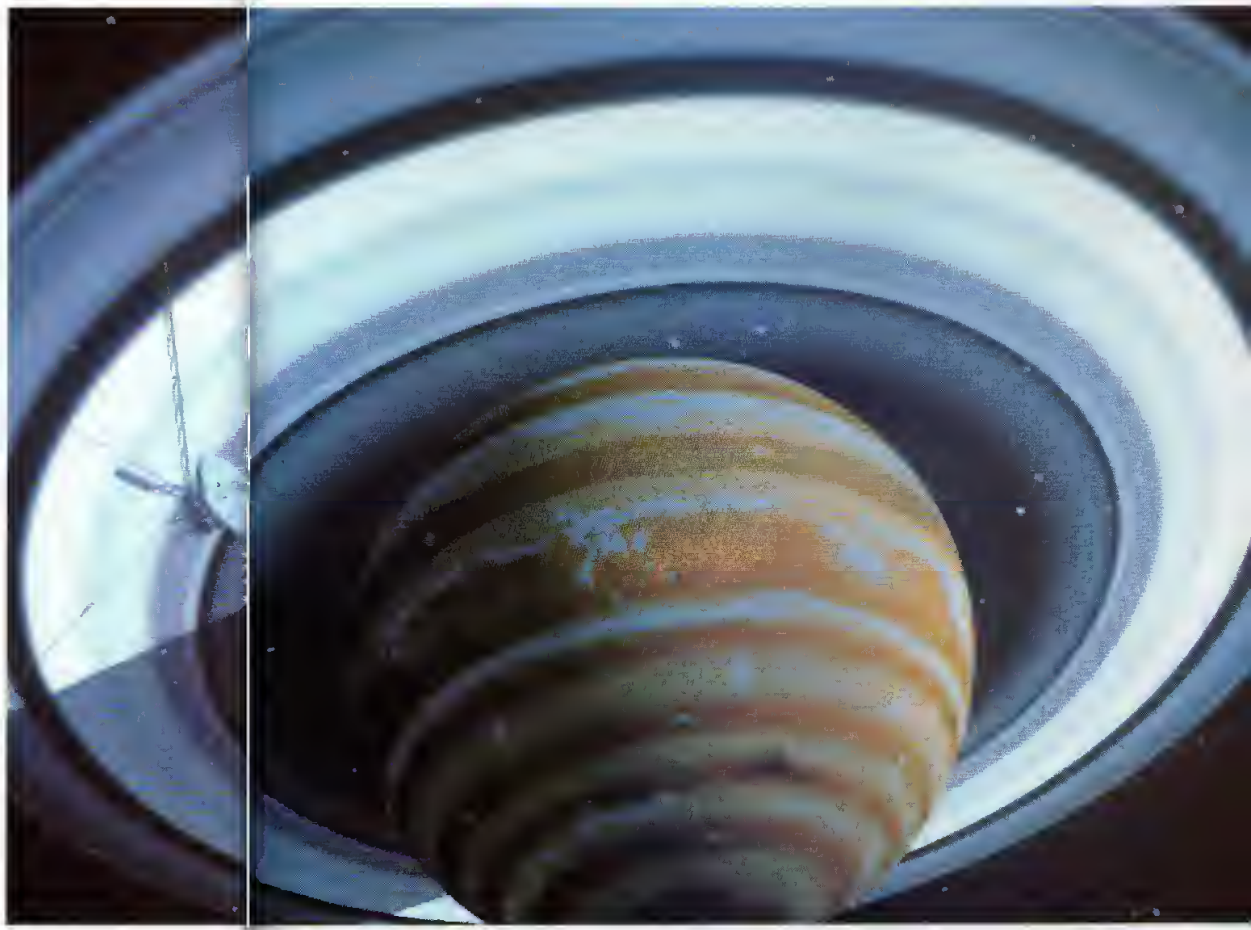
When it's all over, just under nine years from now, we're going to look back on Voyager as the greatest mission of planetary discovery in the history of the American space program. The two Voyager probes will have visited as many as four giant planets and an impressive number of their three dozen moons.

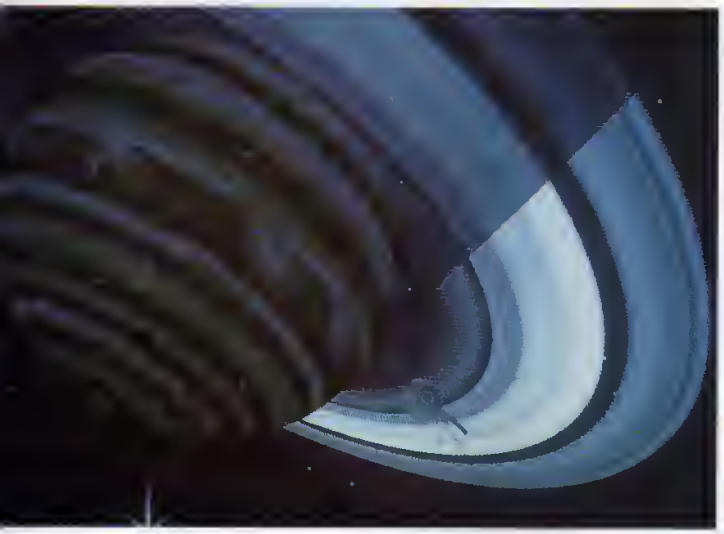
Voyager's primary goal is to learn about the vast planetary systems of Jupiter and Saturn. The fantastic discoveries around Jupiter during March and July of 1979 far surpassed all expectations. The pictures gathered by these deep-space robots proved more able to fire the imagination than any achievement since the first lunar landing. Io, Europa, Ganymede, and Callisto made headlines; the largest of Io's eight volcanoes appeared on the covers of three national magazines all in the same week.

Both spacecraft are still in good health. *Voyager 1* is rapidly closing on Saturn, its closest approach scheduled for 6:46 PM EST, November 12. Serious observations of Saturn began on August 22 and will continue through December 15. After the probe leaves Saturn, it will pass out of the solar system without meeting other planets. *Voyager 2*, however, will arrive at Saturn next August 25, then go on to Uranus and Neptune.

The elegant Voyager flight paths were chosen from nearly 10,000 possibilities. *Voyager 2*'s gravity-assisted trajectory from Jupiter to Saturn, Uranus, and Neptune, often known as the Grand Tour, cannot be flown again for 172 years.

Voyager 1 should show us a great deal about Saturn's domain. The huge gas giant,





composed mainly of hydrogen and helium, is large enough to house 750 Earths, yet its density is less than that of water. Saturn has at least a dozen moons, which range in diameter from Phoebe's 80 kilometers to the 5,100 kilometers of mysterious Titan.

Reddish-brown clouds and haze may conceal Titan's surface from *Voyager 1*'s TV cameras. Titan's atmosphere contains substantial amounts of methane and hydrogen, it is at least as thick as the Martian atmosphere and may be as dense as our own. Though Titan is too cold to support life as we know it, planetary scientists once speculated that warm regions might exist

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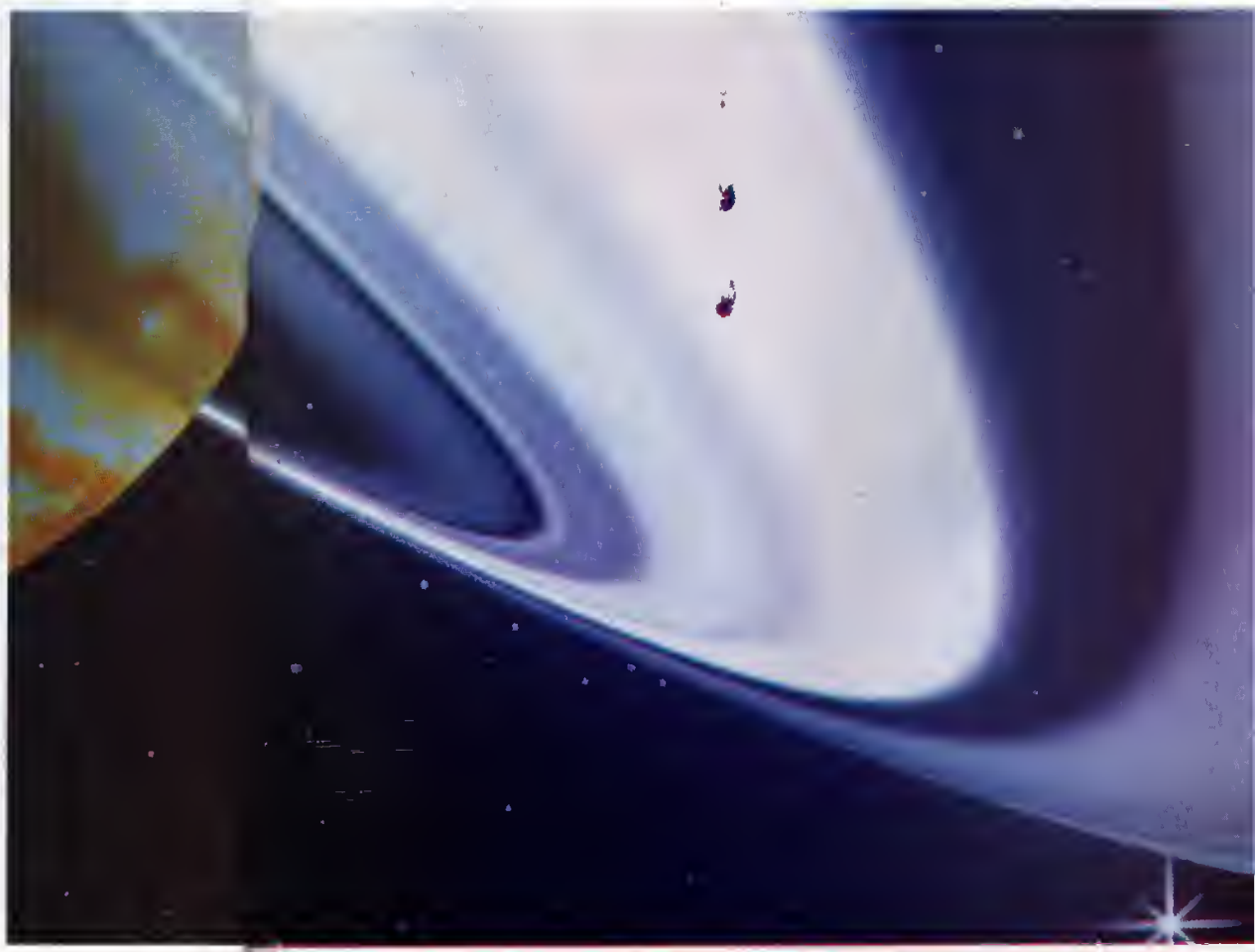

I SING THE BODY ELECTRIC

BY KATHLEEN McAULIFFE

By boosting
the
body's own
electricity,
we might
direct
cells to
re-form
a lost limb,
reconnect
a severed
nerve—
perhaps
even convert a
cancerous
tumor
back
to normal
tissue

PHOTOGRAPH BY
PETER ANGELO SIMON

"It's time the medical community accepted the idea that regeneration could be restored to humans."

Imagine if we could speak to cells, instructing them to grow more quickly or slowly, change their shape and function, or organize themselves into new tissues to replace damaged ones. Without lifting a scalpel to flesh or injecting a chemical into the bloodstream, scientists are doing just that. They have discovered a way to tap into the body's internal communication network and transmit messages in a language that cells understand. That language consists of electrical signals—the universal code by which living organisms regulate growth, development, and repair.

We all wear an invisible garment, an electromagnetic cloak that shields us from head to toe. From the moment of conception, electrical currents begin to flow in the tiny embryo, guiding the incredibly intricate process that culminates in birth. When a salamander regrows a limb, similar currents flow along the injured extremity as if reenacting a crucial step of embryogenesis. Once the new organism—or limb—is fully formed, the currents abate. Yet we all retain an electromagnetic halo as a birthday suit that we carry throughout life. Disturbances in these fields portend illness. In fact, this is the basis for acupuncture diagnosis. Whenever bodily injury is sustained, our primordial currents flow strong until the wound heals over.

Bioelectricity is nothing new. As far back as the eighteenth century, Luigi Galvani discovered this source of energy in the twitching of a frog's leg strung between two pieces of metal. Only recently, however, have we realized just how pervasive a role electricity plays in governing vital cellular functions. Our enlightenment has revealed a radical new approach to medical therapy. Doctors are seeking to alter our internal currents with external ones. By applying electricity to the body, they believe, it will one day be possible to grow back the amputee's limb, repair the paraplegic's severed spinal cord, and stop the cancer victim's uncontrolled proliferation of cells.

"Electricity will become as ubiquitous in medical practice as surgery or drugs; in many instances it will supplant them," says Dr. Andrew Bassett, of Columbia-Presbyterian Medical Center in New York City. An orthopedic surgeon, he was one of the first to use electricity to mend bone fractures that had stubbornly resisted all other treatments. Dr. Bassett's technique is to position electric coils around the injury

Becker in his laboratory at Syracuse, New York

so that a pulsating electromagnetic field induces tiny currents in the bone.

"The patients love it," Bassett says, "because they don't have to go under the knife. They don't even have to be hospitalized. Once the coils, given out only by prescription, have been specially fitted, they can be taken home in a lightweight case. If they are worn 12 hours a day, the fracture usually mends within four to six months. And the therapy is totally painless.

"You would experience almost the same field strength by standing under a fluorescent light," Bassett says, "except that the fields employed in therapy are organized in a different informational pattern."

BEYOND BONE REPAIR

So far, bone healing is the only use of his electrical coils approved by the U.S. Food and Drug Administration, but Bassett is anxious to see the applications spread beyond the orthopedic wards. From his animal studies, for example, Bassett discovered that electricity will consistently double or triple the growth rate of peripheral nerves—those found in the limbs.

"If peripheral nerves are severed," says Bassett, "they rarely repair themselves. If an individual ruptures his sciatic nerve in a head-on collision or puts his hand through glass and cuts his median nerve, years of therapy may be required before he regains even a fraction of the normal motor control."

Although only two human patients have been tested up until now, Bassett is greatly encouraged by the results. The electromagnetic field promoted the same beneficial nerve growth seen in laboratory animals. "It's still too soon to say whether this is the panacea for peripheral nerve injuries or not," Bassett cautions. "Time will tell. But I think we have the upper edge."

It is clear Bassett believes that electricity will also give medical science the 'upper edge" in repairing damage to the central nervous system. A solution to this pressing problem might benefit more than 6 million people in the United States alone, ranging from paraplegics to stroke victims.

How does electricity produce these startling effects? Cells respond to artificially induced currents just as well as to the body's own. Nature alone performs miracles; scientists merely exploit them.

Earlier in this century several investigators began to study the electrical currents produced by a variety of living organisms—from embryonic seaweed to tadpoles. Working after World War II, Dr. Robert O. Becker, of the Veterans Administration Hospital in Syracuse, New York, had one distinct advantage over his predecessors: the growth of sophisticated electronic technology. "The kinds of tools available to me right off the shelf were much more sensitive," Dr. Becker said. Although many of his colleagues see him as the supreme catalyst in the field—"the man in modern times who asked the right questions at the right moment," one puts it—Becker takes another view. "If you look at things from a historical perspective, I'm not such a smart guy. I was just plain lucky."

Becker's involvement in electrical therapy began with a pioneering study of injury currents. Immediately after an organism is wounded, damaged cells become leaky. Charged atoms, called ions, pour out of the cells, forming a current. By measuring voltages generated at injury sites, Becker uncovered clues to one of nature's most baffling inequities: why the lowly salamander can regenerate as much as one third of its total body mass, while man can scarcely endure damage to a single vital organ. Moreover, his findings suggested that currents of only a few billionths of an ampere might be the key to rectifying this gross imbalance of the evolutionary

"Electricity will become as common in medical practice as surgery or drugs are today"

scale. Using an implanted electrode, Becker stimulated a rat to regrow its amputated foreleg down to the elbow joint. The portion that grew back was not perfect, but there was clear evidence of multitissue organization, including new muscle, bone, cartilage, and nerve.

Then a researcher at the University of Kentucky Medical School, Dr. Stephen Smith, applied the same technique to regenerating the legs of frogs. A more highly evolved species than the salamander, the frog cannot normally grow back an amputated extremity. But Dr. Smith modified Becker's procedure in one important way. Electricity was introduced through an electrode that migrated down the limb as new tissue grew back. "In one instance," he reported, "a new leg formed in complete anatomical precision, right down to the individual digits of the frog's webbed feet."

For over 20 years Becker has doggedly pursued an unorthodox theory. Higher animals—whether frog, rat, or man—don't naturally regenerate limbs because they produce too little electricity to trigger the formation of a limb bud. Becker has long suspected that, given the appropriate electrical environment, the cells in our body—like those in the salamander—could still be made to differentiate into new tissues.

"It is time the medical establishment accepted the concept that a considerable amount of regenerative growth could be restored to the human," he states in his characteristically forthright manner. "This applies to almost every tissue in the body, from the brain through the spinal cord to peripheral nerves, fingers, whole limbs, and organs. If we can identify the mechanisms that stimulate and control regeneration in the salamander, I see no innate reason why man cannot be stimulated to do the same thing."

MIRACLES IN THE MARROW

If the "medical establishment" has been slow in coming round to his viewpoint, it is hardly astonishing. Until Becker's landmark experiment on the rat in 1973, many doctors considered his ideas heretical. That weak currents could transform an amputee's stump into a limb seemed more akin to witchcraft than to medicine. Furthermore, Becker's theory assumed that mammalian cells were capable of extraordinary feats for the process of regeneration is, in its very essence, a rebirth.

Bassett with subject in bone-regeneration study

When a salamander regrows a limb or an organ, red blood cells at the injury site lose their specialized function. They return to a primitive, almost prenatal state, ready to be molded anew. In fact, this cluster of amorphous cells is called a blastema, a term sometimes applied to embryonic cells. As the blastema grows in size, the undifferentiated cells become specialized again, regrouping themselves into all the complex tissues of the body part that they are to replace.

No one ever dreamed that mammalian cells could undergo such a dramatic metamorphosis. For a start, our red blood cells, unlike those of the amphibian, have no nuclei and thus do not contain genetic material. Yet when minute electrical currents were applied to the rat's forearm, a blastema formed. Becker's detective work soon solved this mystery. In mammals, the blastema appears to be derived from nucleated cells in the bone marrow.

The implications were far-reaching. We have retained our ancient ancestors' capacity to regenerate! It is only the controlling factor that has been lost over the course of evolution. All the evidence pointed to electricity as the controlling factor, but a central enigma remained. Why do some organisms generate more than others? What drives the injury current?

Acupuncturists have long been aware of electromagnetic fields surrounding the body. Eastern practitioners today commonly monitor variations in these fields to diagnose underlying disease. In his effort to track down the "organic battery" that powers the injury current, Becker began to investigate these natural fields. Over a five-year period he measured stable voltages on the skin of organisms ranging from salamander to man. In all instances the fields roughly paralleled the major pathways of the nervous system.

This gave Becker an important lead. For a mysterious link between nerves and regeneration had been known since the early 1950s. Dr. Marcus Singer, at Case Western Reserve University in Cleveland, showed that nerves must make up at least one third of the total tissue mass in an extremity before regeneration will occur spontaneously. By transplanting extra nerves to a frog's forelimb, he produced about a centimeter of new tissue growth at the amputation site. Could nerves provide the electrical signal that triggers blastema formation?

To find out for sure, Becker carried his investigation one step further. He measured electrical voltages on the outside of the nerve fibers themselves. According to standard textbook accounts, there is only one mechanism by which nerves transmit an electrical signal. That message consists of a series of brief impulses that move down the nerve fiber. Becker, however, discovered what he believes to be a second and more primitive method for the nervous system to transmit information. His measurements indicated that the cells coating the outside of peripheral nerves carry a continuously flowing current, in contrast to the short bursts of electrical activity the nerves themselves conduct. This constant current, he believes, radiates throughout the body's dense network of peripheral nerves and gives rise to the field patterns all organisms display. It seemed logical to him that disturbances in these fields, created by an injury for example, would be detected by cells, which would then begin repair processes. If the nerve mass were large enough, the voltages generated could be sufficient to initiate complete regeneration. Otherwise, scar tissue would form.

Becker's theory clashed with the traditional concept of how the nervous system functions. "I got an awful lot of lumps on my head when I first published my report in

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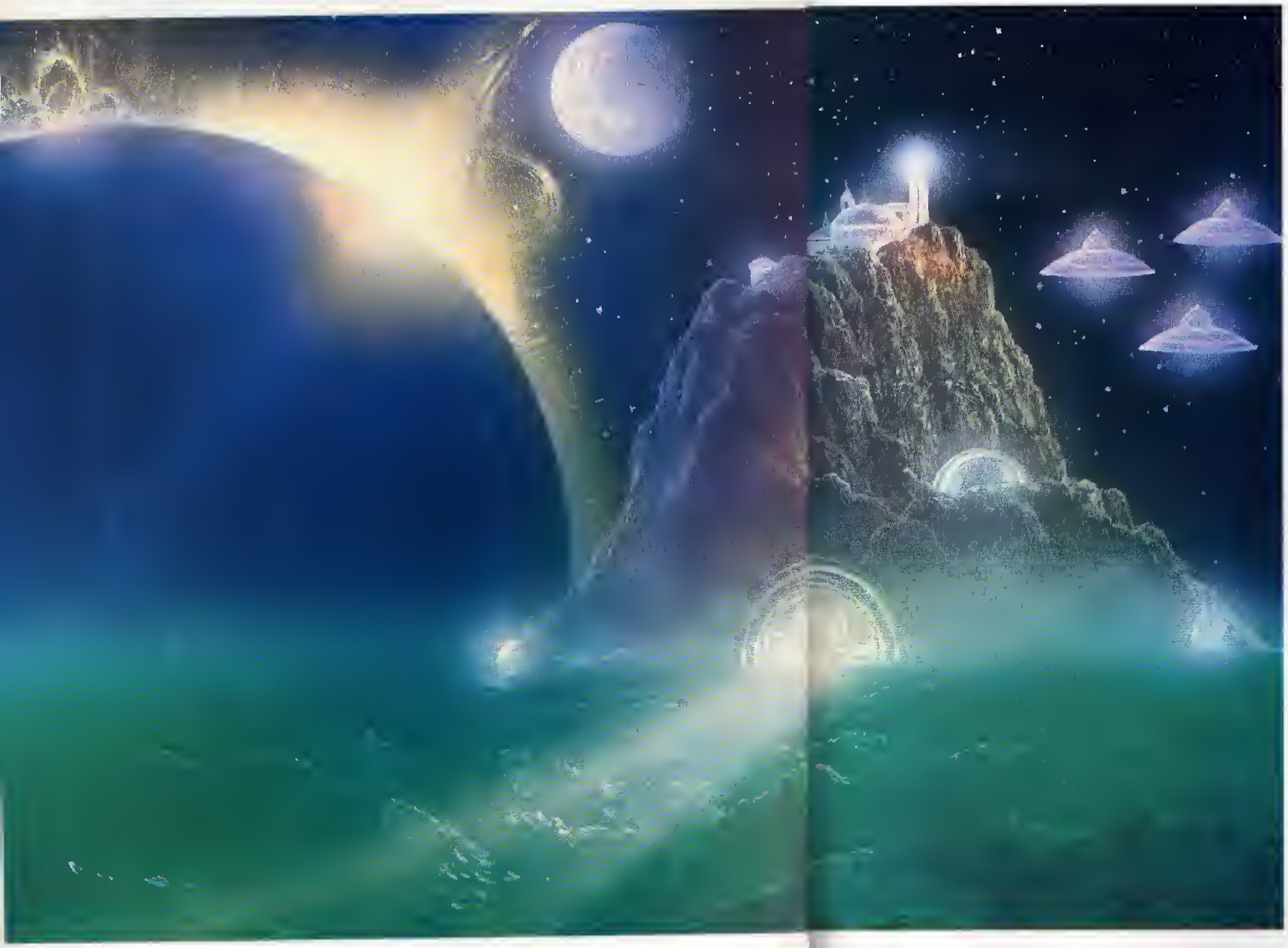


Gilbert Williams portrays a universe of archetypes

CELESTIAL VISITATIONS

BY ROBERT SHECKLEY

The paintings of Gilbert Williams, a young California artist now living in Marin County, are good examples of what visionary art is all about. The images are dreamlike—landscapes filled with glowing color forms that could have sprung from your own unconscious, painstaking in their attention to symbolic detail.

"When I work," Williams says, "I start from a general idea that grows and takes on a life and direction of its own. I don't know the direction a painting will take until I start really getting into it. The process is one of nonverbal evolution."

Williams was born and raised in Los Angeles. He has had little formal training, relying instead on his own imagination and development of technique. In 1973 Williams moved to Mount Shasta, California, an area he describes as "steeped in metaphysical legend and natural beauty." There he met his wife, Valerie, and produced most of the paintings shown here.

Williams is an exponent of visionary art, a genre that emerged in northern California with its spiritual home in the Illuminarium Gallery in Mill Valley. The movement grew out of the psychedelic and fantastic art of the Sixties and Seventies, and it combines spiritual seeking with an eye for detail. Its roots, however, lie deeper with the surrealist painters of the Twenties—most especially Salvador

Dali and Giorgio de Chirico. The bitter and satiric edge of the surrealists is gone now; visionary art searches for the next transformation in man. It is an optimistic art, akin to science in its humanistic view of man's potential.

In *The Hidden Order of Art*, Anton Ehrenzweig writes, "Any work of art functions like another person, having independent life of its own. An excessive wish to control it prevents the development of a passive watchfulness toward the work in progress, which is needed for scanning half-consciously its still scattered and fragmented surface."

Williams echoes this thought: "My art is basically an expression of my own inner journey into my own inner space. It evolved

Clockwise, from above: Welcome Home, Moon Flight, Secret Paradise

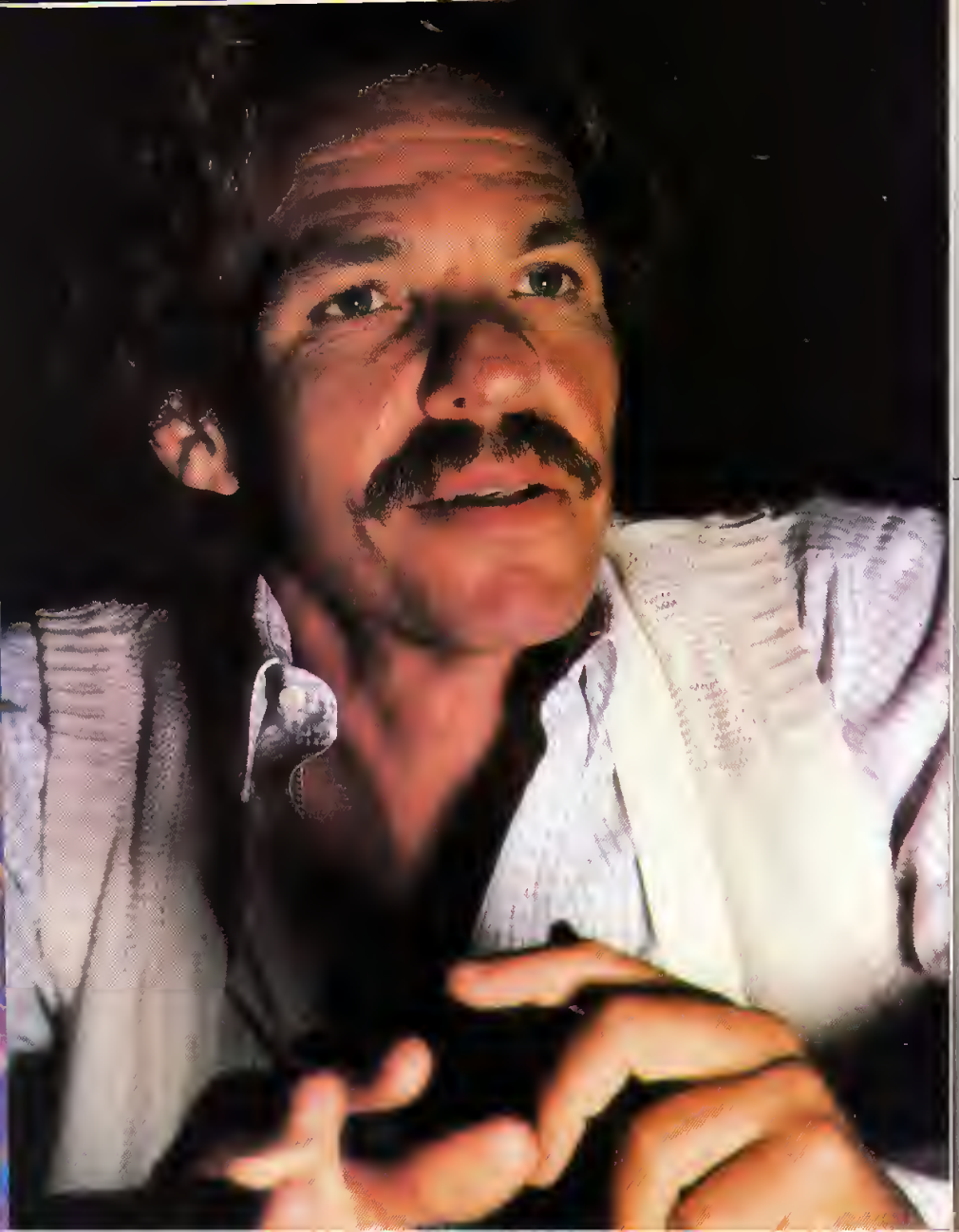
"The artist uses traditional symbols as the basis for his art. The roots of the Tree of Life bind together heaven, Earth, and hell. Sceptered angels represent divine authority."

"Among the most potent of symbols are the medieval unicorn, representing innocence, the jewel, denoting wisdom and transcendence, the pyramid, for firmness and stability"

out of my interest in man's spiritual evolution. It involves the exploration of archetypal symbols rising from my unconscious."

The futurist trend in Williams's art is apparent: saucer-shaped objects moving through a light-dazzled sky, man-made constructions floating in space, strange buildings on alien landscapes. Although Williams uses potent images from the past, such as winged horses, sailing ships, spiritual messengers, mystical roses, and gigantic statuary, his work suggests the next step in mankind's development—a step foreshadowed by science as well. It looks forward to a time when we will live out among the stars and discover in the newness of the universe the ancient symbols of man's dreaming past.

Clockwise, from below: Sky Messenger, Dragon Song, Sea of Visions



Photographs by Lisa Underhill

Would you accept a prescription, or even advice, from this psychiatrist? We would — yes, yes, oh, yes

INTERVIEW

ARNOLD MANDELL

Arnold Mandell is a living demonstration of the left-brain–right-brain theories prevalent in neuroscience today. The brain's left hemisphere, according to these theories, dictates behavior that is rational, rule following, verbal, and aggressive in the "Damn the torpedoes, full speed ahead!" sense. The right hemisphere grooves on colors, music, and intuition, feels no particular loyalty to a "normal" time-space frame, and has a that's-cool-I-love-you attitude toward the world.

Left-brain Mandell is the son of a hard-driving advertising executive father and a master piano teacher mother, who, at seventy, has not retired from a full schedule of teaching and recitals. A magna cum laude graduate of Stanford University, Mandell trained in medicine at Tulane and in psychiatry and biochemistry at UCLA. When he was named founding chairman of the psychiatry department of the medical school of the University of California at San Diego, he was, at thirty-five, the youngest person in the country to hold a psychiatry chair. He's now in the middle of his third decade of widely respected research on the brain and behavior, has authored or coauthored more than 200 scientific papers, and has served on more than a score of professional committees.

Right-brain Mandell was a reefer-blowing Beat of the Fifties who played bebop and progressive jazz with such historically important musicians as Art Tatum, Stan Kenton, and Cannonball Adderley. He is a scholar who examined the peyote rituals of the Huichol Indians, a social theorist who sees football and amphetamines as symbols of the rage-riding military-industrial complex—and soccer, skiing, California Governor Jerry Brown, surfing, marijuana, and long-distance running as harbingers of the mind-set of an era that may be emerging in America.

It was right-brain Mandell, perhaps, who naively volunteered his services to the San Diego Chargers professional football club, only to experience a soul-wrenching lawsuit and professional damage. But this half of his brain may also be credited with his brilliant autobiography, *Coming of Middle Age: A Journey* (Summit

"There is the time when you face death. I think the primordial expression is a burst of energy at the end. You see a light. But there is no shining light. That is the God in your brain going off."

Books 1978), a piece of emotional unzipping and intellectual flashery, with elements of Dante's *Inferno*, St. Augustine's *Confessions*, Bunyan's *Pilgrim's Progress*, Freud, Darwin, Marx and a Ulyssean afternoon with Molly Bloom. It chronicles Dr. Mandell's transformation—through cancer a heart attack, divorce, frustration with modern psychiatry, the agonies of letting one's children go, the assaults of vengeful football partisans—and the subsequent emergence of Dr. Sam Shambhala, a shaman persona for whom the human brain is all the cosmology required.

I first met Mandell when I interviewed him about an article he had written called "Dr. Hunter Thompson and the New Psychiatry." In a display of chemical literary criticism, Mandell contended that the array of writing styles in Thompson's *Fear and Loathing in Las Vegas* reflected the various drugs used by the author at the time. In his article Mandell used Thompson's prose styles to portray drug actions on the personality and to drive home the broader point that very small doses of even such conventional psychiatric drugs as lithium and the antidepressants—not to mention drugs not yet developed—will permit the dislodging of old patterns and the emergence of new ones.

To check out Mandell's beliefs, I conducted an experiment of my own in benign drug use. I had not written a word for two months and was behind on important deadlines, and so in desperation—despite a lifelong distrust of pill medicine—I tried a very small amount of an antidepressant I had learned about through my research on Mandell. After a few days with this drug, a monoamine oxidase inhibitor called Eutonyl, nothing much seemed to be happening, except that instead of getting a half page out of the typewriter I was giving birth to an average of 15 pages a day.

Before 1975, Mandell had done some of his own prescribing—with less happy results. Brought in by the San Diego Chargers' coach to determine why the team posted such ups and downs, Mandell soon unearthed one of the causes: the Sunday Syndrome, the universal slopping down of amphetamines on a big game day. A California Medical Board investigation found Mandell to be following legitimate treatment practices, but soon after publication of *The Nightmare Season*, Mandell lost his right to prescribe amphetamines and also tarnished his scientific reputation in the process.

The Arnold Mandell of 1975 drove a Lincoln and lived in an expensive high-rise apartment on the golden La Jolla coast. Today Mandell pays a good portion of his salary to his ex-wife and his lawyer, drives a Volkswagen, and seems more at home in his small, crowded office in the Basic Sciences Building on the U.C.-San Diego campus, where he and his small staff (pyramided behind him in the photo, above left) continue to probe the mind's inner workings.

—*WILLIAM K. STUCKEY*

Omni: Before we get into questions about brain research, let's clear up the story about the San Diego Chargers. When I call your colleagues around the country to get a line on you, they first say, "You mean Mandell, the Chargers guy?" and mention your book *The Nightmare Season* [Random House, 1976]. Then, almost as an afterthought, they usually add that your research is very good.

Mandell: Well, the Chargers' head coach, Harland Svare, who played linebacker for the New York Giants in the Fifties—before professional football became a business instead of a sport—asked me to observe close in and see what I could learn that might give the team a professional edge. One of the things I found out was that the dramatic personality changes I saw on Sunday mornings in the locker room weren't natural.

Omni: What do you mean by personality changes?

Mandell: Well, the normally sophisticated banter from these often-elegant men gradually, almost imperceptibly, became more frenetic, irritable, louder and finally obscene. They were white-lipped, staring, vomiting, pacing, mumbling repetitiously. It seemed as if the place could explode into a riot any minute for no reason. Once I got too close to an offensive guard, a man I'd been friendly with, I brushed his elbow as we walked through the tunnel to the field, and he rammed me into the wall. Later he didn't remember doing it. For a while I just thought getting up for the game was a special talent successful professionals possessed. Later I found out they were taking, oh, ten to maybe two hundred milligrams of amphetamines on Sunday mornings. That's maybe fifteen times what a dieting person would consume in a day.

Omni: You testified that you gave the players a whole season's worth of amphetamine prescriptions, instead of the weekly renewable prescription, to keep them away from dope dealers and the impurities of street drugs.

Mandell: Yeah, they already had the dope. I wrote prescriptions for nine veteran users. It's ironic. I rarely prescribe amphetamines to anyone because they're very cruel. They work for only about four hours, and they leave you worse off than you were before. When lab animals are given amphetamine in the dose ranges the players were taking, they freeze and rock. Once I saw a defensive end who was in that state playing a sweep to the wrong side, vacating his position again and again. The opposing team made yards running to where he had been. Finally the line coach had to bench him.

Omni: Why do the players take them?

Mandell: Well, that question is . . . it's at the heart of the whole mystery of how social dynamics relates to the brain and behavior. This isn't very scientific, but it seemed to me they took them to change their vibes—much the way executives who want to look cool might take Valium before an important committee meeting. Profes-

sional football is a game of intimidation right? The men—from the commissioner on down to the third string tackle—try to dominate one another by radiating potential violence. High doses of amphetamine change the internal fantasies to thoughts of danger and persecution. Everyone becomes an enemy. You'll break the leg of a friend on the other side, a guy who picnicked with you and yours at the last players' convention, in order to protect yourself.

Omni: What about players who didn't use drugs?

Mandell: Well, there were players whose rage was so high by game time from the memory of some earlier insult that they paced and swore without any drugs. Some of them even collected notebooks filled with insults. The amazing way the brain and the world mirror each other.... well, we struggle in awe. Do you know that a study at the National Institute of Mental Health found that normal subjects who acted like manic patients showed the chemical changes of mania in their spinal fluid? Losing sleep can lead to hyperactive insomnia. Your brain becomes what you do, or anyway it appears to. Perhaps it's also true that the world around becomes like your brain.

Omni: You got into a lot of legal trouble.

Mandell: Yes. After *The Nightmare Season* was published, I was brought up before an administrative judge of the California Board of Quality Assurance on four charges about those prescriptions. This was two years after state authorities who had investigated the prescriptions recommended that no action be taken. Eventually the judge found me guilty of "clearly excessive prescribing of a dangerous drug," but innocent of the other charges. I was put on five years' probation. But some friends and colleagues encouraged me to have the decision reviewed by the California Superior Court. Last spring that court ruled that the legal actions the board had taken against me were in error.

Omni: How did the scandal affect you?

Mandell: There's been detraction and skepticism. I felt compromised enough in my effectiveness to resign the chairmanship of my department. The hullabaloo coincided with the end of my twenty-two-year marriage. All that stress didn't really do my Type A nervous system any good. But the last few years have brought many good moments, too—and many acknowledgments.

Omni: What about the use of amphetamines in football? Has that changed at all?

Mandell: It still goes on, but I think more people are paying attention. *Sixty Minutes* produced a powerful segment about drugs and injuries in pro football games. Amphetamines have become a work practice in a situation where men in their thirties must muster sustained temper tantrums—vendettas—to keep up with their mortgage payments and so on. The drug somehow fills the void when there's no real reason to fight another human being. It's the same as in Vietnam, where there was incredible amphetamine use. This was reported in a congressional hearing. A GI would take three to six of them before marching into that dark meaninglessness.

Omni: What about another of your books, *Coming of Middle Age*? The picture of you on the dust jacket is weird. It depicts a shaman, not a respected brain researcher.

Mandell: What it amounted to, then, was a religious conversion, which I wrote about without having any religion, being a Jew. We didn't have God in the curriculum. We had history—rationales for being abused, for historical foods, and so forth. I guess you could say I was trying to portray the magic, and the cliché about what is now the most popular phase transition—the mid-life crisis. Really it's as much a discontinuity as adolescence is. Perhaps it's the only permanent psychiatric treatment—the karmic exhaustion. Followed by a fresh context and energy.

Omni: In your book you mention a mother octopus. In the last part of this book you describe your conversion to a shaman—to Dr. Sam Shambhala.

Mandell: After her babies are hatched, a mother octopus stops eating and dies. No amount of lobster, her favorite food, will tempt her. Jerome Wodinsky, an experimental psychologist at Brandeis, removed

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FICTION

Edna chose to awake this morning to good old breakfast loop A John was reading a newspaper over pancakes and sausages in the kitchen of their old home The kids were gulping the last of their food and were anxious to be on their way to school

After yesterday's real-time-shared breakfast with John, she really felt she needed the soothing old familiar tape from her files today It might have been shot way back during the 1987–88 television season on a crude home deck It might be snowy and shaky, but Edna still ran it three or four mornings a week in preference to the breakfast soaps or more updated domestic footage Somehow it captured what prime breakfast time with John and the kids had really been like, and somehow that made it her prime breakfast programming choice

Edna Now Sammy, you finish the rest of your milk before you run outdoors!

PRIME TIME

BY NORMAN SPINRAD

They could live any fantasy, the trouble was the reality

PAINTING BY DONALD ROLLER WILSON

Sammy (slugging down the rest of his milk) Aw, Ma, I'm gonna be late!
Edna Not if you don't take your usual shortcut past the candy store

Of course the old tape hadn't been shot from her stereo perspective, and there was something strange about seeing yourself in your own domestic programming, and it certainly wasn't as well written as a breakfast soap, but then none of the soaps were personalized and none of her other domestic tapes with John had footage of the kids at grade-school age.

John was always after her to share real-time programming with him. He'd voice her over on the communication channel and show her tapes he had made for himself with her in them, or he'd entice her with shared domestic tapes, or he'd bombard her with porn-channel footage.

But the domestic tapes he programmed for them to share all took place in exotic locales, and the story lines were strictly male-type fantasies—John's idea of suitable real-time programming for the two of them to share ran to camel caravans across the desert, spaceship journeys to strange planets full of weird creatures, sailing the South Seas, discovering lost cities, fighting in noble wars. And her viewpoint role was usually a cross between Wonder Woman and Slave Girl. Well, that might be how John wished to real-time-share with her, but Edna preferred her soaps and romantic historicals, which John categorically refused to real-time-share with her under any circumstances.

As for the porn channels that he wanted to real-time-share with her, the only word was *disgusting*.

Still, he *was* her husband, and she felt she had to fulfill her conjugal obligations from time to time, so five or ten times a season she gritted her teeth and real-time-shared one of his crude male porn channels in the sex-object role. Less frequently he consented to time-share a historical X with her, but only because of the implied threat she'd withhold her porn-channel favors from him if he didn't.

So by and large it was mealtime program sharing that was their least distasteful channel of contact and the one that saw most frequent use.

John (wiping his lips with his napkin) Well, honey, it's off to the salt mines. Ready to go, Ellie?
Ellie I got to make wee-wee first.

TOTAL TELEVISION HEAVEN 60-SECOND SPOT #12 FINALIZED BROADCAST VERSION HARD CUT FROM BACK

A series of low pink buildings, emphasizing sunrise through the palm trees.

Announcer's voice-over (medium hard sell) Total Television Heaven, the ultimate retirement community for Electronic Age seniors.

A rapidly cut montage from the adventure channels, the porn channels, the soaps, etc. Make it the most colorful and exciting footage we've got and emphasize expensive crowd scenes and special effects.

Announcer's voice-over (orgasmic) Twenty full channels of pornography, thirty-five full channels of adventure, forty channels of continuing soaps—live, full-time, in over a hundred possible realities, produced by the finest talents in Hollywood.

CLOSE-UP ON A MAN'S HEAD

Intelligent, with neat, dignified gray hair. As hands fit stereo TV goggles over his eyes. (Earphones already in place.)

Announcer's voice-over (institutional) You live as the viewpoint character in a wonderland of sex and adventure through the electronic magic of total stereo TV!

> *Edna didn't like this kind of talk. It was worse than his adventure programs, worse than the porno, worse on a whole other level she had trained herself not to contemplate.*

MEDIUM SHOT ON A FAMOUS OLD ACTOR

Cast someone with recognition value who's willing to sign up for a two hundred year annuity.

Famous Old Actor And that's not all! Tape your family! Tape your friends! Take your loved ones with you to Total Television Heaven and keep them with you forever!

CAMERA PULLS BACK FOR A FULL SHOT

We see that the Famous Old Actor is being helped into a glass amnion tank. He keeps talking and smiling as the attendants strap him to the couch, fit the earphones and stereo TV goggles, hook up his breathing mask and waste tube, and begin filling the tank with fluid.

Famous Old Actor A vast tape library. Custom-cut programs to your order! I wish I'd signed up years ago!

The throat mike is attached, his hand is taped to the tuner knob, the nutrient tube is inserted in his arm (no on-camera needle penetration, please), the amnion tank is topped off and sealed. The camera moves in for a close-up on the face of the Famous Old Actor, seen floating blissfully in his second womb.

Famous Old Actor (filtered) I'm never coming out—and I'm glad!

DISSOLVE TO SUNSET OVER TOTAL TELEVISION HEAVEN

The sun sinks into the sea in speeded-up time over the pink pastel client-storage buildings, and a glorious, star-filled sky comes on like an electronic billboard.

Announcer's voice-over (transcendent) No man knows God's intent for the hereafter, but at Total Television Heaven modern biological science *guarantees* you a full two hundred years of electronic paradise in the safety and comfort of your own private tank. And a full annuity costs less than you think!

FADE-OUT

John Maybe we can make it out to the lake this weekend.
Edna Supposed to be clear, in the seventies, I heard on the weather.

This season John had been acting stranger and stranger, even during their mealtime sharing. His conversation was becoming more and more foulmouthed and even incoherent. He had taken to appearing in elaborate character roles even over breakfast, and yesterday's real-time-shared breakfast had been just about more than Edna could take.

He'd voiced her over the night before and invited her to breakfast the next morning in Hawaii, where they had real-time-shared their honeymoon in the dim, distant past—so many seasons ago that no recording tape of it existed; none had been made way back then, before anyone had even dreamed of retiring to Total Television Heaven. It had been a very long time indeed since John had invited her to real-time-share their past at all, even in a reconstructed version, and so when he told her he had custom-programmed breakfast on the beach in Hawaii, Edna had been so thrilled that she agreed to time-share his breakfast program against what had lately been becoming her better judgment.

The program wakened her to sunrise on the beach, the great golden ball rising out of the dark sea in speeded-up stop-motion animation like a curtain going up, illumining the bright blue sky that suddenly flared into existence as she found herself lying on the sand beneath it.

This to the theme of an ancient prime-time show called *Hawaii Five-O*, as a majestic breaker rolled and broke, rolled and broke, again and again, in a closed loop beyond the shoreline foam.

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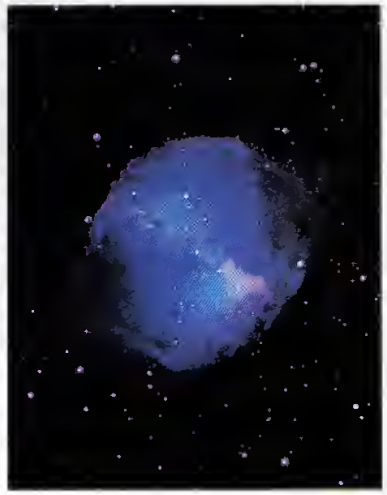
NEBULA

BY MARC KAPLAN

Veils of dust and gas, excited by a central star, become their own source of light in the Dumbbell Nebula (below) or the Trifid Nebula, where ionized hydrogen emits brilliant pink hues



"The Horsehead Nebula has enough material to produce 100,000 stars as massive as our sun"

Throughout the vast distances of space float the materials from which new stars are born. Once thought to be extragalactic "island universes," these threads of gas and dust gravitate toward one another, contract, and increase in density, painfully shaping themselves into a protostar. These galactic clouds are made visible by the stars they helped form. Bright nebulas typically are electrically charged hydrogen gas clouds excited into incandescence by a nearby star. Dusty nebulas block out starlight with particles averaging 0.00001 centimeter in diameter, punching holes in the astral cloth. Reflecting nebulas

Horsehead Nebula is a spinning ball of gas that may condense into new stars (below). Complex molecules and protostars brew within the Orion Nebula (right)

mirror the light of the stars they surround. Like haloes of mist about streetlamps, the nebula scatters light toward the blue end of the spectrum, bathing the star in a cool, gemlike aura. Through modern spectroscopic techniques, reflecting nebulas reveal the chemical composition and the evolutionary stage of the central star. Nebulas are not permanent fixtures in the cosmological array. Should conditions be unfavorable for starbirth, these interstellar clouds are unraveled by stellar wind and the gravity of other bodies. Slowly dissipating, they merge into stellar space, sustaining the ecology of the galaxy. ∞

Hydrogen atoms fluoresce when ionized in the Eta Carinae Nebula (left). Each new star in the Pleiades Cluster (above) shimmers in its own swaddling of dust.

"Twinkling stars may be part diamond—carbon-forged fragments mixed into stellar medium."

BODY ELECTRIC

CONTINUED FROM PAGE 73

Nature, he recalls. But his colleagues' initial skepticism has gradually given way to broader—although by no means universal—acceptance. Neurophysiologists, Becker reports, have been the most receptive to his ideas.

Although there are nonbelievers at a theoretical level, few doubt the practical significance of Becker's work. A growing number of scientists are now confident—which scientists weren't only a decade ago—that regeneration of human body parts will be achieved, probably within our lifetime. And it was Becker, in conjunction with Basseft, who developed the electrical method of healing bone fractures. The treatment may earn both doctors a Nobel Prize in medicine. (It has been rumored that Becker's name appeared on the Nobel committee's list of nominees last year.)

ION MESSENGERS

Bone healing is one of the few examples of man's ability to regenerate an injured part spontaneously. It is truly a regenerative process, says Becker, because a blastema actually forms. In this instance, however, the source of electrical voltage is not the nerves alone. The bone itself becomes electrically polarized when bent or broken. As Bassett and Becker discovered, its crystalline structure converts mechanical stress into electrical energy—a finding independently made at about the same time by two Japanese doctors, Iwao Yasuda and Eiichi Fukada. These voltages in turn help to guide cellular-repair mechanisms, beginning with the appearance of a blastema at the fracture site. Unfortunately, sometimes something goes awry in the normal healing process and a troublesome nonunion develops. Electricity, they reasoned, might be the solution.

Animal studies confirmed the idea. Then, by introducing direct current through an electrode at the fracture, Dr. Carl Brighton and his colleagues at the University of Pennsylvania Medical School were able to cure severely crippled patients, many of whom had been scheduled for amputation because their disabled limbs had become infected. At dozens of clinics in the United States and abroad, electricity has become the preferred treatment for difficult bone nonunions. Since the first clinical experiments, however, orthopedists have varied in their approach to electrotherapy. Bassett, for example, prefers electrical coils to electrodes because they preclude surgical intervention. His procedure's success rate is 85 percent; he hopes it will eventually work in 95 to 98 percent of cases.

RELIEF IN SPACE

Bassett's coils are so simple to operate that astronauts may use them in space to prevent what NASA officials commonly refer to as astro-osteoporosis. Astronauts' bones become thin and brittle owing to a loss of calcium. Over prolonged space missions, the condition worsens. When the Soviet cosmonauts first returned from their 175-day journey aboard *Salyut 6*, they were no more capable of walking than jellyfish are. Vigorous rehabilitation is required to recover from this "spaceman's disease," which for a while threatened to jeopardize the future of manned space exploration.

But astro-osteoporosis is not a disease. In fact, it is a remarkable adaptation to life in zero gravity. "The astronauts produced less bone," says Bassett, "because they didn't need big, heavy bones in the weightlessness of space. Their bone was under less mechanical stress. Hence, it did not generate the normal electrical voltages that help maintain bone formation." The coils, he believes, should counteract what would otherwise be a superior adaptation to permanent residence in space.

Like several other doctors in the forefront of electrical medicine, Bassett is now attacking the problem of repairing damage to the spinal cord—the cause of partial or total body paralysis. Earlier in his career, while working with neurosurgeon James B. Campbell, he discovered a simple, nonelectrical technique to promote central-nervous-system growth. After the scientists created a defect in a cat's spinal cord, the injured area would be wrapped in a millepore sleeve, a type of filter material. Hundreds of thousands of nerve fibers would grow across the gap.

"Unfortunately," says Bassett, "the lower half of the cat's body remained paralyzed. By the time the nerve fibers had grown back, the motor neurons below the point of transection had formed abnormal connections with neighboring cells—what we call collateral sprouting. The switchboard was busy. There were no free circuits for the nerves to connect to."

"Now what triggers collateral sprouting in the first place is an injury current. To open the switchboard, we then inserted electrodes into the spinal cord. This drove the voltage in the opposite direction, countering the injury current. In fact, we found we could eliminate collateral sprouting in small, defined areas. To do this on a practical basis, however, we would have needed two billion electrodes, each touching an individual cell. But now we can induce currents in the spinal cord using coils. We don't have to make do with electrodes."

"Conquering cancer, regrowing whole limbs and organs, augmenting cognitive processes in the brain—these are just a few of the advances the new era of electrical medicine portends."

DOGGED EXPERIMENTATION

Bassett has a commanding presence. Behind his facade of determination one senses a warm man who has much compassion for his patients. While we were sitting in his office, one of his experimental subjects—a short-haired beagle—arrived for his inspection. Surrounding its head was a fan-shaped collar, lending the animal the majestic air of an Elizabethan grande dame. The beagle, which Bassett greeted affectionately, had just undergone an experiment studying the effects of electricity on wound healing. The collar prevented the dog from licking the open sore.

"What sore?" I asked, looking over the dog's shiny pelt.

"Well, as you can see, the experiment was successful," Bassett said. "Depending upon the electrical fields we apply, it is possible to modify the pattern of wound healing. Very shortly he will be launching clinical studies to see whether the same approach can be used to heal bedsores, which afflict 20 to 30 percent of all invalids."

Equally encouraging, Drs. Walter Booker and E. B. Chung, at Howard University, in Washington, D.C., have been very successful in treating burn victims with pulsed electromagnetic fields. The therapy not only accelerates healing but reduces swelling around the charred flesh. Dr. Chung says, "Patients report almost immediate relief after a single therapeutic session."

A recurrent pattern pervades the history of medicine. Often new treatments are adopted long before anyone fully understands why they work. Electricity is no exception. Becker's meticulous probing has helped to identify several important sources of bioelectricity, from the electrical voltages generated by bone to the electromagnetic fields that radiate from our nerve network. Yet there is an aura of mystery around the magical transformations that take place at the most fundamental level—that of the cell. By intercepting the electrical messages the body transmits, scientists have learned how to code signals that make sense to cells. In effect, they are practicing a form of speech through mimicry—without understanding the basis of the language itself. What information is encoded in the electrical signal? Why do cells alter their behavior in response to changes in their electrical environment?

CELLULAR FINE-TUNING

There are still many more questions than answers, but a few unifying principles have emerged. In an office adjacent to Bassett's, electrochemist Art Pilla develops and fine tunes the electromagnetic pulses used in therapy. "In every single living system studied," Pilla says, "we have found that the

same level of currents is required to exert cellular control. If the amplitude and frequency of the electromagnetic current do not fall within a specific range, cells fail to respond. Only when he tunes the signal into the biological waveband is it possible to establish a dialogue with cells.

In cellular communication, ions—not words—are the key elements. At the right waveband," Pilla explains, "the electrical signal appears to move ions, such as sodium, magnesium, and calcium, across the selective membrane of the cell. This in turn unleashes a chain of chemical reactions within the cell itself, which may ultimately lead to the unraveling of DNA—the first step toward growth and repair. According to Pilla, the influx of ions may determine, among other things, why some genes are switched on or off. Could electricity transform a cancerous cell into a normal one? Or a bone cell into cartilage? Pilla is seeking the answers to these and other questions that are inextricably tied to genetic control.

Unlike other pioneers in this new field, Pilla did not originally train in biological science. Before he joined the research team at Columbia-Presbyterian, he worked for a battery manufacturer. Then, while flying to the West Coast to attend a conference on electrochemistry, he happened to sit beside a member of Bassett's group.

Today, almost 12 years later, Pilla is convinced that electricity is a revolutionary technique for controlling innumerable processes in the body. "I've always believed in a Morse code approach," he says. "That we could, in fact, send in heavily coded signals and modulate everything. Of course, we don't know how to do it yet!" he exclaims. "But that day is approaching."

Sitting at his computer console, working out the pulsed wave forms he uses, Pilla has the gleeful look of a young child who has just been given a new toy. His enthusiasm is contagious. Dozens of scientists consult him daily over the phone, and he is always entering research projects with them. Every time he gets his hands on a new piece of information, it sparks off yet another idea for an experiment. Working in collaboration with Smith, he has helped develop electrical pulses that will speed salamander limb regeneration by a factor of four—or stop new tissue growth altogether. "In the presence of some fields," says Pilla, "the salamander looks as if it is a nonregenerating form."

CANCELING CANCER

Smith and Pilla are also studying the effects of electricity on cancer growth. "We have found certain pulses that kill lymphoma cells grown in culture," Pilla remarks. "Other fields change the cell lining of the lymphoma, transforming it into a fibroblast—a type of connective tissue cell found throughout the body."

Both scientists caution that their research is still merely at the experimental stage. Yet they are optimistic about the results of one of the first animal studies which Pilla conducted with William Riegelson of the Medical College of Virginia and Larry Norton and Laurie Tansman, of Mount Sinai School of Medicine, in New York City. At the one hundred fifty-seventh meeting of the Electrochemical Society, held in St. Louis last May, the team reported that mice injected with deadly melanoma cells lived an average of 27 days when untreated, 36 days if given chemotherapy, and 43 days when chemotherapy and electricity were combined. Though these early findings are encouraging, more research will be required before electricity's true potential in cancer therapy can be properly evaluated. Pilla notes that the electrical pulses will probably have to be refined for each individual, depending upon the type of cancer.

Cancer therapy is far from the only exciting avenue of research Pilla is now pursuing. He is equally intrigued by the possibility of using electromagnetic fields to alter brain functioning. To test his theories, he is now working with Dr. Ross Adey, president of the Veterans Administration Hospital in Los Angeles. Bassett describes Dr. Adey as "one of the most amazing individuals in biophysics today." Adey has shown that he can increase the rate of learning and memory retention in primates and cats by focusing an electromagnetic field at the animal's head while training is under way. The electrical signal is carried over a radio frequency and Adey modulates its amplitude in the same way an AM radio is tuned. Adey believes that neurological changes occur because the frequency of the electrical signal is within the same range as the alpha and beta waves of the brain. But Pilla emphasizes another interesting aspect of his results. He thinks Adey's findings represent a more general phenomenon. The currents he uses to enhance learning and memory just happen to be similar to those that are biologically active in other cell systems.

For the immediate future, most experts agree that electrical therapy will have the greatest impact in healing tissues that do display some regenerative capacity—skin, bone, and peripheral nerves. But as science becomes more sophisticated in controlling vital functions with electricity, infinite possibilities may open up. Conquering cancer, regrowing whole limbs and organs, and augmenting the brain's cognitive processes are just a few of the advances that electrical medicine may offer.

Earlier in this century the introduction of vaccines and antibiotics brought enormous improvements in the treatment of smallpox, scarlet fever, tuberculosis, and other infectious diseases. Electricity may bring about a comparable revolution in the treatment of chronic diseases and physical impairments now thought beyond hope. There is not a single branch of medicine that will remain unchanged as a result of this powerful tool for controlling life processes," Bassett declares. **OO**

A computer forecast of the economy, based on the major political party platforms

CAMPAIGN '80: A COMPUTER ANALYSIS

BY DICK TERESI AND OWEN DAVIES

It seemad like a good idea. This year's presidential campaign—like all previous campaigns—was too long on rhetoric and too short on information. So *Omni* will provide some information.

Why not take the economic planks of both the Democratic and the Republican parties and feed the data into the most sophisticated computer model of the American economy available? And out the other sida, according to the plan, should come predictions of what the economy will look lika in the years 1981 through 1984, depending on whether the Rapublicans or the Democrats gain the White House.

It should work pretty well, wa thought. After all, business firms avery day use computer models to predict the future of the economy. The famed Club of Rome 'Limits to Growth' study examined resources and economies all over the world for years to come. And "Global 2000," a partially computerized study commissioned by President Carter, covered everything from mineral supplies to wild-animal populations. Projecting what the platforms would do should be a snap compered to thet. So why hadn't anyona dona it publicly before?

Mayba becausa it's political dynamite. As nearly as the computer can tell, the Democratic platform simply adds up to more of what we've had for the past four years. The Rapublicans offer a better daal in nearly every way: a fester economic recovery, faster-growing GNP, higher personal income—everything but more jobs (the Democrats have a slight edge there)—and all of it without significantly raising the inflation rate.

The firm we chose to do the computer work for us was Data Resources, Inc. (DRI), of Laxington, Maesachusetts, a forecasting firm that uses a 900-factor model of the economy to forecast future trends in federal credit, interest rates, consumer spending, housing, employment, and other vital concerns.

The leval of datail is astonishing. When DRI looks at housing, it doesn't just forecast the housing starts. DRI breaks them down into single-unit and multiunit starts. Then it figures in mobile-home shipments, stocks of homes and mobile homes, investment in additions and alterations, population in various age groups, "inventory of unsold single-family homes par naw single-family home sales," disposable income, "mortgage debt sarvica as percent of disposable income," and more than a dozan other arcane factors.

There are 41 figures for "personel consumption expendituras" alone, each one indicating a separate nuance of the American public's buying habits—and that's not counting 35 factors that deal with automobile sales. There are a couple dozen factors concerning various tax depreciation rates, 14 different figures for exports, dozans more for employment, industrial production indices, and so on and so forth. What DRI has tried to do is to quantify the economy and stick it all into a computer.

What we did with the DRI computer was to maka two such simulations. For the Republicans, we plugged the Kemp-Roth tax cut into tha model. This 30 percent cut in the federal personal tax (spread over three years) is the focus of the GOP's economic stance. Also into the computer

PHOTOGRAPH BY PETE TURNER

went Republican proposals to ease business taxes and reduce government spending in all categories except military where the party wants an increase The heart of the Democratic platform is a $12 billion jobs program, along with a modest tax cut and these were fed into the machine

So far so good Then the simulations came out of the computer And the final score is pretty clear

The Republicans win, and win big The Democrats get blown out of the water

The Republican platform according to our simulation would lead to a quicker economic recovery an increase in the average annual growth rate of the gross national product of 3 7 percent compared to only 3 4 percent under the Democrats When talking about hundreds of billions of dollars this difference is significant The average tax rate under the Republicans would be much lower than under the Democrats leading to higher per-capita disposable income (in other words more take home pay)

As you would expect, after-tax profits for corporations would soar under the Republicans ($90 5 billion in 1984) contrasted with what they'd be under the Democrats (a piddling $78 7 billion) What you wouldn't expect however is that despite the tax cuts and higher take-home pay, inflation in our Republican scenario is only slightly higher than in the Democratic simulation (the Democrats would average an inflation rate of 9 3 percent with the Republicans less than a percentage point above that)

The Democrats do win the unemployment battle They would keep the jobless rate to an average 7 3 percent compared to 7 7 percent for the opposition

Why do these results make economists and forecasters uncomfortable? Because to most experts they don't make sense Among these experts is Republican vice-presidential candidate George Bush His party's economic plank is based on the Kemp-Roth tax cut, which Bush referred to as "voodoo economics" and "pie in the sky" during the primary campaign The Brookings Institution studied the bill and found it would be inflationary and at the same time would *not* stimulate the economy Yet our simulation shows that it would be stimulating while still holding the line on inflation

Let's look at some specifics To start here are the growth rates of the gross national product (GNP) in percentage increases, we can expect under each party

Gross National Product

	1981	82	83	'84
Democratic	1 2	4 9	3 5	3 6
Republican	1 1	5 3	4 0	4 2

Obviously the GNP will increase faster under the Republicans A rapidly growing GNP indicates an increase in productivity that must be viewed in tandem with another factor the increase in after-tax profits that we predict will occur under either party Here are the total profits that nonfinancial U S corporations can expect to reap in the coming four years The figures are stated in billions of 1972 dollars, economists use 1972 dollars simply as an industry-accepted basis of comparison in order to compensate for inflation

After-tax Profits (billions of 1972 dollars)

	1981	82	'83	'84
Democratic	65 5	74 7	77 0	78 7
Republican	68 8	78 9	87 4	90 5

The Republicans win again By 1984 corporations would be taking home $11 8 billion more per year under the Republican platform than under that of the Democrats All this extra money for big business will be provided courtesy of the Kemp Roth tax cuts along with Republican proposals for accelerated depreciation and tax incentives to stimulate savings And the extra profits says a spokesman of Data Resources will provide 'an incentive' for the reindustrialization of America The DRI people claim that one of the country's problems is dilapidated plants and equipment—old factories old steel mills old machinery Industry must rebuild and retool to stimulate production More cash will provide an incentive to do this They're very careful about stating it this way because there's no guarantee that this is what big business will do with its new-found profits

"The analysts at Data Resources, Inc., are quick to point out that their model indicates the economy will recover no matter which party wins the election this month."

The analysts at DRI point out that their model indicates the economy will recover no matter who wins the White House Our simulated projection shows a very healthy GNP and large profits under a Democratic administration compared to present stagnated conditions It's just that the outlook under the Republicans is much brighter

You'll get some cash as well The Democrats will attempt to slip some money to the public with a small tax cut and a major infusion of funds ($12 billion) to provide new jobs The Republicans using the old 'trickle-down' argument say tossing tons of money at big business works better Our simulation indicates that they're right

Good news Our disposable income—the amount of money we have after taxes, adjusted for inflation—will grow steadily over the next four years Here are the percentages of growth

Per-capita Disposable Income

	1981	82	83	84
Democratic	1 1	3 4	3 7	3 1
Republican	1 3	4 1	5 1	4 4

The Republicans win But these percentage figures are hard to grasp So we asked DRI to run just the 1984 data through the computer again to find out how much each of us should have in our pockets that year

How much will you gain by voting Republican rather than Democratic? According to our model $325

The simulation shows that present yearly per-capita disposable income is $8 021 In 1984 under the Democrats it should rise to $8 956 Under the Republicans to $9 281 Now you won't be able to buy your own steel mill with the extra $325 the Republicans are offering but to be fair it's a significant amount especially when you consider our figures are per-capita figures We took the total projected amount of disposable income and divided it by the total U S population—every man woman, and child working or not So the average wage earner or household should gain quite a bit more than the per-capita $325 figure

In the projection for unemployment the Democrats come out ahead

Unemployment Rate

	1981	82	83	84
Democratic	8 3	7 4	7 0	6 7
Republican	8 6	8 2	7 2	6 9

There's nothing surprising about this What is surprising is that—given a $12 billion job program—they haven't significantly beaten the Republicans According to DRI the Democrats' job program won't kick in until 1982 after the recovery will already have begun on its own impetus The program should have no long-term impact on employment and might increase inflation

A nice endorsement for the Republicans courtesy of our computer Now for the detractions The main one comes from a spokesman for DRI He said simply "We don't have confidence in the results"

The DRI model is best at analyzing what happens when one introduces subtle changes into the economy And the Kemp-Roth tax cut is hardly subtle calling for a reduction in income tax rates from a range of 14 to 70 percent over three years DRI is afraid these data may have pushed its model beyond its capacity The model also does not take into consideration such unexpected events as severe drought or sudden increases in oil prices

But there is something appealing about more take-home pay and shiny new factories even if they're only figments in the silicon imaginations of our computers Given that and the fact experts at DRI note "the increasingly conservative mood of the American public" the Republicans could draw a lot of votes this month

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the optic glands and the female octopuses went on to live new lives

Omni That was a metaphor for the transitions you spoke of?

Mandell Yes the discontinuities in a system Pavlov's dogs which had hyperactive dispositions became gentle after they survived near drowning You've heard of people being upset about losing feelings for their ex-spouses? They can't identify with the selves they were before the marriage ended William James in *Varieties of Religious Experience* talks about how saints go through a long period of depression before their personalities change—from sin to transcendence A manic the first two or three days after he comes out of his depression—even though he is going to be very crazy and buy fourteen automobiles and have to be locked up—is a saint! He knows what everybody is thinking He's benign intuitive You just can't believe it That's called the Switch Day by NIH's [National Institutes of Health] William Bunney

Omni So who is—or was—Dr Sam Shambhala?

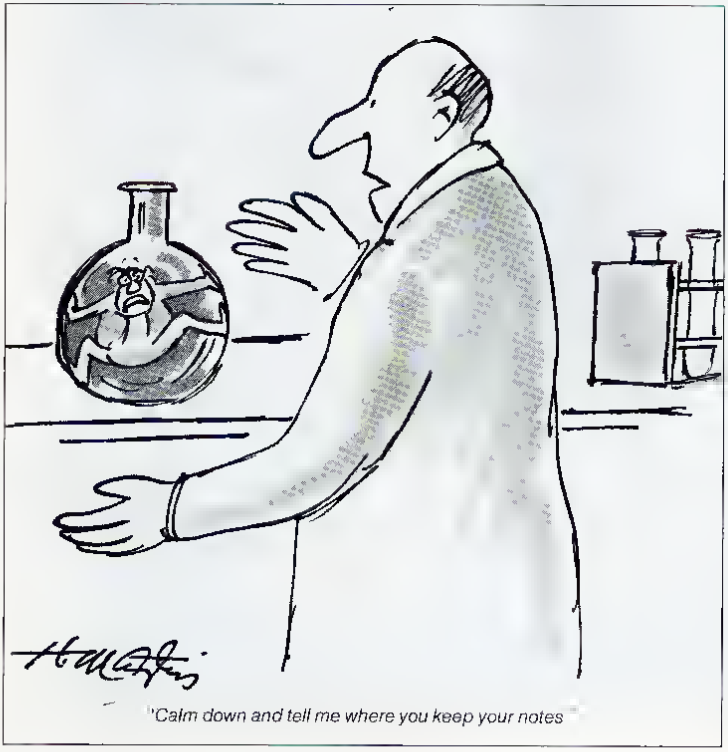
Mandell I think of it as an attempt to fuse images of brain function with human experience my own life childhood, family marriage children diseases depressions, hope despair For me then all right a shaman is someone whose specialty is the induction of a well state someone who may help either through research or through treatment to induce a state in his brain or someone else's brain that will produce health Okay?

But the brain is an open intrinsically unstable system and its higher-level order may be not just the wires and connections of a switchboard but all the turbulence and eddies of streams and waterfalls And yet it has a statistical stability an inertia If it's perturbed enough it gets more and more turbulent It fractures then organizes into a new regime The brain is my cosmology I sometimes think the rest of science is the brain's pictures of itself

Omni How so?

Mandell Who knows? Maybe thermodynamics is really about how the brain feels as it fills and empties of motivation Freud lived halfway up Bergasse between the wealthy and the poor neighborhoods and thus he saw the supply of libido as restricted Marx's economic determination? Limited supply in a closed system! That's the same thing isn't it? And of course we have no-nonsense survival in our Darwinian biosphere

At the turn of the century the world had Pavlov and William James to choose between Whom did it choose? Pavlov! The closed system the predictability of conditioning That's still with us



"Calm down and tell me where you keep your notes"

Omni Don't you like that point of view?

Mandell Biochemists think the body's proteins move because they're pushed not because they have lives of their own But it's just the fact that simply the world the brain, our cosmology is always changing Proteins at body temperature are opening and closing spontaneously—breathing! And if I asked you not to think the word *elephant* for two minutes, you couldn't do it

Omni Right How much do we control our thoughts, after all?

Mandell That's it William James's preconscious stream—which was ignored around 1900—is back in full force It's tumbling through our minds like the weather and we're left in a position to observe negotiate maybe but not control

Omni What about ecstasy?

Mandell Ecstasy? Did you know that some epilepsy patients—those who suffer from temporal-lobe epilepsy—have spontaneous religious conversions between their seizures? LSD and other hallucinogens can be pharmacological tools to look at similar states in animals

But there is the time when you face death I think the primordial expression of that state is a burst of energy at the end Why did we develop this through evolution? If it didn't have some species-survival advantage it would have died out wouldn't it? Visualize the cavemen out of food out of water without sleep for nights and days chased by wild animals Finally they lie down They are going to die Then this ecstatic brain goes off They see a light Maybe the leader sees it too, and so he invokes it among the others in his charismatic way X percent of them are going to find water right? They live

This new death writing about the moment of death and all—that's all in the limbic lobes the "mammalian" brain All that can be obtained by electronic stimulation—you know out of the body, looking down It's all in the brain There is no shining light That is the God in your brain going off

Omni Why the limbic lobes?

Mandell Well most scientists now agree that the brain has three parts [Paul MacLean of the National Institutes of Health formulated the idea of a three-in-one "triune" brain] The most primitive the reptile brain probably appeared in birds and reptiles a hundred million years ago It is the vicious repetitive instinctive territorial macho brain It is the football amphetamine brain This is the brain that Pavlov conditioned in dogs and B F Skinner conditioned in pigeons As evolution proceeded, a new brain was deposited over the "bird" brain the limbic This is found in mammals, it was originally tied in with olfaction The third brain the neocortex, is the higher-primate, or human brain If has produced what we recognize as human culture

Omni So the limbic brain

Mandell The hippocampus septum in the limbic is the species-preserving nexus that gives you the most intense pleasure

when you do something to continue your species That s why sex feels so good That s why the shining light at the moment of death makes you want to go on But there is a devil in the limbic system also the amygdala That s why the outcome of acid trips is so uncertain To prevent tuning in to the amygdala one must purge all the rage and anger which is what saints do in penance This is why certain peyote using Indians go through a purification period before they ever bite the buttons

Omni Will we one day be quantifying transcendent states of consciousness in the laboratory?

Mandell Not soon I think The this-causes-that brain circuitry is okay for finding the exquisite quantitative relationships between the firing rate of a neuron and, say the angle of bend of a limb But it can t describe things like the process of kindling —the excitation leading to still more excitation of the brain That changes such things as the potassium metabolism and the functioning of receptors all over the brain It s a distributed effect

Omni Like mood?

Mandell Yes, exactly A depression changes how food tastes whether music seems pretty how a person walks It changes what s in his dreams his body temperature his appetite whether he asks for a raise or a vacation—stuff like that

Omni Instead of as circuits how else can we picture the brain?

Mandell Well it s a pedestrian image but soup Then you d have feelings which would be like taste—made up of parts—but they d have average values Perhaps you d prefer to think of it as music a symphony a conglomerate of sounds That's another example of overlapping and interacting wave processes We re starting to see the brain as the probabilistic sum of all its chemical parts

Now the soup can contain much information But the information seems to be distributed through the whole brain It s not organized in just one place or another Recently a group at Saint Elizabeths Hospital in Washington destroyed an area in animal brains that makes the neurohormone dopamine The animals had movement problems When brain parts that make dopamine were transplanted the movement problems were ameliorated But here s the interesting part It didn't make any difference where they inserted the transplant tissue in the skull You know light flashes can be received all over the brain even after the visual cortex has been destroyed Maybe ecstasy is a white luminescence that is experienced with the eyes closed

Omni Why white? Why any color?

Mandell Well here s another metaphor for wave processes Picture the brain as a bubbling chemical pool of continually changing colors Think of the colors as feelings—feelings released from floating gland bags White would be for euphoria and hope Black represents depression and despair Red is alertness—and attacking, escaping protecting and mating Yellow is afraid of red Blue stills the racket from outside Alcohol brings great bursts of red at first then retreats to yellow Librium and Valium shut off the yellow at first but they make the valve leak After a while you have more yellow than when you started A drug can bring any of these colors on demand It goes all over the brain and changes the variational properties of other systems

Omni What do you mean by variational properties?

Mandell Psychiatry, for example isn t so interested in the act of shaking hands but in how you do it If you can t shake hands at all you consult a neurologist don t you? But the psychiatrist is interested in your variations Do you grip hard or soft? Is your grip limp? Think of the brain as a small society where every element influences everything else The taste of the soup is the average of all the ingredients influencing other ingredients

Omni Do drugs change the taste of the soup?

Mandell Of course but it s a complicated matter far more complicated than a simple dose and response The brain s chemistry contains thousands of influences already So changing the brain over the long term is like the hope of invading China It s more likely that the intruding force will be swallowed up

Omni But can t mind drugs alter personality? Take Valium

Mandell Valium has been shown to attach itself to specific places in the brain Some people think it dampens the activity of the locus coeruleus a small nucleus in the brainstem that researchers at Yale and elsewhere think regulates high arousal and fear—and maybe the discomfort of drug withdrawal But the other part of the equation is less specific like what happens when your mother-in-law moves in with you Adjustments are made time passes adjustments lead to other adjustments There is no one simple mother-in-law effect You might be able to pick up effects in several parts of the larger system, say the dog s appetite, the youngest child s grades whether the car gets washed on Saturday morning

Omni How do you use drugs in your practice? Or do you?

Mandell I use them less and less—less than I used to I think a drug can teach a patient that another state is possible It can let him experience what it feels like But then he has to get it for himself by doing the things that people do when they are in the state he wants to be in

Your brain becomes what you do, I think It transforms to fit life Neighborhood barflies and junkies on street corners maintain their old brain forms in A A fellowships and methadone clinics Fat women become preoccupied with diets and keep the brain configuration of craving And psychoanalytic patients, for that matter go on

ruminating depressively under the aegis of treatment. Magical drug cures create needs for themselves and leave the patient stuck where he began, don't they? They're like churches that bring relief by forgiveness with implicit blame and guilt.

Omni: Can you give a clinical example—say, depression? How does the drug enter into the picture?

Mandell: Say someone is standing on your toes and you'd like to tell him to get off. When you rehearse the remark to yourself, however, you panic. There's the potential loss of the protection and love you get from that person. When you don't say anything, your rage turns inward and you become depressed. Now a tricyclic drug [the commonest kind of antidepressant. Elavil and Tofranil are tricyclics] would allow the loss, the fantasy of loss, without panic, and your anger and depression would leave as you ordered the person to get off your foot.

Omni: What's your drug?

Mandell: Running a dozen miles a day.

Omni: Wouldn't some people call that a narcissistic preoccupation?

Mandell: There's a movement these days by a large group of people toward a transcendency of mind, using methods like meditation, running, T'ai Chi, and so on, and all that could be part of the texture of a society that has a high divorce rate, a low birthrate, and single life-styles. Look at it this way. In Zen metaphysics the "householder" is supposed to have special problems maintaining enlightenment if he cares too intensely, too possessively, about his house, his family, his accouterments, and such things.

You know the [Hindu sacred poem] *Bhagavad Gita* says that transcendent action is possible through detachment with empathy. God tells Arjuna he should act and not care about the outcome. And in the Tibetan *Book of the Dead* the road to mental health is said to lie in gradual detachment from things of this world. That's a brain state.

Omni: But who minds the store?

Mandell: You do, but in a different way. Moved by the joy of the activity yourself. Maybe dragging around yesterday's messages, maintaining old order in thought forms, is a lot sicker than a reality that's an existential randomness.

Our pilot studies are suggesting, for instance, that drugs such as amphetamines create stable patterns of order in the enzymes, the receptors, and the EEG. High doses of amphetamines lead to fixed delusions. But the whole idea underlying, say, Buddha's enlightenment, transcendence, "no mind," may be a return to randomness, to a lack of order. Sometimes the transition can produce panic. That's why Zen meditators meet regularly with their masters to sort out their hallucinations and altered states of consciousness. Maybe letting go, religious surrender, is the feeling equivalent of a loss of order—the order Eastern philosophers say is, was, artificial in the first place.

Omni: Is this the unconscious, the disordered part of oneself?

Mandell: Before Homer, it was thought to be the voice of God. It's William James's mystical experience, the Quakers' inner light, Jung's universal unconscious, Hinduism's "that." Sf. Teresa's ecstasy, Roger Sperry's right hemisphere.

This is order in randomness. Einstein hated the indefiniteness of this view just as Freud hated the idea of open thermodynamic systems of psychic energy. Einstein referred to [Niels] Bohr's lecture in Como, Italy, as some business about God not playing dice.

Omni: What about the right hemisphere? Is there a natural dualism in the brain's two halves?

Mandell: Sperry has been describing something like this in people afflicted with severe epilepsy who have split-brain operations. When surgeons severed the midline connections between the hemispheres, Sperry's group reported open conflicts between right and left hemispheres. Freud and others talked about a personality continuum from obsessionality to hysteria. But perhaps instead it's a mix of the flat, obsessional, analytic, verbal mode of the left hemisphere superimposed on the labile, emotional, impulsive, visual, intuitive mode of the right hemisphere. There you have Freud's two voices.

> *"Amphetamines have become a work practice in a situation where men in their thirties have to muster sustained temper tantrums—vendettas—to keep up their mortgage payments."*

Omni: What will politics be like in an era of transcendent brain states?

Mandell: I suppose Jerry Brown might be an example. His father, former Governor Pat Brown, put his finger on the difference, I think. Once at a meeting of psychiatrists I heard him ask, "What would you say about a fellow who cared about a lot of people—Chicanos, blacks, the poor, women—in the abstract, but if a single real person in need came to him, he couldn't help? I think he was spelling out the difference he saw between him and his son, between the old and the new politics.

Omni: What about mind drugs as a political weapon? CIA experiments with behavior-altering drugs, for example?

Mandell: I'm not paranoid about that. There were some fairly fancy experiments being done in the Fifties and Sixties, but I'm sure that's been stopped. If you mean, do I think you could spray a country and change its politics, no. But at a subtler level, psychopharmacology does have sociopolitical implications. Psychotropic drugs represent behavioral modes. Amphetamine says, "I'll get that guy before he gets me." Valium says, "I'll just endure it." The antipsychotic drugs say, "I promise to stop this nonsense." Lithium says, "I've decided that the whole glorious trip isn't worth the disaster at the end." Cocaine says, "I'll sit in my quiet glow of superiority." Hallucinogens say, "Let's see how close to death things still look pretty."

Omni: You're talking about already-available stuff. What about drugs of the future?

Mandell: Ah, well, that's a problem of almost-cosmic proportions. I think it would be equal to nuclear energy. For instance, government policy on what kinds of drugs are acceptable under the aegis of treatment automatically alters consciousness. It's conceivable that hormonal agents used for birth control have already altered certain biogenic amines in the brain, such as serotonin, and that birth control pills might be chemically, not just socially, altering people's attitudes toward sexuality.

Omni: So where are we headed in mastering the brain?

Mandell: The most hopeful sign is that some of the best scientists have turned their attention in this direction. Physicists, enzyme kineticists. Until recently theories about the brain were almost embarrassingly primitive. Nerve endings fill up and empty out. Tracts go from here to there, or a "center" does something or other.

The most powerful scientific theories have been advanced in mathematical physics, and ostensibly they've been talking about something out there. But it's possible, don't you think, that those theories are really about everything, including the human brain.

The forms of mathematics—for example, geometry, statistics, algebra—could be the brain's descriptions of its own machinery. A rate of change of a rate of change could be expressed, say, as a differential equation in calculus—or in many other mathematical ways. Perhaps our mathematical-physical theories have been about the brain all along—the brain teaching itself and using an external problem as a kind of Rorschach blot.

Omni: What you're saying, then, is that *Coming of Middle Age* is really an extended metaphor, maybe even some kind of epic simile, about the brain. But isn't it also really about you and about your own sickness and recovery?

Mandell: Yes, both. The brain is unstable, and we all live on the edge of disorganization, whether we allow ourselves to be conscious of it or not. Knowing the limits is wisdom. It took some buffeting, a breakdown of my old self, my old brain, for me to learn about mine. ∞

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structures entitled "Generating and Organizing Variety in the Arts," which argues, among other things, against the convention of violins at the front of the orchestra playing the melody. Now he has taken up the cause with ambient video.

The structure of "2 Fifth Avenue" reflects the function of the terminal and the entire airport. Tones, images, people and planes arrive and depart, each group with its own logic in apparently random patterns. The whole is at once an orchestrated unit and a series of disconnected entities. In this abstract sense then the work relates to the airport, although it might make similar sense in a train or bus station, a restaurant, or a museum. Indeed, "2 Fifth Avenue" has been installed in hospitals in England and at the Minneapolis and Buffalo airports, and a version of it was briefly set up in New York City's Grand Central Terminal.

In an airport you catch yourself listening to patterns and textures of sound. Conversations and machine noises jump and circle around, climaxes, lulls, and ironic sequences of events draw your attention to abstract features of the environment and away from the details and mechanisms of your situation. You begin to notice architecture, music, light and space, and the dynamics of human interaction.

Because "2 Fifth Avenue" is entirely open-ended, it draws your attention to these aspects of the airport. Take it easy, it seems to say, while the technology and the emotional and physical flux that surround you excite all your faculties. "2 Fifth Avenue" is in this sense an extension of the traditional role of the airport facilities. Architecture, colors, and music are all designed to quiet, but not necessarily to relax—presumably to minimize thought about the possibility of disaster while flying.

The effect is something like a "Muzak for airports"—although the method is opposite. Muzak achieves a specific end—such as relaxation—by way of a rigidly organized progression of volumes, tempos, timbres, and feelings associated with familiar tunes. "2 Fifth Avenue," on the other hand, is a seemingly random permutation of tones with no particular connection. Eno selected each shot of the building, but the actual order of the images and the overall structure were the result of random editing. "Instead of a picture that pushes you into its center," Eno says, "you create many different foci of attention."

Each observer, then, is invited to reject predetermined organization in favor of spontaneous interaction, to perceive his or her own order in the piece to allow maximum flexibility in the response to the situation. "Art isn't a quality," Eno concludes. "It is a function that exists between someone and something—an interchange, an operation that occurs between observer and event." DC

PRIME TIME

CONTINUED FROM PAGE 90

John appeared in the role of a tanned blond, muscled Adonis wearing a ludicrously short grass skirt. A breakfast table was set up at the edge of the sea itself in the foot-high wash of foam kicked up by the eternal rolling wave that towered and broke, towered and broke, above them.

Naked, godlike Polynesians—a youth for her, a maiden for John—helped them to their feet and escorted them to the wicker peacock chairs on either side of the strange table. The table was a block of polished obsidian on Victorian-looking brass legs; there was a depression in the center, out of which a grooved channel ran to the seaside edge of the tabletop.

This was certainly not their Hawaiian honeymoon as Edna recollected it, and she didn't need a tape in order to be sure of that!

"Welcome, O love goddess of the north to my groovy pad," John crooned in a strange, cracked voice. He clapped his hands. "An oblation in thine honor."

The naked maiden produced a squealing piglet, which she pressed into the pit in the center of the table. The naked youth handed John a huge machete. "Hail," John screamed, hacking the piglet in half with a swipe of his blade. Blood pooled in the pit in the table, then ran down the groove to the edge and dripped off into the sea. As the first drops of blood touched the ocean, the water abruptly changed color, and for a few moments a towering wave of blood arched over them.

A few moments later, when the eternal wave was blue water again, and Edna's viewpoint angle returned to a shot on the table, the gory mess had been replaced by a white tablecloth, two plates of ham and eggs, a pot of coffee, and a bottle of dark island rum.

"Oh, John," she said disgustedly, "it's all so—, so—"

"Eldritch? Excessive? Demented?" John said petulantly, crotchety annoyance cracking his handsome, twenty-year-old features. "You're such a timid bird, Edna. No sense of fun. No imagination."

"Killing things is not my idea of either fun or imagination," Edna retorted indignantly.

John laughed a weird, nervous laugh. A whale breached not far offshore, and immediately a giant squid wrapped tentacles around it. A fight to the death began. "Killing things?" John said. "But there's nothing alive here to kill! This is Heaven, not Earth, and we can do anything we want without consequences. What else can we do?"

"We can have a normal, civilized breakfast like decent human beings."

"Normal, civilized breakfast!" John shouted. "Decent human beings! A volcano erupted somewhere inland. Terrified natives fled before a wall of fiery lava. "Who cares about being decent human beings when we're not even alive, my princess?"

"I haven't the faintest idea what you're talking about," Edna said primly. But of course some small part of her did, and that part was chilled to the core.

"Sure and begorra, you do, Edna!" John said mockingly. "Avast, matey, what makes you so sure we're still alive? For lo, how many television seasons has it been since we retired? A hundred? Two hundred? Verily and forsooth, time out of mind. Can you even guess, my slave girl? I can't."

Edna blanched. She didn't like this kind of talk at all. It was worse than his machismo adventure programs, worse than the porno programming he enjoyed putting her through, worse on a whole other level; she had trained herself not to contemplate.

"Of course we're alive," she said. "We're real-time-sharing now, aren't we?"

Bathing beauties water-skied in a chorus line through the curl of the wave. A flying saucer buzzed the beach. A giant crab seized their servants in its pincers. It whisked them away as they screamed.

"Ah, mine Aphrodite, how can we be sure of that? Thou couldst be croaked and I could be tuning in to an old tape where you still lived. Har-har. I could be dead except in this program of yours."

"This is certainly no program of mine, John Rogers!" Edna shouted. "Only *you* could have invited me to a breakfast program like this!"

"I stink, therefore I am," John cackled. Lightning rattled. Schools of porpoises leaped in and out of the great wave.

And so it had gone. Nubian slaves lighting cigarettes. Dancing gulls. An orgy sequence. And all throughout it, John babbling and ranting like a demented parrot in his beachboy body. Only one thing had kept Edna from tuning him out and tuning in a breakfast soap, and that was the dim, distant thought that to do so might precipitate the final break between them, the break between her and something that she could no longer conceptualize clearly.

John (rising from the table) What's for dinner tonight, by the way?

Edna Roast chicken with that corn bread stuffing you like.

He kisses her briefly on the lips.

John Mmmmm. I'll try to pick up a bottle of that German wine on the way back from work if I'm not too late.

He opens the door, waves, and exits.

Edna Have a good day.

But now, while she watched her image bid good-bye to John as he left for work on that dim, fuzzy old tape she found so soothing, Edna wondered how long it would be before she would consent to real-time-share a meal with the "real" John again—a John she no longer recognized as the husband in her domestic tapes, a John she

"All right, why does the Nile flow north?"

was not sure she wanted to know about.

After all, she thought, tuning to *Elizabeth the Queen*, her favorite historical romance of this season, too much of that could ruin her domestic tapes with John for her, and then where would she be if she could no longer live comfortably in her past?

Right now she was seated on her throne in the early evening light, and Sir Walter Raleigh was bowing to her with a boyish twinkle in his eye that made her quiver.

Rolling among naked teen-aged girls in a great marbled Roman bath. Popping off Indians with his Remington repeater. Swinging on a vine through a jungleful of dinosaurs. Leading the pack around the last turn at the Grand Prix de Monaco.

Boring, boring, boring! Irritably John flipped through the broadcast channels, unable to find anything capable of holding his attention. What a lousy season this was, even worse than the last! There wasn't a single adventure program that had any originality to it, the porno channels made him think of Edna and her damned disapproval of anything still capable of turning him on, and old domestic tapes—he knew would just make him furious.

Of course he had a big file of classic recordings and custom-programmed favorites to draw upon when real-time programming got boring, and so he started flipping through his videx, desperately looking for something to fill this time slot.

Flying his one-man space fighter low over an alien glass city, shattering the crystal towers with his shock wave as he rose to meet the bandits. Chasing a fat merchantman under a full head of sail. Avast, me hearties, prepare a broadside! Auctioned as a sex slave to a mob of horny women. Doing a smart left bank around a skyscraper with Lois Lane in his arms.

He really had some choice footage in his tape library, but he had run all of it so often, down through the long seasons that every bit of it seemed engraved in his real-time memory. He had lost the ability to surprise himself, even with how gross he could get, and he had to go further and further out to avert— to avert— to avert—

Onward, the Light Brigade! Thousands of screaming teen-aged groupies mobbed the stage, grabbed his guitar, tore off his clothes. "Frankly, Scarlett," he said as she sank to her knees, "I don't give a damn."

If only Edna had the gumption to be a real wife to him! Lord knew he tried to be a real husband to her. Didn't he regularly invite her to real-time-share the porn channels with him, and didn't he take pains to choose the most far-out sex programming available? Didn't he invite her to all his best adventure programs? Didn't he invite her to the best mealtime custom programming instead of the same old domestic tapes?

He did his best to make her programming day interesting and surprising, and what did he get from her in return? A lot of whining about his dirty mind, a determination to get him caught in one of those saccharine historical X's with her, and a dreary desire to mealtime-share the same musty old domestic tapes over and over again. What was the purpose of retiring to Total Television Heaven in the first place if you were afraid of grossness, if you insisted on realism, if all you wanted was to watch endless reruns of the same old, boring past?

Striding through the jungle, a great, hairy gorilla, beating his chest while the natives flee in terror. Executing a snappy Immelmann and coming up on the Red Baron's tail, machine guns blazing. Getting head from the legendary Marilyn Monroe.

Damn it, retiring to Total Television Heaven before either of them was sixty-five had been Edna's idea in the first place. John told himself, though a part of him knew that wasn't exactly totally true. With the kids at the other end of the continent and the economy in such bad shape and nothing interesting going on in their real-time lives, it was only his job that had kept them from trading in their Social Security equity for a two-hundred-year annuity to Total Television Heaven. He figured that if he could work another ten years and save at the same rate, it would enable them to buy an extra fifty years of Heaven. But when the cost of living rose to the point where he wasn't saving anything— well, at that point he hadn't really needed that much convincing, especially since there was a rumor that Social Security was about to go bust and the smart thing to do was get into Heaven while you could.

But what good was two hundred and ten years in Total Television Heaven if your wife insisted on living in her tape loops of the past? How much fun could you have if all you had to rely on was the broadcast programmers and your own imagination?

Making love to a fair rescued damsel on the steaming corpse of a slain dragon. The image began to flicker. Diving out of an airplane, spreading his arms and flying like a bird, the air seemed to turn to a thick, choking fluid. Tarzan of the Apes, making love to an appreciative lioness, felt an uncomfortable pressure against his eyeballs.

Oh, God, it was happening again! For some time now something had been corroding John Rogers. He could feel it happening. He didn't know what it was, but he knew that he didn't *want* to know what it was.

I'm just sick and tired of having to fill every time slot in my programming day with something I have to choose myself, he told himself nervously. Sure, he could time-share with Edna and let her fill some time slots for him, but her idea of programming made him want to puke.

In fact, the lover of the insatiable Catherine the Great felt a bubble of nausea rising within him even as the beautiful czarina crawled all over him. Napoleon's mind felt a nameless dread even as he led the triumphal march through Paris. Because the thought that had intruded un-

bidden into his mind was What would happen if he didn t choose anything to fill the time slot? Was it possible? Would he still be there? Where was there?

And questions like those brought on the leading edge of an immense formless, shapeless choking dread that took him out of the viewpoint character and made him see the whole thing as if through the eyes of a video camera lines of dots pressure against his eyeballs

He shuddered inwardly Convulsively he switched to a domestic porno tape of himself and Edna making love in the grass on the slope of a roaring volcano She screamed and cursed and moaned as he stuck it to her but but

Edna I've got to get out of here!

But what can I possibly mean by that?

Frantically he voiced her over 'Edna I ve got to real-time-share with you he said shrilly "Now!"

"I m tuned in to *China Clipper* now and it s my favorite historical X her voice-over whined as he continued to pound at her under the volcano

"Please Edna porn channel Eight real-time share with me now if you don t if you don t " A wave of molten lava roared and foamed down the mountain toward them as Edna moaned and swore toward climax beneath him

"Not now John I m enjoying my pro gram " her distant voice over said

"Edna! Edna! Edna! John shrieked overcome with a terror he didn t understand didn t want to understand

"John! There was finally concern in her voice, and it seemed to come from the Edna who thrashed and moaned beneath him in orgasm as the wave of lava enfolded them in painless fire

John you re disgusting! she said at the height of the moment "If you want to time share with me we ll have to go to a domestic tape *now*. Loop E

Raging with fear anger and self-loathing he followed her to the domestic tape They were sitting on the back porch of their summer cabin at the lake overlooking the swimming raft where the kids were playing a ragtag game of water polo *Oh Jesus*

"Now what s got you all upset John? Edna said primly pouring him a glass of lemonade

John didn t know what to say He didn t know how to deal with it He didn t even want to know what he was dealing with He was talking to a ghost He was talking to his wife talking to a ghost He he

We ve got to do more real-time-sharing Edna he finally said It s important We shouldn t be alone in here all the time "

"I haven t the faintest idea what you re babbling about Edna said nervously As for more real-time-sharing I m perfectly willing to share mealtimes with you on a regular basis if you behave yourself Here At the house On our honeymoon Even in a good restaurant But not in any of your disgusting programming John and that goes double for the porn channels I don t understand you, John You ve become some kind of pervert Sometimes I think you re going crazy

A burst of multicolored snow flickered the old tape Edna sipped her lemonade His eyes ached He was choking

"I m going crazy? John cried thickly "What about you, Edna living back here and trying to pretend we re really still alive back then instead of here in in—"

In Total Television Heaven John, ' Edna said sharply "Where we re free to program all our time slots to suit ourselves And if you don t like my programming you don t have to time-share it As for your programming, I don t know how you stand it

But I can t stand it!" John shouted as a water-skier was drawn by a roaring speed boat past their porch "That s what s driving me crazy From somewhere came the sounds of a softball game A 747 glided by overhead

"Daddy! Daddy!" the kids waved at him

But this is worse! ' he screamed at Edna young and trim in her two-piece bathing suit A neighbor s dog came up wagging its tail and she gave it her hand to lick "This isn t real and it s not even an honest fantasy; you re dead inside of here Edna living through your old tape loops floating in floating in "

He gagged An image of a fetus faded in faded out faded in again He felt something pressing against his face like an ocean of time drowning him pulling him under Nothing was real Nothing but whatever Edna had become speaking through her long-dead simulacrum near the lake

"Stop it John! I won t listen to such filth!"

"Oh Jesus, Edna we re dead don't you see? We re dead and drifting forever in our own tape loops and only—

Good-bye John Edna said frostily taking another sip of lemonade "I much prefer the way you were to this!

"Edna! Edna! Don t break the time share! You re all that s left!

Edna Say honey why don t we go inside and make a little love in the afternoon

A thunderclap rends the sky It begins to rain Edna laughs and undoes the halter of her swimsuit

Edna Oh I m getting wet Why don't you grab a towel and dry me off

She gets up giggling takes John s hand and leads him inside

"Oh no no! John shouted as his viewpoint followed her For she was no longer there and he remembered every scene every angle every special effect of this program Something inside him snapped He had to get out of here He switched his videx to rapid random scan unable to think of choosing a program to fill his time slot

Getting head from Marilyn Monroe sail-

"Good news and bad news Good news The Ice Age blizzard left only four feet of snow last night instead of six feet Bad news It s August

ing the Spanish Main—fetus floating in the eternal amnion—a giant gorilla chasing dusky natives from dinner with Edna and the kids In the dining room of their house—a million flickering electronic dots against his eyeballs—flying like a bird through the towers of New York around the Eiffel Tower—choking in the sea of time—leading the cavalry charge to plant the flag on Iwo Jima—lungs straining for a surface that wasn't there—stepping out of the air lock under triple suns—trapped in syrupy quicksand forever—arriving at the sultan's harem in King Arthur's squad car—

Awake aware alive for a long horribly lucid moment—floating and choking in the amniotic quicksand with meaningless images attacking his eyeballs—waking up from a long suffocation dream into a long suffocation dream that wouldn't go away couldn't go away or there'd be—

Dueling with the musketeers swinging on a vine through the jungle of the Great Barrier Reef with Edna in a hammock screaming orgasm in the harem with a dozen houris soaring through space screaming around great ringed Saturn screaming against the dead cold black phosphor-dotted everlasting void drowning choking screaming god oh god oh oh oh—

As she faded out of the viewpoint character of Elizabeth the Queen Edna thought of John How long ago had that terrible final real-time sharing taken place? Was it still the same television season?

It was time for dinner and she programmed dinner loop C She John and the kids were seated at Thanksgiving dinner She was wearing her Sunday best the kids were neat and combed and John was wearing a suit

John This stuffing is delicious honey!
Sammy Can I have the other drumstick?
Ellie Pass the cranberry sauce
Edna It's wonderful to have a quiet Thanksgiving dinner just for the four of us isn't it John?

Edna felt so contented so at peace with herself and her family so right with the world *I really should invite John to real-time share this wonderful Thanksgiving*, she thought maternally *I really ought to give him one last chance to be a proper father to the kids and husband to me*

Filled with Christian charity, she voiced over to his channel John? she said scooping up mashed yams with brown sugar and passing the salt to her beaming husband who planted a little kiss on her wedding ring *en passant* I'm having Thanksgiving dinner with you and the kids and I'd like you to be a good father and real-time share with us

There was nothing on the voice-over channel for a moment as John handed the drumstick to Sammy Then as Sammy took it from him and bit into it with boyish gusto John screamed

An endless ghastly blubbering shriek that rattled Edna's teeth and poisoned the moment with unremitting horror

"John Rogers you're an animal I don't know you anymore, and I don't want to!" she shouted back at the horrid sound and broke the connection once and for all

John Don't gobble your food Sammy, or you'll turn into a turkey
Sammy (turkey sound) Gobble, gobble!

All four of them laugh heartily

John Please pass me some more of the peas honey What do you say kids Isn't your mother the best cook in the world?
Sammy and Ellie Yay Mom!

Edna beamed as she handed John the bowl of creamed peas He smiled at her Edna relaxed How good it was to have a nice civilized Thanksgiving dinner with your husband and your family just the way you liked it Peaceful and loving and together forever

She decided to play a romantic porn program after dinner She would meet John in an elegant cafe in old Vienna waltz in a grand ballroom share a bottle of champagne on a barge in the Seine and then make love on a bear rug in front of a roaring fireplace She knew that everything would be just perfect ∞

OUT OF LUCK

CONTINUED FROM PAGE 61

looked at him in recognition, since he had given his name. Their smiles were cool, distant, patronizing. Some nodded at him slightly as he made his way slowly up the avenue toward Sixty-third; some ignored him. Several passed on motorcycles wearing red helmets. A few waved coolly to him. One slowed his motorcycle down near the curb and said "Hi, Harold," and then sped off. Harold closed his eyes.

He got home all right and up the stairs. When he walked into the living room he saw that the cats had knocked his new painting to the floor and had badly smeared a corner of it. Apparently one of them had rolled on it. The cats were nowhere in sight. He had not seen them since Janet had gone.

He did not care about the painting now. Not really. He knew what he was going to do. He could see in his mind the French movie, the man on the motorcycle.

In the closet where she kept her vacuum cleaner, Janet also kept a motorcycle helmet. A red one, way up on the top shelf behind some boxes of candles and light bulbs. She had never spoken to him before about motorcycles; he had never asked her about the helmet. He hadn't thought about it since he first noticed it when he was unpacking months before and looking for a place to put his Samsonite suitcase.

He set the bag of bottles on the ledge by the window overlooking the building where men in brown sleeveless sweaters were now working. He opened one bottle with a practiced fingernail, steadily. The cork came out with a pop. He took a glass from the sideboard and poured it half full of whiskey. For a moment he stood there motionless, looking down at the building. The work he saw without surprise: was getting done. There was glass in the window frames now; there had been none that morning. The plywood ramp had been replaced with marble steps. Abruptly he turned and called, "Kitty! Kitty!" toward the bedroom. There was silence. "Kitty! Kitty!" he called again. No cat appeared.

In the kitchen there was a red-legged stool by the telephone. Carrying his untasted glass of whiskey in one hand, he picked up the stool with the other and headed toward the closet at the back of the apartment. He set the whiskey on a shelf, set the stool in the closet doorway. He climbed up carefully. There was the motorcycle helmet, red, with a layer of dust on top. He pulled it down. There was something inside it. He reached in, still standing on the stool, and pulled out a brown sleeveless sweater. There were stains on the sweater. They looked like bloodstains. He looked inside the helmet. There were stains there, too. And there was a little blue band with letters on it. It read PAUL BENDEL—PARIS. Once in bed, Janet had called him Paul. *Oh, you son of a bitch!* he said.

Getting down from the stool, he thought *For him to know. For me to find out.* He stopped only to pick up the drink and take it to the bathroom, where he poured it down the toilet. Then he went into the living room and looked out the window. The light was dimming; there was no one on Sixty-third Street. He pushed the window higher, leaned out. Looking to his right, he could see the intersection with Madison. He saw several of them crossing it. One looked his way and waved. He did not wave back. What he did was take the two bottles and drop them down to the street, where they shattered. He thought of a man's body shattering in a motorcycle wreck. In France? Certainly in France.

A group of four of them had turned the corner at Madison and were walking toward him. All of them had their hands in their pockets. Their heads were all inclined together and they appeared to be having an intimate conversation. *Why whisper?* Harold thought. *I can't hear you anyway.*

He pulled himself up and sat on the window ledge, letting his legs hang over. He stared down at them and forced himself to say aloud, "Paul." They were directly below him now, huddled and whispering. They seemed not to have heard him.

He took a deep breath and said it louder. "*Paul.*" And then he found somewhere the strength to shout it, in a loud, clear, steady voice. "Paul," he shouted. "*Paul Bendel!*"

Then the four faces looked up, shocked. "You're Paul Bendel," he said. "Go back to your grave in France, Paul."

They stood transfixed. Harold looked over toward Madison. Two of them there had stopped in their tracks in the middle of the intersection.

The four faces below were now staring up at him in mute appeal, begging for silence. His voice spoke to this appeal with strength and clarity. "Paul Bendel," he said, "*you must go back to France.*"

Abruptly all four of them averted their eyes from his and from one another's. Their bodies seemed to become slack. Then they began drifting apart, walking dispiritedly away from one another and from him.

The cats appeared sleepily from an open closet, waiting to be fed. He fed them.

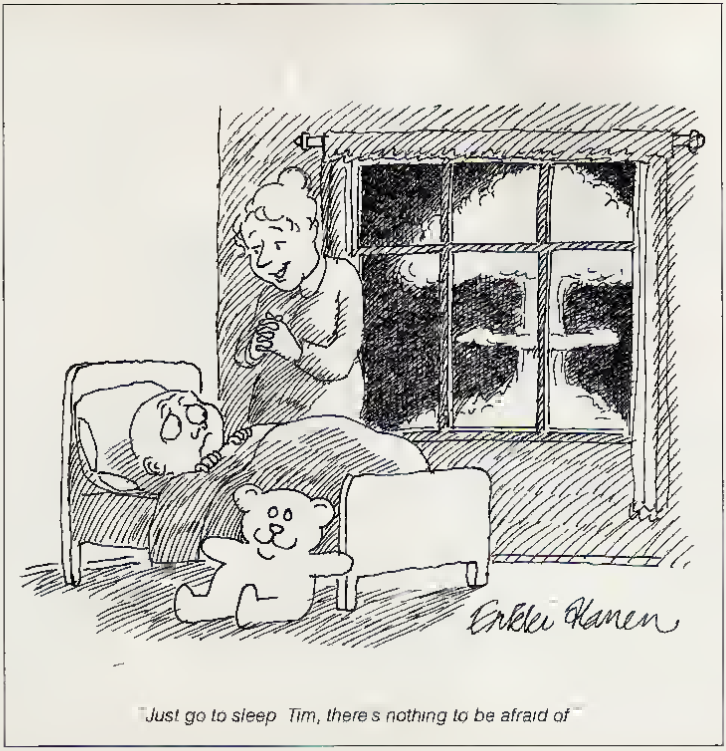
He was redoing a smeared place on the painting when the telephone rang. It was Janet. She was clearly in a good mood and she asked whether the zucchini soup had been all right.

"Fine," he said. "I had it cold."

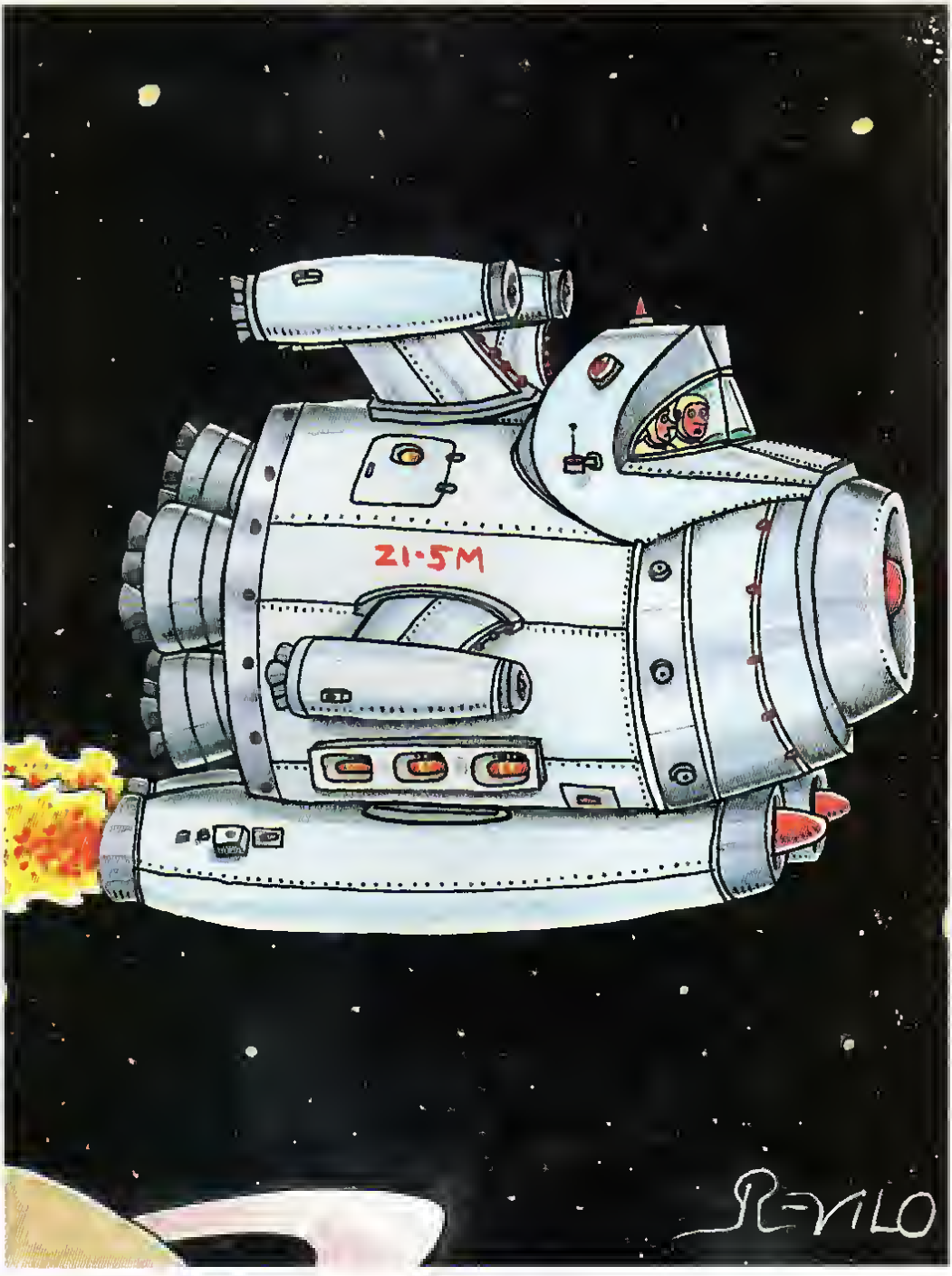
She laughed. "I'm glad it wasn't too burned. How was the *jarret de veau*?"

Immediately, at the French, his stomach tightened. Despite the present clarity of his mind, he felt the familiar pain of the old petulance and jealousy. For a moment he hugged the pain to himself, then dismissed it with a sigh.

"It's in the oven right now," he said. "I'm having it for dinner." OO



"*Just go to sleep, Tim, there's nothing to be afraid of.*"



"What do you mean Pull over The oil light is on?"

COMMUNICATIONS

CONTINUED FROM PAGE 10

could not possibly enlarge the whole brain. This condition would lead to an enlarged head. And, although it may be true that Washington D.C. has a high density of persons walking around with swollen heads and a high density of head shrinks, I can assure you that these conditions are not due to increased thinking.

Herman Vandenburgh
Laboratory of Neurochemistry
National Institute of Mental Health
Bethesda, Md.

Encouraging

"Orthohealing," by Belinda Dumont [February 1980], has conveyed something of the nature and value of orthomolecular medicine to thousands of *Omni* readers. You may be interested to know that nearly 10,000 of them wrote letters to our office requesting information. Our small staff was temporarily overwhelmed. All letters have now been answered. We hope that those who wrote us will use their influence to encourage others to seek orthomolecular care. More physicians may be persuaded to join the ranks of our young organization, which is dedicated to improving the quality of health through nutritional medicine. Thank you for the fine work.

Richard A. Kunin, M.D.
President, Orthomolecular
Medical Society
San Francisco, Calif.

Garbled Message

Dick Teresi, your bias is showing. In the People column [August 1980] you noted that, despite its euphemistic name, [Citizens for Safe Nuclear Energy] is definitely for expansion of nuclear power.

Would the name not be a euphemism if the group were adamantly opposed to nuclear power?

Judith Anderson-Houston
Rochester, N.Y.

Dick Teresi replies: *I felt the organization's name was misleading because it implies that its major concern is improving the safety of nuclear energy when in fact the group's major rhetoric is aimed at persuading the public that the nuclear-power system is perfectly safe as is. Many of the people attending the group's meeting were at first confused about whether it was a pro- or an antinuclear organization. I see nothing wrong with belonging to an organization devoted to promoting nuclear power. But if the organization is ambiguous about where it stands, or has a purposely ambiguous name, one begins to wonder.*

Ambidextrous

It's not fair that I should enjoy your magazine for so long without saying a word, then write to point out a blooper. But what can I say? Gloating is so much more fun than complimenting.

Check page 28 of the August issue. In the photo of the Beatles, John and George are shown playing left-handed guitars while Paul picks at a right-handed bass. We old fogeys know that the way it happened was just the opposite.

Steven Ormiston
Oxford, Ohio

We inadvertently ran the photograph backward, and we thank all the meticulous music lovers who wrote to tell us. —Ed.

Unblinded by the Light

I thank John Gribbin for his fine article "Jupiter's Nonetfect" [Space, June 1980]. He has successfully communicated what I have been trying to explain to people who use the planetary alignment as "proof" of the destruction of the world. Trying to educate them has been like talking to a blind man with sign language, but Mr. Gribbin's article has helped.

Terry Fischer
Grand Forks, N.D.

Chemical Coaching

I greatly appreciate your article on science and sports ["Winners," July 1980]. I am an athlete and was glad to see that Susan Mazur did stress the value of hard work in the perfection of one's skills, but I was even more impressed by her statements on steroids and selective breeding. When performance is so important that we have to rely on drugs and genetics to win, we have gone too far.

Christopher G. Dorow
Glencoe, Md.

Short-cutting the Future

Our space program lacks so many things that it's pitiful. I am in full accord with Peter H. Diamadis's views [Forum, July 1980]. If the space program were allowed to soar, it would secure future energy and raw material needs and solve the problem of overpopulation. College students today will be the victims of the humiliating delays and budget cuts. We simply cannot hold back investigation of the resources locked away in space. We can't solve the staggering resource problems by closing our eyes to them. Or are we just selfish and ignorant? The future can't stand our petty cuts and cancellations.

Steven Janas
Willingboro, N.J.

Viking Fund

When I was a member of NASA's computer team, I felt I was a part of the support group for the Viking and Voyager missions. It was a wonderful and exciting experience, and I was dismayed to see these projects winding down. I feel a strong sense of urgency to get our space program moving in a well-defined direction again, and thus my donation. What a nice feeling it is to be part of things again!

Jerry Zeisler
Sherman Oaks, Calif.

SPACE

CONTINUED FROM PAGE 22

A popular misconception among space enthusiasts is that the aerospace industry lobbies energetically for the space program. Yes, aerospace corporations lobby, but they rarely lobby for space. On average, less than 5 percent of their business is derived from space contracts. Few corporations will jeopardize their regular bread and butter by lobbying zealously for a space issue.

This fact was brought home in no uncertain manner during a recent visit to the office of a senator to discuss the Carter Administration's continuing attempt to delete $5.2 million from the budget for the solar power satellite study. The senator's energy aide started the conversation with, "Where the hell have all you people been? For three years the senator has supported this thing, and yet nobody thinks it important enough until now to come and talk to us about it. Why should we care if you people don't?" Good question. Many of us mistakenly have thought that industry has been knocking itself out for the solar-power satellite.

Learning the political ropes is no easy matter. It may be instructive to review how space policy is made and carried out, and how we can best affect the process.

Policy originates in the President's office. In discussions with his scientific adviser, the NASA administrator and the director of the Office of Management and Budget (OMB), the President sets the broad outlines of his goals for the space program. These are fleshed out and costed by OMB and, if acceptable, included in the national budget for each fiscal year. A policy paper outlining these goals may be made public.

The federal budget is submitted to Congress, where it is broken into its constituent parts and given to committees for examination. NASA falls under the jurisdiction of the House Committee on Science and Technology and its Subcommittee on Space Science and Applications.

After reviewing, and perhaps revising, the administration's proposals, the committee originates a numbered authorization bill. It then debates the authorization and proposes any further revisions before placing the bill before the whole House, where it is again subject to amendment.

The bill now moves to the Commerce, Science, and Transportation Committee of the Senate. It is again reviewed and revised by the Subcommittee on Science, Technology, and Space, then voted on by the whole Senate.

Next the bill is returned to the House Appropriations Committee, where it is subject to intensive review and debate by the Subcommittee on HUD and Independent Agencies. Once the subcommittee votes, the bill passes to the full House for further debate and voting. Leaving the House once more, the bill is forwarded to the Senate Committee on Appropriations and passed to its Subcommittee on HUD and Independent Agencies, where it goes through the same examination and revision before being voted on by the whole Senate.

Finally, any differences existing between the House and the Senate versions are discussed in conference, and then an acceptable compromise is agreed upon. The bill is then sent to the President for his signature. He can veto it if he is dissatisfied.

This is a lengthy and complex process. Although it allows for lobbying at strategic points, it also gives considerable power to the committees, where most of the real analysis and "trading" occur. It is rare for either the full House or Senate to reject the recommendations of their various committees. Consequently, the chairmen of both Senate and House subcommittees on HUD and Independent Agencies wield considerable power. Neither Senator William Proxmire nor Representative Edward Boland, the respective chairmen, is particularly friendly to the space program, which with its "open" funding represents a tempting target in a time of cutbacks. Only a well-supported and organized lobby can prevent such cutbacks from regularly eroding the space program.

No such lobby exists at this time, although efforts are being made to start one. These attempts need all the support they can get. It is no secret that pro-space members of Congress—such as Senators Adlai Stevenson and Harrison Schmitt and Representatives Don Fuqua, Ronnie Flippo, and George Brown, all of whom have sponsored members' bills in this ninety-sixth Congress to enlarge and encourage the nation's role in space—feel let down by the lack of support from the so-called space constituency.

Although we have moved forward in the past year, we need to do even better. The space community is demonstrating that it is politically more aware and active than in the past. But we have a long way to go before we become a force to be reckoned with in Washington.

We need to organize, to develop and sustain our lobbying and political action groups if we hope to affect policy making and the political process. We must commit ourselves to give our time, effort, and money for what may be years. Nothing less will do if this country is once again to lead in opening the space frontier for mankind.

As a first step, here are 25 members of the House who have voted against at least four of the five space bills covered in the table. Let's remember who they are as we enter the voting booth—and forget them permanently as we leave: California: J. Burton, Dellums, Stark; Illinois: Russo, Yates; Indiana: Evans, Jacobs; Iowa: Bedell; Massachusetts: Early, Donnelly, Studds; Michigan: Brodhead; Minnesota: Vento; Nolan; New Jersey: Fenwick, Maguire; New York: Holtzman (now running for the Senate), Weiss, Ottinger; Ohio: Seiberling; Pennsylvania: Kostmayer; Wisconsin: Kastenmeier, Reuss, Obey, Sensenbrenner.

BOX SCORE ON SPACE

The table below lists the votes by current members of the House on five key space bills that appeared before the past two Congresses—the ninety-fifth (1977–78) and ninety-sixth (1979–80). Some 25 members have voted no on at least four of the bills. But fully 195 voted *for* four or all five. Each member is classified by state, name, party affiliation, and voting record (Y = yes, for the bill; N = no, against the bill; ? = no vote recorded because of absence or abstention; blank = not elected at time of bill). The bills covered here are:

Column 1—Bill HR12505, 95th Congress, authorizing $25 million for a feasibility study of the solar-power satellite by DOE and NASA. (Authorization passed by the House, June 22, 1978, by a vote of 267–96. Republicans, 92–29; Democrats, 175–67. Bill not authorized by the Senate.)

Column 2—Bill HR2335, 96th Congress, authorizing $25 million for research by DOE and NASA into the solar-power satellite. (Passed by House, November 16, 1979, by a vote of 201–146. Republicans, 86–42; Democrats, 115–104.)

Column 3—Bill HR1787, 96th Congress, authorizing $185 million supplement to NASA FY 1979 budget (authorized in previous session) for additional expenditures on the space shuttle program. (Passed March 28, 1979, by a vote of 354–39. Republicans, 140–5; Democrats, 214–34.)

Column 4—Bill HR1786, 96th Congress, authorizing $4.8 billion for NASA in FY 1980. (Passed March 28, 1979, 323–57. Republicans, 128–12; Democrats, 195–45.)

Column 5—Bill S2240, 96th Congress. Adoption of conference report on bill to authorize $5,587,904,000 for NASA in FY 1981. (Passed July 2, 1980, 384–21. Republicans, 147–3; Democrats, 237–18.)

	1	2	3	4	5
ALABAMA					
Edwards (R)	Y	Y	Y	Y	Y
Dickinson (R)	Y	Y	Y	?	Y
Nichols (D)	?	Y	Y	Y	?
Bevill (D)	Y	Y	Y	Y	Y
Flippo (D)	Y	Y	Y	Y	Y
Buchanan (R)	Y	Y	Y	Y	Y
Shelby (D)		Y	Y	Y	Y
ALASKA					
Young (R)	?	?	Y	Y	Y
ARIZONA					
Rhodes (R)	Y	?	Y	Y	?
Udall (D)	N	N	Y	Y	Y
Stump (D)	Y	Y	Y	Y	Y
Rudd (R)	?	?	Y	Y	Y
ARKANSAS					
Alexander (D)	Y	?	Y	Y	Y
Bethune (R)		Y	?	Y	Y
Hammerschmidt (R)	Y	Y	Y	Y	Y
Anthony (D)		Y	Y	Y	Y
CALIFORNIA					
Johnson (D)	Y	Y	Y	Y	Y
Clausen (R)	Y	Y	Y	Y	Y
Matsui (D)			Y	Y	Y
Fazio (D)		N	Y	Y	Y
Burton, J. (D)	?	N	N	N	N
Burton, P. (D)	N	N	Y	Y	Y
Miller (D)	N	N	Y	N	Y
Dellums (D)	?	N	N	N	N
Stark (D)	N	N	N	N	N
Edwards (D)	N	N	Y	Y	Y
Royer (R)		Y			Y
McCloskey (R)	Y	?	?	?	Y
Mineta (D)	N	N	Y	Y	Y
Shumway (R)		Y	Y	Y	Y
Coelho (D)		?	Y	Y	Y
Panetta (D)	Y	N	N	Y	Y

	1	2	3	4	5
Pashayan (R)		N	Y	Y	Y
Thomas (R)		Y	Y	Y	Y
Lagomarsino (R)	Y	N	Y	Y	Y
Goldwater (R)	Y	Y	Y	Y	Y
Corman (D)	Y	N	Y	Y	Y
Moorhead (R)	Y	?	Y	Y	Y
Beilenson (D)	N	N	Y	N	Y
Waxman (D)	?	N	Y	Y	Y
Roybal (D)	Y	N	Y	N	Y
Rousselot (R)	Y	Y	Y	Y	Y
Dornan (R)	Y	Y	Y	Y	Y
Dixon (D)		N	Y	Y	?
Hawkins (D)	Y	Y	?	?	?
Danielson (D)	Y	N	Y	Y	Y
Wilson, C. H. (D)	?	Y	Y	Y	?
Anderson (D)	Y	Y	Y	Y	Y
Grisham (R)		Y	Y	Y	Y
Lungren (R)		N	Y	Y	Y
Lloyd (D)	Y	Y	Y	Y	Y
Brown (D)	N	N	Y	Y	Y
Lewis (R)		?	Y	Y	Y
Patterson (D)	Y	N	Y	Y	Y
Dannemeyer (R)		Y	Y	Y	Y
Badham (R)	Y	N	Y	Y	Y
Wilson, B. (R)	Y	?	Y	Y	?
Van Deerlin (D)	N	?	Y	Y	Y
Burgener (R)	Y	N	Y	Y	Y
COLORADO					
Schroeder (D)	Y	N	Y	Y	Y
Wirth (D)	Y	Y	Y	Y	Y
Kogovsek (D)		N	?	Y	Y
Johnson (R)	Y	Y	Y	Y	?
Kramer (R)		?	Y	Y	Y
CONNECTICUT					
Cotter (D)	Y	Y	Y	Y	Y
Dodd (D)	?	N	?	?	Y
Giaimo (D)	Y	?	Y	Y	?
McKinney (R)	N	N	Y	Y	Y
Ratchford (D)		N	Y	Y	Y
Moffett (D)	?	N	Y	Y	?
DELAWARE					
Evans (R)	Y	N	?	?	Y
FLORIDA					
Hutto (D)		Y	Y	Y	Y
Fuqua (D)	Y	Y	Y	Y	Y
Bennett (D)	Y	Y	Y	Y	Y
Chappell (D)	Y	?	Y	Y	Y
Kelly (R)	N	N	Y	Y	Y
Young (R)	Y	Y	Y	Y	Y
Gibbons (D)	Y	?	?	?	Y
Ireland (D)	Y	?	Y	Y	Y
Nelson (D)		Y	Y	Y	Y
Bafalis (R)	Y	Y	Y	Y	Y
Mica (D)		Y	Y	Y	Y
Stack (D)		Y	Y	Y	Y
Lehman (D)	N	N	?	?	Y
Pepper (D)	Y	Y	Y	?	Y
Fascell (D)	Y	Y	Y	Y	Y
GEORGIA					
Ginn (D)	Y	Y	Y	Y	Y
Mathis (D)	Y	Y	Y	Y	?
Brinkley (D)	Y	Y	Y	Y	Y
Levitas (D)	Y	Y	Y	Y	Y
Fowler (D)	?	?	Y	Y	Y
Gingrich (R)		?	Y	Y	Y
McDonald (D)	N	N	Y	N	N
Evans (D)	N	Y	Y	Y	Y
Jenkins (D)	Y	Y	Y	Y	N
Barnard (D)	?	Y	Y	Y	Y
HAWAII					
Heftel (D)	Y	Y	Y	Y	Y
Akaka (D)	Y	N	Y	Y	Y
IDAHO					
Symms (R)	?	N	Y	?	Y
Hansen (R)	N	N	Y	Y	Y
ILLINOIS					
Stewart (D)	?	N	?	?	Y
Murphy (D)	N	Y	Y	N	Y
Russo (D)	N	N	N	N	N
Derwinski (R)	Y	N	Y	Y	Y
Fary (D)	Y	Y	Y	Y	Y
Hyde (R)	N	N	Y	Y	Y
Collins (D)	Y	Y	Y	Y	Y
Rostenkowski (D)	Y	?	Y	Y	Y
Yates (D)	N	N	N	N	Y
Porter (R)					N
Annunzio (D)	Y	Y	Y	Y	Y
Crane (R)	N	?	Y	Y	Y
McClory (R)	Y	?	Y	Y	Y
Erlenborn (R)	N	N	Y	?	?
Corcoran (R)	Y	Y	Y	Y	Y
Anderson (R)	N	?	?	?	?
O'Brien (R)	N	Y	Y	Y	Y
Michel (R)	Y	Y	?	?	Y
Railsback (R)	Y	Y	Y	Y	Y
Findley (R)	?	Y	?	?	Y
Madigan (R)	Y	Y	Y	Y	Y
Crane (R)		N	Y	N	Y
Price (D)	Y	Y	Y	Y	Y
Simon (D)	?	N	Y	N	?
INDIANA					
Benjamin (D)	Y	N	Y	Y	Y
Fithian (D)	Y	N	Y	Y	Y
Brademas (D)	Y	N	Y	Y	Y
Quayle (R)	Y	?	Y	Y	Y
Hillis (R)	Y	?	Y	Y	Y
Evans (D)	N	N	N	N	N
Myers (R)	Y	Y	Y	Y	Y
Deckard (R)		N	Y	Y	Y
Hamilton (D)	Y	N	Y	Y	Y
Sharp (D)	Y	N	Y	Y	Y
Jacobs (D)	N	N	N	N	N
IOWA					
Leach (R)	Y	Y	Y	Y	Y
Tauke (R)		Y	Y	Y	Y
Grassley (R)	N	?	Y	Y	Y
Smith (D)	Y	?	Y	Y	Y
Harkin (D)	Y	Y	Y	Y	Y
Bedell (D)	N	N	N	N	N
KANSAS					
Sebelius (R)	N	N	Y	Y	Y
Jeffries (R)		N	Y	Y	Y
Winn (R)	Y	?	Y	Y	Y
Glickman (D)	Y	Y	Y	Y	Y
Whittaker (R)		Y	Y	Y	Y
KENTUCKY					
Hubbard (D)	Y	Y	Y	Y	Y
Natcher (D)	Y	N	Y	Y	Y
Mazzoli (D)	Y	?	Y	Y	Y
Snyder (R)	Y	Y	Y	Y	Y
Carter (R)	Y	Y	?	?	Y
Hopkins (R)		Y	Y	Y	Y
Perkins (D)	Y	?	Y	Y	Y
LOUISIANA					
Livingston (R)	Y	Y	Y	Y	Y
Boggs (D)	Y	N	Y	Y	Y
Treen (R)	Y	?	Y	Y	Y
Leach (D)		Y	Y	Y	Y
Huckaby (D)	?	Y	Y	Y	Y
Moore (R)	Y	Y	Y	Y	Y
Breaux (D)	Y	N	Y	Y	Y
Long (D)	Y	N	Y	Y	Y
MAINE					
Emery (R)	Y	Y	Y	Y	Y
Snowe (R)		Y	Y	Y	Y
MARYLAND					
Bauman (R)	N	N	Y	?	Y
Long (D)	N	N	Y	Y	Y
Mikulski (D)	Y	Y	Y	Y	Y
Holt (R)	Y	N	Y	Y	Y
Spellman (D)	Y	N	Y	Y	Y
Byron (D)	Y	Y	Y	Y	Y
Mitchell (D)	Y	N	N	N	Y
Barnes (D)		N	Y	Y	Y
MASSACHUSETTS					
Conte (R)	Y	Y	Y	Y	Y
Boland (D)	Y	Y	Y	Y	Y
Early (D)	N	?	N	N	Y
Drinan (D)	N	N	Y	Y	Y
Shannon (D)		N	Y	Y	Y
Mavroules (D)		N	Y	Y	Y
Markey (D)	?	N	Y	N	Y
O'Neill (D)					
Moakley (D)	N	N	Y	Y	Y
Heckler (R)	?	Y	Y	Y	Y
Donnelly (D)		N	N	N	Y
Studds (D)	N	N	N	N	N
MICHIGAN					
Conyers (D)	?	?	?	?	Y
Pursell (R)	Y	N	Y	Y	Y
Wolpe (D)		N	Y	Y	Y
Stockman (R)	Y	?	Y	?	Y
Sawyer (R)	?	?	Y	Y	Y
Carr (D)	Y	N	Y	Y	Y
Kildee (D)	Y	N	Y	Y	Y
Traxler (D)	?	Y	Y	?	Y
Van der Jagt (R)	?	N	?	?	Y
Albosta (D)		Y	Y	Y	Y
Davis (R)		N	Y	Y	Y
Bonior (D)	N	N	Y	N	Y
Diggs (D)	Y	?	?	?	
Nedzi (D)	Y	N	Y	Y	Y
Ford (D)	Y	N	Y	Y	Y
Dingell (D)	Y	N	Y	Y	Y
Brodhead (D)	N	N	N	N	Y
Blanchard (D)	Y	Y	Y	Y	Y
Broomfield (R)	Y	?	Y	Y	Y
MINNESOTA					
Erdahl (R)		N	N	N	Y
Hagedorn (R)	Y	Y	Y	Y	Y
Frenzel (R)	?	Y	?	?	Y
Vento (D)	N	N	N	N	Y
Sabo (D)		N	Y	Y	Y
Nolan (D)	N	?	N	N	N
Strangeland (R)	Y	Y	Y	Y	Y
Oberstar (D)	Y	N	Y	N	Y
MISSISSIPPI					
Whitten (D)	?	Y	Y	Y	Y
Bowen (D)	?	Y	Y	Y	Y
Montgomery (D)	N	Y	Y	Y	Y
Hinson (R)		N	Y	Y	Y
Lott (R)	N	Y	Y	Y	Y
MISSOURI					
Clay (D)	Y	N	N	Y	Y
Young (D)	Y	Y	?	?	Y
Gephardt (D)	Y	?	N	N	N
Skelton (D)	Y	Y	Y	Y	Y
Bolling (D)	Y	?	Y	Y	Y
Coleman (R)	Y	Y	Y	Y	Y
Taylor (R)	Y	Y	Y	Y	Y
Ichord (D)	Y	Y	Y	Y	?
Volkmer (D)	Y	Y	Y	Y	Y
Burlison (D)	Y	Y	Y	Y	Y
MONTANA					
Williams (D)		N	Y	Y	Y
Marlenee (R)	N	N	Y	N	Y
NEBRASKA					
Bereuter (R)		Y	Y	Y	Y
Cavanaugh (D)	Y	Y	N	N	Y
Smith (R)	Y	N	Y	Y	Y
NEVADA					
Santini (D)	?	N	Y	Y	Y
NEW HAMPSHIRE					
D'Amours (D)	Y	N	Y	Y	Y
Cleveland (R)	?	?	Y	Y	Y
NEW JERSEY					
Florio (D)	N	N	Y	Y	Y
Hughes (D)	Y	Y	N	N	N
Howard (D)	Y	N	Y	Y	Y
Thompson (D)	Y	N	Y	Y	Y
Fenwick (R)	N	N	N	N	Y
Forsythe (R)	Y	Y	Y	Y	Y
Maguire (D)	N	N	N	N	N
Roe (D)	Y	Y	Y	Y	Y
Hollenbeck (R)	Y	Y	Y	?	Y
Rodino (D)	?	Y	Y	Y	Y
Minish (D)	Y	?	Y	Y	Y
Rinaldo (R)	Y	Y	Y	Y	Y
Courter (R)		Y	Y	Y	Y
Guarini (D)		N	?	?	Y
Patten (D)	Y	Y	Y	Y	Y
NEW MEXICO					
Lujan (R)	Y	?	Y	Y	Y
Runnels (D)	?	Y	?	?	?
NEW YORK					
Carney (R)		Y	Y	Y	Y
Downey (D)	N	N	Y	Y	Y
Ambro (D)	Y	Y	Y	Y	Y
Lent (R)		Y	Y	Y	Y
Wydler (R)	Y	Y	Y	Y	Y
Wolff (D)	Y	Y	Y	Y	Y
Addabbo (D)	Y	N	Y	Y	Y
Rosenthal (D)	N	?	N	N	Y
Ferraro (D)		N	Y	Y	Y
Biaggi (D)	N	Y	Y	Y	Y
Scheuer (D)	Y	N	Y	Y	Y
Chisholm (D)	N	N	Y	Y	Y
Solarz (D)	N	N	Y	Y	Y
Richmond (D)	N	N	Y	Y	?
Zeferetti (R)	?	Y	Y	Y	Y
Holtzman (D)	N	N	N	N	N
Murphy (D)	Y	Y	Y	Y	?
Green (R)	N	N	Y	Y	Y
Rangel (D)	N	N	Y	Y	Y
Weiss (D)	N	N	N	N	N
Garcia (D)	N	N	Y	N	Y
Bingham (D)	N	N	Y	?	Y
Peyser (D)		N	Y	Y	Y
Ottinger (D)	N	N	Y	N	N
Fish (R)	Y	Y	Y	Y	Y
Gilman (R)	Y	Y	Y	Y	Y
McHugh (D)	Y	N	Y	Y	Y
Stratton (D)	Y	Y	Y	Y	Y
Solomon (R)		Y	Y	Y	Y
McEwen (R)	Y	Y	Y	Y	Y
Mitchell (R)	Y	Y	Y	Y	Y
Hanley (D)	?	Y	Y	Y	Y
Lee (R)		?	Y	Y	Y
Horton (R)	Y	Y	Y	Y	Y
Conable (R)	N	?	?	?	Y
LaFalce (D)	N	N	?	?	Y
Nowak (D)	Y	N	Y	Y	?
Kemp (R)	Y	Y	Y	Y	Y
Lundine (D)	N	N	Y	Y	?
NORTH CAROLINA					
Jones (D)	Y	Y	Y	Y	Y
Fountain (D)	Y	N	Y	Y	Y
Whitley (D)	Y	Y	Y	Y	Y
Andrews (D)	Y	Y	Y	Y	Y
Neal (R)	Y	?	Y	Y	Y
Preyer (D)	N	N	Y	Y	Y
Rose (D)	Y	Y	Y	Y	Y
Hefner (D)	Y	Y	Y	Y	Y
Martin (R)	Y	N	Y	Y	Y
Broyhill (R)	Y	N	N	N	Y
Gudger (D)	Y	Y	Y	Y	Y
NORTH DAKOTA					
Andrews (R)	Y	Y	Y	Y	Y
OHIO					
Gradison (R)	N	N	Y	Y	Y
Luken (D)	?	Y	Y	Y	Y
Hall (D)		N	Y	Y	Y
Guyer (R)	?	Y	Y	Y	Y
Latta (R)	N	Y	Y	Y	Y
Harsha (R)	Y	Y	Y	Y	Y
Brown (R)	?	Y	Y	Y	Y

	1	2	3	4	5
Kindness (R)	Y	?	Y	Y	Y
Ashley (D)	N	Y	Y	Y	Y
Miller (R)	Y	Y	N	N	N
Stanton (R)	Y	N	Y	Y	Y
Devine (R)	Y	N	Y	Y	Y
Pease (D)	N	N	Y	Y	Y
Seiberling (D)	N	N	N	N	Y
Wylie (R)	N	Y	Y	Y	Y
Regula (R)	Y	Y	Y	Y	Y
Ashbrook (R)	?	?	Y	?	?
Applegate (D)	Y	Y	Y	Y	Y
Williams (R)		?	Y	Y	?
Oakar (D)	Y	?	Y	?	Y
Stokes (D)	N	N	Y	N	Y
Vanik (D)	?	N	?	?	Y
Mottl (D)	Y	Y	N	Y	Y
OKLAHOMA					
Jones (D)	Y	N	?	?	Y
Synar (D)		N	Y	Y	Y
Watkins (D)	Y	Y	Y	Y	Y
Steed (D)	Y	?	Y	Y	Y
Edwards (R)	N	?	Y	Y	?
English (D)	Y	Y	Y	Y	Y
OREGON					
AuCoin (D)	N	?	Y	Y	Y
Ullman (D)	Y	Y	?	?	Y
Duncan (D)	Y	N	Y	?	?
Weaver (D)	N	N	?	?	?
PENNSYLVANIA					
Myers (D)	Y	Y	Y	Y	Y
Gray (D)		N	Y	Y	Y
Lederer (D)	Y	Y	?	?	Y
Dougherty (R)		N	Y	Y	Y
Schulze (R)	Y	Y	Y	Y	Y
Yatron (D)	Y	Y	Y	Y	Y
Edgar (D)	N	?	?	?	Y
Kostmayer (D)	N	N	N	N	Y
Shuster (R)	Y	Y	Y	N	Y
McDade (R)	Y	Y	Y	Y	Y
Flood (D)	Y	Y	?	?	Y
Murtha (D)	Y	Y	Y	Y	Y
Coughlin (R)	Y	N	Y	Y	Y
Moorhead (D)	Y	Y	Y	Y	Y
Ritter (R)		Y	Y	Y	Y
Walker (R)	Y	Y	Y	Y	Y
Ertel (D)	Y	Y	Y	Y	Y
Walgren (D)	Y	Y	Y	Y	Y
Goodling (R)	N	Y	N	N	Y
Gaydos (D)	Y	Y	?	?	Y
Bailey (D)		Y	Y	Y	Y
Murphy (D)	Y	Y	Y	Y	Y
Clinger (R)		N	Y	Y	Y
Marks (R)	Y	Y	Y	Y	Y
Atkinson (D)		Y	Y	Y	Y
RHODE ISLAND					
St Germain (D)	?	Y	Y	Y	Y
Beard (D)	Y	Y	Y	Y	Y
SOUTH CAROLINA					
Davis (D)	Y	?	Y	Y	Y
Spence (R)	Y	Y	Y	Y	Y
Derrick (D)	N	Y	Y	Y	Y
Campbell (R)		Y	Y	Y	Y
Holland (D)	?	Y	Y	Y	Y
Jenrette (D)	Y	Y	Y	Y	?
SOUTH DAKOTA					
Daschle (D)		N	N	?	Y
Abdnor (R)	Y	Y	Y	Y	Y
TENNESSEE					
Quillen (R)	Y	Y	Y	Y	Y
Duncan (R)	Y	Y	Y	Y	Y
Bouquard (D)		Y	Y	Y	Y
Gore (D)	Y	Y	Y	Y	Y
Boner (D)		Y	Y	Y	Y
Beard (R)	Y	Y	?	?	?
Jones (D)	Y	Y	Y	Y	Y
Ford (D)	Y	?	N	Y	Y
TEXAS					
Hall (D)	N	Y	Y	?	Y
Wilson (D)	Y	Y	?	?	Y
Collins (R)	N	N	Y	N	Y
Roberts (D)	Y	?	Y	Y	Y
Mattox (D)	N	N	Y	Y	Y
Gramm (D)		Y	N	Y	Y
Archer (R)	Y	Y	Y	Y	Y
Eckhardt (D)	Y	Y	Y	Y	Y
Brooks (D)	Y	Y	?	?	Y
Pickle (D)	?	Y	Y	Y	Y
Leath (D)		Y	Y	Y	Y
Wright (D)	Y	Y	Y	Y	Y
Hightower (D)	Y	?	Y	Y	Y
Wyatt (D)		?	Y	Y	Y
de la Garza (D)	Y	?	Y	Y	Y
White (D)	Y	Y	Y	Y	?
Stenholm (D)		Y	Y	Y	Y
Leland (D)		N	Y	N	Y
Hance (D)		Y	Y	Y	Y
Gonzalez (D)	Y	Y	Y	Y	Y
Loeffler (R)		Y	Y	Y	Y
Paul (R)		N	?	Y	Y
Kazen (D)	Y	Y	Y	Y	Y
Frost (D)	?	Y	Y	Y	Y
UTAH					
McKay (D)	Y	Y	?	?	Y
Marriott (R)	?	?	Y	Y	Y
VERMONT					
Jeffords (R)	N	?	Y	N	Y
VIRGINIA					
Trible (R)	Y	Y	Y	Y	Y
Whitehurst (R)	Y	Y	Y	Y	Y
Satterfield (D)	N	Y	Y	Y	Y
Daniel, R.W. (R)	Y	Y	Y	Y	Y
Daniel, W.C. (D)	Y	Y	Y	Y	Y
Butler (R)	?	N	Y	Y	Y
Robinson (R)	Y	Y	Y	Y	Y
Harris (D)	Y	N	Y	?	Y
Wampler (R)	Y	?	Y	Y	Y
Fisher (D)	Y	N	?	?	Y
WASHINGTON					
Pritchard (R)	?	Y	Y	Y	Y
Swift (D)		Y	Y	Y	Y
Bonker (D)	Y	Y	Y	Y	Y
McCormack (D)	Y	Y	Y	Y	Y
Foley (D)	Y	?	Y	Y	Y
Dicks (D)	Y	Y	Y	Y	Y
Lowry (D)		Y	Y	Y	Y
WEST VIRGINIA					
Mollohan (D)	Y	N	Y	Y	Y
Staggers (D)	Y	Y	?	?	Y
Slack (D)	Y	?	Y	Y	
Rahall (D)	Y	N	Y	N	N
WISCONSIN					
Aspin (D)	Y	?	Y	N	Y
Kastenmeier (D)	N	N	N	N	Y
Baldus (D)	Y	N	Y	N	Y
Zablocki (D)	Y	Y	Y	?	Y
Reuss (D)	N	N	N	N	Y
Petri (R)		N			Y
Obey (D)	N	N	N	N	Y
Roth (R)		Y	Y	N	Y
Sensenbrenner (R)		N	Y	N	N
WYOMING					
Cheyney (R)		N	Y	Y	Y

Part of this table appeared recently in the Congressional Quarterly. *The author supplemented that information with tallies of the votes on each bill, supplied to him by the* Congressional Record.

PEOPLE

By Dick Teresi

John Glenn is a U.S. senator. Michael Collins is curator of the National Air and Space Museum. Frank Borman has his own airline. Astronauts usually do well when their flying days are over. One of our earliest space explorers hasn't been so fortunate.

Allen Appel is a Washington, D.C., writer. His latest offering is a yet-unpublished novel, *Cross*, about a chimpanzee and a Jane Goodall-type character that produce a child together. He likes chimps and often visits Washington's National Zoo. The zoo has one chimp. There is no sign on the chimp's cage, but his name is Ham.

On February 1, 1961, Ham became America's first primate in space. It was a rough flight. On liftoff the thrust rocket jammed at full open, subjecting Ham to 17 unexpected g's. His escape rocket fired too early. His reentry angle was too steep and his speed too high. He splashed down—hard—225 kilometers off course. Three hundred sixty kilograms of ocean leaked in before the Navy found the capsule, and when sailors popped the hatch, the water was up around the chimp's ears. They arrived just in time.

Ham's job in flight was to flip two switches in response to red and blue lights. He had been conditioned to do this by negative reinforcement supplied by a pair of metal-soled sneakers that shocked the bottoms of his feet. Ham made only two mistakes that day, but they zapped him both times anyway.

When he came down, he was famous. They took his picture after they pried him out of the capsule, and there he was, as Appel puts it, "looking as crazy as a June bug with popped-out eyes and a gigantic chimpanzee grin of fear and rage. Newspapers everywhere translated this grin as an expression of chimpanzee joy."

When he was retired to the National Zoo, they put up a sign outside his cage at NASA's insistence, declaring Ham to be our first chimp in space and a hero among animals everywhere. His new mission was "to warm the hearts of little children everywhere for years to come."

Ham is 23 years old now. Appel says his hair is fringed with gray and that he moves slowly when he moves at all. He lives in an indoor/outdoor cage with a concrete floor. Appel says he has an obvious dental problem that seems to cause him pain. His front teeth have grown forward in a strange shelflike formation. He spends a lot of time pulling on his teeth and his gums.

When Appel first asked the zoo what was wrong with Ham's teeth, a spokesman refused to admit there was any dental problem at all. Finally he allowed that Ham's teeth were messed up, but he claimed the chimp was in no pain.

As for his sign, a zoo worker told Appel it was removed about 18 months ago because the zoo administration had decided Ham should be treated no differently from the other apes. But a zoo official later said it was removed because it was an outmoded type of sign and that Ham will get a new sign when he moves into a new cage with the gorillas and orangutans.

It's possible that Ham could live another 15 years or so. The zoo said his new cage will be "much nicer." While Ham won't be permitted outside, like the gorillas and orangutans, he will benefit from soft new climbing devices, as contrasted with the metal shelves of his present cage.

The new cage should be ready for occupancy this month. Allen Appel, and *Omni*, will be watching.

Space chimp Ham at the National Zoo. No cushy retirement job for our first primate astronaut.

"Some of the volcanologists at Mount St. Helens have been kidding me," says Janet **Cullen-Tanaka**. "They want to know what power I have to get the mountain to explode in time to publicize my first novel."

Ms. Cullen-Tanaka is a social psychologist, an urban-planning expert whose specialty is volcanic hazards, *and* a writer. Her first novel, *Fire Mountain*, is about what might ensue if Mount Rainier should erupt. It's just been published by Zebra Books, but she wrote it six years ago. Some of the parallels between the book and real events are surprising.

- The May 18 explosion of Mount St. Helens included a directional blast, horizontal rather than straight up. Rainier also erupts in the same manner as St. Helens, spewing ash horizontally.
- St. Helens extruded a lava dome that

quickly exploded, in Cullen Tanaka's book. Rainier does the same thing • In *Fire Mountain* Indian activists want to use the Rainier explosion to dramatize their cause. The same thing happened early on with Mount St. Helens.

But one parallel is too uncanny for the author's sensibilities. "David Johnston, a U.S. Geological Survey [USGS] volcanologist, was killed by the directional blast at Mount St. Helens during the May 18 eruption," she says. "In my book the leading male character is a USGS volcanologist whose first name is David, and he is killed by a directional blast from Mount Rainier.

"When that actually happened, it really shook me," Cullen-Tanaka confides.

Five or six dolphins came in very fast, circling me. They took off like a scouting party, brought back the larger group, and stayed around for an hour, assuming formations resembling [those of] the June Taylor Dancers."

The speaker is **Stephen Gagne**, a twenty-nine-year-old diver who claims to be a Pied Piper of dolphins, despite the fact that oceanographer Jacques Yves Cousteau says that dolphins will not allow divers to approach them in the wild. Tame dolphins enjoy playing with humans and will even seek them as playmates. Wild dolphins, however, will swim near ships, but shy away from people in the water.

Gagne says they will—if you woo them with music. Formerly a sound technician for rock impresario Bill Graham's Fillmore concert halls, Gagne has developed an instrument resembling a piano. It has a keyboard, is air- and battery-powered, and is housed in a Plexiglas case. Gagne swims along underwater with his strange piano, improvising tunes as he goes.

Gagne uses music because he feels it's one expression that breaks down barriers between culture and language. He says dolphins swim to him by the tens, twenties, and forties, lining up on their tails like so many bowling pins to listen to him play. A documentary movie, entitled *Dolphin*, filmed in the Bermuda Triangle, has captured some of these events. The film has been aired over PBS television.

Novelist Cullen-Tanaka. Some rather frightening—and heartbreaking—volcanic predictions.

Toledo and his Cuisinart. Pancreas puree.

Gagne's next step will be to establish a relationship with a school of dolphins, or even a single dolphin. "I'd like to have an instrument the *dolphins* will play," he said.

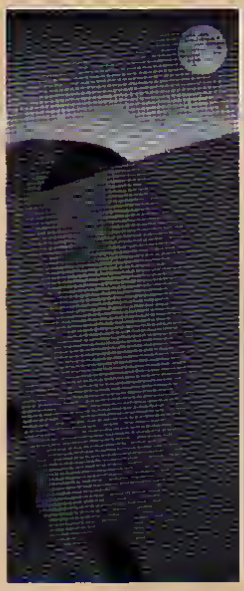
You can chop with it and grate with it. And now you can even puree a pancreas with a Cuisinart food processor.

That's what **Luis H. Toledo**, a doctor at Detroit's Mount Carmel Mercy Hospital, does with his Cuisinart. It's all for the sake of patients who had to have their pancreas removed. Obviously, these people will have diabetes unless a pancreas, removed from another human, can be pulverized and its insulin-producing cells are implanted in the patient's liver.

One drawback is that the machine needed to pulverize the pancreas costs $5,000. One night when Dr. Toledo was at a dinner party he caught sight of a $250 Cuisinart. He says his hostess was a little shocked when he asked, "Will one of those things grind up a pancreas?"

Turned out it would. Now Toledo travels around Detroit in a mobile laboratory, pureeing pancreases on the spot. ∞

NEXT OMNI



DESERTS

JAYNES

BERKEY

THE BICAMERAL JAYNES—Princeton's quiet, scholarly Julian Jaynes seems an unlikely candidate to come up with the wildest idea in psychology but there it is Homer Hammurabi the men who recorded most of the Old Testament—in fact every human being who lived more than 3,500 years or so ago—would be committed today as hopeless schizophrenics They didn't think as we do Jaynes believes The ancients truly lived with the voices of 'gods' who lived in the right half of the brain For a fascinating look at Jaynes and his work see the December *Omni*

LIFE EXTENSION—A cure for aging may be discovered before a cure for hay fever is This decade's explosion of information about DNA and genetic engineering has opened the door to the cell's nucleus In probing the macromolecular world of the supergene gerontologists now suspect that the genetic program for longevity may be relatively simple to enhance. In next month's *Omni* you will visit the laboratories where the secret messages of immortality are being decoded one gene at a time

THE UNGREENING—Desert making is as old as civilization. In his overcultivation overgrazing, burning and wood collecting ancient man became a destructive geophysical force Modern man's depredations continue on an alarming scale Annually the world loses to desert an area nearly the size of Maine If something isn't done to arrest this process we will lose one third of the planet's arable land by the end of the century Can we stop the spread of desertification? Environmentalist and leading author Kenneth Brower examines the possibilities in *Omni* next month

JOHN BERKEY—'I've never looked at myself as a science fiction artist as opposed to just being an artist, says John Berkey But his colorful work on the posters for *The Towering Inferno*, *King Kong* and other movies captivated the SF community Soon his sleek and vibrant spaceships were gracing the covers of many paperbacks Berkey's streaks of color and seemingly brittle edges add a certain speed and airless feeling to his space scenes Next month *Omni* readers can look forward to flights of fact and fancy through the imagination of an emerging artist

SCIENCE FICTION—Next month a man wrestles with the ultimate enemy in Ian Watson's A Cage for Death Orson Scott Card's 'Saint Amy's Tale is a moving post-holocaust story about a personal tragedy that becomes the basis for a new religion and two sisters are on the prowl in The Hunting of Hewlish, a light hearted satire by Sam Nicholson Good reading guaranteed in December

SATURN

CONTINUED FROM PAGE 67

where complex organic molecules could assemble themselves Voyager should settle the question

Distant Iapetus the final destination of the ship *Discovery* in *2001 A Space Odyssey* appears to be extremely strange Its trailing hemisphere is as bright as snow the leading hemisphere darker than a blackboard *Voyager 1* will examine the dark half *Voyager 2* the bright one

Voyager 1 will also study Mimas Dione and Rhea at moderate ranges These moons are believed to have icy surfaces

The probe also hopes to reveal the secrets of Saturn's spectacular rings They appear to consist of innumerable ice or ice-coated particles the largest of them perhaps a meter or so across The rings may have condensed where they are during the formation of the solar system or they may be the fragments of a satellite torn apart by the tidal forces of Saturn's gravity field If Voyager discovers large chunks they would support the tidal destruction theory small particles would suggest condensation Whatever the outcome the flight past the rings will be one of *Voyager's* most exciting maneuvers

Voyager 1's major encounters occur between 26 hours before arrival at Saturn and 8 hours after The closest approach to Titan 4 350 kilometers will take place at 12 41 A M EST on November 12

Focus then shifts to periodic observations of Saturn, the rings and selected satellites *Voyager 1* will be closest to Tethys at 5 16 PM EST In the eight hours after the nearest approach to Saturn several noteworthy events will occur There are four satellite flybys as well as occultations of the earth and sun by Saturn and the rings Closest approaches to the moons happen in quick succession Mimas at 8 43 PM Enceladus at 8 51 PM Dione at 10 39 PM and Rhea at 1 21 A M on November 13 During this period *Voyager 1* will be sending about 400 pictures a day back to Earth

Voyager 2 will then probe the mysteries of Uranus and Neptune It is scheduled to arrive at Uranus in January 1986 and at Neptune in August 1989

The beautiful views of Saturn seen here were generated by the amazing computer programs of Dr James F Blinn of Pasadena, California's Jet Propulsion Laboratory All appear as they would to someone on or near the *Voyager 1* spacecraft The relative brightness of Saturn's rings however has been shown as the rings appear from Earth This will change when they are seen from other directions

After several millennia of human evolution and emerging intelligence mankind is beginning to understand how the universe is unfolding and how we may use the discoveries of our space ventures The Voyager expedition is an important link in that evolving chain of human endeavor ∞

GAMES

ANSWERS TO GAMES (PAGE 144)

1 MATCH UP VT = l Velocity × Time = length

2 Pick up the third match light it and set fire to the two leftmost matches at the base of the V Assuming complete combustion you are left with the perfect equality, I = I

3 CALCULATOR GAMES The machine rounded up the last two digits to produce 710 7735 SELL OIL

4 READER ORIGINAL −230 When the calculator is turned sideways with the display at the left, the column of figures reads OMNI

6 THE 12 COINS

WEIGHING	Pan #1		Pan #2
First	1, 2 3 4	vs	5 6 7 8
Second	1 2 5 6	vs	7 9 10 11
Third	1 7 9, 12	vs	4 5, 8 10

Use the following system to obtain a three-digit number If Pan #1 is heavy write down a *1* If Pan #2 is heavy write down a 2 If the pans balance write down a 0 Find the number on the chart, below to identify the bad coin and determine whether it is heavy or light

COIN	HEAVY	LIGHT
1	111	222
2	110	220
3	100	200
4	102	201
5	212	121
6	210	120
7	221	112
8	202	101
9	021	012
10	022	011
11	020	010
12	001	002

8 ONCE IN A LIFETIME At exactly four seconds before 12 35 (A M or PM) on July 8 1990 there will be one second of silent observance for 12 34 56 7/8/90

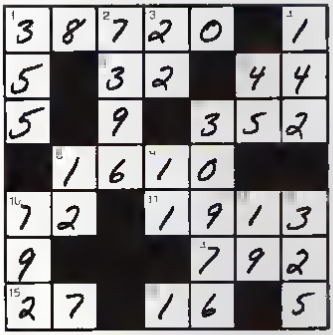
10 LUCKY 13 Fourteen "There are 13 ways in which the number *13* is represented on the back of a dollar" is the fourteenth But then there are more than 13 representations A paradox of self-reference

DOG S MEAD

Here is the answer to *Dog's Mead* the cross-number puzzle presented in last month's column The clues are reprinted for your convenience

Across

1 Area of Dog s Mead, in square yards
5 Age of Martha Dunk s older daughter
6 Difference between the length and the breadth of Dog s Mead in yards
7 Number of roods in Dog s Mead times 9 Down
8 The year when the Little Pigley farm was first occupied by the Dunk family
10 Farmer Dunk s age
11 Year of birth of Mary Farmer Dunk's younger daughter
14 Perimeter of Dog's Mead in yards
15 Cube of Farmer Dunk's walking speed in miles per hour
16 15 Across minus 9 Down



Down

1 Value of Dog s Mead in shillings per acre
2 The square of the age of Mrs Grooby Farmer Dunk's mother-in-law
3 Mary's age
4 Value of Dog s Mead in pounds
6 The age of Farmer Dunk s firstborn Edward who next year will be twice the age of his sister Mary
7 Square of the number of yards in the breadth of Dog s Mead
8 Time, in minutes it takes Dunk to walk 1 1/3 times around Dog's Mead
9 See 10 Down
10 10 Across times 9 Down
12 Sum of the digits in 10 Down plus 1
13 Number of years the Little Pigley farm has been in the Dunk family

We can t take you through every step of the puzzle but here are the first few stages in one approach to the solution As suggested work on 15 Across first Farmer Dunk s walking speed must be 3 or 4 mph since the speed's cube is a two-digit number So 15 Across is either 27 or 64

8 Across and 11 Across are four-digit dates the first digit of which must be 1

16 Across equals 15 Across (27 or 64) minus 9 Down 9 Down ends in the digit 1 If 15 Across is 64, then 16 Across would end with a 3 But 7 Down is a square number and cannot end in 3 Thus Farmer Dunk's walking speed is 3 mph and 15 Across is 27 Also, 16 Across is 27 minus 9 Down a two-digit number ending in 1 It can t be 21 because this yields only a one-digit answer So 9 Down must be 11 and 16 Across is 27 − 11, or 16

Continue logically to eliminate numbers and analyze every step ◻◻

TINY TV, MICROPRINTER

INNOVATIONS

We have not been impressed by the increasing number of microtelevisions presently on the market. With a picture too small for comfortable viewing, they have always seemed more gimmick than product. But small can be beautiful, and Sony has proved it with its innovative KV-4000, the smallest Trinitron color television in the world. Wrapped around a 3.7-inch (diagonal) Trinitron picture tube is Sony's very compact cabinet—just 4¾ inches square by 11⅝ inches deep. The screen can be tilted to any of three angles for easy viewing or can be folded down for maximum compactness and to cover controls safely. The AC/DC four-way power KV-4000 tuner scans up or down, finding and tuning TV stations automatically. It also contains video and audio line inputs so that it can be used as a portable video monitor. The unit, with a suggested retail price of $549.95, is attractive, its picture crisp and—as we've come to expect with Trinitron—pleasant to watch. Sony has come up with a big winner here. This is a TV set that will soon be seen everywhere—in kitchens, bedrooms, offices, hotels, and cars and even on beaches.

Currently available only in Europe and Japan is another Sony innovation, the remarkable M-302—one of the most interesting microcassettes we have seen. Weighing seven ounces and measuring 2⅜" × 3½" × 1", the two-speed M-302 fits easily in one's hand. You could hardly go wrong with this microcassette unit. What makes this one exceptional is a 2⅜" × ⅝" × 1" transmitter which screws onto the bottom of the M-302. When the transmitter is attached, you can transmit to an FM-receiver placed nearby. You can also transmit voice through the M-302's built-in microphone or through an external microphone jack, and you can transmit a microcassette tape from the playback mode of the M-302. The approximate range of the transmitter is 100 yards outdoors and 30 yards indoors. In addition, you can simultaneously transmit and record with the M-302. All in all, the M-302 represents a really remarkable combination of technologies. To speak into the unit and hear your voice reproduced on a radio across the room is an exciting sensation. We are not sure, however, what exactly is the purpose of the M-302 transmitter, but we know that when it's introduced in this country it will certainly excite gadgeteers.

Now that small calculators are becoming so widespread that you find them built into watches, pens, and necklaces, and in countless other shapes and forms, the next step seems to be a miniaturization of printing calculators. An example is Toshiba's BC-1020PV, an easily transportable printer with a full complement of business capabilities in addition to standard calculator functions: ten-digit display, four key memory, automatic item count, automatic round-off, selectable decimal point. Furthermore, the user has the option of viewing their input in either the print or the nonprint mode. Printing, with a one-piece ink ribbon, is quick and quiet. The unit measures 3¼" × 7 5/16" × 1¾" and carries a suggested retail price of $64.95. And we guess it won't be long before Toshiba or some other manufacturer takes that calculator watch of yours, adds a micro-ink ribbon and a microroll of adding-machine paper, and gives you back a timepiece that both calculates and prints.

Toshiba has a tiny, silent, multialarm travel clock that is so small you're liable to leave it behind in the dresser drawer along with matchbooks and spare coins. But the LQ-200 Travel Clock, at 2½ inches square and ½ inch thick, with a weight of just 1.76 ounces, is alluring, easy to use, and practical for the traveler. Having a battery life of 7,000 hours, this clock is guaranteed against battery failure during your trip. The three alarms, including a timer and a five-minute snooze feature, make it easy for you to wake up on time and stay on schedule during the day. A large, six-digit liquid-crystal display shows the day and indicates alarm and AM/PM functions. The travel clock, which also contains an automatic calendar, has a suggested retail price of $29.95.

Micromight: Sony's tiny Trinitron (left) and cassette transmitter (center). Toshiba data printer (right).

FORUM

CONTINUED FROM PAGE 12

The story related to me of how the word *canard* became part of aeronautical jargon is this.

The French contemporaries of the Wright brothers, hearing of the famous flight at Kitty Hawk, asked for information concerning the design of the aircraft. The Wrights obligingly sent them some drawings, but the French, for some reason, refused to believe that the ungainly-looking craft had actually flown. Accordingly they sent a message that contained the expression "*C'est un canard!*" Meaning, of course, they thought it was a hoax. The true implication was somehow lost in the Wright brothers' translation. Thus, any aircraft design having the horizontal control surface located forward of the wing is said to be a "canard configuration."

Tim Trowbridge
Redondo Beach, Calif.

We did not claim or imply that Burt Rutan singlehandedly solved all the problems of the F-4. What he did figure out was a particularly vexing and dangerous problem of spinouts, especially noteworthy in view of his age at the time (just out of college). As for push-and-pull engines, there have indeed been other planes in this configuration. The point of a story on Burt Rutan was not that he was the first to think of these designs, but to show readers a man daring enough to use radical solutions to solve complex problems. The Defiant is one of very few 'fast, safe, and inexpensive' twins in the world. —Ed

Just Human Beings

Walli Leff's article "Barriers of Fear" [Mind, August 1980] supports my belief that society's reactions to the handicapped stem from fear and ignorance.

But I object to the statement that these negative attitudes result in a life for disabled persons that is "little but a shell of a normal existence." As a paraplegic, I am a happy and fulfilled person with a wide range of interests, good friends and a wonderful marriage. I would suggest that perhaps Frances G. has more holding her back than her prosthetic arm.

Still, I thank you for your article. It shows that the handicapped are just human beings and should be treated as such.

Elizabeth O'Keefe
Lindsay, Ont., Canada

Carrot Circuitry

"Vegetable Voltage" [Continuum, September 1980] explained how one could detect the internal state of a plant by monitoring its EEG pattern. Farmers formerly had to guess how much water their crops needed; years of experience (and a good farmer's almanac) told one when to water. If one can recognize an EEG pattern that indicates when a plant needs water, it seems the next logical step would be to have the plants water themselves. Electronic circuitry could be designed to recognize the "thirst pattern" of a plant, triggering an irrigation mechanism. Healthier plants would result because over- and underwatering would no longer impede plants' growth. You could save time and water and avert the frustration of wondering whether your plant is screaming to be watered.

Kyle J. Bunch
Pueblo, Colo.

Battle over Bathtubs

I have been addicted to your magazine for at least a year now, enjoying every month of it. But I have noticed that you are human and do, on occasion, make mistakes.

Your June 1980 Games column erred with regard to "Battleship In a Bathtub." It seems your theoretical ship will sink.

I base my assumption on the law of displacement. For the ship to float, there would have to be more water in the tub than the ship would displace. Otherwise, why couldn't a man float on one foot while standing in a pan of water? If I am wrong, please let me know.

Frank Haislip
Madisonville, Tex.

Scot Morris replies: *You are confusing the amount of water "displaced" with the amount necessary to float the ship. The ship displaces 30,000 tons (a very small battleship, to be sure). If the bathtub is filled to the rim with water and you lower the ship in, the amount of water that will spill over the side (remember Archimedes) weighs 30,000 tons. But that's water over the rim. The amount of water left inside floating the ship could be a great deal less. If the "fit" between the ship's hull and the tub's wall is tight enough, the water could be contained in a thin envelope only an inch thick, completely surrounding the ship. This principle is put into practice at Mount Palomar Observatory, in California, where the giant 530-ton horseshoe telescope actually floats in a basin on a thin cushion of hydraulic oil.*

Let's Get to Work

The time for solar-power satellite construction is now! Not in 10 years, or 50, but immediately. Nonrenewable resources—oil, mineral ores, all the things we need to maintain modern civilization—are dwindling perceptibly. The next generation may not even be able to muster enough resources to keep going.

Microwave-power transmission is condemned by environmentalists for two reasons: fear of possible climate damage and fear that birds flying through the beam will be killed. Yet migratory patterns can be mapped and avoided, and enough desolate areas with low humidity exist in this country and throughout the world to prevent both of these problems from developing. Let's get to work now for the Age of Easy Resources is gone with the Age of Cheap Fossil Fuel, and the enormous supply of energy from solar-power satellites will be badly needed to mine the low-grade ores that alone will remain.

Michael E. Mulleady
Providence, R.I.

Yin and Yang

The ideas presented in Belinda Dumont's article entitled "Orthohealing" [February 1980] and Joe LaRock's letter [Communications, June 1980] suggest a strict categorization of sex hormones into "male" (testosterone) and "female" (estrogen, progesterone) classifications.

Research in endocrinology indicates we may need to modify our views. It has been known for quite a while that small amounts of estrogen are formed in the testes, at levels one fifth of those observed in females. Recently investigators reported the existence of estrogen receptors in male genital organs, implying a regulatory system. Further, it is now known that the adrenal cortex of both sexes secretes very small amounts of androgens (the generic name for male hormones).

The functions of these seemingly aberrant hormones remain unknown. They may be involved in systematic interactions, especially within the central nervous system (CNS). Receptors for estrogen and progesterone in the female CNS are known, as are those for testosterone in the male. Might the CNS of one sex have receptors for hormones of the opposite sex?

There is little doubt that estrogen (and possibly progesterone) affects the female psyche via direct CNS interaction. If androgen receptors exist, then the libido (and more) may be determined by a balance of "maleness" and "femaleness." This might depend upon the relative concentration of the two classes of sex hormones in a person's body.

The ancient Chinese philosophers spoke of a mixture of maleness (yang) and femaleness (yin) in every person. Is this another example of their being 3,000 years ahead of the times? I suspect so.

Daniel H. Lowenstein
Harvard Medical School
Cambridge, Mass.

PHOTO CREDITS

We apologize for omitting photo credits from our September issue. The photos on **pages 104–107** are by Edwardo Castaneda, except for that at the bottom of **page 105** and the one at middle right on **page 107**, which are by Bill Roy.

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EARTH WATCHING

EXPLORATIONS

By Phyllis Wollman

It is 4:30 A.M. in Nepal. Swaying in the predawn breeze, the naked bulb casts an eerie light over my struggle to get into perennially damp and mud-caked sneakers. No time for a leisurely toilette. Grabbing my backpack, I hurry to join three fellow volunteers in our makeshift office at the Kathmandu guesthouse.

There is still a ballroom with crystal chandeliers on the second floor, but this once royal palace now furnishes unpalatial lodgings. Hikers and aspiring mountaineers are housed here on the outskirts of Kathmandu, Nepal's capital and largest city.

Sleepily and with a minimum of chitchat, we breakfast on yogurt, mangoes, and instant coffee. Then, off on our Chinese one-speed bicycles for an eight-kilometer ride over narrow roller-coaster roads and across one of the vertiginous suspension bridges that lace the length and breadth of this isolated mountain kingdom, nestled in the lap of the Himalayan peaks.

Our destination is a five-hectare walled forest in which. In rotating dawn-to-dusk shifts, four of our team spend at least three and a half hours daily (except weekends) observing the troop of wild rhesus monkeys that roam there. Our job is to note whatever infant rhesuses eat and bring back food samples that we identify with the aid of slides or botany book sketches. The samples are then labeled and prepared for the plant dryer, who will preserve them for later analysis in the States.

Information gleaned from this project might help efforts to start breeding colonies in the United States since the government of India has banned export of these animals so necessary to the field of biomedical research.

How did I happen to journey halfway around the world to find out what infant monkeys eat? My road to Nepal began in my bathtub in New York City. While treating my tennis elbow to a long hot soak, I flipped the pages of a magazine, stopping only at the travel section because I have incurable wanderlust. An item about Earthwatch caught my eye and kindled my longing for travel.

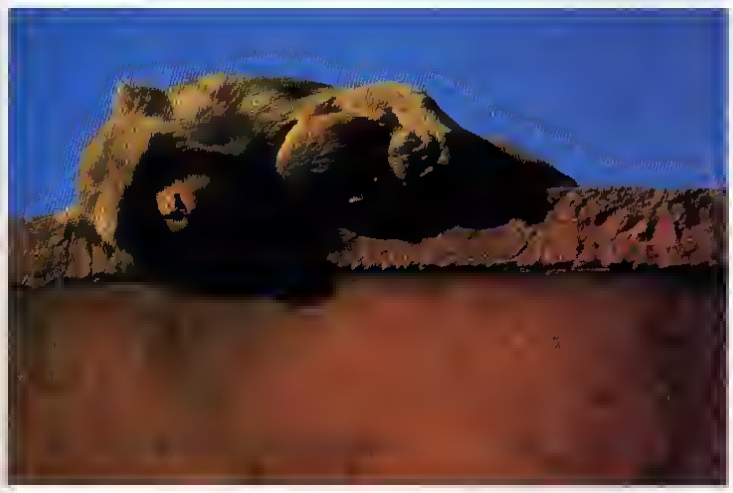
Earthwatch is a nonprofit organization that brings together fund-starved scientists and volunteers eager to travel and work all over the world, at their own expense. The group offers participants a chance to advance scientific frontiers and enjoy a different kind of vacation. The prospect of being more than a passive tourist filing dutifully through one more castle or museum intrigued me. The next morning I telephoned Earthwatch headquarters in Belmont, Massachusetts, for information.

Earthwatch's catalog turned out to be a smorgasbord of travel temptations, spanning the globe and the calendar. There's an Earthwatch expedition to somewhere every month of the year. According to your interests and depending upon whether you climb mountains or scuba-dive, you might study animal behavior in Guanacos, about 2,000 meters up in the Chilean Andes, or marine biology on the bottom of the Caribbean Sea. Closer to home were an ornithological experiment in Pennsylvania and an archaeological excavation in Maine.

A forest near Kathmandu is a far cry from Hyde Park or the Bois de Boulogne, which is one of the reasons why I chose to observe rhesus monkeys in Nepal. My fellow volunteers included a few college students, several schoolteachers, a physicist, and a dentist. All of us were seasoned travelers, seeking an adventurous vacation with a purpose.

Almost anyone between the ages of sixteen and seventy-five can become scientist-for-a-summer, or for a month, or even for just two weeks. To make certain that participants are well matched to the research projects, Earthwatch sends along numerous questionnaires designed to determine an applicant's interests, abilities, general health, and physical condition. Included in the description of each project is a frank appraisal of requisite skills. One's interest in art preservation, animal behavioral studies, astronomical work, or anthropological studies is an invaluable asset to Earthwatch and its projects.

Besides having stamina and the patience to track small animals in a dense forest, Nepal project volunteers had to be



A ban on the export of rhesus monkeys necessitates their breeding in captivity for research

able to ride old-fashioned bikes up and down steep roads for the nearly 16-kilometer round trip to and from the forest every day. Nerves of steel were not on the list, but they came in handy because taxi, bus and rickshaw drivers (there are no privately owned cars yet) drive with one hand on the horn and the other on the wheel. Humans and chickens scatter quickly or else. There are exceptions. Cows and bulls are sacred animals to Hindus, so drivers veer around them with ill-humor but with care on even the most heavily trafficked streets of the capital city.

After my application had been approved by the principal investigators, Drs. Bernadette (Bunny) Marriott and Jane Teas, of Johns Hopkins University, they sent me detailed information about their joint project. Jane was concentrating on certain behavioral patterns in older male rhesuses, and Bunny's interest lay in infant feeding patterns. The project was a continuing one that had been begun a few years earlier with Earthwatch support, and return trips were in the planning stages for a few more years. It takes a long time to reach scientific conclusions; only in films do researchers suddenly cry "Eureka! I've got the answer."

Volunteers make their own travel arrangements, but they are expected to advise Earthwatch of their plans. On arrival at Tribhuvan Airport, on the outskirts of Kathmandu, each of us was welcomed by a staff member and briefed.

The 18 participants in my expedition were divided into two teams. The group who were going to observe animal behavior moved into huts near their study site, which was at Swayambhunath, a thirteenth-century *stupa* (a Buddhist temple). This *stupa*, situated atop a hillock west of the city, is the oldest in Nepal and is an important religious shrine (Buddha was born near here).

Those of us who were to concentrate on monkey nutrition remained at the guesthouse, which was close to the forest where we would be spending so much time. This forest had once been a royal garden; even now near the gate there are a few beds of marigolds—a flower with symbolic importance to Hindus. Monks from nearby Pashupatinath, Nepal's most famous Hindu temple, come here to gather the flowers. Monkeys that live in the forest come to eat them.

In the pantheon of Hindu deities, the monkey god Hanuman is a legendary figure, so monkeys are permitted to roam freely through all the temples in the country. Though the small creatures vex farmers by stealing their crops, it would be sacrilegious to harm them.

On our first day of field work, Dr. Marriott gave us clipboards with legal-size observation sheets in which to tick off descriptions of rhesus activity at three-minute intervals for the entire shift. Each of us was handed a set of snapshots of the monkeys with descriptions to help tell them apart. (No, not all monkeys look alike, but it isn't always easy to know which one is which.) We explored the main paths and groves where the monkeys tend to congregate in the morning, at siesta time, and late in the afternoon when they feed. It was a while before our eyes became accustomed to the leafy gloom and we were able to distinguish monkeys sitting just overhead on low branches. They were staring down at us.

We strangled on the neckstraps of binoculars and lurched as backpacks got snagged on branches. More than anything else, we feared losing sight of one another. We felt clumsy and inexperienced. Small wonder the monkeys seemed to be snickering at us from above.

After only two days, however, we were no less at home in the forest than the monkeys themselves, and we soon learned to recognize many of them by name. The trails became familiar, we studied monkeys instead of the map.

"Our expeditions are tailored to meet the specific needs of our principal investigators. We're looking for strong legs and shoulders," says Earthwatch president Brian Rosborough. "someone who doesn't mind physical work and unconventional accommodations." Participants must also be prepared to pay for their own transportation and contribute to help defray costs. Contributions range from $400 to $1 000—the Stateside projects falling at the lower end of the scale than those in far-off Nepal or Kenya. Contributions and all out-of-pocket expenses (including those for transportation and equipment) are tax-deductible.

Since the organization was founded in 1973, more than 5 000 volunteers from 50 states and 18 foreign countries have contributed their brains, brawn, and approximately $3.5 million to support research that might not have been funded otherwise. And scientists from more than 300 universities and museums have led expeditions in 45 countries.

Although these expeditions are not designed for tourists, time is always allotted for sightseeing and cultural experiences. We visited medieval Nepalese villages untouched by the twentieth century except for the fact that little boys kept asking us for comic books. We also drove to the Tibetan border on a trip into the uplands where few outsiders have ever gone. On another jaunt we met a Buddhist priest who meditated in hermit fashion in a cave gouged out of a towering hillside. And we made ourselves at home in the maze of exotic bazaars.

As my diary reveals, the expedition proved to be a physical ordeal that, for some moments at least, reduced me to exhaustion. But I'm glad I gave science a helping hand. Looking back on those sometimes peaceful, sometimes hectic hours with monkeys that afforded me rare glimpses of their lives, I know that I received much more in return.

For further information, write to Earthwatch, 10 Juniper Road, Box 127, Belmont, MA 02178.

Higgledy Piggledy/Omni competitors/
Sent to this editor/Five thousand rhymes

COMPETITION

By Scot Morris

Omnipotentially, polysyllabically, incontrovertibly our readers shine. Competition #14 announced in July, asked for double dactyls. As Anthony Hecht and John Hollander explained in *Jiggery Pokery* (Atheneum), a double dactyl is: (1) an eight-line poem in which the fourth and eighth lines rhyme and each of which has four syllables, stressed on the last; (2) all other lines are double dactyls: six syllables with stresses on the first and fourth (DAH-dah-dah-DAH-dah-dah); (3) the first line of the poem must be a double dactylic nonsense line ("Higgledy Piggledy" will always do); (4) the second line must be a double dactylic name (e.g. *Samuel Coleridge-Little Red Riding Hood-Cannonball Adderley, Australopithecus*); (5) finally, somewhere in the poem, preferably in the last stanza and ideally in the seventh line, there must be at least one double dactylic line that is only one word (e.g. *infinitesimal-ornithological-cinematography*).

Most common reasons for landing on the reject pile: names that may be six syllables long but aren't double dactyls (*Christopher Columbus, Senator Bill Proxmire*); invented names; awkward stretching of names (*Ben Bova SF man*); padding of lines (*Sir Isaac Newton did*); hyphenated words at the ends of lines; and, most often, lines that simply do not scan. Not that some of these didn't get through. We forgave an occasional transgression if the rest of the poem had redeeming value. On the positive side, we looked for appropriateness, originality, humor, irreverence, rhyme, and not too many similar entries using the game name and six-syllable word.

Some readers complained that this rhyme form is more addictive than the limerick. Mike Moxcey of Barrington, New Hampshire, wrote: "Help! I have been struck involuntarily by an unceremonious unanalyzable irritability due to semitheatrical, omnidirectional, incomprehensible double dactylry. Please send a cure before I'm completely ununderstandable."

Thanks to all who entered for these extemporaneous memorabilia.

GRAND PRIZE WINNER $100

Higgledy Piggledy,
Erich von Daniken
Writes of green spacemen that
Come from afar

Next he'll be telling us
Extraterrestrials
Landed in Dallas to
Murder J.R.

—Craig Wright,
Detroit Lakes, Minn.

RUNNERS UP $25

Higgledy Piggledy
Gabriel Fahrenheit
Flunking from college, said
"Fiddle-dee-dee!"

Life is mercurial
Vicissitudinous
"One way or other I'll
"Get my degree!"

—Heber Bouland, Silver Spring, Md.

Higgledy Piggledy
Alfred, Lord Tennyson
Felt that his dactyls were
Horses to charge

Half-a-page, half-a-page
Half-a-page onward, a
Dactylomaniac
Hotspur at large

—John S. Flagg, Lexington, Mass.

Wearimus Rearimus
Gloria Vanderbilt
Stitched on a monogram,
Started a trend

Who said we wanted to
Go around flashing some
Autobiography
Each time we bend?

—Lynn Atkinson, Midland Park, N.J.

Pocketa Pocketa,
Yakima, Washington
Lay in the path of a
Blanket of ash

Volcanological
Memorabilia
Soften the blow with an
Influx of cash

—George Reardon, Sarasota, Fla.

Flappity Clappity
August von Wassermann
Bacteriologist
Germany's best

Extracurricular
Heterosexual
(Overpromiscuous)
Flunked his own test

—Chris Doyle, Burke, Va.

Plinkety Plunkety
Vladimir Horowitz
Plays the piano and
Everyone comes

What is the secret of
Such virtuosity?
Hyperextendible
Fingers and thumbs?

—Collins Kenny, Baltimore, Md.

Hastily Wastily
President Washington
Chopped down the cherry tree
I will not lie

Said: "Yes, it was me who
Chopped down the poor little
Amygdalaceae
"Let's have some pie."

—Suzanne Hubbard, Ottawa, Canada

Higgledy Piggledy,
Herr Werner Heisenberg
Pleaded: "Your Honor, it
"Just isn't fair

"That I was speeding is
"Unascertainable,
"Or if I was, then I
"Can't have been *there*!"

—John S. Flagg, Lexington, Mass.

Higgledy Piggledy
H. R. (Bob) Haldeman
Railed at reporters who
Called him a thief

Down with the ship he went
Melodramatically

Singing in basso Oh
Hell, to the chief
— R James, Los Angeles Calif

HONORABLE MENTION

Octava Iactava
Johann Sebastian
Wrote for the harpsichord
In every clave

If he could hear the Moog
Playing his music he d
Unostentatiously
Spin in his grave
— Orson Scott Card Orem Utah

Higgledy Piggledy
256
Is the eighth power of
Binary base

Binary numbers are
Homeomorphical
Mapping quite well to a
Decimal space
— Joe Halderman Ormond Beach Fla

Higgledy Piggledy
Wilt the Stilt Chamberlain
Asked by some wag Hey up
There how s the air?"

Spat on the ninny, then
Meteorologized
Cloudy up here should be
Raining down there
— Steven J Lovelace Carmel Calif

Fabilly Abilly
Hans Christian Andersen
Ogre tin soldier and
Duckling to swan

Needing an Andersen
Fantasy lead? There s no
Variability
Start Once upon
— William R Baldorossi Orlando Fla

Loonisex Spoonisex
Ms Christine Jorgensen
Gaily received a re
Quest to betrothe!

Asked, Are you bride or groom?
Well, she replied with my
Ambidexterity
'I can be both!
— James Kason Lynwood Calif

Spookety Flookety
Sir Arthur Conan Doyle
Spoke to some spirits and
Wrote what they said

Some skeptics I have known
Think he should write his own
Autobiography
Now that he s dead
— Andrea E Burgoyne, Baltimore Md

Howdy-do. Cowdy do,
Dandy Don Meredith
Countrified metaphors,
Clear as a bell

Monday night footballers
Rate him much higher than
Sesquipedalian
Howard Cosell
— Lottie Lisle Alexandria Va

Haradox, Paradox,
Zeno of Elea
Ancient philosopher
Reasoned with care

Proved that a tortoise could
Outrace Achilles by
Infinitesimal
Splitting of hair
— Allan Rogers Burke, Va

Grippity Slippity
Jacqueline Kennedy
(Onassis Bouvier,
(What's in a name?)

Wants to get married soon
Someone with glamour please!
Seems that a husband s her
One claim to fame
— Karen Meredith Houston Tex

Printhony Pranthony
Susan B Anthony
Hoped that her quarter sized
Coin would take hold

People won t use it a
Fraid they might lose it The
Ultraconservatives
Stay with the fold
— Mark Rand El Paso Tex

Bristlenooke Thistlenooke
Ignaz P Semmelweis
Worked to eradicate
Bugs of all brands,

Found a solution so
Simple he shook his head
Incomprehensible!
Just wash your hands
— Janice E Katz, Tallmadge Ohio

Flyingly Skyingly
Jonathan Livingston
Was a wise sea gull not
Part of his flock

Soaring the skies o er the
Ocean he flew with no
Thanatophobia
Into a rock
— Carol Sanderson Bainbridge Island Wash

Higgledy Piggledy,
Henry A Kissinger
Shuttle diplomacy s
Certified fox

Stopped off in Cairo and
Undiplomatically
Ordered a helping of
Bagels and lox
— Carl Holzman Chicago Ill

Andy roid Dandy-roid,
R2 and 3PO
Charmed halt the earth with their
Daring pursuits

Now we re bombarded by
Unrealistic ly
Engineered robots with
Terminal cutes
— Sharon L Prange Boulder Creek Calif

Tippity Toppity
Edmund P Hillary
Everest conqueror
Had an affair

Asked why he did it, the
Climber responded quite
Unhesitatingly
Cause she was there
— Sam Oliver Fairfax Station, Va

Trickery gimmickry
Mission Impossible
Cooks up wild ventures and
Knocks off our foes

How close they are to re
Ality only our
Counterintelligence
Agency knows
— Richard Glassco Alexandria Va

Politics Schmolitics,
Erich von Daniken
Fly in some candidates
I can vote for!

Peanuts or Hollywood?
God what a choice to make!
Responsibilities!
Bartender pour!
— Harry Stephey Havertown Pa

Higgledy Piggledy
Candidates Anderson
Carter and Reagan are
Nothing but shams

Vote for Miss Piggy who ll
Bring home the bacon the
Neopolitical
Choicest of hams
— Ron Swonger Ypsilanti Mich

Cheerio Dearie
Raymond J Atkinson
Happy I am to have
Married the man!

He s so delightfully
Doubled in dactylry
Involuntarily
Suiting the scan
— Lynn Atkinson Midland Park N J

Higgledy Piggledy
Omni the magazine
(That s as distinct from the
Automobile)

Stands as the ultimate
Ultraintelligent
Superiodical
That s how I feel!
— Dale F Martin, Greenville Ill

UFO

CONTINUED FROM PAGE 32

special news dispatch to the *New York Times* (December 10 1967), Zigel insisted that the UFO problem would have been solved already had not sensationalism and irresponsible antiscientific assertions regarding flying saucers interfered with it.

Yet references to Soviet UFOs have cropped up in the most unusual places. Until recently a textbook entitled *Introductory Space Science Vol 2* was required reading in the physics department of the U S Air Force Academy In one of its chapters, "Unidentified Flying Objects," some of the material covered bears a marked resemblance to a report of the USSR Academy of Sciences "On 24 July 1957, Russian antiaircraft batteries in the Kuril Islands opened fire on UFOs. Although all Soviet antiaircraft batteries were in action no hits were made The UFOs appeared luminous and moved very fast

Most of this now-deleted chapter further identifies shapes, behavior effects and expert witnesses all of which share elements of the Soviet report

In the closing months of 1967 both the United States and the USSR had scientific commissions investigating UFOs Then in 1968, the American committee was disbanded and the Russians announced that UFOs didn't exist In February 1968 critical statements regarding UFOs appeared in *Pravda* and Soviet ufologists went underground as did many of their American counterparts It was during the pre-1968 period of official support for UFO research that Zigel collected the data for the current Academy of Sciences report And therein lies its significance Zigel's witnesses were of the highest caliber They reported observations of aerial phenomena many of which still cannot be explained Even the U S Air Force's Project Blue Book ended by admitting that, at the very least, some UFOs were indeed unexplainable

The fact remains that UFO reports continue and 30 years of study has resulted in virtually no progress With the current rate of 100 sightings per day new parameters of research must be developed to investigate a global phenomenon that won't go away

Although the UFO debate can be settled only by an international consortium of serious scientists, such global cooperation is fraught with practical problems Considering that UFOs have been reported in at least 130 countries, the translation problems alone seem insurmountable The way to proceed is through an existing international network with translation facilities, such as UNESCO Some interest has already been voiced from this body Let's not allow the data to pile up for another three decades ∞

E Lee Spiegel produces a series on unexplained phenomena for NBC radio

CONTINUED FROM PAGE 14

birth defects among their offspring

Compounding the physical problem, many vets suffer severe psychological impairment as a result of radiation exposure. Last April, at a Citizens Hearing for Radiation Victims in Washington, D.C., California physician Henry Vyner described the atomic veteran syndrome. "This illness is caused by a fear of radiation-induced disease and by governmental denials of the veteran's claim that such a connection exists." Dr. Vyner further noted that the syndrome "is characterized by a preoccupation with the veteran's medical problems which evolves into an obsession with nuclear exposure. The subsequent results are: A healthy man becomes unhealthy, a patriot becomes angry at his government, and a social person becomes isolated."

"Not one of us is a disloyal American," says Saffer, but atomic veterans are angry at their government for having used them as guinea pigs in massive military and scientific experiments. They want the VA to pay them for their suffering and for their enormous medical expenses.

Responding to public pressure, the VA issued new criteria for establishing atomic veterans' benefit eligibility. The crux of the problem is that the VA and the federal agencies that determine radiation safety standards base their findings on outmoded studies of Japanese atomic-bomb survivors: American radiologists and people who had undergone x-ray therapy. But recent research indicates that those studies underestimate low-level radiation's health risks by 10 to 40 times.

Dr. Edward Martell, a radiochemist at the National Center for Atmospheric Research, in Boulder, Colorado, explains why the findings of the Japanese bomb-survivor studies should be suspect: "Since the bombs dropped on Hiroshima and Nagasaki were air blasts that released a single *external* exposure to gamma and neutron radiation, there was hardly any fallout." Dr. Martell notes that inhaled atomic particles emitting alpha radiation continue to irradiate and break cells down after ingestion and are, thus, more damaging and carcinogenic in the long run than even a large exposure to external radiation. Scientists estimate that inhaled alpha particles may be 8 to 20 times more hazardous biologically than a single exposure to the same amount of external radiation. No studies were conducted to determine the separate effects of blast radiation and fallout on the Japanese survivors.

The revised rules also fail to take into account the increased susceptibility of young people to low-level radiation. They state that 10,000 man-rems (equal to 10,000 servicemen receiving one rem each) would be needed to produce one statistically unexpected fatal cancer. Dr. John Gofman, professor emeritus of medical physics at the University of California at Berkeley, says these figures would be accurate for a group of older men. "But these were not fifty-year-olds," he says, "they were in their twenties."

One of the first significant low-level radiation studies was performed in the mid-1970s. Thomas Mancuso (now a research professor of occupational health at the University of Pittsburgh), along with epidemiologist Alice Stewart and statistician George Kneale, studied workers at the Hanford atomic plant in Richland, Washington. They found increases in fatal cancers of all kinds, particularly multiple myeloma, leukemia, and cancer of the pancreas, among workers exposed to radiation averaging 1 to 15 rems—levels much lower than those set by U.S. safety standards.

In 1978 the Center for Disease Control in Atlanta conducted a study of servicemen who participated in the 1957 Shot Smoky atomic-bomb test. The average readings of the soldiers' film badges showed an external exposure of about one rem. Dr. Glyn Caldwell, who headed the study, says that among the 3,224 servicemen exposed to that blast, 3.5 cases of fatal leukemia were statistically expected. "We've found eight," he says. "And we're not through looking."

The VA and the nuclear industry have good reason to want to minimize radiation's health hazards. Lewis Golinker of the National Veterans Law Center in Washington, D.C., estimates that it might cost the government "easily tens of millions each year to cover the disability benefits for the expected cancers" among the some 250,000 atomic veterans. The unexpected cancers and other adverse effects would increase that amount considerably.

Internist and radiation researcher Thomas Najarian explains why the industry is concerned: "If the effect [of low-level radiation on nuclear workers] is real, the production of energy and current procedures in the nuclear-weapons program will almost certainly be affected. Billions of dollars in compensation money could be demanded [by] more than a million former and current nuclear workers. The nuclear industry can ill afford lawsuits brought by uranium miners and nuclear-reactor maintenance workers, let alone civilian plaintiffs."

But as more cases of low-level radiation disease among veterans are reported, their chances for getting compensation increase. Several lawsuits have been filed on behalf of atomic veterans or their families. One, a class-action suit filed recently by the National Veterans Law Center (4900 Massachusetts Avenue, N.W., Washington, D.C. 20016), seeks to force the VA to throw out its June 1979 rules and start over. The suit alleges that the agency did not seek the participation of scientists, veterans, and the public, as required by law. Orville Kelly, a veteran of nuclear-weapons tests who died of lymphatic lymphoma in June, founded the National Association of Atomic Veterans (1109 Franklin Street, Burlington, IA 52601) to help other vets prepare their claims and to push for legislation.

If successful, these efforts may result in an equitable settlement for atomic veterans and end a long, harrowing battle for many families. But scientists still do not fully understand the consequences of human exposure to low-level radiation. Nuclear workers and servicemen are exposed every day to low-level radiation within current safety standards that may imperil their lives and the lives of their offspring. As of now, no federal funds have been appropriated to study Pacific A-bomb vets, so the onus falls on independent scientists to establish the pathology of radiation illness. Only comprehensive research can conclusively determine when, and *if*, low-level radiation is safe. And only such research can prevent a repetition of the sufferings experienced by the atomic veterans. ∞

Crouching in radioactive debris, GIs turn their backs to atomic blast at Yucca Flats, Nevada, in 1957

FILM

CONTINUED FROM PAGE 30

take twentieth-century people flatten them out, and have them spout attitudes that are current. What I've tried to do in playing these roles is to find the underlying differences between their societies and our own, then blend this tone, this shading, into the characters as they are developed in the script. Or underdeveloped, as is often the case. In *The Awakening*, for example, we worked hard to make the archaeologist not just your standard mad scientist screaming, 'Don't you understand? He's far more complex than that.'

In addition to what he has garnered from research, Heston fleshes out his characters by writing meticulous outline-cum-biographies to which he refers during shooting and which he distributes to his fellow filmmakers.

He admits that this brand of intensity can lead to curious eccentricities, as it did on the *Planet of the Apes* set. 'During meal breaks,' he remembers, 'I noticed that the humans would tend to eat together and not only did the apes eat by themselves, but the gorillas would eat with gorillas and the chimpanzees with chimpanzees. They did it instinctively.'

Heston maintains that while this "natural" segregation was eerie, it had the creative by-product of heightening the feeling of alienation that his part required.

Though Heston is disappointed with the poor quality of recent films, and SF films in particular, he expresses far greater discontent with the declining quality of human thought and endeavor in society at large.

'People seem to reject as elitist most innovations, most developments in technology or creative changes. I don't know quite how we came to coin the word *elitist* as a pejorative. The idea that quality and improvement are somehow no good is appalling to me. It really is an Orwellian concept, like some of the reverse words in *1984*. Anyone who has the capacity to think has to see this is stupid, bloody rot.'

Heston provides an interesting perspective. 'I fly the polar route a great deal to London. Now on one level, the jet plane is an improvement over the B-25s I flew during World War II. But on another level entirely, you look out the window and think, "My God, men crawled over that ice in the absolute last extreme of effort, on the bare edge of survival, to get to the North Pole, and here I am sitting and drinking scotch, and I'm the same animal." It's quite marvelous, and I'm awed and impressed to mark that kind of perception.'

That a vocal minority can eclipse such achievements and sway the judgment of many people is something the actor sees as inordinately dangerous. 'Take nuclear power, an energy source that we clearly and absolutely require,' he says. 'The very people that were trumpeting how great it was going to be (some of them used to say nuclear plants would provide power too cheap to be metered), well, these same people now scream, "No nukes! No nukes!" I find that aberrant and irrational.'

Heston is convinced that the blind hatred of progress is prodded by a double-edged fear. 'First, there is the toryism of our leaders. Any situation that prevails—in running a country or a union or an army or even a corner grocery store—always favors those who are in control. If you sell a certain kind of crop and they introduce the kiwi fruit, maybe oranges won't sell so well then. The horse cavalry resisted the Gatling gun, but when the machine gun came along, they were out of luck. Change is threatening. Man, as a territorial carnivore, resists it.'

The second problem confronting progress is the popular belief that the contemporary is always paramount, is always good and secure. 'That's simply not so. Society's view almost invariably has too short a focus. We say, "Well, since Vietnam we've learned this," or "Since the Great Depression we've learned that." Bullshit. The unwillingness of people to learn from the sum of history, even to read history, is staggering. We use our brain to create technology—which, among other things, has spawned *Omni*—but we're not farsighted enough to recognize that what we've created is necessary. We respond instead to our instincts. And one of the most atavistic of all instincts is to run from danger, whether real or perceived.' This, Heston believes, is a reaction on which the political alarmists depend.

Yet Heston is not quite ready to eulogize logic and reason. 'Though we no longer live in an age where an Edison can raise some money from his friends and go off and invent the light bulb, all things are cyclical. For instance, the arts. Why did Russia produce writers like Chekhov and Gorki and Tolstoy in the closing decades of the nineteenth century, and musicians like Tchaikovsky and Borodin in the same decades, but never did anything of equal magnitude in those arts in any other period? Why were the Italian painters of the sixteenth century so overwhelming? The only explanation I can offer is that, in a given nation, people's energies become focused on a goal. Maybe because Marlowe was writing, Shakespeare began writing, because of Chaplin there was Keaton or Laurel and Hardy. Extending this to science, the Soviet *Sputnik* can be said to have created the American space program, at least it forced it ahead when our energies became focused. We may simply be experiencing a lull at this time.'

Heston suggests that while scientists today are 'upside down in a net,' they are far from helpless. 'Christ nailed to the Cross somehow managed to make his point, and Gandhi in prison was worth three divisions.' Heston smiles confidently. 'Or, to paraphrase Stalin's famous comment, "How many divisions does the pope have?" science may yet offer the clear rebuttal. "More than one would think!"'

STARS

By Mark R. Chartrand III

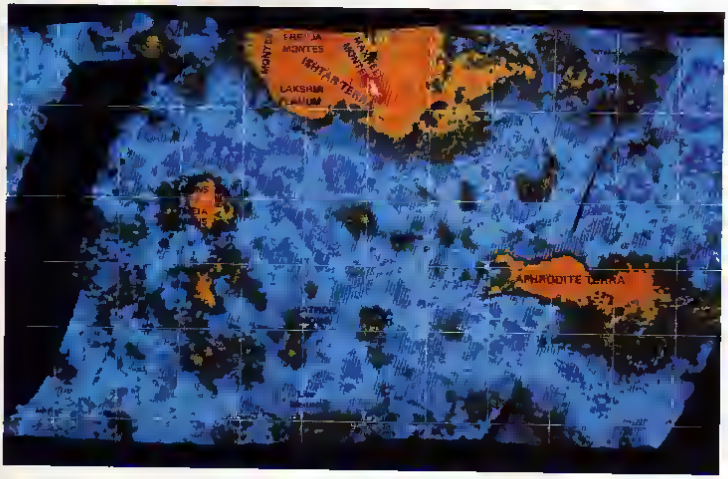
Problem. We have 460 million square kilometers of newly mapped real estate. It's scenic, secluded, mostly rolling plains with picturesque chasms, mountains, plateaus, and craters, and a severe case of overcast skies. What shall we name it?

The real estate as a whole has a name already—Venus. But thanks to radar mapping by the *Pioneer* spacecraft, which arrived there two years ago, we now have more than a sketchy idea of what the surface is like. Two members of the Pioneer program's radar altimetry team, Drs. Gordon Pettengill and Harold Masursky, have revealed in the fall issue of the *Journal of Geophysical Research* just how our sister planet differs from our own. To talk about the surface features, they have to engage in a bout of toponymy.

They and a committee of the International Astronomical Union have decided that major surface features should be named, as a NASA press release says, "after mythical goddesses." (Is there any other kind?) Minor features are to get the names of "other mythical females," and still smaller circular features (mostly craters, we presume) will honor historical women. (Note to would-be eponyms: You've got to be dead first.)

Mars recently posed a comparable conundrum. Few of the light and dark features mapped from Earth corresponded closely to the geology (areology?) seen by the cameras aboard the *Mariner* and *Viking* spacecraft. New names based on older mythological traditions sprang up on the maps. The list includes a name honoring the Mariner mission itself—Valles Marineris. One can get into trouble with such latter-day Latinisms. One scholar has noted that the word *marineris* does not occur in Latin. As near as he can figure it, the name very roughly translates as Pickled—or Marinated—Valley!

Fortunately, not every discoverer's suggestion is taken. When, in 1781, William Herschel discovered a new planet, British astronomers wanted to name it Herschel. He himself wanted to honor his patron, the King of England, and proposed "Georgius Sidus." To the eternal credit of the scientific community, neither name stuck.



Map of Venus, assembled from Viking data, puts cloud-hidden real estate on view

Now it's Venus's turn. Even the adjectival form of the name of this cloudy planet presents a problem. For Mercury there is "Mercurian," for Mars, "Martian," for Jupiter "Jovian" (not "jovial") and so on. But what to do about Venus?

Properly it should be "Venerian," which sounds odd, or "Venereal," which already connotes a class of transmissible diseases. "Venusian" is inelegant. Some writers adopt "Cytherean," after a Sicilian name for the goddess of love. Still others simply avoid using an adjective at all. But the features of Venus still need names.

Two continent-sized plateaus dominate the landscape of the planet. These plateaus, made up of low hills and broad expanses, have been designated Aphrodite Terra and Ishtar Terra. Ishtar was the Babylonian goddess of love and war—a purview that the Greeks chose to divide between Aphrodite and Ares.

Two other large regions retain the names given them after crude radar mapping from Earth. Alpha Regio is an area of rough terrain. Beta Regio turns out to be two gigantic shield volcanoes, somewhat like Mauna Kea and Mauna Loa, on Hawaii, but larger than the entire Hawaii-to-Midway archipelago. The two peaks have been named Theia Mons and Rhea Mons. Theia and Rhea were sisters of the Titan Cronus, whom we know as Saturn. Rhea, in addition, was Cronus's wife.

The problem can only get worse. Consider. *The Times Atlas of the World* lists about 215,000 features on Earth (including two named Venus, one each in Texas and Florida). And Venus has three times Earth's land area.

There's little doubt that this problem will be solved, however. It has cropped up before. A century ago, when asteroids were being discovered as fast as ants at a picnic, an enterprising astronomer proposed, "Why do not some of the discoverers go to the Aztec pantheon, which would give a large number of beautiful names? Take, for example, Chalchihuitlicue, the sister of the Aztec rain god, and herself the patroness of salt, dirt, and immodesty." ∞

PHENOMENA

As a snow squall sweeps the Japanese island Hokkaido, whooper swans (*Cygnus cygnus cygnus*) defy raging winds and bitter cold by huddling together for warmth. Heads nestled in plumage, these snowbirds adapt to extreme temperatures in an unusual manner. While preening their dense down coats, they massage protective oils, secreted from a gland near the tail, into their feathers. These natural oils form an insuleting layer around the swan. Skeins of 11,000 swans prepare for winter migration in October and November by absorbing as much food as possible for their flight from Sibaria, across Korea, to northern Japan. Teiji Saga has been photographing these extraordinarily adaptable birds for some 17 years. This remarkable photo was taken through an 80mm Planar lens mounted on a Hasselblad camera. Saga used an f/11 aperture. The photo was shot in 1/250th of a second. ∞

Another year of reader response and a rumor competition

GAMES

By Scot Morris

As *Omni* enters its third year we take time to review the mail that has come in since we devoted a column to readers' ideas just one year ago.

1. MATCH UP (October 1978) New ideas continue to raise this puzzle from the dead. Seven matches are arranged thus: VII = I and you are asked to move one match to make a valid equation. Our "expected" answer was VI = I. Steven L. Greene, an engineering student at the University of Wyoming, noted that our answer, if looked at as letters instead of as numerals, becomes another perfectly valid equation. What is it? (Hint: Who is Steven L. Greene?)
2. One reader (we've lost his name, unfortunately) set up the matches this way:

He struck up a clever, presumptuous solution in which only one match is moved. How did he cook the problem?

3. CALCULATOR GAMES (February 1980) Our calculator column included the familiar puzzle in which you set out to find the culprit behind the gas shortage: punch in several numbers, [(426 46407 − 3) × 5], and finally come out with an answer of 710 77345. When the display is turned upside down, it reads shELL"OIL. Robert Knight, of WBAI-FM in New York City, set his calculator to display only four decimal digits in the answer and found the best way to get around the energy crisis. What is it?

4. READER ORIGINAL. $25. The calculator games prompted David Milliken of Ottawa, Ontario, to ask: "What costs $2.00 per issue (enter 200), has 130 pages of future-oriented material (add 130), contains more than 40 pieces of excellent fiction per year (add 40), and allows a subscriber to save $6.00 per year off the newsstand price (subtract 600)?"

5. RHYMELESS (March 1980) We asked for common English words, of five or six letters each, that have no rhymes. Three we had in mind were *oblige*, *orange*, and *month*. John L. Latimer of Cleveland responded in verse:

PET NAMES
When younger, Elijah was nicknamed Elij
To change his name back, he would
gladly oblige

THE BUILDER'S ORDERS
We will first hang this door on a door hinge
And afterward paint the door orange

"MY THUN LITHPETH (FREE VERTH)
I take my boy to the doctor
Wunth
A month

6. THE 12 COINS (May 1980) You have 12 coins, one is counterfeit and is either heavier or lighter than a genuine coin. With a two-pan balance scale, how can you find the odd coin in three weighings? We printed a detailed answer in which four coins are first placed on each pan and subsequent weighings are determined as a function of how this first weighing turns out. Some readers found faster strategies. Mike Kellen of Oakdale, Minnesota, and Gregory B. Stone of Paris, France, demonstrated that the problem can be solved without such conditions as "If this happens, you do that." They specify in advance what the three weighings will be, before knowing which way the scales will or won't tip. Can you find an unconditional strategy? (Hint: Each weighing is four coins vs. four coins.)

7. DESIGNATURES (April–May 1980) Our competition for graphic wordplay brought much appreciative mail, a mention by Johnny Carson on the *Tonight Show*, and a reprint in the second-largest newspaper in the free world, *Asahi Shimbun* in Tokyo (daily circulation 7.5 million). Several readers were intrigued by the results and sent in new designs. Among the best were those of John Langdon of Wenonah, New Jersey, and Robert Petrick of Philadelphia. Langdon's "Touch" has left-right symmetry; it was designed as a logo to be etched on a glass door that can be read from both sides. His Victoria and Petrick's "Angel" and "Utopia" are upside-down symmetrical designs.

8. ONCE IN A LIFETIME (May 1980) What unusual event occurred on May 6, 1978, at 12:34? At that instant one could write the time and day as a string of integers: 12 34 5/6/78. Several readers noted the time 12:34 occurred twice on this momentous day, the likes of which will not be seen again until 2078. Anthony Staunton of Brunswick, Victoria, Australia, noted that 12 34 5/6/78 would designate another date: 5 June 1978, because of the convention in Australia (and other countries) of specifying a date as day/month/year. Several others noted that on a digital watch that displays seconds there will be a grand lineup of ten integers in the next decade. When will it be?

9. PHYSICS 101 (June 1980) We made a few goofs this time. In ANT'S WALK we meant to say that the ant is walking away from the man at one inch per second relative to the hot dog, not relative to the man's mouth. The correct answer is 181 inches per second, not 179 ips. INNER SPACE asked whether there is more or less gravity down in a coal mine than there is at

the surface of the earth The point was to show that gravity does not come from one source of attraction at the center of the earth as many people suppose but comes from the combined attraction of all the parts of the globe working together If changes in centrifugal and centripetal forces are ignored and if we assume uniform density of the earth gravity would be less in the mine because part of the earth s mass is above us and cancels the effect of some of the mass below our feet Several readers raised the issue that the earth is not uniformly dense and that gravity would increase slightly as one got closer to the earth s dense nickel-iron core Quite so At some points on Earth this could extend 3 000 kilometers down far deeper than any mine But as one descends into the core the effect of gravity would be less and less and at the earth's center it would be zero

Can you float a BATTLESHIP IN A BATHTUB? Many letters argued it can t be done A sample, with reply appears in Forum (page 132) in this issue

10 LUCKY 13 (May 1980) How many times is "13" represented on the back of a $1 bill? We said nine but readers found more There are two decorative strands of 13 beads each that look like rattlesnake tails extending from the outer rims of the two faces of the Great Seal C M Pawlak of Sumner Washington found 13 lines of written words five ONEs IN GOD WE TRUST, ONE DOLLAR THE UNITED STATES OF AMERICA, THE GREAT SEAL OF THE UNITED STATES (they re sep arated), E PLURIBUS UNUM ANNUIT COEPTIS, and NOVUS ORDO SECLORUM Shawn Patterson of Sarasota Florida, found he could spell *thirteen* from the letters in THE UNITED STATES OF AMERICA

Questionable 13's One reader found 13 distinct shadows on the ONE, but only if one counts them the right way Several mentioned the loop pattern to either side of the ONE in the center of the bill and claimed to see 13 loops in each though others might count them differently Heather Fulton of Sarasota declares that her dollar loses at least 13 percent of its value every year she holds it If we disallow the Questionables in this paragraph the total comes to what?

Answers including the solution to last month s Dog s Mead puzzle page 129

UTOPIA

COMPETITION #17
UNCONFIRMED RUMORS

It has been more than a decade since Paul McCartney died The proof of his demise was found in the Beatles 1968 album *Magical Mystery Tour* At the end of Strawberry Fields it was said one could hear someone intoning, "I buried Paul" On the cover of the *Abbey Road* album Paul was barefoot and had his eyes closed—"symbols that Paul was dead and that the others were conducting a massive charade An oddly parked Volkswagen in the picture had a license plate with the line 28IF—obviously a cipher meaning that Paul would have been *28 if* he had lived to see the album s release

We haven t had a good unconfirmed rumor like that in a long time This competition is designed to remedy that situation For example have you heard

- During the Eisenhower Administration a UFO crashed and killed its occupants The green bodies are now on ice at Wright-Patterson Air Force Base in Ohio

- There are alligators in the New York City sewers, grown from baby Florida souvenirs that were flushed down toilets after their owners grew tired of them

- If you order scallops in a restaurant you ll likely get shark meat that has been stamped out with a cookie cutter

- The American Medical Association is secretly subsidizing the tobacco industry because of the immense profitability of cancer treatments

- During the gasoline crunch of 1979 a newsman followed a Shell (or Exxon) gas truck down a deserted country road and filmed it as the driver got out and dumped all the gasoline into the dirt The film has recently been purchased by *60 Minutes*

- Marilyn Monroe was killed by the Mafia for disgracing Joe DiMaggio

- Walt Disney s body is frozen in suspended animation

- No astronauts ever went to the moon The famous "landing" was filmed at a secret government base in Nevada

- Reading the *Omni* Games column will raise your I Q extend your lifespan and make you multiorgasmic

We cannot vouch for the truth of any of the above statements We report them only as unconfirmed rumors Remember however that even paranoids have real enemies If you don t see conspiracies all around you you re not paying attention

The best rumors are outrageous but just barely plausible Send your sneaking suspicions and unconfirmed rumors to *Omni* Competition #17 909 Third Avenue New York NY 10022 Postcards preferred (that s so the mailman can tear yours up and send in the idea himself) postmarked by December 15 1980 All entries become the property of *Omni* and will not be returned (naturally) Conspiracy theories are cheap but we ll pay $100 for the best one and $25 each for runners-up (Of course all our contest winners have been picked in advance and you have no chance whatsoever of winning but send something in anyway) ∞

LAST WORD

By David Saltman

"The lunar rocks had a density almost exactly equal to provolone and Vermont cheddar cheese."

Whatever happened to the rocks retrieved from the moon? I ask you to search your memories. Have you heard much about them? I have you ever seen one? Do you know more than something vague like, "Oh, I think Nixon gave some of them to China," or, 'Aren't they all in museums or laboratories somewhere?"

The fact is that the greatest treasures discovered in the history of exploration are still in the original cartons, unopened.

Most of the rocks are in stainless steel cabinets filled with nitrogen gas at the Lyndon B. Johnson Space Center in Houston. Of the 386 kilograms of rocks recovered, 347 kilograms are still untouched by earthly hands or instruments.

The remaining 39 kilograms are mainly the "easy stuff," according to Dr. Gerald Wasserburg, who oversees the Caltech research unit known as the Lunatic Asylum.

The rocks are "easy" because they appear to be something like earthly rocks. There are lavas. There are rocks that only rarely appear on Earth, but they do appear. There are rocks like chunks of gravel, mixtures of small pieces that appear to have fused on "impact" during some mysterious but violent cosmic event. There are also the strange and wonderful orange-colored lunar soils.

One botanist mixed this soil with some Earth soil and planted liverwort seeds. When water was added, the liverwort shot up at what NASA described as "four times the rate of an ordinary plant."

This "liverwort syndrome" became one of the queer anomalies of the moon-research program. It would appear to the layman to be a discovery of the first magnitude. But this is exactly where science departs from art. Other researchers, not occupied with liverwort, proved "that the moon has no biological activity." Therefore, the liverwort experiments were never followed up, on the presumption that any discovery so wonderful must be wrong.

To explain the "fast-growing liverwort" phenomenon, scientists postulated that certain "trace elements" in the moon soil must have combined with elements in the Earth soil to give the plant added nutriment. Case closed.

Most moon-rock research has concentrated on physical properties. Taking a sample of soil can give an idea, through its "layering," of how the moon responds to cosmic events.

The moon-rock research army is so undisciplined and so disorganized that the precious rock fragments must be sent through the U.S. mails to laboratories as remote as Singapore for study.

You may not think this matters much. However, there is neither air nor water on the moon. The addition of the merest particle of either totally changes the research picture. Not to mention the charming variety of "trace elements" that can be added during a trip through the U.S. mails, even when encased in Teflon and clearly marked SPECIAL DELIVERY.

About the best the physical analysis of the moon has done is to come up with a new branch of science: "planetology." This line of study posits basic tenets that confirm certain fantastical theories about the creation of the universe. For instance, Dr. Wasserburg says it is now virtually certain that there was a "massive event" in our solar system 4 billion years ago. He says it was like a tremendous bombardment by "small planets." The moon exploded "as if it had been torpedoed."

How, or if, the moon came together again is still a mystery. Unlike Earth, it has no central core. Its center may be partly molten, but it is not magnetic. The moon has no magnetic field, yet the moon rocks are extremely magnetic. This finding was totally unexpected, as was the corollary fact that the rocks are also very radioactive. This magnetism and radioactivity are not generalized, like a field or emission from the moon as a whole. But our familiar satellite is a veritable uranium mine of radioactive and magnetic lodes. For some reason they all seem to congregate on the "western" side of the lunar face.

Scientists believe the moon once had a magnetic field, but they think that the "terminal lunar cataclysm" blew it all out of whack. They don't try to answer the question of just where a magnetic field goes when it vanishes.

Possibly the most telling achievement in lunar research came out of the laboratories of one Dr. Orson Anderson, now of UCLA. Admittedly, some of his colleagues have accused him of attempting to measure water with a sieve. In a famous article in *Science* magazine's "moon" issue of 1970, Dr. Anderson published his results, causing a furor in the research world.

Anderson asserted, "Aided by considerations of much earlier speculations concerning the nature of the moon, I found the lunar rocks had a density and compressional velocity almost exactly equal to [those of] provolone and Vermont cheddar cheese."

There were altogether 386 kilograms of moon rocks. Now you will find 290 kilograms are stored in nitrogen cabinets at the Lunar Sample Facility in Houston. There are 57 kilograms stored in stainless steel canisters at Brooks Air Force Base in San Antonio, Texas. 23 kilograms distributed via registered mail in Teflon bottles to scientists in 13 foreign countries. 11.5 kilograms on display at the National Air and Space Museum or going around on a rotating show. Four more kilograms have been cut into polished microsections, divided into two parts, and lent for study to colleges and high schools. Lastly, 500 grams were reduced to sawdust and lost in handling. ∞

David Saltman is a writer, TV producer, magician, linguist, and boulevardier.