OMNI

APRIL 1980 $2.00

RAY BRADBURY: MEDITATIONS ON LIFE, SPACE, STARS, AND CARL SAGAN

FUTURE ART: LASERS, SKY SCULPTURES, AND CYBERFORMS

THE COMPUTER AS ENEMY

ARTHUR C. CLARKE: ILLUSTRATING LAWS THAT DOMINATE HIS WORK

TAMING A BLACK HOLE

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OMNI

APRIL 1980

CONTENTS

Cover art for this month's Omni is a painting by internationally famous Gervasio Gallardo, noted for his style of extreme realism coupled with a puckish sense of humor. Gallardo's exquisite paintings have adorned the covers of countless works of fantasy.

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FRANK HERBERT

Beginning it will be at least a matter of self-defense to have your own computer . . . You are already being taken advantage of by people who use computers.

[illegible] should [illegible] your own computer. You will find it rewarding [illegible] for nothing else than the freedom it [illegible] from tedious jobs.

We don't say you can [illegible] in this skill [illegible] any investment of time, an [illegible] te the contrary. In fact, a general [illegible] computers is that there is no [illegible] saving up front. It takes just as long, [illegible] example, to put your checking account [illegible] a computer as it takes to put the information into a handwritten ledger. It's at the other end where you get the marvelous payoff in time saving and automatic recall of useful information.

What we assure you is this: The payoffs are enormous.

Before long it will be at least a matter of self-defense to have your own computer and to be able to use it. You are already being taken advantage of by people who use computers. You will not be able to cope with this challenge or keep up with other changes unless you acquire one.

Luckily, very powerful small computers already are priced within the range of most household budgets. Competition in this field is intense. Computer power is going up while the price is coming down.

Please take our warning to heart. Very soon, if you don't have access to a computer, you're going to be racing in something equivalent to the Indianapolis 500, but you'll be on foot. An elementary look at what computers do makes this obvious.

It is often said that computers are "number crunchers," that they can handle large and complex mathematical problems very rapidly. This is the most common description of computers, and our acceptance of them as such forms a barrier against a deeper understanding of computers even among scientists.

Okay, here's a demystification for you:

YOU DON'T NEED TO BE A MATHEMATICIAN TO RUN YOUR OWN COMPUTER

The most important fact about computers is that they do things very rapidly. Few people latch on to that key word—*rapidly*. We want you to focus your attention on it. That single fact contains the unguent that can take the sting out of your future shock.

We have said that people with computers are taking advantage of you. There is no doubt that your historical rights of privacy and freedom have been violated by business and government through their use of computers.

Private information about your life, information stored in government and other data banks, has been sold [illegible] eople who use it for private gain. It is used to plan assaults on your wallet and your liberties.

Computer crime is on the upswing. Clever programmers each year are stealing millions of dollars through their inside knowledge of computers. If you own a business and it uses computers in any way, it would not hurt you to know a few of the basics.

Computer automation may be creeping up on your job. This makes it a matter of survival for you to know how you can benefit from these machines.

We are already surrounded by people who use the computer as an excuse for avoiding personal responsibility. How many times have you heard this excuse? "We are very sorry about the mistake in your account. It was a computer error."

This is a lie. It leads to a kind of mental parasitism, a destructive dependency. Every time you hear this excuse you should tell the person who uses it, "You are a liar."

COMPUTERS DO NOT MAKE ERRORS

All so-called computer errors lead back to some human being. People make errors. People produce inadequate programs. Manufacturers produce hardware that breaks down.

These few comments don't begin to plumb the problems of the Computer Age. We are just touching on a few salient points to emphasize the urgency.

Right now there is an explosive growth in computers and in the number of things they can do. Not only are their numbers increasing at a dazzling rate, but the storage of information in giant data banks is growing in the same explosive way.

We have no way to control this and none in sight. In fact, the very nature of this growth says that all controls will lag far behind computer developments. Any attempt to ban them will only drive computers underground. Never lose sight of the fact that computers "crunch time." The speed at which computers can operate tells us that legislation cannot keep up with them. The person with a computer can dance rings around you while you react as if you were embedded in molasses.

What can you do?

Get your own computer. Learn how to use it. If you don't do this, the Bill of Rights is dead and your individual liberties will go the way of the dodo. ∞

Excerpted from *Without Me You're Nothing*, by Frank Herbert and Max Barnard, to be published by Pocket Books (Simon and Schuster), fall 1980.

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OMNIBUS

POST

BRADBURY

KEEFAUVER

MALONE

Do you know that black holes may someday serve as a communications link to the far reaches of the universe or become launch pads to boost planet-sized payloads to nearly the speed of light? These and other intriguing uses are examined in "Star Power for Supersocieties" (page 44), by *Jonathan V Post*, author of "Cybernetic War" (May 1979). Post takes us on an exciting journey to the very surface of a black hole to explore the methods by which we might harness this powerhouse of the universe. As senior engineer in software technology for Boeing Aerospace Company, Post is a scientist, author, and editor who believes black holes are important to any advanced interstellar civilization. Post writes, "It is possible that our first evidence of alien life will come from the observation of black holes." Post has graduate degrees in mathematics, computer science, and English literature.

Science-fiction great *Ray Bradbury* takes a philosophical view of the space shuttle in "Beyond Eden" (page 88). A descendant of English settlers who landed in America in 1630, Bradbury was a gifted child with a penchant for fantasy and horror magazines. His classic anthology *The Martian Chronicles* earned him the reputation of being a "brilliant discovery in the science fiction field" during the early 1950s. Though literary critics still doubted Bradbury's talents, their qualms were soon allayed by the release of *Fahrenheit 451* (1953), a frightening account of an antiutopian world where the written word was outlawed. A movie based on this novel was released in 1966 by director Francois Truffaut, with less-than-spectacular success. Bradbury's more recent works have consisted of fantasy novels and theater and film productions. *The Beast from 20,000 Fathoms*, a 1953 Warner Bros. film, was adapted from his short story "The Foghorn." A mixture of science fiction, fantasy, and striking flights of imagination highlights Bradbury's more popular works, including *The Illustrated Man* (1951), *The Golden Apples of the Sun* (1953), and *I Sing the Body Electric* (1969).

Joining Bradbury this month is another giant of science fiction, *Arthur C. Clarke*, known as the father of the satellite and the seer of *2001: A Space Odyssey*. Clarke's fiction reflects his abiding interest in space travel and his belief that man's destiny lies in the stars. Clarke's memorable novels include *The Sands of Mars* (1953), *Against the Fall of Night* (1953), and *The Fall of Moondust* (1969). His observations in "Law Giver" (page 80) are introduced by *Robert Sheckley*. The brilliant paintings of *Gervasio Gallardo* are provided by Jeff and Frank Lavaty.

John Morressy ("The Last Jerry Fagin Show," page 58) and *John Keefauver* ("Giant on the Beach," page 48) are represented among this month's fiction.

Omni senior editor *Scot Morris* interviews *James Randi*, theater and television personality and master magician. Randi discusses rocks that fall from the sky, ESP, and dowsing. See page 76.

Art born of technology is the subject of "Cyberforms" (page 52). It's a look at how the tools of technology—wires, TV screens, lasers, and computer terminals—are molded by the artist's hands to express the same creative urges as paint and stone. Author *David Lyttleton-Smith* explains, "Art and technology have a very close connection. Great artists and great scientists share many of the same qualities: tenacity, courage, and imagination." A painter by profession, Lyttleton-Smith was a university art teacher in Miami, Florida, for ten years. It was there he first learned about the wonders of techno-art and decided to investigate it for *Omni*. "What is the new art? It's a world in which art and technology become indistinguishable," Lyttleton-Smith asserts.

Robert Malone, former dean of Pratt Institute, provides a fascinating essay you won't want to miss. It's entitled "Three Futures" (page 92). Malone, author of *The Robot Book* (Harcourt Brace Jovanovich 1978) and *Rocketship* (Harper and Row 1977), was editor of *Industrial Design* magazine for over 20 years. Responsible for many photographic exhibitions, he has been deeply involved in the visual arts, particularly science-fiction illustration.

Frank Herbert, author of the science fiction classic *Dune*, provides a valuable lesson in "getting to know your home computer" in First Word (page 6).

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APRIL

LETTERS

COMMUNICATIONS

Feinberg Phenomenon

I am writing in regard to an item in the Continuum section "A Real Feinberg" [January 1980]. As any *Star Trek* fan knows, a feinberg is not a what, a feinberg is a who, specifically Irving Feinberg. Hence the capital F.

Irving Feinberg was the property master on *Star Trek*. A property master buys or rents whatever is needed for a particular show and stores these items until they are needed on the set.

The tiny saltshakerlike device used by Dr. McCoy was one of a group of futuristic-looking saltshakers acquired by Feinberg, all of which looked so futuristic that it was felt that no one in the audience would recognize them as saltshakers. They were eventually designated for other uses and were kept in Dr. McCoy's medikit. These and other ready-made devices became known on the set as Feinbergers. Devices not already made were designed and made by Jim Rugg, and they became known, of course, as Ruggisms.

Shirley A. Suneda
Monterey Park, Calif

Innocence Through Ignorance

As pointed out in "Computer Threat" [Continuum, December 1979], despite all the plugs, switches, knobs, and buttons of "higher education," we have adequate proof that the privilege to remain ignorant is man's prime birthright and his only real freedom, which can never be taken from him by any superior force, not even by Computer Omnipotent! Every major breakthrough he effects eventually breaks up and leaves man standing as the perpetual bubble blower of the universe.

Rochelle Vickey
Vista, Calif

The Human Ape

Eugene Linden's excellent piece on language-using chimpanzees and gorillas ["Talk to the Animals," January 1980] neglected to deal with an important issue: the legal status and rights of higher apes, which function more or less as humans.

In my novel *Eden II*, written mostly in 1972 and suggested by the work of Allen and Beatrice Gardner, I tried to make the point that the legal concept of "person" in American law should logically cover language-using simians. Surely Washoe and Koko have shown that they have acquired a degree of "humanity" at least equal to that of many millions of young children. Ergo, the law should accord them much the same rights as it grants to human children. Agreement on the personhood of chimpanzees and gorillas could lead to their protection from extinction and to the development of the simian communities that Linden says Dr. Roger Fouts and Penny Patterson have spoken of.

Edd Doerr
Silver Spring, Md

Look Earthward

I suspect that Ben Bova's contention that "the overpowering grandeur of a giant rocket climbing into the sky on billowing tongues of flame is the closest to a religious experience many of us have ever come" [First Word, January 1980] is an accurate assessment of reality. If it is, I feel deeply for those who wish to put their entire hope for the future on line with a million-to-one shot into a distant, empty space.

Mr. Bova offers some interesting and helpful suggestions to boost the space program, but I sense an attitude that is no different from the one that created the need for us to look to space in the first place: the idea that all we have to do is to drive on toward the unconquered, ever expanding the influence of man. Let's complete our efforts to build a sustainable life here on Earth before we take on the risks that Bova advocates.

There is hope, but the challenge has just begun.

David Langford Smith
Panama City, Fla

Time and Time Again

"Time is just nature's way of keeping everything from happening at once" won Yolanda Thomas of Flagstaff, Arizona, an Honorable Mention in your recent Graffiti

CONTINUED ON PAGE 138

DIALOGUE

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.*

Gorilla Rights

The research reported in your article "Talk to the Animals" [January 1980] has disturbing moral and legal implications. Koko the talking gorilla has a 600-word vocabulary and an I.Q. well within the range of average human intelligence. A human child with the same capacities has fundamental rights that are protected by law. These rights are derived from the child's rationality. Koko shares these rights, for she shares the rationality that is their ground. Shouldn't her rights be protected by law as well?

Killing Koko is the moral equivalent of killing a five-year-old human child, yet it would be legal for Koko's keepers to sacrifice Koko in order to dissect her brain. Nothing prevents them from selling Koko when she is no longer useful to them.

Koko ought to be able to own property, to sue in court for damages, to be protected by criminal law. Perhaps the courts ought to appoint a guardian to protect Koko's interests and to make certain that she has a say in what becomes of her. If her mental development continues to keep pace with her age, Koko may one day want to vote, to marry, and possibly to worship in the church of her choice. If so, it would be irrational to deny Koko her civil rights solely because she lacks a human body.

Koko asserts that she is a gorilla, not a human being. But this very assertion demonstrates that, morally and legally, there is far less difference than we thought.

Professor Jim Stone
Denver, Colo.

Dome Homes

I am very interested in the dome-home concept [Continuum, September 1979] and would like to get in touch with the NADHM in Chicago, or any equivalent in Great Britain. I have doubts as to whether planning permission for a dome would or could be obtained in this country. The British councils [county governing bodies] tend to be very conservative, and a dome might not be welcomed in the market town of Stafford.

Gail Hyde
Moss Pit, Stafford, England

Stuart Diamond replies: *You are one of about two dozen people who sent letters asking for further information on geodesic domes. The National Association of Dome Home Manufacturers is located at 2505 Grosse Pointe Road, Evanston, IL 60201. Its phone number is 312-475-7530.*

Another source that might be of use is Space Structures International, located at 155 Dupont Street, Plainview, NY 11803 (telephone: 516-938-0545). It usually does commercial domes. For residential domes, an established firm with a good reputation is Monterey Domes, P.O. Box 55116-W, Riverside, CA 92517 (telephone 714-684-2601).

You also say that the 'conservative' English planning commissions might not approve geodesic homes because of their different designs. I might counter by pointing out that geodesic domes have two traits 'conservative' planners usually like: reasonable cost and efficiency.

Death on the Range

In response to Harry Lebelson's article "Death on the Range" [UFO Update, January 1980], I would like to pose a hypothetical explanation for the livestock mutilation-deaths.

Suppose that a government "agency" (such as the military) wanted to monitor the long-term environmental impact of some of its research activities—Nevada nuclear explosions or chemical warfare experiments in Utah, for example. This would be best approached by collecting and examining specimens of soil, water and plant and animal life from a wide area surrounding the test site. Livestock would be of particular interest, because many farm animals serve as food.

However, the "agency" would not want to encourage public questioning by purchasing the animals openly. Therefore, a plan is devised. Animals are spot-lighted at night by men using unmarked helicopters in secluded areas and are tranquilized. Specimens of fluids and tissues are then obtained, later to be tested for the environmental contaminant. Blood, cerebrospinal fluid, muscle, and vital organs would be appropriate specimens to examine for the contaminant. The carcass is then airlifted on a tether and dropped at a spot several miles from the site of evisceration.

The military is a large, highly organized, disciplined, and well-financed group that is notoriously secretive about its research activities—especially those that might stimulate adverse publicity. Certainly, the military employs expert veterinary surgeons who could perform the "mutilations." A few collecting teams in helicopters could easily cover a very large area in a relatively short period.

The seemingly bizarre circumstances surrounding the mutilations have led to a climate of alarm and fear among some individuals, and the usual rumors of supernatural or alien intervention have ensued. This may be exactly what is desired by the "agency"—a diversion of attention from the facts. It is extreme to suggest that supranormal forces are at work in the livestock mutilations when the

CONTINUED ON PAGE 134

VELA'S VISION

EARTH

By Kenneth Brower

The old satellite was nearing the end of its career. It had been orbiting the earth for nine years. A member of the Vela class, it had been launched in 1970 to help monitor the atmospheric test-ban treaty of 1963. By now it had outlived all but two of its sisters. Five Velas had ceased functioning before it: the family was dying out.

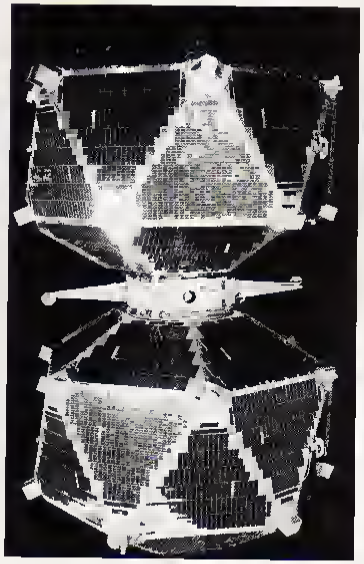
Vela was a pretty satellite, multifaceted, like one of those silver balls that revolve to scatter flecks of light along the walls of a discotheque. There was no party though, out where Vela orbited. For nine years, in absolute solitude, through the abysmal cold and the radiation storms of space, it had made its endless rounds. Desert travelers on high American plateaus, waking in their sleeping bags under spangled skies, had seen it pass from horizon to horizon, a steady and dependable beacon that refused to sputter out. The desert travelers had felt their eyelids grow heavy and had fallen asleep again. Vela's own sensors were lidless. The satellite did not blink back. In Nepal, herdsmen had watched it travel between Himalayan peaks, a new celestial phenomenon racing over an old civilization. The yakherds had wondered what that light was. In the Australian bush, wild dogs had howled up at it as it crossed the southern constellations.

On September 22, 1979, at 3 A.M. South African time, the satellite was watching a region of southern ocean off the tip of Africa, a dark circle 4,800 kilometers in diameter, when it saw a double flash. The intensity patterns were typical of a nuclear explosion. Vela and its sisters had recorded 41 such explosions before, and they had always been right—independently corroborated. The only thing peculiar about this blast, if indeed it was a blast, was its very small yield. No nation in the world would admit to having tested a little bomb, or any other kind of explosive device, in the region.

What did Vela see that morning?

In the months since the incident, scientists have been trying to figure it out. The Institute of Nuclear Science at Wellington, New Zealand, reported finding traces of radioactivity in rainwater two months later, which suggested that someone had detonated a bomb in the Southern Hemisphere. The trouble was that the Wellington scientists afterward were unable to duplicate their results.

Vela was equipped with sensors designed to detect the radiation and the electromagnetic disturbances that follow nuclear detonations, but Vela's sensors failed to record anything. Vela was left with only a vision—two bright pulses of light. Could the satellite have seen two lightning bolts, down near the black arc of the planet's horizon? Or two meteors? Or some other natural phenomenon that could mimic a nuclear blast? U.S. government scientists are investigating these possibilities, but they are puzzled. They point out that Vela's optical sensors had been calibrated a week before the incident and were rechecked immediately after it. The experts suspect a bomb. The low yield suggests a test carefully scaled down to avoid detection, or a "fizzle" in which things didn't go according to plan.



Did Vela's sensors detect a nuclear explosion?

Suspicion fell immediately upon South Africa. That least loved of nations was the closest to the site of the flash. South Africa possessed the technological capability to set off such a blast.

While I watched several South African diplomats being interviewed on television, I thought that there was something fishy about their denials. An intuition like that is worthless as evidence, of course. Such intuitions, unfortunately, are all the evidence we may ever have about the episode. The South Africans pointed out that a Soviet submarine had been traveling in the area. They suggested that perhaps the USSR had tested a bomb there, or perhaps the Chinese or the Americans had. Maybe so. It could, for that matter, have been almost anyone.

The mystery of Vela's vision is its most troubling aspect. The small, two-stage flash seen by the satellite drew an inordinate amount of attention from the public and the press—more attention than just another big test in Polynesia would have, when the French were conducting their series there, more attention than merely another Chinese test at Lop Nor or another underground test in Nevada. The world seemed to have sensed, in the very anonymity of the blast, a momentousness out of proportion to the yield.

The blast, if it was that, was momentous. The proliferation of nuclear weapons is the greatest peril confronting life on this planet.

If South Africa does not yet have the bomb—and observers of these matters think it highly unlikely that it doesn't—then it could soon have one. Through 1976, South Africa had received more than 50 kilograms of enriched uranium from the United States. In some of that uranium, destined for the Safari reactor, the U-235 had been enriched to 90 percent and was easily convertible for use in weapons. Did all of it really go to the Safari reactor?

India already has the bomb. Indian scientists assembled it from materials and know-how borrowed from U.S. and

CONTINUED ON PAGE 129

AN END TO CAVITIES

LIFE

By Dr Bernard Dixon

Thanks to smallpox vaccine, a feared and vile malady was purged from the planet about a year ago. Today microbiologists are vying with one another to predict the *next* vaccine that will have such a spectacular effect on human well-being. Immunization against measles, perhaps? Theoretically that disease could also be eradicated. A really potent influenza shot? One for malaria? Or one for the common cold?

My guess is that a quite different vaccine will make the headlines during the 1980s. This decade will see the introduction of a vaccine to combat what is probably man's most common disease: tooth decay. The Western world is now being ravaged by a massive epidemic of dental caries, even among young children. Fluoridation and avoiding sticky candies can help, however; inducing immunity would be a tremendous advance.

What is the basis of this prediction? Two batches of caries vaccine already exist. They were prepared in London, at Guy's Hospital and at the Royal College of Surgeons, and they have been stunningly effective in preventing tooth decay in monkeys. But unsolved technical and ethical problems will have to be confronted before the gap is bridged between the lower animals and man. Despite much pain, discomfort and anxiety, caries is not a dangerous disease, we must make sure that the vaccine is safe before we use it in humans.

Like smallpox or influenza, caries develops because of infection. It is caused by bacteria that colonize the surface of teeth, thriving within white plaque, which adheres to the enamel. From experiments with both germ-free and infected animals, we know that only two conditions are necessary for decay to begin. First, the food must contain sucrose or some other carbohydrate. Second, a bacterium known as *Streptococcus mutans* must be present. By fermenting carbohydrate, the bacterium produces an acid strong enough to erode enamel and begin the process of decay.

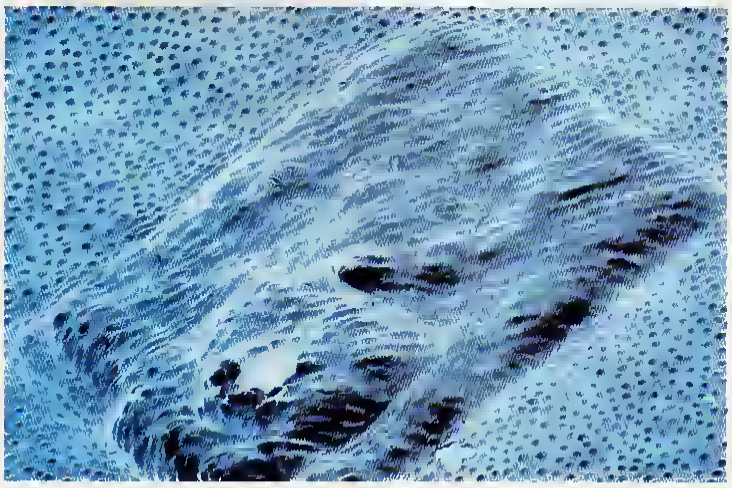
Armed with this information, we should be within reach of a vaccine against caries. As with other microbes, it should be possible to change *S. mutans* so that it triggers antibody production when injected but no longer causes disease. The only snag is that teeth seem to be "outside" the body, shielded from antibodies present in the bloodstream. Over the past decade, however, we have found that a fluid rich in antibodies seeps through the crevices between teeth and gums. This discovery has greatly boosted hopes that immunization can prevent decay. Indeed, early findings suggest this strategy is highly feasible.

Professor Bertram Cohen and his colleagues at the Royal College of Surgeons have raised irus monkeys on a diet rich in fermentable carbohydrate and injected them with a vaccine based on *S. mutans*. The monkeys remain free of decay as much as nine years after being treated. At Guy's Hospital, Professor Thomas Lehner and his team have reported equally promising results with rhesus monkeys. Because the structure and development of these animals' teeth, and their vulnerability to decay, are very like those of human teeth, the prospects for success in man look excellent.

Until recently one major hypothetical difficulty remained. As far as our immune system is concerned, some components of streptococci closely resemble some parts of the human heart. That is why rheumatic fever arises. Following a sore throat caused by these bacteria, antibodies generated to repel the invaders occasionally attack heart muscle instead. The possibility that this might happen with *S. mutans* vaccine worries scientists.

Professor Cohen's group has now discovered that the component of *S. mutans* that reacts against heart muscle is not needed for the vaccine to work. Efforts are being made to purify vaccine containing only those parts of the bacterium that confer protection and none that could do harm.

The cost of caries in treatment, pain, loss of teeth, and lost time in industry and education is incalculable. The prospect of its prevention is one of the most welcome and unexpected dividends of science from the Seventies. ∞



Warning to dentists: A vaccine may soon eliminate cavities like the one above, magnified 100 times

POWER ORBITER

SPACE

By G Harry Stine

We can totally eliminate the energy crunch if we get busy in the 1980s and work the engineering bugs out of Dr Peter Glaser s Solar Power Satellite (SPS)

The concept calls for large solar collectors located 36,290 kilometers above the earth s equator in geosynchronous orbit Using photovoltaic or thermal converters the SPS could generate up to ten gigawatts (10 billion watts) of electricity from the constant sunlight of space It then converts this solar-generated electricity into a microwave beam which transmits the energy to a large rectifying antenna—a 'rectenna'—on Earth Alternatively a laser beam might be used

An SPS would be big—nearly 13 kilometers long by 5 kilometers wide The rectenna on the ground would cover 16 by 24 kilometers Its function is to convert space power to the local frequency and voltage, then switch it onto the existing electric-power grid

There seems to be no technical economic health or environmental reason why an SPS system can t be our cleanest and safest source of electrical power 'The solar-power satellite is probably the most environmentally acceptable power generating concept we've studied said a long-range planner for one of the large utility companies

The power-transmission beam—whichever type is finally chosen—will have such low energy density that it wouldn t even heat water much less cook a bird that happened to fly through it We are not talking about the microwave energy density of a household oven or the sort of science-fiction laser cannons of *Star Wars* Microwaves will transmit the required energy without harming the earth s atmosphere or causing environmental damage This has been checked out in tests at the Jet Propulsion Laboratory in Pasadena, California and with the big radio telescope dish at Arecibo Puerto Rico

The SPS concept is more than some far-out dream The requisite technology either is on hand or can be achieved with a little more refinement The Department of Energy has completed a series of preliminary studies on the SPS system and is now funding in depth examinations of specific engineering requirements You can get copies of the completed studies by writing to the U S Department of Energy Office of Energy Research, Satellite Power System Project Office Washington DC 20585

What remains is to check out critical items in space using the shuttle to help solve such engineering problems as how to build large structures in space and keep them pointed at the sun without twisting them out of shape After all even in zero gravity one moves a structure 100 meters thick and 65 square kilometers on a side gently and slowly lest it crumple like a sheet of paper

Expensive? Yes but so is an equivalent coal-burning power plant on Earth Preliminary estimates by several groups indicate that an SPS can be built for about the same cost as a coal-fired plant—about $2 000 per kilowatt The cost of electric power from an SPS system delivered to a home has been estimated from 7 mils per kilowatt-hour to 27 mils per kilowatt hour—in other words comparable to, or slightly less than today s electric rates If it costs the same or even nearly the same, to do it in space as on the ground it should be done in space because this generates a considerable spinoff the SPS Connection

Solar power Our key to energy abundance?

First an SPS system uses a renewable energy source the sun A coal plant built on Earth at the same cost within 25 years may face slowdowns because of coal allocations And the coal plant will pour tons of radioactive carbon-14 into the atmosphere, releasing far more radiation than has ever leaked from any nuclear reactor

It s true that at current rates of consumption we have enough coal in the United States alone to last 2 million years but this ignores world needs As coal exporters we could look forward to seeing the last of this resource by the year 2250 Humankind requires a more permanent energy supply And coal and other fossil fuels are far more precious as chemical feedstocks that can be recycled than as fuels that cannot Once they've gone up the stack as combustion products we ve lost them forever

To make the SPS system work we must build at least two generating stations in space every year so that we can begin to shift to the SPS system as our demand for electric power increases between 1990 and 2010 In 1975 the total electric-power capacity in this country was 228 gigawatts by the year 2000, the demand will rise to 940 gigawatts But by the year 2000 if we get the SPS program in gear there could be at least 26 satellites carrying more than one fourth of the load By the year 2020 there would be more than 100 SPS units on line, and they would then be carrying the bulk of our electrical base load

Building an SPS system will require space transportation capable of carrying people and cargo into space at reasonable prices—$22 per kilogram or less This would allow us to do other things in space take on lots of space research improve communications facilities and

CONTINUED ON PAGE 126

THE ARTS

By Jeff Rovin

Technology is the answer the *only* answer to many problems our nation faces. I don't know whether science-fiction films can convey that to a mass audience, but using the genre to sharpen this point is something that's very, very close to me."

The speaker is Robert Wise, renowned director of such films as *Somebody Up There Likes Me* (1956), *West Side Story* (1960), *The Sound of Music* (1965), and *The Sand Pebbles* (1966). For the first time in over a year the soft-spoken filmmaker was at ease. He had just spent 16 months directing the motion picture *Star Trek*, a literate SF epic that opened to the largest box-office grosses in the history of film.

The movie's success is doubly rewarding to Wise. He brought the twenty-third century to the screen in the face of countless production problems—among them, shooting without a completed script and the dismissal of the picture's original special-effects team. And the film may be said to represent the most provocative approach to technology that the cinema has seen since *2001: A Space Odyssey*, creating a workaday environment in space while simultaneously showing how little we really know about the universe.

Achieving that kind of texture is not easy," Wise explains, "because the studios don't have a real concept of science fiction. If they have a thrust in any direction, it is for adventure and action rather than anything strongly pointed toward the scientific or the technological. I have always attempted to be more authentic than that and, if possible, more cerebral, creating suspense by appealing to the mind."

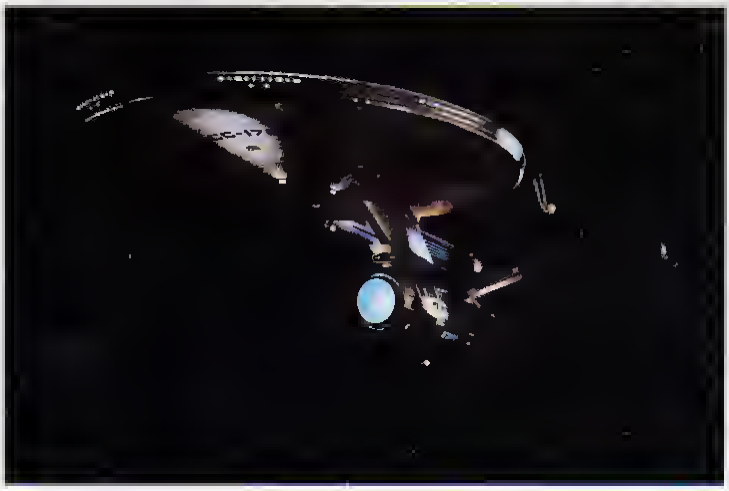
If Wise achieved this goal in *Star Trek*, it should come as no surprise. He had previously directed one of the handful of bona fide SF classics, *The Day the Earth Stood Still* (1951), starring Michael Rennie as the peacemongering alien Klaatu, and had skillfully translated *The Andromeda Strain* from novel to film (1971). His success, though, is attributable to the way he approaches any project. "The vehicle is never as important as the story," he declares. "Although you work in the mode that fells your tale and makes your points in the best way possible. If you haven't got a strong foundation, all the special effects and gadgetry in the world won't save a science-fiction film, any more than music alone can make a great musical."

Though Wise's repertoire is an eclectic one, he admits that science and technology have been powerful influences in his work. Born in Winchester, Indiana, in 1914, Wise was forced out of school by the Depression. Unable to get work in 1933, he went to Hollywood, where his elder brother held a position as an accountant for RKO Pictures. Wise found a job lugging cans of film around the lot, but it was not long before he sought and landed a position with more of a future, as an assistant film editor. Within two years the talented newcomer had been selected by Orson Welles to edit *Citizen Kane*. By 1944, Wise had his first directorial credit, the brilliant horror film *Curse of the Cat People*.

As a youngster, Wise had been caught up by the imaginative riches to be found in science fiction, regularly reading *Amazing Stories* and being entranced by such films as *The Lost World* (1925) and the futuristic *Metropolis* (1926). Thus, almost immediately after earning his director's stripes, in 1945 he tackled an adaptation of Robert Louis Stevenson's short story "The Body Snatcher." In it, the head of a medical school conspires with a killer to buy the bodies of the man's victims for research. This conflict between progress and morality thereafter became a recurrent theme in Wise's films.

Less controversial aspects of science surfaced in many other of Wise's 38 features, including *Run Silent, Run Deep* (1958), a submarine film that captured the psychological impact of these vessels on their crews; *The Haunting* (1963) and *Audrey Rose* (1977), wherein technology was called upon to combat the paranormal; and *The Hindenburg* (1975), for which Wise lovingly and painstakingly re-created the simple majesty of travel by airship.

Despite the inevitable concessions one must make to survive as a filmmaker, Wise has always treated science with adamant respect. He does a great deal of



Starship Enterprise, *from the film* Star Trek. *Special effects made up half the film's budget.*

the preproduction research personally and whenever possible hires experts to work with him on the set. On *The Andromeda Strain*, accuracy was ensured by the constant input of technicians from the Jet Propulsion Laboratory, UCLA, and TRW. NASA scientist Jesco von Puttkamer and astronaut Russell Schweikart were on hand for *Star Trek*.

"One must consult the authorities, and I don't understand when this isn't done. Sure, there are times when you are forced to say, 'Okay, it's going to take too long to develop this or that completely true to life,' or 'To do it that way is just not effective as cinema.' Still, you try to keep the instances of violating scientific accuracy to a minimum.

"But who knows? *Star Wars* was a huge hit and a wonderfully entertaining film, and people seem to accept a picture that puts Raquel Welch in a submarine [*Fantastic Voyage*]. In fact, if you'll look down through the years at the popular films, more of those hit the audience in the gut instead of in the head. Maybe I'm the one who's wrong. Maybe one must be a modified purist, tainted a little bit."

Yet, in spite of Wise's support of science, there is one aspect of progress that troubles the silver-haired man. "It has nothing to do with the hardware, be it a nuclear-power plant or a Skylab. I don't blame one scientist for anything that's ever been invented. Rather, I'm troubled by our managerial ability, which leaves much to be desired.

A case in point, Wise says, is television. He attributes a large share of the decay in our society's aesthetics and imagination, and hence the generally poor quality of movie fare, to what we see on television. "It's a popular feeling in Hollywood that because of what audiences are exposed to on the tube they won't sit still for motion pictures that are maybe a little slower, but effective and truthful deliveries of things, as against movies that are overcharged and forced along at an accelerated pace. There is probably a great deal of truth in that. Because of TV, we're fidgety and jumpy. Television gives us instant gratification. We can flip to this or turn to that or snap to something else rather than sit with something thoughtful."

Wise feels that the film industry, at least, is now at a crossroads. He sees film fare improving over the next few years, with more sophisticated science-fiction pictures a hallmark of this new direction.

"I don't think we're experiencing just another cycle of science-fiction films right now," he says. "Science has become such a large part of our lives. It's real and ever-present. There may be a wave of SF up and down, but I think it has come into its own as a staple, like the Western. Actually, we may see the Western film supplanted entirely by science fiction. That is the past. SF is the future. SF is the frontier now."

Asked why upcoming works of SF will differ from the pop-culture special-effects fests we've had in recent years, Wise cites cost, particularly the cost of the special effects. "The effects are improving all the time, and we're able to do more and more and do it better as the years go along. But with the new technology and the addition of computers, it's also getting very, very expensive. Special effects made up half the budget of *Star Trek* [the film cost a staggering $43 million]. So you can't just keep making films where the primary goal is for your special effects to outdo those of the other guys.

But it may be a blessing in disguise, for while you will always have the problem of mass appeal, the studios will be looking more and more at the foreground, at the quality of the scripts, rather than at the dressing and the background. As a result, I think we can anticipate pictures where the characters and stories are better and more true to life and the treatment of science is more honest and realistic."

As much as rising costs will change the content of movies, Wise points out that they will also influence the way movies are shot. "Motion pictures, as we know them, will probably always exist, because of the convenience and effectiveness of their exhibition. There will be ongoing improvements in the fidelity of the audio and the depth of field of certain of the lenses.

"But the big change we'll see is in the use of videotape for moviemaking. It's certainly more versatile, looser, and freer to use. You can erase what you don't want and double up on cameras. You can also do a lot of your special effects right in the camera, while you're shooting, which is marvelous. Economically, it will be very, very helpful to us. The big question right now is quality. And so far we just don't have a one-to-one transfer from tape to film that gets anywhere close to the one hundred percent resolution that is necessary. They're working on it, and I'm sure it's just around the corner."

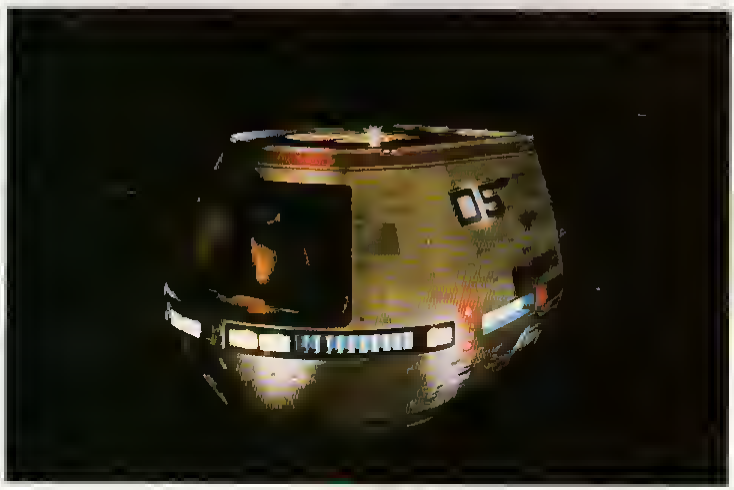
Looking slightly further ahead, Wise sees holograms playing a role in the media. "Perhaps it will one day be possible for an actor to play a part in New York and have his image transmitted to a sound stage in Hollywood. I suppose it's also conceivable that we'll be viewing holograms instead of two-dimensional TV down the line."

With his feet firmly planted in the art of science, what does Wise hope to do next? Asked whether he would be interested in a science-fiction musical (*The Sound of Muons* is suggested), he winces and smiles. "I don't think so. What he is looking forward to is 'something smaller than *Star Trek*, something very humanistic that deals exclusively with people.

'But I suppose it would be nice,' he adds wistfully, 'to sit down and devise a story in which we project ourselves fifty, seventy-five, or one hundred years from now, using what we now know to be possible energy sources, and illustrate how these can indeed be the energy of not necessarily a half century from now, but ten years from now. Make a point of showing how they're applied, underlining it with the message that technology must continue to advance and improve if we are to survive. It would be rewarding to develop a story that would embrace that.'

However, Wise says that it's best to keep these ideas in mind whenever he reads a property, instead of trying to evolve a script to present these ideas. 'You can't just preach in film, because an A for effort isn't enough. If you put two years of your life into a picture, you want it to succeed.'

In an industry populated by fast-buck artists and filmmakers more preoccupied with style than content, Wise has succeeded eloquently with the future.



Star Trek *space scooter. SF movies may entirely supplant Westerns, Robert Wise believes.*

THE ARTS

By Spider Robinson

Most of the arts have some kind of annual awards program. Few, unfortunately, have more than one kind.

Annual awards encourage an artist to strive for excellence even though tripe pays just as well...and they provide a kind of consumer guide for an audience faced with the harsh reality of Sturgeon's Law ("Ninety percent of *everything* is crap.") Clearly, it is to everyone's advantage to hang some sort of flag on the good stuff; this gives it a longer shelf life.

But who decides?

Usually the professionals. The theory seems to be that a professional is uniquely qualified to know good stuff when he or she sees it. Going on the evidence to date, I cannot grant this theory even the status of an approximation. Yet consider the Oscars, Emmys, Tonys, Grammys, Obies and the rest. The people enfranchised to define the year's best are either all of the working and retired professionals, or a small core group thereof, or, in a few rare cases (such as critics' awards for books), an elite in group of interested nonpractitioners.

However, is popular opinion any more reliable? Is *The Other Side of Midnight* really a better book than *The Wanting of Levine*? Is Norman Mailer really a better writer than John McPhee?

In science fiction there are several sets of annual awards. When the smoke has cleared, everybody has had a vote, including *you*, if you're interested enough to bother. Let's look at the awards for science fiction and fantasy.

NEBULAS

The Nebulas are science fiction's analog of the Oscars et al.: voted by active and associate members of the Science Fiction Writers of America. This organization consists of approximately 500 active SF writers. Despite its name, SFWA is *not* restricted to Americans—my directory lists well over a dozen British members, several from Canada, Australia, Ireland, West Germany, and France, and individual members from Mexico, Jamaica, Argentina, Sweden, Greece, Hungary and Sri Lanka. Editors, anthologists, reviewers, artists, and even agents are accepted into SFWA, but only as affiliate members. The "active or associate" clause in the Nebula franchise means "writers only."

The Nebula nomination and voting procedures have been changed as often as underwear, but since 1974 things have run pretty much like so. Over the course of a year any member can recommend a given short story (under 7,500 words), novelette (7,500–17,500 words), novella (17,500–40,000), novel (over 40,000) or dramatic presentation for a Nebula. Eventually a committee edits the pile of recommendations down to a final ballot, almost invariably on the basis of most recommendations received, and distributes this list to the eligible voters. An outside party tallies the votes by the "Australian ballot" system, and the winners are announced at an annual banquet ceremony which alternates between the East and the West coasts. Since 1974 a Grandmaster Nebula has also been awarded for lifetime contributions to SF; the first winner was Robert A. Heinlein.

Hugo Award: a romantic, but used, spaceship

The actual Nebula awards are strikingly beautiful artifacts. The traditional design is a heavy plastic block about 10 centimeters square by about 20 centimeters high. The bottom quarter is a black pedestal with a frontal inscription; the rest is transparent. Embedded therein is a beautiful quartz crystal, about the size and shape of a fist-ax, and over this there is a silver-glitter spiral nebula, slanted toward the viewer. They are quite expensive as trophies go, and I don't know any other as impressive-looking. For all their heft, they are fragile. I'm told Roger Zelazny once took one from an air-conditioned room into a hot day and had it shatter in his hands.

Could a Nebula vote be unfairly influenced? Well, I have heard grumbles—no, let's be candid, I've heard outright accusations—but frankly I don't see how it could be done very effectively. You can't very well put pressure on a majority of 500 people (surely not SF writers, an ornery and dangerous bunch), and bribing them all is simply cost-ineffective. As for occasional complaints of back-patting and logrolling, I can only report that when I won my Nebula, I was not a member of SFWA (a condition I have since corrected) and was personally acquainted with fewer than a tenth of the membership. No, the Nebulas represent an honest consensus of opinion—opinion well worth listening to.

HUGOS

Here is where SF is virtually unique. Barring the All-Star Game and the Nova Scotia fiddle championships, I know of no other art form where the customers get to vote. Except, of course, through the indirect vote expressed in dollars (however, if you buy a book and end up bitterly regretting it, you cannot unspend those dollars). But SF fandom gives every bibliophile on Earth the opportunity to reward his or her favorites and to tell the nice publishers what they like.

Every year on Labor Day weekend a World Science Fiction Convention is convened somewhere on the planet (there

CONTINUED ON PAGE 130

CRIES AND WHISPERS

PEOPLE

By Dick Teresi

Christians have Christmas and Jews have Yom Kippur and scientists have the annual meeting of the American Association for the Advancement of Science (AAAS). It's the psychosocial event of the year in the scientific community and this past January some 5,000 scientists went to San Francisco to deliver papers, talk shop and dodge the water balloons from a neighboring Shriners' convention. The 1980 meeting did not match in pure hatred the 1978 edition, at which anti-sociobiology protesters drenched E. O. Wilson with a pail of water; nor did it equal the ridiculousness of the 1975 meeting, during which Cleve Backster announced that his yogurt could talk. Still, it had its moments.

It was Pearl Harbor all over again as **Simon Ramo**, keynote speaker, distinguished scientist, and (most important) director of "a company called TRW," bemoaned the loss of America's technological leadership to Japan. It was to be a leitmotiv of the meeting, as the engineer types constantly raised the specter of aggressive Orientals straying our domestic markets with their Sonys and Toyotas. Ramo announced that "our technological slip is showing," and he revealed some of the culprits behind the mess. American workers' wages are rising at 8 percent a year while productivity is increasing by only 1.5 percent, he said, and the difference is inflation. The cure? Bigger and better profits. Ramo is the "R" in TRW and AAAS members applauded his speech politely.

"Most scientists today are employed by the military-industrial complex," commented Boston pediatrician **Helen Caldicott** the following day. "That's where the money is."

Caldicott's warning: "We'll lose our babies."

For a man opposed to the nuclear arms race, MIT professor **Henry Kendall** has the damnedest collection of hydrogen-bomb photographs, all in glorious color. At a panel entitled "Ending the Nuclear Arms Race," Kendall showed us one oddly beautiful explosion after another. Blast, ten megatons. Producing a three-thousand-foot-diameter crater three hundred feet deep. He deadpanned while projecting a towering mushroom cloud on the auditorium screen. Then, with a brilliant red explosion as a backdrop, he recited the numbers expected to die of radiation burns. Perhaps in honor of the Soviet invasion of Afghanistan that week, Kendall revealed a U.S. "targeting strategy" for Moscow: 46,200 kiloton ground bursts aimed at three-mile intervals in a neat grid across the city. If anything, Kendall went out of his way to appear cold and uninvolved in the deadly information he was relaying. And panel moderator **Linus Pauling** was almost whimsical about the whole affair. He joked that the best our military could do in speculating on the most efficient targeting strategies for destroying the United States was a kill rate of 80 percent of the population. "It turns out that lobbing warheads over at random from Russia," said Pauling, "would kill more than ninety-two percent."

Ramo: "Our technological slip is showing."

More passionate was Helen Caldicott, of Children's Hospital Medical Center in Boston, speaking on the medical hazards of nuclear arms. As a doctor, she said, she will face a dilemma. One must stay in a bomb shelter two weeks to be safe. Should she remain inside or go out and help the "burned and mutilated," knowing it probably means death? There will be no drugs, no painkillers, she noted, because pharmaceutical stockpiles are in targeted areas. Physicist **Philip Morrison** reiterated his view that the United States is overarmed (we're producing "three new H-bombs a day," according to Caldicott) and that the defense budget could be sliced by 42 percent without sacrificing national security. Caldicott called upon women to use their political clout—over 50 percent of the vote—to put an end to the nuclear-arms buildup. One of the few women to speak at the AAAS, Caldicott claimed that all men in the Northern Hemisphere carry plutonium in their testicles because of bomb tests. "If we women don't end the weapons race," Caldicott said, "we'll lose our babies."

Up in North Beach, San Francisco's skin-and-sin district, the women were offered another alternative. On a Friday night, as a group of scientists and their wives made their way past nightclubs advertising "Live Man-and-Woman Sex Acts," a sidewalk barker threw his pitch at the men. "We have the most disgusting act in town," he yelled with pride. And, getting no response, he diverted his attention to their wives. "Watch somebody else do it for a change," he said. "Take a load off your backs."

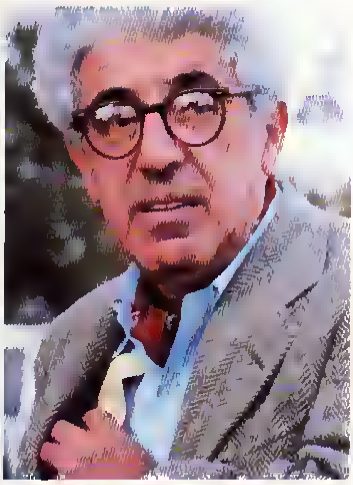
On the energy front, it was gloom all around. The consensus of a roundtable on Energy in the '80s was that we are reaching an "energy hiatus." (Translation: We're running out.) **Daniel Yergin**, of Harvard, appropriately entitled his talk "The Vindication of Chicken Little." He predicted a likely war over the drying up of oil supplies. But hope came from a surprising source. **Barry Commoner**, normally a prophet of doom, but lately mentioned as a third-party presidential

Calvin and his petroleum-producing plants

candidate, said we could end gas lines "probably next year or the year after." Commoner's solution is to switch major croplands from soybeans to sugarbeets, which could be made into alcohol to be mixed with gasoline. **Melvin Calvin**, of the University of California at Berkeley, had a more direct plan: Get plants to manufacture our petroleum for us. Many plants, such as *Euphorbia lathyris*, are rich in hydrocarbonlike materials that can be refined into fuel, and Calvin envisions huge petroleum plantations yielding ten barrels of oil per acre per year. "One landmass the size of Arizona," said Calvin, "will supply ten percent of America's oil needs." And he's not even running for president.

Jesus Christ made one of His rare appearances before the AAAS. That's who some people believe is captured photographically on the Turin Shroud, anyway. **Joseph Accetta** spoke of the Los Alamos team's recent trip to Italy to examine the relic. Their conclusion: They don't know whose picture is on the shroud or how it was made. But a man behind me whispered, "It's a miracle!" The Shroud seminar was not for the faint of heart, as Accetta explained some of the grislier medical realities of crucifixion. Roman style. Example: Only four fingers of each hand are shown on the shroud, a convincing detail, says Accetta, because driving nails through a man's wrists causes the thumbs to retract. Accetta, who, when he isn't examining religious relics, works for the weapons laboratory at Kirtland Air Force Base, admitted that the American team was funded mostly by a single philanthropist. He wouldn't reveal the man's name, but he said he is a Roman Catholic.

Linus Pauling, at one point nonplussed by the timidity of his antinuclear audience, sighed, "We need the students of the 1960s again." The site for the meeting was at least well chosen: San Francisco retains vestiges of the social upheaval of the 1960s, though the evidence is largely fossilized. Taped to the cash register in



Commoner: Gas lines, campaign promises

poet Lawrence Ferlinghetti's City Lights Bookstore is an old gift certificate made out to Bob Zimmerman/Dylan from rock impresario Bill Graham. And you can still buy posters of rock-protest band Country Joe and the Fish ("And it's one, two, three, what're we fightin' for?/Don't ask me, I don't give a damn/Next stop is Vietnam"). It was in the 1960s when I last interviewed **Kenneth Boulding**, outgoing president of the AAAS. He was railing against Lyndon Johnson and the war then, and doing it with some style and wit. The fire was missing this year as he delivered the presidential lecture. He told the scientists not to falsify their experiments, because "the only thing that can cause you to be expelled from the scientific community is to tell lies." It wasn't the kind of speech guaranteed to offend anyone. Perhaps Boulding best summed up the lessons of this year's meeting when he departed from his notes to poke fun at himself. "I always tell my students," he said, "that the purpose of education is to transmit information from decrepit old men to decrepit young men."

UFO UPDATE

By Harry Lebelson

Billed as the "UFO Event of the Year" it promised—and I quote the brochure—"to weave a pattern of mind-boggling events into an emotion-shattering conclusion." Promised but never delivered, UFO '79 offered the same old clichés to an audience long familiar with the pros and cons of ufology. There would be no revelations about 1979's most important UFO discoveries, investigations, or conclusions.

My own doubts about this November conference, held in San Diego, crystallized when someone named Walter H. Andrus, international director of the Mutual UFO Network, digressed on "A New Look at the UFO Entity Evidence." We were told that four types of aliens are looking in on us: dwarflike humanoids, human-appearing beings comparable in size to ourselves, animallike creatures, and robots. Each category possesses the following characteristics: head, body, two arms, two legs, and appendages (known to us as hands and feet). Though the similarity was not immediately apparent, these descriptions reminded me of some bizarre sculptures I had looked at earlier in the foyer of the Point Loma Royal Inn.

"The real purpose of a conference of this kind is to get people from the scientific community together who can exchange personal information and data," said James A. Harder, professor of civil engineering at the University of California at Berkeley. But where were the scientists? The absence of two key speakers, both scientists, suggested that the conference was in trouble. Yet the promotional material claimed otherwise. After all, there were artifacts galore, automatic writing, and enough occult phenomena to attract any scientist.

A hot rumor at the conference hinted that recent analyses of metal fragments relating to a celebrated case were so startling that Carl Sagan himself asked to see them. The astronomer the story went, told researchers not to reveal their findings to "those UFO nuts," but to present them before a legitimate panel of scientists for genuine verification. When asked about this incident, however, Sagan stated, "Nothing ever happened. I never met these people, and in fact I've never even heard of them." Similar distortions compound the doubts that already surround UFOs.

Later on in the conference, Dr. R. Leo Sprinkle, psychologist and professor of counseling services at the University of Wyoming, was introduced at the podium. Dr. Sprinkle spent the next 40 minutes boring everyone with an elaborate analysis of what he called emerging patterns of UFO activity. It all seemed redundant, so I excused myself to get a cup of coffee, hoping that the remainder of the conference would offer something new. I wandered down the foyer past a display of alien models, one of which bore a striking resemblance to a certain UFO skeptic.

I later bumped into nuclear physicist and UFO proponent Stanton Friedman. Slightly miffed, he spoke candidly about the symposium. "I think the organization of this conference leaves a lot to be desired," he declared. "It's poorly attended, sloppy in preparation, and three of the speakers failed to show up." UFO '79 was the brainchild of Hal Starr, a veteran promoter, UFO researcher, reporter, and lecturer.

This whole thing seems to be a big public-relations setup organized by Starr and an independent film outfit for the purpose of putting together a package for possible sale to national television," Friedman continued. "I have nothing against this attitude if it's made implicit in the advertising promoting the event. In this particular case that wasn't so."

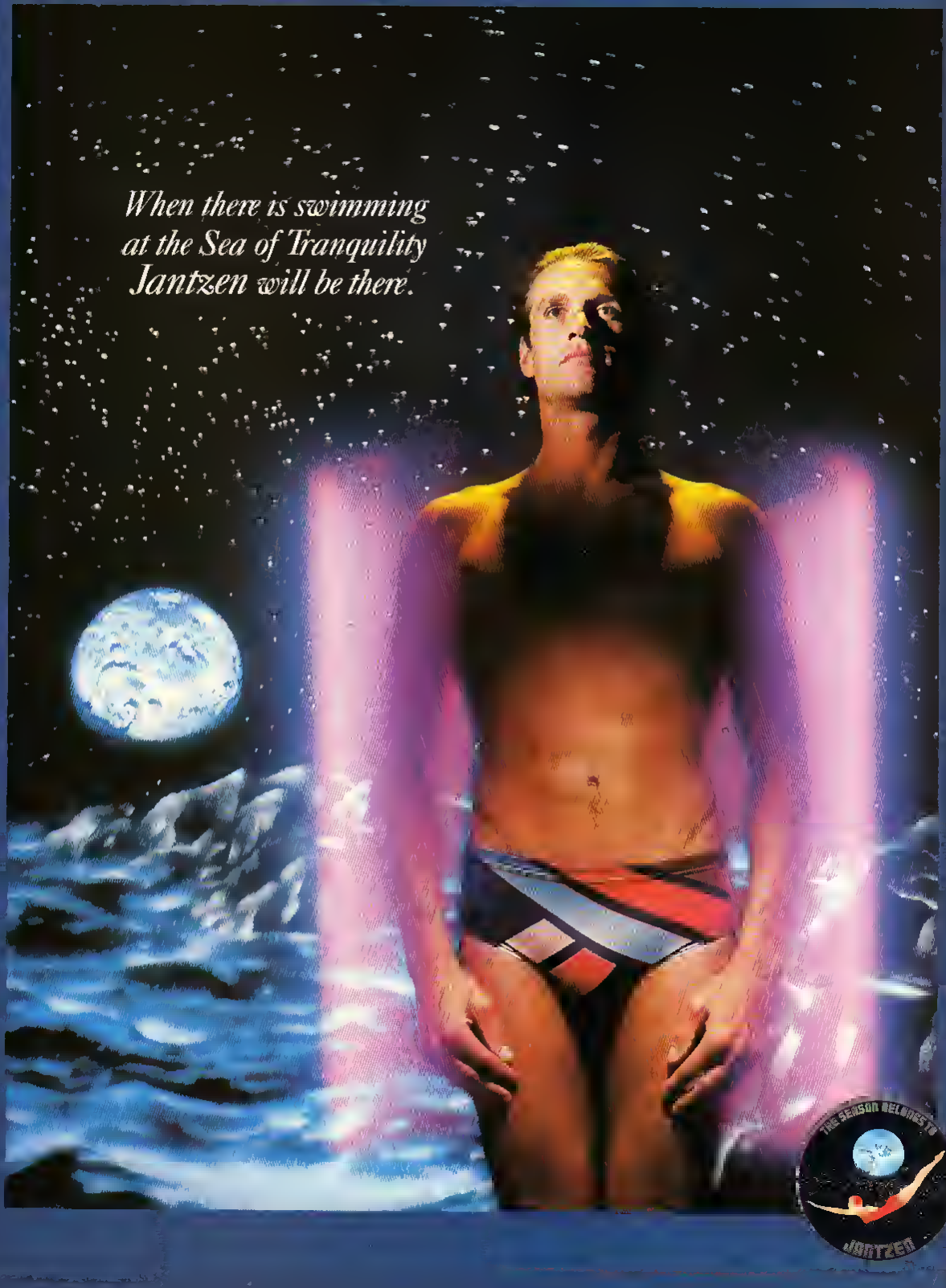
Indeed, as Friedman implied, people spent $145 for a two-day symposium on UFOs and deserved more professional preparation than they received.

After lunch, one of the few highlights of the conference surfaced when Alan Holt, astrophysicist training supervisor at NASA, spoke on "Field Resonance Propulsion." Holt suggested it may be possible to develop a spacecraft capable of carrying a team of explorers to another stellar system by the year 2000. Using physical theories that he hopes will eventually be accepted by mainstream physicists, Holt described the interaction between magnetic and electrical fields and the theory of space-time curvature as it relates to gravitational propulsion. Although Holt's paper was well articulated, its substance was beyond the grasp of most of those assembled. Their reactions ranged from indiscreet yawning to broad indifference. I found most of the material incomprehensible in spite of Holt's efforts to ensure clarity through visual aids.

"I wanted to give this research broader exposure but was disappointed by the lack of scientific inquiry in a number of the papers presented here," Holt told me later. "I expected a more scientifically motivated session and was appalled by the overall tone of the conference."

To sum up UFO '79: All the papers presented seemed to cry out for the scientific community to accept UFOs. Yet despite the efforts of people like Holt, rational scientific inquiry had clearly taken a backseat to promotion by those UFO groupies who sell the notion of visitations by alien beings. ∞

In the foyer: a familiar face at UFO '79


When there is swimming
at the Sea of Tranquility
Jantzen will be there.
THE SEASON BEGINS
JANTZEN

CONTINUUM

REDUCING THE X-RAY HAZARD

Two years ago Barbara Askins, a NASA chemist working at the Marshall Space Flight Center, in Alabama, invented a process that could restore the image of a badly underexposed astronomical photograph. The process, called autoradiographic image intensification, won her the 1978 Inventor of the Year Award.

Since then scientists have realized that her invention could be used to restore old, faded black-and-white photographs; furthermore, it could be used to enhance the image of underdeveloped x-ray radiographs, thereby minimizing the x-ray dose a patient has to receive to obtain a clear image.

With Three Mile Island fever sweeping the nation, Askins's invention would seem welcome news. Yet, so far, it has received less than favorable comments from the one group that could help it reach the public: the medical community.

The complexity of the process itself is partly to blame. The invention involves soaking the underexposed negative in a solution of radioactive thiourea sulfur-35. The sulfur binds with the silver in the film and emits bursts of radioactive particles onto another film overlying the first. Thus, the image in the underdeveloped film is transferred and enhanced on this second film, later to be made into a black-and-white print.

By itself, the radioactive material is relatively harmless. It emits only beta particles, effective in producing an image on film, that can be stopped by a thin piece of cardboard. It also has a half-life of 88 days and therefore disintegrates rather quickly.

The problem lies in both its cost and time. One 8" × 10" photograph, for example, may require several hours to be restored and may cost a minimum of $20. The process also requires a Nuclear Regulatory Commission license. 'That in itself,' the inventor admits, 'stops a lot of people from using it.'

For its advocates, though, the process has an important selling point. The amount of exposure can be decreased to a very low level. Askins found that even in a film receiving only 1.5 percent of normal exposure—six stops below normal—the faint image could still be brought back almost entirely with the process. This was enough to send many scientists scurrying in search of new applications.

At the University of Alabama-Birmingham, Kerry Akridge has been using the process to restore the images of eighty-year-old photos faded with age, and this spring, with a grant from NASA, Akridge and his colleagues are starting the National Nuclear Image Enhancement Center for Autoradiographic Development, a lab where they hope to develop and refine Askins's invention, eventually using the facility to enhance the photographs sent from archives and the public. Akridge, who originally thought of the idea, has other applications in mind, too. 'We've experimented with the same process on some old nitrate negatives—old films that a lot of archives had before Kodak came out with the safety negative. So there's no reason why it shouldn't work on them.' The FBI, Akridge says, is interested in the invention. Having recently developed a fingerprinting process that can take fingerprints from curved surfaces—such as bodies—the bureau wants to use the invention to enhance its investigative success.

The biomedical field has found a home for the process, too. Yutaka Kobayashi, manager of New England Nuclear's Liquid Scintillations Laboratory in Boston, says that the invention can reduce the time it takes to extract information from radioactive cultures. Samples that are radio-labeled with a very weak emitter may require months before the images are dark enough to be seen on film. 'But,' Kobayashi says, by using Askins's invention, 'you can reduce the time by a factor of ten.' Already the process has been used in both DNA and cancer research.

Yet the most controversial application has been in the medical-health field. Using the invention, a patient has to receive only 10 percent of the x-ray radiation to get a clear image on a fixed radiograph. Most physicians, however, agree that other methods already in use do the same thing. But the real advantage of the process, Askins says, is that a patient doesn't have to be reexposed to the same X ray if the radiograph turns out to be underdeveloped. There is no reshooting.

Despite this, most doctors are leery of the method. The reason for this, says Kobayashi, is the time involved. 'The medical profession is impatient. Doctors want instant data.'

But that, too, may change. Azuwuiki Owunwanne, who has been working at Strong Memorial Hospital in New York to improve Askins's invention, thinks that by automating the system and clearing away some of the bugs, he can drastically reduce the time. If the medical community can be convinced of its worth, it might be on the market in five years. —*KENNETH JON ROSE*

CONTINUUM

COMPUTING SUICIDES

A computer may have saved a man's life recently when officials af fhe Univer sity of Wisconsin Medical School's clinic learned that a patienf who was abouf to be released after treatmenf for depression had a gun, bullefs, and a precise suicide plan Though some 80 percent of self-inflicfed deaths result from depression, the clinic therapists failed fo discover the patient's infent until a computer programmed by a professor of preventive medicine and by psychiatrist John Greist predicfed he would fry fo take his life

A preliminary study by the two has shown that their compufer was usually a befter forecaster of sformy thoughts than trained M D's were Though many patienfs want to bare their darkesf secrefs to their doctors, the physicians themselves are often reluctant to broach the subject of suicide or don't know how fo analyze the responses

In fact, when physicians, clinicians, and other health professionals tried to predicf which of 63 patienfs in Dr Greist's study would attempt suicide the therapisfs failed to identify any of the fhree who would try wifhin 48 hours, while the computer picked all of them When the sfudy was expanded to fhree months, 91 percent of the subjects who actually atfempted suicide had been given better than-even chances of doing so by the compufer, compared to a 16-percent score by the professionals

Between 25 000 and 50,000 suicides are reported each year in this counfry and Greist says fhe vicfims usually had visited fheir docfors recently Furthermore he found fhaf clinicians and nurses were fypically better predictors fhan their beffer-trained colleagues

Though fhe medical profession has been slow to accept his method Greist hopes thaf fhe program will see wider use At leasf 1,000 institutions in this counfry have computers thaf can handle it, and the 40-minute interview costs only $1 50 in computer time

And for those of you wondering how the computer figured out that the Wisconsin patient had a gun—if simply asked the man, "Do you have a gun?'

—Stephen R Dujack

Man About to jump from Empire State Building A study indicates computers can predict potential suicides better than professionals can

GALLOPING GLACIERS

Most glaciers move so slowly their progress is invisible to the naked eye Mosf—but not all Variegated Glacier, near Yakutat, Alaska, flows so fast you can actually see it move. It s called a galloping glacier, and Dr Charles Raymond, of the Universify of Washington, wants to find out why it moves so rapidly

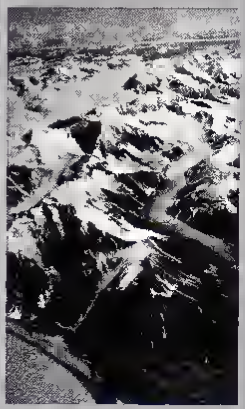
"There are about fwo hundred of fhese glaciers in North America," says Dr Raymond, 'and they move as fast as three hundred feet a day" Raymond and his colleagues are sfudying Variegated Glacier to find out what causes its sudden, galloping surges and how ifs geomefry changes during these sudden dashes

Variegated Glacier on the western slopes of the St Elias Mounfains, was picked because ifs geometry is simple, it is small, and it is not subject to sudden internal temperature oscillations

'This parficular glacier last went into a surge in 1974 " Raymond reports "Now we are expecting it to starf galloping again wifhin the nexf five years."

The project is a long-term one By beginning to sfudy the glacier now Raymond says, the team can build up a profile of its changes before, during, and after it gallops

There are pracfical reasons for studying galloping glaciers, too Some of them lie near the Alaskan oil pipeline If one of fhem sfarted charging foward the pipeline, if could cause ecological disaster There'd be nofhing to sfop it —Joel Davis



Riverlike Variegated Glacier can zip along at 300 feet a day

'One of our problems is trying to figure out which way is up and which way is down '
—John Young
(from Apollo 10*)*

MAN'S BEST GOOSE

Sojourn in Dumbarton, Scotland and you might get to see 70 geese at the local distillery guarding 115 million liters of whisky worth about $900 million If you trespassed there you would be greeted by honking hissing, and perhaps a bite from this web-footed alarm system

In the United States about 1 million geese weed fields of corn, cotton, potatoes strawberries and other crops A pair of geese can clear an entire acre of grass and weeds leaving the cash crop untouched

The goose, it turns out, rivals the dog as man s best friend Immortalized in *The Gift of Birds* a collection of essays published recently by the National Wildlife Federation the goose even lays claim to saving a civilization In the second century a gaggle of geese honked a Roman garrison awake one night as hostile soldiers approached a strategic hill in Rome The Romans watchdogs had been quieted by food the enemy threw to them

Many naturalists believe that the goose domesticated for 4,000 years has lost fewer of its original characteristics than any other tamed bird or mammal Besides its watchdog characteristics the goose provides feathers for beds and quilts fat for butter and ointment eggs for breakfast and meat for dinner Certainly it bests the dog in that regard

How about an endearing goose story? The book cites the tale of a gander leading its aged blind mistress to church every Sunday by taking the hem of her dress in its bill The bird clipped the grass in the nearby cemetery during worship The book says that whoever coined the term as silly as a goose' obviously never spent any time with geese —Stuart Diamond

Ferocious goose This majestic species provides feathers for quilts fat for butter meat for dinner and makes an effective security device

We may as well go to the moon, but that s not very far The greatest distance we have to cover still lies within us

—Charles de Gaulle

INSTANT DEMOCRACY

An electronic device designed to speed up business meetings may one day revolutionize the democratic process Called Consensor, it s the brainchild of former IBM executive W W Simmons who was looking for a method that would allow businessmen to express their opinions anonymously and quickly in executive meetings

So he invented Consensor, which consists of a television monitor and individual terminals one per voter Each terminal has two dials One is graded on a scale of 0 to 10 allowing the voter to select a degree of approval The second dial registers intensity how strongly the voter feels about the importance of the issue Or it can be set to register the voter s degree of expertise on the matter Companies already using Consensor (Exxon Avon Chase Manhattan, and AT&T) report time savings in meetings between 30 and 50 percent

But the device s real future may lie in politics With a voting terminal hooked into cable TV and connected to a central information desk, we could express our opinions and how strongly we felt about them instantly on any issue (A modified, statewide experiment using Consensor

Consensor video display registers approval and intensity

was conducted in Alaska last fall) Voter apathy could be a thing of the past and Congress would be in constant touch with the voice of the people—or at least with the television-watching people —John Anthony West

'It is easier to accept the message of the stars than the message of the salt desert The stars speak of man's insignificance in the long eternity of time, the deserts speak of his insignificance right now'

—Edwin Way Teale

'There is something fascinating about science One gets such wholesale returns of conjecture out of such trifling investments of fact "

—Mark Twain

CONTINUUM

COMPUTERIZED BACKPACKING

Backpacking à la computer? The purists may be outraged by the idea but it could prove to be a boon both to them and to the casual hiker.

Backpacker hikes over Sloan Peak in Washington State's Cascade Mountains. Custom-made hiking paths available now via computer

The University of Washington with the Institute for Governmental Research (IGR) and the Urban Data Project is compiling a computerized data base of more than 600 hiking trails in Washington State. IGR staffer Ruth Ittner, project coordinator, says the results will be made available to the general public as early as this summer.

"Right now we have information on 418 U.S. Forest Service trails entered into the computer," Ittner reports, "with 50 to 100 items of information on each." That information includes such things as the length, location and altitude gain of each trail.

The hiking paths in the system so far are located in the Mount Baker/Snoqualmie and Olympic national forests. Trails in the Mount Rainier, Olympic, and North Cascades national parks will also be included, along with those in state parks.

Beginning this summer, prospective hikers can get instant, up-to-date data on the trails by contacting the Joint Forest Service/Park Service Information Center in Seattle. With the computer system, a hiker can find just the kind of trail to suit him, her or the little kids, just by specifying the type of trail wanted.

And the possibility exists, Ittner adds, that the information will someday be available on terminals located in your favorite sporting-goods store. —J.D.

CESAREAN BOOM

In the midst of the "natural childbirth" revolution, more and more babies continue to be born by the most unnatural method of all: Cesarean section.

High-technology hospitals consistently deliver 20 to 25 percent of all babies by Cesarean. And it's not uncommon for the rate to soar as high as 35 or even 40 percent for a single month. Now the National Institutes of Health (NIH) are investigating the reasons behind the high rate of Cesareans.

Why so many? NIH researchers say the Cesarean boom may be only the tip of a technological iceberg that threatens to sink the Back-to-Nature movement for good. Even natural-childbirth mothers today are routinely chemically induced, electronically monitored, and intravenously fed.

Cesarean delivery: Tip of the medico-technological iceberg

Their babies are checked for genetic defects by sampling amniotic fluid; their pictures are taken with ultrasound.

And there's more on the horizon. The NIH are currently conducting research into what initiates labor, so that doctors can stall a premature baby or hasten the delivery of one who's overdue. A whole new field of "fetal medicine" may make it possible not only to detect abnormalities in utero but also to correct them.

"It has the potential for making a tremendous impact on society," said one NIH spokesman. "It's mind boggling."

Some doctors say the high Cesarean rate and attendant technology are simply a response to parental pressure for perfect babies. One obstetrician from a certain well-known university put it this way: "A baby who is born naturally might come out smart enough to be president of the United States, but he wouldn't make president of Harvard."

—K. C. Cole

"I once wanted to make small talk with a physicist by asking, 'What's new in physics?' but then I remembered I don't know what's old in physics."

—Isaac Bashevis Singer

"We are always the same age inside."

—Gertrude Stein

"Ninety percent of the work done in this country is done by people who don't feel well."

—Theodore Roosevelt

SPACE ODDITIES

Two British satellites, each named *Ariel*, are giving scientists here on Earth more than they bargained for in the way of some bizarre discoveries made while whizzing around the globe

The first satellite, *Ariel 5*, has spotted what the space experts call a large "inhomogeneity" better known as a blob out in space, about 10 billion light-years away

Writing in *Nature* magazine, two British astronomers, Andy Fabian, of Cambridge University, and Robert Warwick, of Leicester University, say that what's intriguing about this blob is that its gravity is drawing Earth and for that matter, the whole galaxy slowly toward it

It's not particularly dense—slightly more than 1 percent denser than the universe But it is huge about 3 billion light-years across is their best guess

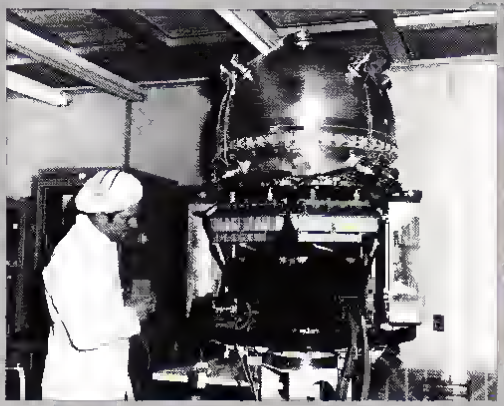
While astronomers are working to explain this enigma other space experts are puzzling over a kind of Bermuda Triangle in outer space Another satellite *Ariel 6*, has this weird problem every time it passes over British Columbia or the Caspian Sea on a sunny day It turns itself off

Nature reports that two of the satellite's three high-voltage supplies click off when it passes these points on the globe What is very peculiar is that the third supply never goes off

To add to the mystery scientists on Earth found they can immunize *Ariel 6* against these shutoffs if they beam the main command signal to it just before it passes over these spots

The leading contender as the cause of these odd doings, according to *Nature*, is "a space variant of the Bermuda Triangle legend "

—Douglas Colligan



Bermuda Triangle in space When Ariel 6 *(above) passes over British Columbia or the Caspian Sea, it mysteriously turns itself off*

"Sometimes I think we're alone Sometimes I think we're not In either case, the thought is quite staggering "
—R Buckminster Fuller

A HEALTHY TAN?

For some time doctors have warned that a tan is not as healthy as it looks, but the new fad of getting year-round tans in parlors using ultraviolet-light booths has them particularly worried

The indoor-tanning craze began in Searcy Arkansas when Tantrific Sun, Inc opened a small parlor in August 1978 that proved so successful the owners began a franchise operation Other companies entered the market under such names as Tanfastic, Tanique, and Sumtan, and the indoor-tanning parlors are now found nationwide

All of the tanning salons work on the same basic principles After a customer's skin type and tanning sensitivity are analyzed often by computer he or she steps into an individual shower sized booth lined with medium-wave ultraviolet light bulbs The customer stays anywhere from 30 seconds to 15 minutes over the course of 20 visits Though fees vary, $35 is about average for 20 visits

While doctors are still debating whether skin damage from ultraviolet light is cumulatively effected or is triggered by burning, the American Society of Dermatologists recently issued a strongly worded statement warning that cosmetic tanning in these booths is neither a safe nor an innocuous procedure

Indoor tanning parlor Now skin damage winter or summer

Dr John Epstein, professor of dermatology at the University of California at San Francisco, says, "We want to educate the public to the fact that a tan is not a healthy thing, because it damages skin cells, including the genetic material membranes, and proteins —Allan D Maurer

"Space is to place as eternity is to time "
—Joseph Joubert

Let your soul stand cool and composed before a million universes "
—Walt Whitman

' There's a hell of a good universe next door, let's go "
—e e cummings

CONTINUUM

SCENT OF SEX

A human sex pheromone may finally have been isolated by a team of scientists working at Warwick University in England. The key to a man's sexual attraction, according to the research of chemist George H. Dodd, may lie in his sweat.

It has long been known that animals affect one another's behavior—including their sexual behavior—through the secretion of pheromones, chemical odorous substances. Until now the search for a pheromone in humans has come up with nothing.

But Dodd and his group were recently given a clue to the type of compound to look for by an animal few men or women, identify with—the boar.

Pig breeders in England use a synthesized boar pheromone spray on sows to make them receptive to artificial insemination. Dodd surprisingly identified two pheromone-type compounds similar to the boar's in human sweat. The scientist then isolated and synthesized one of these, a compound called alpha-androstenol, a chemical related to sex hormones. Purified, it smelled tantalizingly of sandalwood.

Next Dodd anointed a group of men with alpha-androstenol and another group was left unanointed as a control group. Men and women were asked to evaluate both groups and the preliminary results, as reported in *New Scientist*, showed that women consistently assessed the pheromone wearers higher while men downgraded them.

The female response is easy to explain. The male rejection is more problematical, but it may be a form of aggressive reaction. Boars are made aggressive by other boars producing an androstenol-like pheromone.

Perfume makers help fund Dodd's research, and so an aftershave lotion incorporating alpha androstenol or a derivative may reach the marketplace soon.

—Kathleen Stein

The sex pheromone from the boar has already been isolated and synthesized. Now it appears humans will be getting the same treatment.

"All the signs suggest that life exists on Mars, but we can't find any bodies."
—*Gerald Soffen*

FEATHER BOMBS

One of the stranger interludes in biological-warfare experimentation has just come to light. In the 1950s, according to recently declassified military documents, Upstate New York was used as a testing ground for a new weapon—the poisoned turkey feather.

In a formerly Top Secret report entitled "Feathers as Carriers of Biological Warfare Agents," army scientists at Camp Detrick, in Maryland, described their efforts to kill off oat plants using bird feathers dusted with cereal-rust spores. The papers were obtained by American Citizens for Honesty in Government, an organization sponsored by the Church of Scientology.

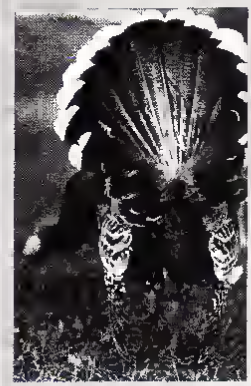
There were two experiments with bird feathers. In one, pigeons were dusted with rust spores and released to fly over preselected areas in the Virgin Islands.

In the second set of experiments, "washed, fluffed white turkey feathers of a uniform size" were dusted with spores of *Puccinia graminis avenae*, an oat-plant fungus, and then were dropped from the air on what is now Camp Drum, near Watertown, New York, where some target plots of oats were growing.

The beauty of the turkey feathers, the report noted, was that they contain "numerous barbs and hooklets," which hold the spores.

The result of the feather bombing? The scientists found feathers could carry enough spores "to initiate a cereal-rust epidemic." Elsewhere in the same report they also observe: "It appears that feathers alone could be used as carriers of BW [biological warfare] materials."—DC

"There is a coherent plan in the universe, though I don't know what it's a plan for."
—*Fred Hoyle*



Documents prove there's no shortage of turkeys in U.S. Army.

LOU GEHRIG'S DISEASE

A new clinic has been established for persons suffering from a strange and deadly muscular disease called ALS (amyotrophic lateral sclerosis). Located at Mount Sinai Hospital in New York City, the clinic helps those with ALS make the most of their losing struggle with the disease.

Also known as Lou Gehrig's disease, after one of its better-known victims, ALS is a progressive neuromuscular decay of the body. Its victims are typically in the prime of their lives (aged thirty to sixty) when they start sensing a weakness in the hands and arms and have trouble swallowing or speaking.

Once it surfaces, ALS kills its victim in a couple of years, though the crippled patient always retains his mental faculties. Over the years it has taken an impressive string of victims. Ezzard Charles, the boxer; jazz musician Charlie Mingus; and Henry A. Wallace, Vice President under Franklin Roosevelt; British astrophysicist Stephen Hawking currently suffers from ALS.

Baseball star Lou Gehrig, suffering from amyotrophic lateral sclerosis, says farewell at Yankee Stadium, 1939. No cure, and no treatment.

The disease has no cure or effective treatment, and doctors are still baffled as to its causes. According to ALS researcher Dr. Barry Aranson, chairman of the University of Chicago's department of neurology, the evidence indicates ALS is inherited in about 5 to 10 percent of all cases, and that in others the cause may be a slow virus or some built-in metabolic deficiency.

In the meantime, according to Rochelle Moss, of the National ALS Foundation, ALS sufferers have been ignored. "The problem has always been that if you're discovered to have ALS, the doctor just tells you to go home and die," she says.

The clinic, she hopes, will offer some alternative to this. For more information about the clinic, write to the National ALS Foundation, Inc., 185 Madison Avenue, New York, NY 10016. —D.C.

THE LORD'S ENERGY

So you think you've got energy problems? Consider Manhattan's St. Patrick's Cathedral, with 36-meter high ceilings and cold stone walls. Or the myriad synagogues, churches, and other places of worship in the world where single-pane stained-glass windows let the heat escape.

Following the maxim "God helps those who help themselves," clergymen have been embarking on their own energy-efficiency program. St. Patrick's has installed clock thermostats and extra light switches to illuminate only the area in use. About 10 percent of the nation's 3,500 synagogues now have energy-efficiency programs, and another 40 percent plan them, says Rabbi David Saperstein, chairman of the Interfaith Coalition on Energy.

Clergymen from dozens of denominations met with President Carter and U.S. energy officials earlier this year to plan their energy campaigns. "There is definitely a theological basis for saving energy," says Mark Talisman, director of the Council of Jewish Agencies. He notes that the Bible instructs the faithful not to waste the earth's resources. Among them, of course, are oil and natural gas.

Places of worship also waste a lot of energy because they are fully occupied for only a small part of the week but are heated and cooled continually. The churchmen hope that the new-found energy consciousness will result in savings that can be used for religious missions.

Only a handful of religious centers have solar panels. But one stands out for mixing energy and theology. Over the altar at Temple Emanuel, in Lowell, Massachusetts, is a solar-powered Eternal Light. With two six-volt batteries for storage, it hasn't flickered in 13 months of usage. —S.D.

"The eternal silence of these infinite spaces frightens me."

—Blaise Pascal

Temple Emanuel's solar powered Eternal Light. Not a flicker.

CONTINUUM

TURTLE TURMOIL

A new kind of shrimp net being tested by the U S Marine Fisheries Service may help save some of the endangered sea turtles in our waters The net which was described at a recent international conference held in Washington, D C , has a panel at the mouth that keeps out turtles while allowing shrimp to slip by

The sea turtles in U S waters that could benefit from the new net are the loggerhead, green hawksbill, and leatherback varieties All are endangered

The loggerhead and green nest along our southeastern coast, where they face additional problems In Florida, according to Rutgers University biology professor David Ehrenfeld, a conference participant, newly hatched green turtles resting just below the surface of the sand are run over by off-road vehicles Once aboveground both green and loggerhead hatchlings tend to crawl toward the brightest area, which today is more often a highway rather than the sea Heaps of crushed hatchlings are seen on highways

Of seven species of sea turtle in the world, six are imperiled Outside the United States, which now provides sea turtles complete protection, they face such hazards as egg poaching, exploitation for meat, and a thriving trade in 'tortoiseshell' items (Tortoiseshell is the shell of the hawksbill) The most threatened species, Kemp s ridley, has only about 1,000 females left A few hopeful notes were sounded at the conference, including a plan for a marine park off Nicaragua to shelter the green turtle — Barbara Ford

Female turtle, having just nested, treks back to the sea Tracks make it easy for poachers to find turtle nests and steal eggs

MILK-CRAZED HOODLUMS

Imagine a gang of milk-crazed teen-age hoodlums terrorizing your block Lactose addicts wholesome-looking as Pat Boone stealing cars and mugging old ladies Shades of *A Clockwork Orange*

Well, it might not be quite like that, but a Seattle, Washington, study suggests that hard-core milk drinking and juvenile delinquency go hand in hand

Alexander Schauss and Clifford Simonson, of City College, Seattle, discovered that hundreds of chronic juvenile offenders drank an average of 12 to 15 eight-ounce glasses of milk a day That's twice the amount consumed by the study's controls youngsters with behavior problems but no run-ins with the law

"It s the last thing on Earth we expected " Schauss, a psychologist says Junk food and sugar were more likely culprits, but the law breakers ate *less* junk food, and only slightly more sugar, than the controls did

So what s wrong with milk — at least in large amounts? Schauss s pet theory is that the preservatives BHA and BHT impair behavior — Judith Hooper

EARTH DAY RETURNS

Like a summons to a high-school reunion, the announcement of a second Earth Day—April 22, 1980—reminds us how young we were

Earth Day 70 was a students' event a nationwide chain of campus teach-ins at a time when the environment was regarded as a precious concern of the middle class Yet environmental awareness did spill over into society in general, bringing the Clean Air Act, the Clean Water Act and the ever-growing fear that we may well be making the earth uninhabitable

Earth Day '80 starts with a public already well acquainted with environmental problems The observance will involve conferences seminars, and street fairs about alternative technology and agriculture energy issues, and community organization Coming as it does about a year after Three Mile Island threats of damage to the ozone layer, and talk of runaway greenhouse effects, Earth Day '80 seems eminently relevant — Anne Klein

Environmental protester at original Earth Day in 1970

An awesome source of perfect energy lies at the core of our galaxy

STAR POWER FOR SUPERSOCIETIES

BY JONATHAN V. POST

Ahead of us is an amazing sight. Our spaceship has brought us thousands of light-years from Earth to the rim of a giant black hole.

The galaxy in miniature appears. A disk of gas, dust, stars, and rocky debris looms ahead, as wide as our solar system. The outer edge is translucent, like the rings of Saturn. Farther in, the disk turns opaque and chunks the size of mountains smash one another into rubble. A spectacular light show begins at the center of the disk. It glows red hot, yellow hot, blue hot, white hot. Everything solid melts and then vaporizes. The vapor swirls and is tortured into iridescent ions. Two stars are spun close together, then are torn apart, exploding in blinding fireworks.

This is the accretion disk, formed of material trapped in the black hole's gravitational field. Energy is lost from the whirling stuff as it collides, compresses, and radiates. Millions of fragments spiral inward, ever faster, ever hotter, toward their fiery death.

Why journey to such a violent place? Because this is where reality assumes impossible dimensions. Here is a source of stupendous energy. Here is a communications link to the far reaches of the universe. Here is a launchpad that will boost a planet-sized payload to

PAINTING BY DON DIXON

nearly the speed of light. Here is a time machine that can fling us a million light-years into the future.

Steering clear of the accretion disk, we hurtle through a veil of glowing hydrogen and neon. Moments later a clear view of the giant black hole emerges. We have waited a long time for this moment. The name *black hole*, coined by John Archibald Wheeler in 1969, compels us to hold our rising expectations in check. Have we come thousands of light-years just to look at a big black ball of nothing? Or will we see the verification of predictions made by Caltech astrophysicists William L. Ames and Kip S. Thorne?

A cosmic rainbow! We gaze upon a brilliant spectrum thousands of times as wide as planet Earth. There is no horizon to interrupt the circular target formed by its sweeping curves. Radiating from the red inner ring are bands of increasing brightness: orange, yellow, green, and, along the outside rim, blue and indigo of dazzling intensity. The name has not misled us completely, however. The core is black—blacker than ebony, blacker than intergalactic space. No light at all, not a single photon, can struggle free from the supergravity and rise up to meet our astonished eyes.

As we approach the bull's-eye, it grows to grotesque proportions. Our confidence begins to waver. If even a photon, traveling at the speed of light, cannot escape, we surely have no chance of survival. Downward we plunge.

While we look back the way we came, the universe appears strange. Stars are not in their proper places; they are all shifting their colors toward the blue end of the spectrum. This is another phenomenon predicted by Einstein's general theory of relativity. Gravity has bent the light rays of the stars away from a straight path, making them look askew. But we are the ones out of position, and we, not they, are suffering the gravitational red shift.

Stranger still is the effect gravity exerts on time. Looking behind us, we see the universe speeding up. All motion seems to be accelerated equally; all music is higher in pitch; all life is moving to a more frantic rhythm. This is because we are slowing down: we have put on the brakes and apparently are frozen forever at the edge of the black hole.

Ahead of us is the surface of infinite red shift. The universe blurs into a dim blue flickering and then an ultraviolet ghost. Illusion to the contrary, we have cut through this surface. Nothing can be seen from behind. We have penetrated the core.

Until moments earlier a black hole was little more than a theoretical entity in our minds. Thanks to modern technology, we are now verging on the warped axis of time and space: cosmic limbo has become concrete reality. Yet before space travel, before there were even the means to detect black holes from afar, a handful of visionaries suspected their existence. Let us briefly review this sequence of events. It may ultimately determine our own fate.

GRAVITY TRAP

In the late 1700s the British physicist John Mitchell first suggested that a sufficiently massive body could hold all matter and all light in a gravitational trap. More than 100 years passed before Karl Schwartzchild calculated that any object would have this property. If compressed into a small enough sphere. The earth, for example, would become a black hole if it were crushed to the size of a grape. In 1939 J. Robert Oppenheimer and his students George M. Volkoff and Hartland S. Snyder deduced that a star could indeed shrink down inside its Schwartzchild radius after its nuclear fuel was exhausted. S. Chandrasekhar and the Russian physicist Lev Landau later showed that for this to happen, the star must be at least twice as massive as our sun.

By the late 1960s, rockets and satellites began to scan deep space for scientific evidence. Such astrophysicists as S. A. Colgate and R. H. White performed computer calculations that showed how a large star could blow away most of its matter and energy in a supernova explosion, causing the remaining matter to undergo total collapse. X-ray-emitting sources and supernova remnants were intensely observed for clues to the mysteries of black holes.

"Our confidence wavers. If even a photon, traveling at the speed of light cannot escape, we surely have no chance of survival. On we plunge to the core of the giant black hole."

One such x-ray source is Scorpio X-2, at least ten times more massive than our sun, orbiting the supergiant star HD152667. Another likely black hole is at the core of M87, a giant elliptical galaxy some 32 million light-years away. Can our galaxy have a similarly stupendous anomaly at its center? Some scientists believe that an object called SS433 may be just that.

According to all the early work in black hole theory, once we have fallen in past the surface of infinite red shift, we are lost. Not only can we not escape, but gravity will be our executioner. A tidal effect begins to take hold. The difference in gravitational attraction between one part of an object and another part becomes significant. If we are falling feet first, our lower extremities will be pulled more strongly than our head. We will be stretched until muscle, tendon, and bone give way. Our cells will be torn asunder, and then gravity will overcome electromagnetism and tear our molecules apart. Bone and sinew convert to a long, thin thread of atoms, no longer recognizable as a once-living being. Gravity then overcomes the strong nuclear force, and our atoms shred. Briefly we exist as a line of quarks, until that line meets the so-called singularity at the center of the black hole. At this point all known laws of physics cease to operate, and no one can say what occurs next.

Would we have taken our voyage only to end our lives so terribly strung out? What saves us from molecular disintegration is something known as angular momentum, or spin. As Roy P. Kerr first calculated, a spinning black hole is different from a nonspinning one. The surface of infinite red shift on an ordinary black hole is a one-way membrane. Matter and energy can pass in, but never out. For a spinning black hole, the surface of infinite red shift bulges out at the equator, leaving a space before the one-way membrane is encountered. This space is called the ergosphere. From the ergosphere, escape is still possible.

We have only a few seconds before falling past the point of no return. Tidal forces have not yet torn us apart, but they have made us decidedly uncomfortable. The readings on our instruments also make us feel uncomfortable. They tell us that almost every direction is down. They also reveal that here, in the ergosphere, it is absolutely impossible to stand still. Everything is moving, mostly near the speed of light.

Just as planned, our spacecraft splits in two. One half is blasted toward the one-way membrane, also called the event horizon. The half we occupy is kicked off in the direction of the black hole's rotation.

Suddenly we leave the ergosphere, break through the surface of infinite red shift, and rejoin the universe at large. As predicted by the British mathematician Roger Penrose, we are moving faster now than when we entered. We have stolen a fraction of the black hole's angular momentum. It spins microscopically more slowly now. We have momentarily tapped the greatest power supply in the universe.

The worst of our fears now past, we drift into a deep slumber. Thirty thousand light-years away, we awaken with a new worry—one that has also troubled many scientists. Has our brief encounter with the black hole catapulted us forward in time? Will we return to the same planet we left, or are we destined to become relics of an era long past? As we approach the Orion Spiral Arm of the Milky Way, our stellar neighborhood looks the same as before. Surely all has gone according to plan, and we have at most gained a year or two. Our suspense will end shortly, for the multicolored globe of Earth is once again in view.

Despite our newly gained perspective on the universe, our thoughts quickly return to

CONTINUED ON PAGE 96

FICTION

GIANT ON THE BEACH

There always seems to be at least one uninvited guest at every cocktail party. Hal's was no exception

BY JOHN KEEFAUVER

The cocktail party was well into its second hour when somebody out on the terrace noticed the naked black lying on the beach—not that anybody at first realized his size. It wasn't until someone, perhaps with fewer drinks in him, looked at the figure through binoculars and yelled, "God, look at the size of him!" that anybody learned of the hugeness of the man. Even after they'd all started down to the beach, carrying their drinks, laughing and chattering about how you never knew what Hal and Liz were going to do to make their party a winner, nobody had any idea who, or what, the black would be.

In fact, even when they could begin to make out how large the man was through the fog and drizzle, a few kept on laughing and making jokes about how Hal had really outdone himself this time, getting a mannequin that size made and hauled to the beach in front of their house and leaving

PAINTING BY DOMINIQUE PEYRONNET

it there. Even when everybody was huddled around the motionless form and could see that the enormous figure was human and had apparently drowned—or at least was unconscious—there were still a few of the drunker ones who refused to believe it and who continued giggling. That Hal! Of course those who knew him at all well knew he would never put a black anything anywhere near his house.

The figure was at least twice the size of a regular man—perhaps larger. And in proportion. There was nothing misshapen or ugly about him. He wasn't bloated. If anything, he was a handsome black in his early twenties, and with a smile—a big smile. It was the smile that made some of the revelers think at first that he was just sleeping—that and the fact that he was lying on his back. But when he was yelled at and shaken, he didn't show in any way that he was alive, and everybody finally decided that he had drowned and had been washed up onto the shore, since he was right on the ocean's edge. However there was one drunk who said he still thought that Hal and Liz were putting them on. "They hired him from some circus," he said. He wobbled over to the black and, almost losing his balance, put his lips close to his four- or five-inch-long ear and yelled, "Time to get up, the show's over!"

A few scoffed at him, but by this time mostly everyone had sobered up enough to realize what was going on, especially after Hal and Liz kept saying—swearing—that they hadn't had anything to do with it. Hal, in fact, was mad—damn mad—about it. "Goddamn nigger, on my beach!" he kept exclaiming. "Next thing you know they'll be right in the house!" Then when he was the first to say that somebody ought to call for an ambulance, a lot of his guests were surprised, until they heard him say that that would be the quickest way to get rid of the man.

Hal must not have realized that the black was way too big to fit in an ambulance. Two or three guests said that they ought to get some blankets to put over him. (Hal had thrown his coat over the black's privates right away.) The blankets would have to be gotten from Hal and Liz's house, of course, since nobody else lived as close to the beach as they did—not that anybody expected Hal to do it. But Hal immediately put his drink down and, with George Bascomb tagging along, ran off to his house. He yelled back, "I'm going to phone the cops!" and he added that he was going to get something more suitable to put over the black's private parts.

As soon as Hal left, Hank Martin lowered his ear to the black's chest and listened for a heartbeat. "Hear anything?" someone asked him. He said he didn't; he said the body wasn't even warm.

"No telling how long he's been lying here with nobody knowing it," Hank said as he began to press on the man's chest, attempting to give him artificial respiration. Others agreed, considering that no one else was likely to be out walking on the beach in such weather (and no one was out walking now, that was for sure); moreover, nobody was apt to notice the body from a house farther along the shore because of the fog and drizzle and near darkness. Just by luck nosy Phil had seen him from the terrace. Who knew how long he'd been in the ocean? It was really cold this late in the year. (Everybody by now was assuming that he'd definitely been washed ashore.)

"Aren't you supposed to turn them over when you give them artificial respiration?" Liz asked Hank.

"Not anymore," he said. "I doubt it I could turn him over anyway."

After a minute or so during which the black showed no sign of life, somebody said, "Breathe in his mouth, Hank," but Hank didn't want to do that. He didn't do it, and he didn't say anything. He just kept on pressing on the man's chest. Every once in a while he'd say, "No telling how long he's been in the water."

"Wasn't a blemish on his skin. Considering how good he looked—healthy—it was hard to think of him as dead, especially with that smile, which he never lost, it was almost a laugh."

Apparently he hadn't been in the water long enough, though, for the fish to get to him; there wasn't a bite on his body that anybody could see. Wasn't a blemish on his skin, although Hank did say that he seemed to have some sort of small cut on his face but that it was too dark now for him to see it clearly.

Considering how good he looked—healthy—it was hard to think of him as dead, especially with that smile, which he never lost; it was almost a laugh. You could see his teeth even in the near darkness. It was eerie. "Can you keep a smile after you're dead?" somebody asked softly. Nobody really knew, but they assumed you could, for there wasn't a sign of life about him, no matter how good he looked.

By this time the man who had yelled, "Time to get up, the show's over!" kept looking back to the house. His glass was empty, and the black was dead. Before he headed back to the house, he said, "Maybe it's lucky for us he's dead, big as he is."

Of course there had been talk about his size. Whether he was alive or not was, in a way, secondary to his size. After all, you could understand how somebody might drown, but how could a person his size—at least twice as big as anybody else they had ever seen—exist? "Especially in this neighborhood," Hal had said before he went to the house. He meant a black in this neighborhood, not that *that* had anything to do with it. (Some thought *then*, anyway.) Whether the neighborhood was all-white or not had nothing to do with his size, a couple of the soberer ones pointed out.

Others, though, who knew Hal better, weren't so sure; they said that the very size of the black made the whole thing somewhat rational from Hal's standpoint, considering what he'd said all his life about blacks, not that he called them by that name, of course. And it was common knowledge what he'd done after he'd found out about that voodoo place some people had tried to start not far from his house a short time ago. There had been talk of shootings, not to mention the fire, but Hal, as usual, had come out of it smiling. Anyway, the longer the black lay there without a sign of life, the wilder the theories got, even if what was said was mostly joking—it that's what it was. There were a lot of nervous chuckles every time somebody said where he thought the giant might have come from. Flying saucers were even mentioned.

By the time Hal and George returned from the house the drizzle had turned into a steady rain. Hal said he'd phoned the cops and that they were calling an ambulance. He had brought a couple of blankets back to cover the man. When Hank put the blankets over him, end to end, they just barely covered him.

Everyone simply stood around in the rain then—those who hadn't gone back to the house already, that is—until Hank said, "If you all want to go back to the house, I'll stay here until the cops come. No use everybody getting soaked."

So everybody who was left, except for Hank and Hal, started back to the house, carrying their empty glasses with them. Then Hal decided he'd go back, too, saying, "I'm not about to get wet because of a dead nigger."

Hank thought he saw one of the blankets move above an arm (he was later to say). Then he heard what might have been a voice. It might have been the wind, though, and in such darkness who could be certain? Had the blanket had moved?

But when the blanket moved again—either from the wind or from the giant—Hank started to walk to the house. There was nothing he could accomplish by staying by the body, and he needed a drink.

He had gulped one drink and was starting another when a patrol car and then an ambulance pulled into Hal's driveway. Hal and George Bascomb and a few of the others led the cops and the ambulance attendants down to the beach. Most of the guests remained in the house, including Hank. At that point he hadn't told anybody about the blanket's moving or about the voice he had heard. He didn't want to be laughed at.

CONTINUED ON PAGE 126

CYBERFORMS

Art's new masters interpret life with technology, not paint

There s a painting at the Frick Collection I never tire of says New York writer and art thinker Bill Chamberlain "Suppose I could literally enter the painting Say that I could actually walk onto the canvas and move around in an environment given to me by Bellini or Giotto or Tintoretto That would be an extraordinary thing to do It s the highest example of technology used in the service of art

Chamberlain is one of a new breed of artists who anticipate a future in which art and technology become so totally merged as to be indistinguishable A world in which the tools of the technician—wires computer terminals TV screens and lasers—are molded by the artist s hands to express the same creative urges as paint and stone

"Technology represents a new natural element added to earth air fire, and water says Otto Peine director of MIT s Center for Advanced Visual Studies in Cambridge Massachusetts "It has become a natural part of everyone s life So when art deals with life it must deal with and through technology This is an essential ingredient of the present and the future

New art born of technology says Gyorgy Kepes (pronounced keh-pesh) director emeritus of the MIT Center, instead of being cold and technical represents a warm contemporary humanism "Art implies to be human in the most holistic and complimentary sense he says "And, in order to be human one has to be aware of

Video motion from Paik (top) and neon in motion (below)

BY DAVID
LYTTLETON-SMITH

Peine's gas-filled 14-meter Milwaukee Anemone (left) floats on air while the Lifesaver fantasy (above) illustrates the potential of computer art

> *Computers may control vast outdoor laser networks to soothe or stimulate the urban complex, as desired*

the essential problems of a certain epoch in history. In our time, he thinks, the central problems are technological, and the new art can describe them better than traditional methods can.

Some in the field, including Chamberlain, predict that computers will be the key technological development in the new art because they can free the artist from much of his production drudgery and allow him to concentrate on creative concepts.

"If we talk about art up to now and back to Egyptian or Sumerian art," Chamberlain says, "the issue of having your tools—be they parchment and pen, chisel and hammer or brush and paint—do even a portion of the conceptual work for you was never even there. That's a brand-new issue."

Others believe that the computer's influence on fine art will be eclipsed by the brilliant potential of laser technology. "The laser will utterly restructure our perceptual environment," Kepes predicts, "and transform the city from a place where we store human beings into an exciting dialogue between man and the world around him."

Whichever form dominates, technology-based art will flourish when technical tools are mixed into the raw reservoirs of creative inspiration by a new, but familiar, type of artist.

"I have a good friend," Chamberlain says, "who can play a terminal the way Vladimir Ashkenazy can play a Steinway. This guy sits down at a computer, and suddenly things begin to happen. He starts bopping around from system to system, effortlessly creating art forms that would take me months to do. He has a relationship with that computer. He's relating to it in a sublime way."

Possibilities arising from this sublime relationship include complex geometric and free-form graphics which computers can generate and display in any medium. Artists like John Mott-Smith and Charles Csuri (pronounced chew-ree) have already utilized computers in this area because they can work at levels of speed and intricacy that the human hand could never attain. This raises the possibility for a unique version of time travel through computer simulation.

Beyond microelectronics, "a new technology of light" will convert urban skylines into orchestrated laser symphonies during evening hours, according to Kepes. "We cannot shape the cities, make them something fancy, rich and embracing, by using chisel and brushes," he claims. "We must utilize the optimum range of contemporary technology."

Already Barron Krody, laser designer at the Art Institute of Cincinnati, and such artists as Rockne Krebs have used lasers to transform public spaces into dazzling light environments. Krebs once created a phantasmagoria of mirrors and lasers spanning the Washington Monument mall. On a lesser scale, Krody has crafted light environments in limited spaces that draw the viewer into sparkling infinity. Creating space and depth through light makes even the narrowest city alley a place of delight and openness, Krody believes.

Our first view of atmospheric light transformation may come during the flight of the space shuttle. One of the vessel's projects will be the creation of a suborbital light show. A human-forged Aurora Borealis will shimmer across the sky in an outburst of light and motion that will be visible to everyone in the Northern Hemisphere. Further ahead we may see permanent orbiting art forms that produce bands of radiance in the night sky. Other ocean-borne laser displays will unite sea and sky into immense dancing-light patterns.

Ultimately, computers may control vast outdoor urban laser networks, just as they now regulate energy and other service systems. The computers could vary the rhythms, colors, and intensities of the displays, soothing or stimulating the urban complex, as desired by the artist.

Lasers also present the opportunity for bringing true three-dimensionality to art for the first time, through holography. Limited 3-D photos have been possible for years, but holography is maturing as an art form. Artists like Harriet Casdin-Silver and Rudy Burkhout create startlingly dramatic and highly resolved images that float in space. More recently, the Russians succeeded in producing a rudimentary 3-D movie more than 90 minutes long.

The future holds promise for holographic and photographic systems that won't require light, capturing images with sound waves instead. These units will have the obvious advantage of working in total darkness as well as in broad daylight. Audio-holography systems are currently in experimental use for medical diagnosis.

The greatest impact of technology-based art will be in the way we relate to art and our world. The new forms, Kepes says, will bring about "a reintegration of the artist into society." The inbred limitations of traditional museums and tightly framed circles of collectors will regress while art spans the globe, touching every life.

Peine tells a story that dramatizes the difference between the new art and the old. A well-known New York collector was scrutinizing an electronic light work. He paced around the piece for a while, looking somewhat puzzled, and then, making up his mind, exclaimed with exasperation, "What good is a piece of artwork if you can't buy it!"

During the Sixties, Peine recalls, "there was a real attempt to domesticate the [technological arts] so that we could put them in a box, because of collectors and dealers. And we had light boxes and sound boxes. We had all these expansive art forms that we could put on the wall or on a pedestal. All this came out of the tradition of collecting objects."

The new art has since broken free from these bounds, and most people in the movement feel this has been good. "I've never liked the idea of visiting art in museums," says Howard Wise, owner of Electronic Arts Intermix, a New York firm promoting new art forms. "That's the appeal of kinetic and electronic art for me. It's a part of everyday life."

Within a couple of decades, according to Korean-born video pioneer Nam June Paik, video will be as common a personal art form as the 35-millimeter camera is today. Paik and Stephen Beck have independently developed the basic tool of video

CONTINUED ON PAGE 100

FICTION

He was the first alien to appear on TV. Ever. And his act really set Jerry and the world on their ears

THE LAST JERRY FAGIN SHOW

BY JOHN MORRESSY

The other networks were wiped out, and they knew it. After this there would be no more "Big Three." There would be only a single network, and Jerry Fagin would rule it like a king.

The others tried to put up a fight, of course. There are no good losers in this business. One network threw together a nude musical version of the *Kama Sutra*. Another did a live eight-hour report on torture and execution of political prisoners around the world. The PBS stations had the best solution. They reran the Fischer-Spassky match.

But only the Jerry Fagin show could offer a real live honest-to-H. G. Wells alien from outer space as a guest. The projected audience was 99.3 percent of all potential viewers. It was figured that 0.4 percent would tune in to the other networks purely out of habit, and the remaining 0.3 percent would be watching their own canned reruns of *The Lawrence Welk Show*.

Given Jerry's personality and the nature of the television industry, the wipeout was inevitable. A cage of tigers can be pretty impressive, but if you drop a gigantic dinosaur into the cage, the tigers all of a sudden turn into pussycats. And Jerry Fagin was looking like a very big tyrannosaurus rex. He had been one all along, but he kept the fact hidden. Most people thought he was a pussycat. Those of us who knew better said nothing—and kept our jobs.

Jerry Fagin was a funny man, as everybody knows. He had half a dozen foolproof comic characters, but he didn't really need any of them. He could stand in front of a camera deadpan, hands in his pockets, looking up at the ceiling, and reel off a monologue that had everybody helpless with laughter. He was born with pure comic instinct. At a party I've seen him zero in on the one person out of, maybe, two hundred total strangers who could feed him perfect straight lines.

Jerry was probably the funniest man I ever worked for, and I've worked for them all. Along with all the funny he had a streak of pure killer. But Jerry had talent, and, more important, he had luck, so the killer side hardly ever showed. He always seemed to be on the scene at the right time or to know just the right person and have something on him.

So he wound up, at twenty-nine, hosting *Late Night Live*. At thirty, he was the hottest thing in the industry. The *Late Night Live* title was forgotten. Everybody called it *The Jerry Fagin Show*.

Jerry could play an audience like Horowitz playing the fiddle, or the piano, or whatever the hell Horowitz plays. You know what I mean. He took small-town talent-show winners

PAINTING BY DONALD ROLLER WILSON

and made them into stars with shows of their own. Just by holding up a book, he could turn a piece of schlock by an unknown hack into a best-seller. He could take a clubhouse errand boy and make him into a political figure. And he did. And they always paid.

The payoff was never in money. By this time Jerry wasn't worried about money. He wanted other things. He just hung in there and smiled and played kindly Uncle Jerry until he needed a favor. He never had to ask twice. Everybody knew that what Jerry Fagin had built up overnight he could tear down just as fast.

When the alien ship landed in Washington, Jerry counted up his I O U's and decided that it was pay-up time. He must have called in every one he had to get that thing on his show, but he succeeded. At the personal request of the President, no less.

The alien was called Twelve. He came from a planet with a name that sounded like cowflop being tossed into a mudhole. Some White House speech writer tagged it Brother Earth, and that was the name that stuck, over the protests of the enraged feminists.

Twelve looked like a human being designed by a committee and built by nursery-school dropouts. He seemed to have started out to be symmetrical, but missed. Two arms and two legs, like us, but they were of different lengths and thicknesses and set just a bit off center. Body lumpy as a potato, with a smaller potato for a head. Two eyes, a nose, and a mouth, but they moved around like the features of a melting snowman. Above one eye was a shiny spot. Twelve called it the weiox and tried to explain its function. No one understood a damned thing he said about it. They figured it was some kind of ear and let it go at that.

Aside from his weiox and a few other small details, mostly internal, Twelve made himself pretty clear right from the start. It turned out that he had been orbiting Earth for the last sixty-three hailumes, which was somewhere around twenty-seven of our years. All that time he was monitoring our broadcasts. And since most of his source material was supplied by television and radio, he had picked up a peculiar view of humanity.

For one thing, I think Twelve never really grasped the fact that there's a difference—most of the time, anyway—between a sitcom rerun and the *Eleven O Clock News*, or an old Cagney movie and a junk-food commercial. They were all new to him, and all equally real. Or unreal. Or whatever.

Twelve's civilization had no word for *entertainment*. The concept simply did not exist for them. They did have some kind of music, but it wasn't an art form; it was a part of their digestive process. And that was all. They had no drama, no literature of any kind, no art, and absolutely no sense of humor.

They didn't have wars, either, and Twelve didn't seem to know what weapons were for. So everyone breathed a lot easier.

Now it was clear to me that if you're going to interview something like Twelve on television, live—before the biggest audience in history—you go get Sevareid out of retirement, or you hunt up a Lippmann or a Cronkite or somebody serious like that. You want the kind of people who cover elections and moon landings. You don't want Jerry Fagin.

But nobody asked me. Jerry Fagin landed the alien and scheduled him for a Friday night show. Then he sat back, read the headlines, listened to his telephones ring, and gloated.

I watched the show by myself that night, and I certainly didn't gloat. I had been alone most of the past month, ever since Jerry dropped me from his staff, loudly and publicly. In this business there is nobody as untouchable as a loser, and an out-of-work

> *"The alien was called Twelve . . . from a planet with a name that sounded like cowflop being tossed into a mudhole. Some White House speech writer tagged it Brother Earth, and the name stuck."*

comedy writer is a loser of the *Hindenburg* class.

So I settled in, hoping to see Jerry screw up and blow his big moment and knowing all the time that no matter how big a son of a bitch Jerry Fagin might be, he was a pro, and this would be the show of his career. But I could hope.

At the same time, I didn't want to see Jerry completely wrecked—just badly damaged and requiring some repairs. Humiliation and disgrace were fine, but I didn't want him ruined. He was still my best potential source of income, and I was starting to feel the pinch. Trouble tonight, and Jerry would be calling me back, asking me to polish up some of the failure-proof routines that had helped put him where he was. And I'd be there. I was not about to turn down the best-paying job in the business just because Jerry had made me look like a fool in public and closed every studio door to me. I mean, I have my pride, but I have my bills, too.

I started watching early, so I could savor the full hype. Spot announcements every fifteen minutes. On the *Seven O Clock News*, a special five-minute report on the universe. At eight, ninety minutes of interviews with astronauts, starlets, clergymen, science-fiction writers, senators, a rock group, and the president of the Descendants of Prehistoric Alien Visitors. During the nine-thirty commercial interlude—toothpaste, deodorants, and detergents hawked in skits starring, respectively, teen-agers and aliens, secretaries and aliens, and housewives and aliens—I started drinking. I could tell it was going to be better than a one-bottle night, and I wanted to start early and avoid having to rush things later on.

After the barrage of commercials came a special one-hour feature on alien visitors as depicted by Hollywood. Sixty minutes of blobs, globs, bugs, slugs, crawling eyes, brain-eaters, body-snatchers, mind-stealers, worms, germs, robots, and androids, and every ten minutes a screaming reminder of tonight's once-in-a-lifetime *Jerry Fagin Show*.

What kind of impression all this was supposed to make on Twelve, I could not imagine. Maybe they made sure he was nowhere near a television set.

At ten-thirty a longer, louder announcement. Then, after the mature-viewer commercials—wine, tampons, and laxatives peddled respectively by diplomats and aliens, female skydivers and aliens, and grandmothers and aliens—a half-hour special to remind the viewer who might have forgotten that there are nine planets in the solar system, that we are but a grain of sand on the shore of the great ocean of infinity, and so on. Very profound stuff, delivered like *Sermonette* or an insurance commercial. I kept on drinking.

Eleven o'clock brought the traditional mix of news, commercials, and station ID, and then, at eleven-thirty, came *The Jerry Fagin Show*. It was presented like the Second Coming.

The familiar Jerry Fagin theme was gone, and so was the studio orchestra. In their place was a selection from *The Planets*, performed by the Hollywood Symphony and the Mormon Tabernacle Choir. Billy Bragg, Jerry's apple-cheeked, white-haired butterball of an announcer, did no clowning on this sacred night. He marched on camera with the step of a man in a college commencement procession. He was in white tie and tails. I took another big drink.

As I should have anticipated, Jerry was playing with his audience. After the solemn buildup, the show opened with a young comic. Billy appealed for a big hand for the kid in his first TV appearance, and the poor jerk—his name was Frankie Mars, for God's sake—came on and did a monologue about aliens landing in Brooklyn. It was the thirty-first one I'd heard since Twelve's arrival. There were alien-and-Puerto Rican jokes, alien-and-cop jokes, Jewish mother-and-alien jokes. I found it all very cozy and familiar. I had stolen a lot of

those very same gags for my early sketches

The comic died and he was followed by a singer who did a new number written in honor of Twelve The only lines I can remember are The whole room rocks and I shake in my socks when you jiggle your eyes and wink your weiox The rest was a lot worse

The singer gave it all she had but she went down like the *Titanic* same as Frankie Mars Scattered applause from three relatives in the studio audience silence from everybody else The entire home audience was either in the bathroom or at the refrigerator Comics and singers they could get anytime What they wanted was Jerry and his guest

That was a distinct Jerry Fagin touch Subtle and deadly I could picture him setting it up the Uncle Jerry smile and This will be the biggest audience in history and I m going to give some new talent a chance And it s not until they re on camera that the new talent realize that they couldn t hold this audience if they stripped naked and sacrificed themselves to a trash compactor I wondered why Jerry had picked this particular comic and this particular singer to destroy Probably an interesting story there if I could dig it out I drank to their memory

Jerry sauntered on camera white tie and all and was greeted with five solid minutes of uproar He stood with his hands in his pockets looking humble and saintly and when the noise died down he made a little speech in which he used the words *honor* nine times and *privilege* eight *Grateful* came up eleven times In just over a minute

Then Twelve appeared at last I turned the welcoming ovation low and took a good look He moved smoothly for something as lopsided as he appeared to be The lumpy grayish-brown plastic sack that covered his pale body didn t help his looks much He looked like something that stepped off the cover of a cereal box and those wacky wandering off-center features were halfway between a nightmare monster and an idiot mask

I turned up the sound The people in the audience were still applauding wildly and Jerry let them go on But when someone whistled Jerry held up his hands for quiet Twelve s eyes and nose moved around a little and then were still

Our guest has requested one courtesy Jerry said Whistling sets up a painful feedback in his communication apparatus so I must insist that no one whistle during the show

Thank you, Mr Jerry Fagin said Twelve His voice rolled out in a deep gluey flow like gravel being tumbled around in syrup

Thank you for consenting to appear on our show, Mr Ambassador It s a great honor Jerry said

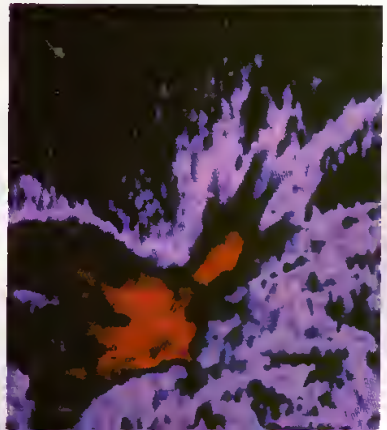
Once Jerry got started thanking he couldn t stop himself He thanked the Pres-

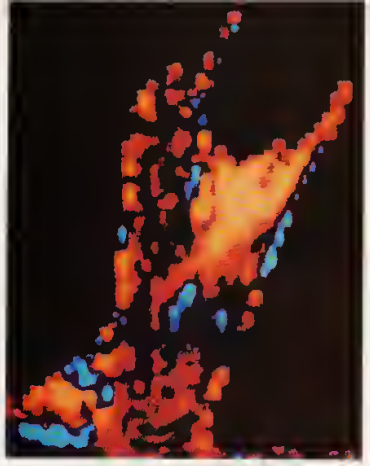
CONTINUED ON PAGE 110

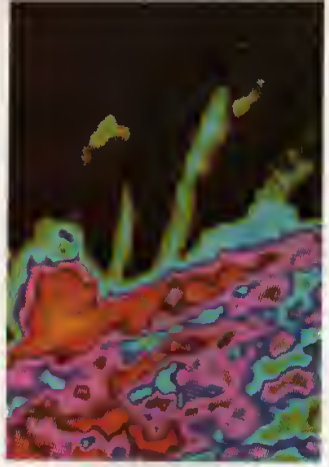
NEW SUN

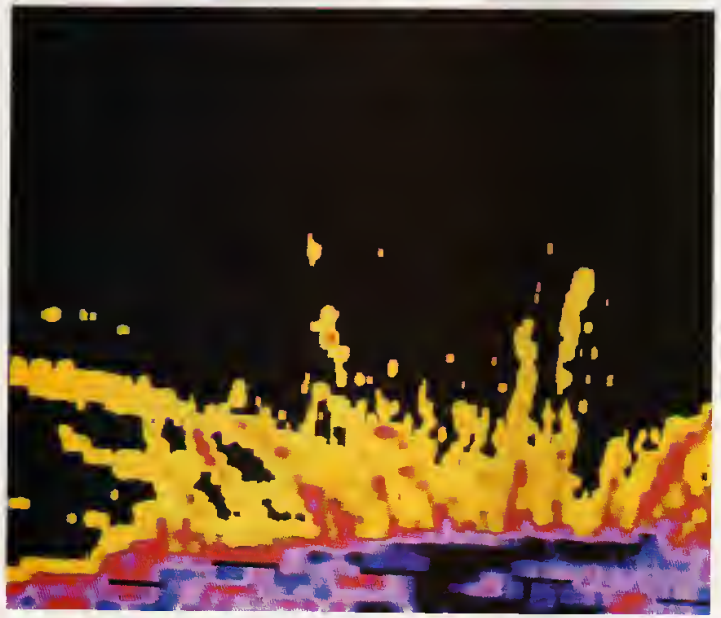
BY MIKE EDELHART

Our vital star's hidden nature unfolds in the clarity of deep space through telescopic imaging. Mechanical eyes borne by orbiting probes transform solar flares into ultraviolet infernos (left) or prismatic computer arrays



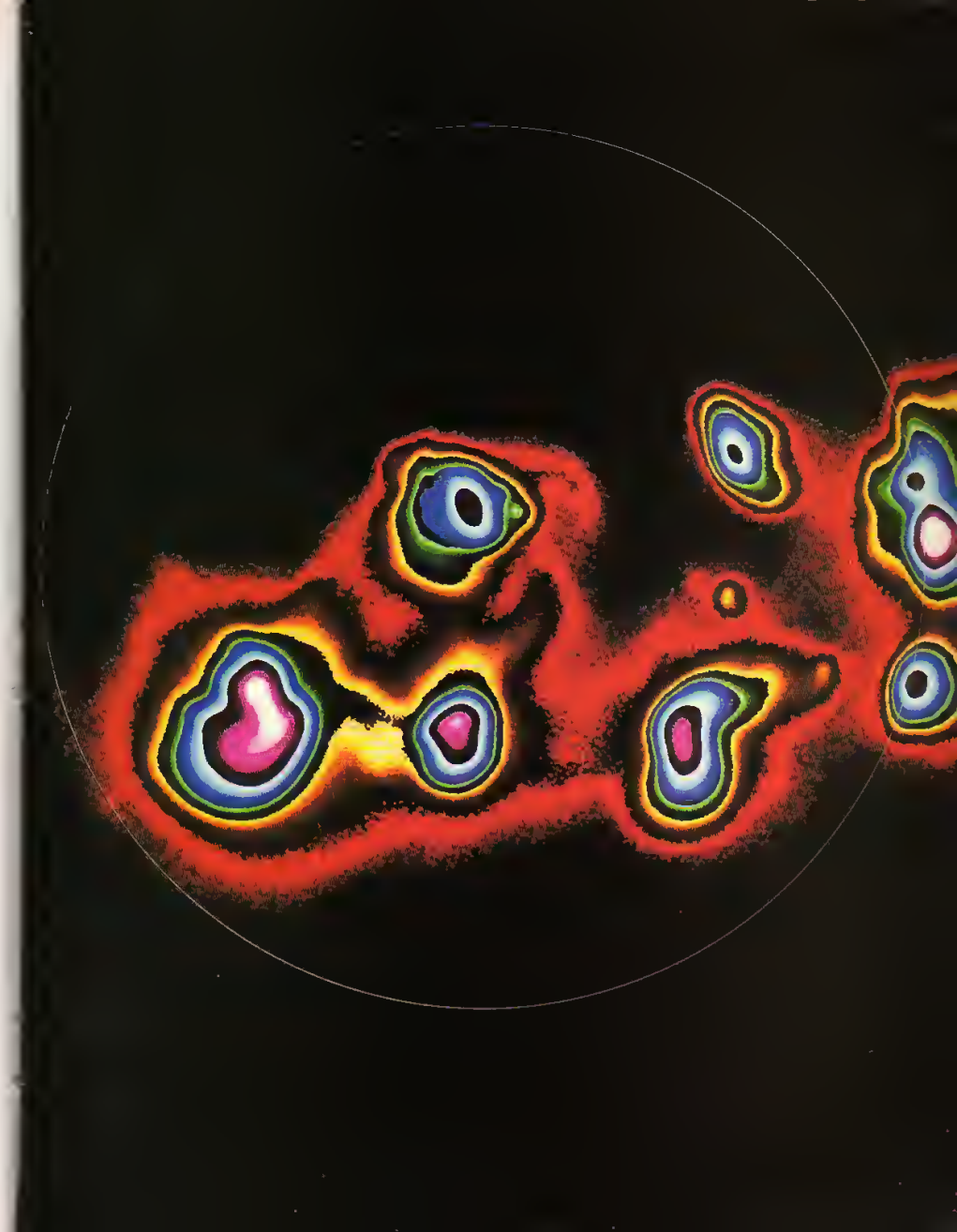






We view the sun from Earth with eyes shrouded by a blanket of air Since the atmosphere gobbles up radiation we have only a ghost of the solar spectacle to study To learn more we launch satellites that peer through the clarity of space These sophisticated orbiting telescopes see emissions from Helios beyond our earthbound senses redefining our image of the sun A multitude of new suns emerges each enriching our understanding of the complex daylight star the H_{α} sun, a blood-red reflection of the light of hof hydrogen the x-ray sun a mass of swirls and pinpoint lights the ultraviolet sun a roiling ionized-helium

Dancing colors result from computer closeups of disruptions on the solar surface (left) an x-ray image shows amoebalike centers of solar violence banding the equator (right) White represents the hottest spots 5×10^6 degrees Kelvin



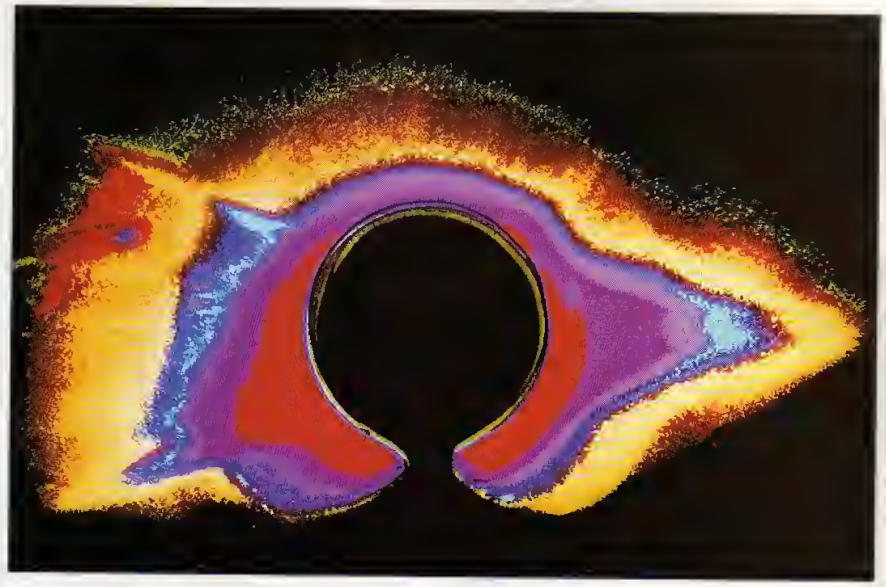


image of the hot layers buried beneath the solar skin, and the magnetic sun, a portrait of the stormy force fields that drive the solar engine.

Computer enhanced images from space have shown us for the first time that solar flares are propelled by raging magnetic loops. The solar wind, which disrupts Earth's magnetic field, rushes out through never-before-seen holes in the sun's corona. Solar poles, we have discovered, are packed with spiny prominences beneath a strangely distended atmosphere. By examining the sun from space, we transcend our terrestrial myopia and establish new pathways to our vibrant star. ∞

A computer-enhanced composite differentiates brightness across the sun's face in a contoured image of solar hot spots (left), while a computer coronagraph displays the multicolored Afro of the normally invisible outer corona (above).

Seen from the clarity of space, the sun reveals itself as a complex crucible of nuclear fusion.

FICTION

WHY DOLPHINS DON'T BITE

BY THEODORE STURGEON

Dom Felix found his faith shaken. But by accepting the challenge, he could bring to mankind its greatest gift

PAINTING BY MICHEL HENRICOT

Dom Felix has brought his credo of Acceptance to the three human-evolved races of the planet Medea. Now, hoping to promote understanding between humans and the native Medeans, he goes to the alien city of Arca.

For centuries, humans have tried in vain to communicate with the Arcans. Only one, Aquare, seems willing or able to talk, and even he has great difficulty translating his thoughts into comprehensible English.

In the Medean city of Arca, however, Dom Felix finds no need for words, for with the help of Aquare he experiences a series of lucid visions depicting the history of Medea. These images are disturbing. The apparent savagery of the Medean life cycle fills him with

disgust. Only gradually does Dom Felix realize that these unsentimental aliens have a wise approach to life and death.

Vision upon vision, with these swift partitions of mist between them.

Arcans, in single file, toiling through the badlands toward the mountains.

The Entry (not an Arcan word, the Arcans have no words)—not so much a cave mouth or doorway but a myriad of overhangs, cavities, and entrances that soaked up the pilgrims like a thread of water falling on a sponge.

Underground (of *course* underground! Would not a high culture, but a non-technological culture, find for itself some environment of continuity not subject to the hellish attacks of Medean weather? And of *course* the Terran enclaves, preoccupied with their own survival, were as yet unaware of it!)—underground, the city, the country of the Arcans. Here was their agriculture (largely fungoid). Here was their animal husbandry, caged and corralled creatures of great variety, feed and excreta neatly sequenced through the farming, or its analogs. Here was their industry, such as it was: tools being hands and pincers, powerful limbs, sheer numbers, and that strange ability uncaptained to team—to move in concert or individually with near-perfect synchronization. It was largely a silent city, completely nonverbal, for they apparently had something better—something better, at least for them, and they had as little use for machines as they had for words.

Here were the young and the females—and an explanation for the almost total similarity of all the Arcans that Dom Felix had yet seen. The inhabitants were anything but similar to one another. The infants had ten appendages, and so had all the young until adolescence. Dom Felix was led through many scenes of regimentation, organization, and ritual, most of which he could not begin to understand, but which he could acknowledge as their schools, their religious institutions, and their conventions. He saw no hospitals and few injured or maimed individuals, though occasionally he saw a damaged or even amputated part obviously healing, even regenerating. It occurred to him that a species evolved from those creatures he had seen in the pocket valley promethean as they were, undergoing successive metamorphoses in each single lifetime, may well have regenerative capabilities. As far as sicknesses were concerned, anything that survived on Medea was by that very fact a prime survival type, and anything that had not killed them off by now could never do so.

He saw courtship and the choosings—a far cry from the coarse brutality of the couplings of the primitives, once he was aware of these, he came to the realization that only six-legged females were so wooed.

He began to recognize something akin to a family grouping—a centaurlike male, a six-legged female, an infant. Sometimes there were two males, one invariably older than the other.

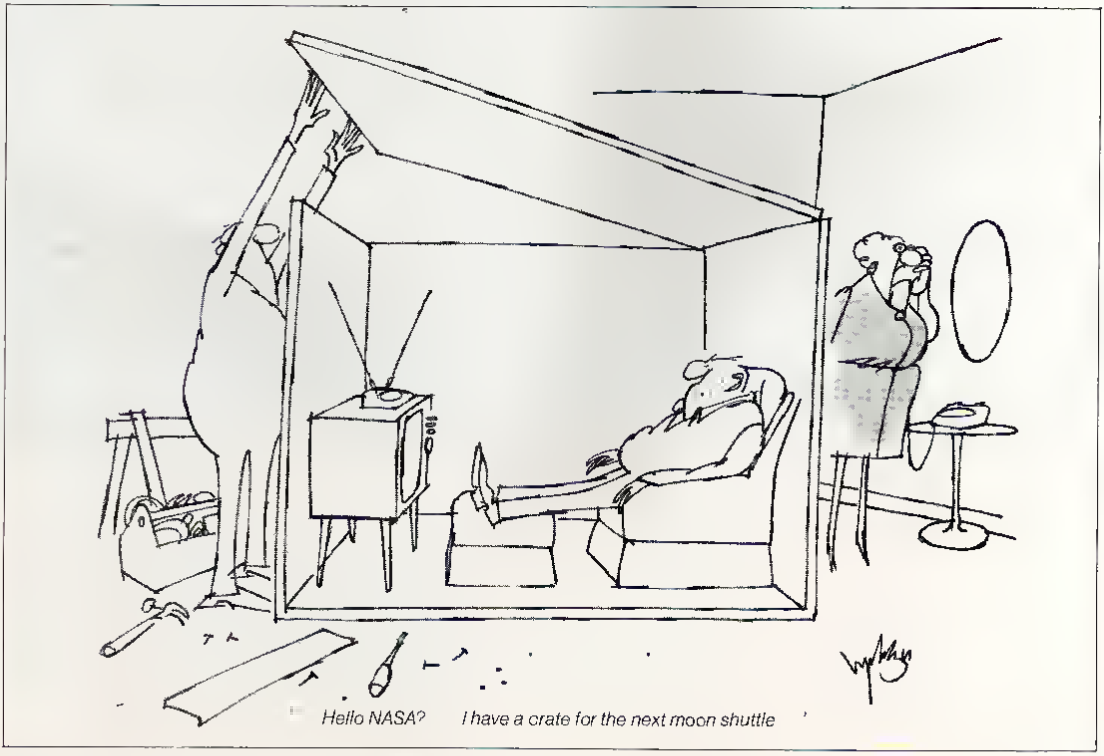
When familiarity began to replace curiosity and confusion, Dom Felix was introduced to the more intimate and—could one say "sacred"?—aspects of the city's life.

He saw the metamorphosis each surrounded by gentle ritual, the first birthing, which apparently changed the child into the marriageable female, and its two phases, the parting of the last body segment and the care and guarding that it went through until its moment came and it delivered, witnessed in joy by the entire "family" and, ritual echoing a far-past biology, the delivery of the afterbirth to the male. Then the second birthing, which changed bride into male centaur and the delivery of this afterbirth to the father of the new child.

Then the ritual of departure for the new centaur, no longer wife and mother, now single and free and male and ready to seek a wife.

And at last the ordeal of final metamorphosis—the separation of the male segment of the centaur and the appearance of the Arcan bipeds known to Terrans—the totally mature, the completed.

It crossed Dom Felix's mind that this was a treasure trove—that the likes of Altair II, anthropologists, and comparative cul-



Hello NASA? I have a crate for the next moon shuttle.

turologists would give anything in life to be able to study these people. The word *confidence* intruded so immediately and so forcefully on his reverie that he was snapped back to his presence in Arca, with Aquare beside him, that he was frightened. He looked at the impassive figure, fervently wishing that the Medean were capable of some sort of expression, of body language, of some way of coloring his flat messages, but Dom Felix only felt that the creature was angry—angry at even the beginnings of the thought that the confidence might be violated.

No words passed at that point. Dom Felix's regret for his own half-formed thought and the devout renewal of his promise were sufficient. Perhaps Aquare needed the reinforcement, not because of the wayward thought, but for the revelations he was about to make.

The visions resumed.

There was the gathering of the bipeds, the Arcans he had known, and the population watching their procession toward the place Dom Felix had called Entry. The bipeds filed through the entire city, their forearms crossed and resting on their heads (where had he seen that before?) until they emerged on their way to the shrine, at which time they lowered their arms.

There was the first copulation, performed on the maturing child by the head of the household, the centaur.

There was the father's solemn ingestion, after the first child was born, of the afterbirth.

There was the similar ritual by the female's mate after the second birth.

And then there was the return pilgrimage to the city.

Dom Felix once read an account of the Parsis, or Parsees, a sect of western India, written toward the end of the first millennium. They were a highly cultured people, and many of them traveled to other countries and attained high places in government and industry. And no orthodox Parsi failed to plan his life and his affairs otherwise than to return home to die, nor failed to make arrangements to have his body returned should he die abroad. No Parsi escaped the curious, the intrusive, the impolite, the callous questioning about the details of a Parsi funeral, and no Parsi was unaware of the distaste, even horror, that these details evoked in other lands. No Parsi was so cultured, so civilized, so excellent in all his accomplishments, nor so polished in his manners that he could eliminate this pall on his presence, the matter was certain to emerge sooner or later, and certainly more than once.

And this was the manner of a Parsi funeral. After the final services, the body was wrapped in cloth and laid on a litter and borne to a great stone tower, cylindrical with no roof. The bearers would unlock and open a door at the bottom, carry their burden through a welter of broken dry bones to the center of the enclosure, set it down, and

leave as quickly as they possibly could

At the approach of the funeral procession the vultures began to clutter the sky coming from everywhere to the tower where they perched on the parapets more and more of them, fighting for places, wheeling and darting when at last there was no more room. And when the bearers left, the signal of the slam of the lower door sent the birds, scores of them, sometimes hundreds, plummeting down the stone chimney in a screaming storm, to tear and devour the corpse in minutes.

Despite the fact that the procedure was ecologically sound, though it denoted a sane evaluation of the mutability of the flesh and the freedom from it of the soul, the Parsis, no matter how superior their conduct, their religion, their culture, were regarded by many as berbarians because of this single aspect of their orthodoxy.

Witnessing the procession of returning pilgrims from Arca and the waiting population that silently met them, Dom Felix was forcefully reminded of the Parsi rites. When they were all within the city, walking steadily and sedately in single file, this time without the strangely defensive placement of forearms on heads, there was—must have been—some silent signal, for the Medeans, one and all, of all ages and degrees of maturity, surged forward and fell on the pilgrims, except for the silence, it was to Dom Felix's mind, the same as the swoop of the Parsis' vultures. In moments the pilgrims were struck down, their heads cracked, their skulls torn open, and their brains scooped out and gulped down. The larger and stronger brought dripping handfuls to the smaller and weaker, until every individual had had some part. Then the corpses were taken up and carried away to be mulched and returned to the soil of the agricultural sections.

"God! God! Oh, my dear God—" Dom Felix fell back on an old chant, to keep his feelings under rein until he could control them again. How much of his feelings could be divined by the impassive Medean, he could not know.

"Can Acceptance accept," Aquare said at length. Clearly a question.

"Well, of course. Acceptance makes no judgments, especially on an—I mean, other-species behavior. Aquare, why do you—did they kill the pilgrims, the old ones?"

"For last sharing."

"I don't understand that."

"You have see now all of us life, what we do, how we do."

"But not why, Aquare."

"Could be you not want why. Could be you know why, not want know."

"There is *nothing* I don't want to know," said Dom Felix heatedly. "Now tell me. Why were the old ones killed like that? What is 'the last sharing'?"

"To make-later the—" (Flash of high flight, flash of red leaves under a white sky.) "Also the—" (Flash of reverent removal of an afterbirth, raising it to the lips of a centaur.) "Together give the seeing."

"I'm trying hard to understand. Are you telling me that by eating the brains of your own kind, and by doing the same with an afterbirth, you can gain that power—to project visions, to see anywhere faster than light can go?"

"That is how. You also."

"What do you mean, me also?"

"Not so well perhaps. But can share from others." Apparently sensing Dom Felix's perplexity, Aquare went on. "You eat brain of music man, you make better music. You eat afterbirth of painter woman, you paint more good."

"Nonsense!"

"Not nonsense. I talk Terrans many-much long time, little with one, little another, much much. Altair Terran can have see-far like Arcan, like many more many else place. Terran always say no, turn away. Terran see *sadhu*—is right, *sadhu*?"

"Holy man." Dom Felix assented.

Double-tripping was a privilege accorded long-term Terran settlers or their immediate children, should they wish to cease their subjective lives and resume them a century or so later.

"Terran see *sadhu*, *sadhu* have see-far, Terran say nonsense. Terran make medicine, medicine give see-far. Terran forbid take medicine, make medicine study, learn medicine."

"You've been talking to Altair, all right. I think you mean drugs, especially mind-altering drugs. They were regarded as dangerous—well, they *were* dangerous. So they were withdrawn, and research was stopped. But I don't see—"

"Terran find other Terran eat Terran. Make stop."

"Cannibalism! Of course we stop it!"

"No animal Medea, no animal Terra stop it. All eat kind but you kind. You breed sister."

Dom Felix did not have a sister, almost said so, then realized Aquare's words were not a statement, but a question. "Would I mate with my sister? Certainly not."

"All animal Terra, all Medea, mate sister, daughter. All animal Terrans make for eat, make for work. Terrans breed sister-brother, father-daughter."

"And you are telling me that if Terrans committed incest and cannibalism, they would have the—the see-far?"

"Yes."

"Then," said Dom Felix victoriously, "why don't our pigs and horses and tropical fish and cats and dogs have it?"

And Aquare intoned, "Many do."

How to dead-end an argument? Dom Felix thought. He tried another tack. "Aquare, you haven't answered my question. About the old pilgrims."

"Yes, I answer. You want answer more. Yes. You see Arcan born, eight legs, two arms. Is female. Make one young, drop last legs. Make one more young, drop two legs. Is male. Soon mate, one, two, more times. Drop two legs. Is no more male. Is no more female. Is Arcan. In brain is self of all life, female self, mother self, woman-love self, male self, male-love self. In brain is all selfs of past Medean before. Now is Arcan, come to time of reward. Come Arca. Now after life of change, change, now no change, now rest. Now stay still, see-far to here-place, there place. Each Arcan sometime find new place, share, share."

Aquare went on. "Time comes to die. Old now. One more share to do. Go home. Last share."

"Do the old ones always make it back? Suppose they die on the way?"

"All share."

All share. Dom Felix could imagine it—the old Arcans gathering around the dying one on the trail, cracking the skull, slurping the brains, throwing the carcass off the trail.

"Acceptance."

"If that was a question—of course acceptance applies—acceptance of all you, are and all you do. Do you doubt it?"

Acceptance accepts Medean.

Dom Felix understood completely and he deliberately refused to respond to it. With great precision Aquare had nailed the fact that Terra would not -probably could not, accept these practices for itself, no matter what the reward.

Dom Felix had forgotten that speech was his convenience, not Aquare's, and was not necessary to the Medean, who knew perfectly well what he thought and felt.

Aquare rose, and Dom Felix rose with him. Aquare said, "Arca here to be near Terrans. Be near. Aquare go to Terrans. Hope join Terrans in the see-far, hope Terrans learn join sentience everywhere. No hope. No hope. Then come you. Is hope. Acceptance say all learn feel like all. I be you, I be you young old male female big little. Anything. Is hope. Is hope. I bring you Arca, tell everything. You not most great Terran. You not great Terran. You only one more Terran. Is no hope. No hope."

Ask Altair why dolphins never bite." And he took off his translator and threw it onto the floor.

And Dom Felix stood for a long time after Aquare sat down against the wall. He spoke to him and shouted at him and picked up the translator and thrust it at him, but none of it made any difference; Aquare, like the rest of the Arcans, just sat. So Dom Felix returned to the enclave alone. There

he found out that Wallich was pregnant with his child

Altair II was a very old man when the transfax writer got him by Receiver from Terra. The historian was quavery and rambly, with occasional flashes of his wit and his ability to flip out aphorisms, but the writer named Trudi, had him on hold for more than a week and got an amusing, though possibly inaccurate, story out of him. Since entertainment scored higher than accuracy, however, there was no permanent harm from that; there seldom has been in the writing of history. This is actually one of old Altair's own aphorisms.

The reason Trudi made the effort to find Altair II and speak to him is that she had learned somewhere that he was the only man still alive who had actually known Dom Felix. How he had survived so very long had a great deal to do with Dom Felix; he, Altair, was a Double-Tripper. Double-tripping was a privilege accorded long-term Terran settlers or their immediate children if they wished to cease their subjective lives at a certain point and resume them a century or so later. This was done, if there was available space, by tripping back to Terra in biostasis, but instead of being defrosted there, being stored until the next ship departed and returning to Medea. This, Altair did, and he lived a long life afterward.

Why? It had much to do with Dom Felix. There were other reasons, of course, but even those led to Dom Felix. "Funny little fellow," he told Trudi. "Crazy, of course. Not crazy, maybe—obsessed. Nothing wrong with that. All the movers and shakers of history have been obsessives. Reasonable people who can see both sides of a question cancel themselves out. One thing he did for me—he straightened me out. I'd been soaking myself for so long in the past that I had forgotten that the present is history, too, and it pays to keep your eye on it. Now I'm a Double-Tripper with a lot of years to boot, and the present I had is now everybody's history, even mine. Heh!"

"About Dom Felix—" Trudi nudged gently.

"Well, you see, he's why I double-tripped. I mean, I had to know. You see that, don't you? How could a historian not know a thing like that?"

"A thing like what?"

"What happened to him! I mean, a man comes to a planet, solves an insoluble social problem, solves an insoluble technical problem, changes the history of the whole human species and probably a lot of others along with it, then goes back to Terra, and what? And *what*? Never another word about him, anywhere. A historian can't hold still for that!"

"All right," said Trudi, to get this out of the way, to get on with her main thrust. "All right, then, what *did* happen to him?"

"According to the transcript I had tucked into my freeze bottle when I went back, very little. I mean, a lot, but very little that explains anything. He joined the Brothers of Shame."

"What is *shame*?" Trudi wondered.

"It's like guilt. He took an oath of silence and never wrote or said another word. The Brothers devote themselves to meditating on their sinfulness. Spend their lives at it and die inside the walls without even a death record. That's what he did, and I'll never know why."

"Ah," said Trudi, unable to think of anything else. "Then, You were going to tell me how he invented the Receiver."

"Yeah. Yeah. He came back from Arca. I was down at the cycle pool when he came in. He said we could have instant transmission, faster than light. He said it could be done. But not that way, he said, never that way. I didn't know what he was talking about."

"Wait a bit. What or where is Arca?"

"Oh, it's long gone. Settlement or something. Medean natives, intelligent species, long gone, too, far as I know. Or maybe went underground. That's Medea for you, full of ecological pockets, mutational radiation, fast evolution, species come, species go. They say there's a whole race of intelligent balloons over on Castorview. An old theory, but now it's supposed to be proven. They—"

"Please—about Dom Felix."

"Yeah. Yeah. After he came back, the natives abandoned Arca. Must've no bodies around. They must've pulled the plug on

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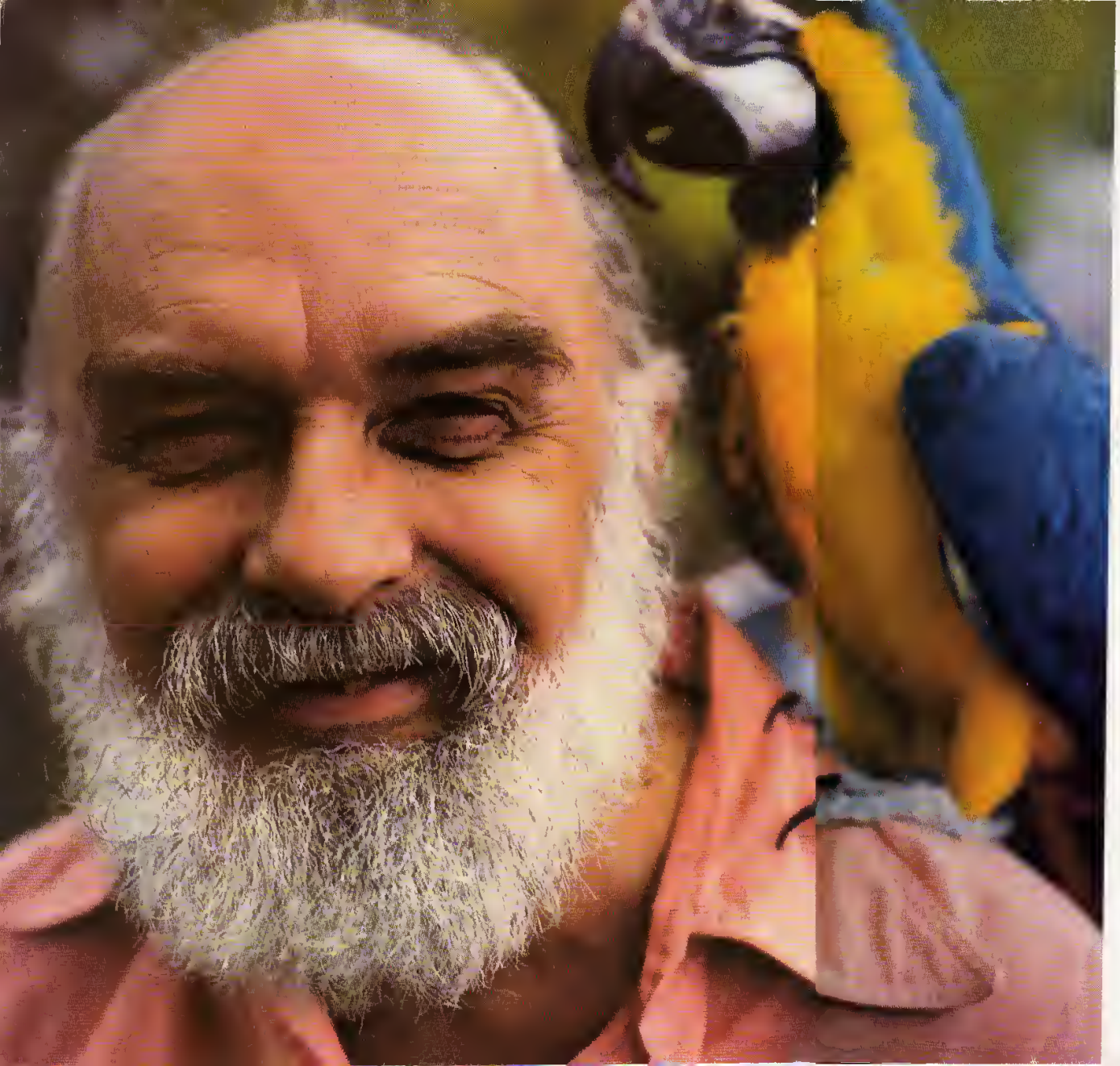


This magician needs no wires to lift paranormal claims into the spotlight and only Occam's razor to cut them into very small pieces

INTERVIEW

JAMES RANDI

It came as no surprise when the closing address of a symposium on science and pseudoscience at this year's convention of the American Association for the Advancement of Science was delivered by a man who proudly calls himself a professional charlatan. A founding member of the Committee for the Scientific Investigation of Claims of the Paranormal (CSICOP), James Randi is more than willing to see such claims taken up by scientists. But as the Amazing Randi, a professional magician and escape artist, he frisks the claimants first and asserts that once he has shaken them down for fraud and self-delusion, not many are left to enter the laboratory. "Scientists deal with truths of nature," he says, "not with chicanery and deceit. I have a peculiar expertise that allows me to see through flummery."

He began to develop that expertise 35 years ago, as a precocious adolescent named Randall Zwinge. His "telepathy" act was so successful that newspapers wrote him up and people began asking him to find lost children. "I couldn't live that kind of lie," he recalls. "So I went back to the rabbits and handkerchiefs." Since then he has performed all over the world, even at the White House, escaped from a straitjacket while hanging head down over

Photograph by Scot Morris

Niagara Falls, and taught Henry "The Fonz" Winkler how to do Houdini's famous escape from a locked, water-filled milk can for an episode of *Happy Days*.

As a principal investigator for the CSICOP, Randi has earned the respect of such fellow members as Isaac Asimov, Carl Sagan, B. F. Skinner, and Martin Gardner. "Perhaps nobody in the world understands both the virtues and the failings of the paranormal as well as Randi does," Asimov says. "His qualifications as a rational human being are unparalleled."

Randi's rationality doesn't cramp his impish, flamboyant style, as the title of his forthcoming book suggests: *Flim-Flam! The Truth About Unicorns, Parapsychology and Other Delusions* (Lippincott and Crowell, 1980). He delights in duplicating the alleged psychic accomplishments of such persons as Uri Geller by the "ordinary" methods of the skillful conjurer. At their first meeting, Randi agreed to do some Geller-style key-bending for *Omni* senior editor Scot Morris. Morris watched closely, undistracted by Randi's patter, and was pleased with himself for spotting the instant when Randi's hand dropped below the edge of the table. Morris put the bent key back on his key ring, only to find the next time he reached for his keys that *all* of them were bent.

Warier than ever, Morris took all his skepticism to the interview sessions. Now, however, Randi set out to prove that his interviewer, too, could be a successful psychic. He laid down a red and a black playing card, then directed Morris to deal out the rest of the deck into two piles, sight unseen. "Just follow your hunches, Scot. They're actually profound psychic impressions." Sure enough, although Randi never touched the cards, Morris was dealing out, until the process was complete, they proved to be neatly separated into red and black piles.

Omni: Incredible! You must be psychic!

Randi: You're kidding, but people have said that seriously. I showed that trick to Colin Wilson, a very well known British writer. I'd had him buy and shuffle his own deck, so he'd be sure I hadn't set it up, and I did the trick the same way I've just done it for you. Astonishing! All red on one side, all black on the other. Later Wilson said in a TV interview that the burden was now on me to prove I was not a psychic, because he had seen me do things that "cannot be done by trickery."

Well, it *was* done by trickery! It's a very old trick, called Out of This World, and I've been doing it since I was eighteen. But Wilson said, as Lyall Watson did in another interview, that it's up to me to prove I'm not psychic. Bull! You can't prove a negative. Let the "psychics" prove that they *are*.

Omni: Do you think that paranormal phenomena are impossible?

Randi: No, I've never said they're impossible. From what I know about science, I'd say there seems to be very little possibility, but at one time there was very little possibility of X rays or stones falling from the sky. I would assign a probability very close to zero to ESP, the Bermuda Triangle, biorhythms, dowsing, and so on—slightly lower than the probability I assign to Santa Claus, for whom there's more evidence. I've seen the red suit and the beard and millions of pictures and paintings.

Omni: A lot of psychics think you're their enemy, that your mind's made up and you're out to discredit them all.

Randi: I do want to discredit those like Uri Geller who are doing ordinary magic tricks and claiming supernatural powers, because they are a disgrace to my profession. They are liars and frauds. But for those who honestly believe in some paranormal power, I only want to show them that the evidence for their belief is full of holes.

Omni: What harm does their belief do? Why not just let them believe?

Randi: To some extent I can say, "Let them believe. It's their life," which is just like giving a heroin addict all he wants. Let him become useless. But why should we let people become mentally useless? When you come to accept such bull, you're open to belief in anything.

Omni: Have you always been such a confirmed skeptic?

Randi: Since I was fourteen or fifteen, when I visited a church in Toronto called the Assembly of Inspired Thought. There I saw a demonstration of the most blatant message-reading act, the old "one ahead" reading method that's used in "spirit churches" all over the world. The innocent people there, who believed in spirits, were just being suckered in. I hated anyone who'd do that to people who believed in them. And I still do.

Omni: Some have said that the bizarre phenomena of quantum theory might yield a theoretical basis for paranormal phenomena—that precognition, for example, might be linked to particles that move faster than light or to instantaneous action at a distance.

Randi: Well, first there's the weakness of developing a theory to explain observations that are faulty from the beginning—paranormal events that just aren't there. And then the parapsychologists take principles of physics, such as the Heisenberg uncertainty principle—which applies specifically to measurements of subatomic particles—and stretch them way out of shape, using them in totally inappropriate ways. You can't apply the Heisenberg principle to a falling apple or use it to explain why psychic abilities disappear when the subject is being watched closely. That's just using science as a smoke screen.

Omni: Is the universe totally rational? Could there be phenomena that are inherently unapproachable by science?

Randi: Well, I do think that the universe is entirely rational. Otherwise we don't have such a thing as science, a system for explaining observed phenomena. I assume that we *can* find explanations for everything and that when we don't, it just means we have to expand science further.

Look, I'm willing to be shown. I've always allowed the possibility that someone can receive telepathic messages or predict the future or affect a pair of dice. I have a ten-thousand-dollar offer for any demonstration, under controlled conditions, of any paranormal ability [see page 108]. If I see a convincing demonstration, I will accept it as a *fait accompli*, and no one will be more thrilled than I. But in thirty-five years of looking for such a demonstration, I haven't seen one. The more you look into paranormal research, the more holes you find in it.

Omni: Why has belief in the paranormal become so widespread?

Randi: I blame three groups. First, the scientists who don't speak up and call their colleagues incompetent when they see the basic rules of investigation being broken. They are as reluctant to denounce one another publicly as lawyers or doctors are.

Then there are journalists, people in the media who shamelessly exploit the public's interest in the paranormal and ignore facts that would weaken that interest. I would point specifically at NBC for [presenting] programs and series that have been totally lacking in integrity. Of course, they declare in advance that the shows are based on surmise and speculation, but the total effect is very different. It's as if your doctor were to say, "Now this is only a tentative analysis, but I think you have terminal cancer. What are you going to remember about that statement?"

Third, I blame the magicians and their organizations that have refused to publicize statements against the paranormal. The Society of American Magicians, at least, has recently made a regulation that its members may not claim divine origins or supernatural powers, and I applaud them for that, as I do the Magic Circle in London, which has a similar rule.

Omni: Why do magicians have a special responsibility? What makes you, as a magician, qualified to judge scientists' studies of the paranormal?

Randi: Look, scientists and journalists can be alert, intelligent, well-informed good observers and so on, but their fatal assumption is that they can detect trickery, whereas they can't. They assume that claims of the paranormal are amenable to scientific or journalistic analysis. Well, they are, but only after they've been taken apart and cleaned up by a specialist in trickery. If you order a hamburger, and the waiter brings you a steer on a bun, it's not the same thing. You have to reduce the steer to meat, right? So I have to reduce the evidence for the paranormal to its constituent parts—and show scientists how to do it—to see whether there really is any good beef in there.

And you know what? After thirty-five years of searching and fifteen years of putting my money where my mouth is, I haven't found a morsel of hamburger. We've been

CONTINUED ON PAGE 104

LAW GIVER

Progress adheres to three precepts set forth by Arthur C. Clarke

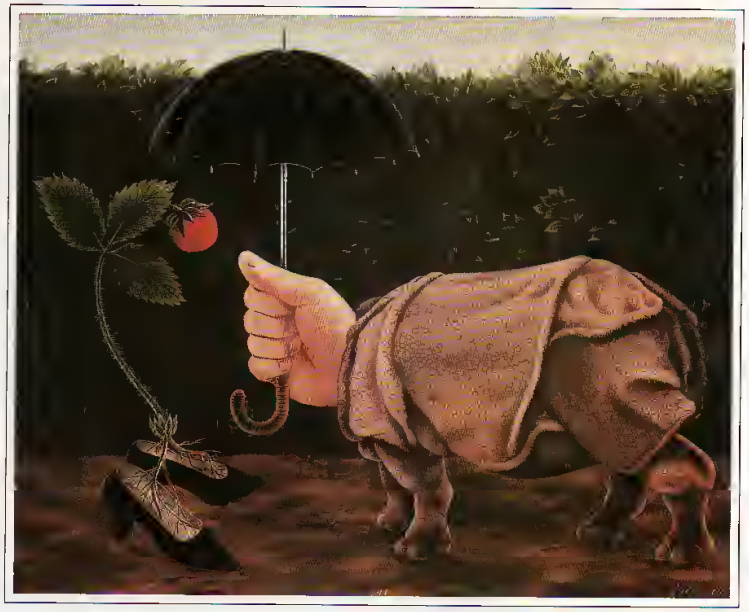
We begin with old age, the steady state, the humdrum condition of narrowed possibilities. It is a state of mind rather than a physiological condition. To be young is to think young, to find possibilities rather than impossibilities. To think young is to enter a magical progression from age to childhood.

The movement is paradoxical. After old age comes mature manhood. What is a man's task? To go beyond the familiar, the reasonable, the predictable. To do what has never been done before. To dive into the bottomless sea of the impossible and stand on the ocean floor.

The final stage is youth. We reach it by going from the established to the unprecedented. We live with magical vision in a child's unobstructed universe. This is the underlying theme of technology—to return us to the magic of childhood, and this time to make it work.

PAINTINGS BY
GERVASIO GALLARDO

Clarke's First Law When a distinguished
but elderly scientist says that something is possible,
he is almost certainly right When he
says it is impossible, he is very probably wrong *
**Elderly* in this context means over thirty



Clarke's Second Law
The only way to find the limits of
the possible is by going
beyond them to the impossible

Clarke's Third Law
Any sufficiently advanced technology
is indistinguishable from magic

∞

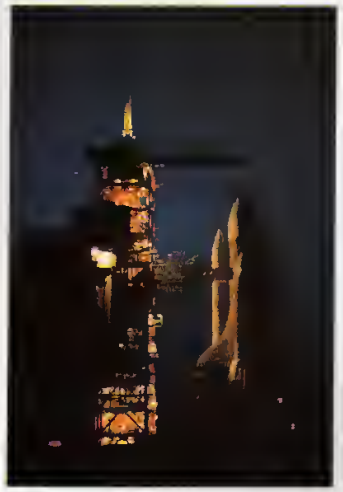
BEYOND EDEN

God, man, and machine will soon share the star-strewn corridors of creation

BY RAY BRADBURY

The Space Shuttle! This will *not* be an article about it. I mention its name as I once mentioned Zen Buddhism in a crowded editorial office: merely to attract attention.

Oh, I'll speak a bit about the Shuttle. But when I've handed you just so much data and fattened you up with what, for me, laughingly passes for fact, beware. From there on, it'll be one long Aside. Be prepared for my arias, my semitheological proclamations, and my secular papal bulls.



PHOTOGRAPHS BY
JAMES L. LONG ASSOCIATES

But first, the Shuttle

Here it comes out of the sky But as its birth nears, there seems none of that old throat wrenching, tear-welling, chest-knocking emotion that bowled us over while keeping us up nights 10, 11, 12 years ago when Space was New and Old Mankind gladly bathed in its waters and told the ghost of Ponce de Leon, "Look! The Fount has at last been found!"

As we remember the triumphant ascensions of *Apollo*, with their thunderous blossomings of fire, we glance half-sidewise at this Shuttle. Have we given up our grand Roman biremes for some smaller Viking open boat? Have we leaped off the *Queen Mary* onto some dumb life raft? How come the next big step for Mankind seems to be one hop back instead of, as Uncle Wiggily said, two ahead?

These comparisons are wrong-headed for the Space Shuttle, if less dramatic, less romantic, less beautiful to contemplate than *Apollo*, could be a greater cornucopia of miracles once it reaches Space.

It is hard to step down, of course. We don't want to give up our nursery Moon or our bloody Mars.

No need.

We must resist the easy metaphors of failure or regression, even as we thrust up these new and difficult machines that measure us against our own sky and, soon after, the full heavens of the Universe.

The Space Shuttle.

How will it profit the men of New Bedford? How many kegs of oil can it bring to your Nantucket Market? Is there a seed farmer in the American fields, a churchwarden on his knees, an idler on Manhattan's docks who, looking up and seeing the Shuttle fly high, will be a penny richer, a half-ounce of philosophy better, less given to ill temper, more filled with salvation?

So might Starbuck have queried Ahab re the White Whale 50,000 nights ago.

My answer must imitate Ahab's, who said, touching his chest, "It will reward me here, Starbuck, *here*!"

For if the Space Shuttle is not as much heart and blood as it is mind and fact, then we shouldn't fly in Space at all.

If it doesn't bake bread for philosophers as well as plastic gimcrack cookware for the ladies, we should quickly invest our cash in street sweepers or a billion more telephones that nonstop talk much and full-stop say little.

I don't have to tell you the weight, size, shape, or crew accommodations of the Shuttle. If you read this magazine constantly, those facts are already yours. The jigsaw pieces of the Shuttle will be manufactured in a dozen countries. But, finally, we ask: Why put it together at all? We go back then to Starbuck's question and Ahab's not-so-mad response.

Starbuck desired cash on the spermaceti barrelhead. Ahab offered a gain in his soul, heart, and blood.

If your long-distance phone bills have been soaring, the Shuttle can bring them down with new and improved Earth-orbiting satellites. Medical labs set up in orbiting, weightless environments may soon give us answers to problems as yet unsolved on Earth.

Mineral and petroleum resources can be spotted around the world, using spectrographic photos from Shuttle-launched satellites. Weather prediction is, of course, already being handled by satellites, but the Shuttle will help us do it better.

The Shuttle Orbiter can also help us fling up solar kites to drift in winds from the Sun, or toss an ion-propelled Eye, Ear, Nose and Throat to see, hear, smell, and taste Halley's Comet as it swerves down to visit us in 1986. And, if we miss our date with Halley, other comets are on their way!

With the Orbiter we might well build vast solar-collection fans to harvest sunlight and shoot it back to Earth to pace our machines, light our towns, reinvigorate our battered pride—all without benefit of Arabs.

> *"I was stunned by the simplest of truths, which overwhelmed me as I gazed at the sky. We are the only creatures ever to inhabit the Earth who have truly seen the stars."*

In what other ways will Shuttle/Orbiter shake our great Christmas Tree of Space?

It will edge us closer and yet closer to the mysteries that surround us and from which we sprang.

Am I speaking of some several-sizes-down Palomar Observatory Telescope shot up to blink at all that Nothing and all those billion stars? I am.

And, in so speaking, I must tell of a night in the summer of 1978, crossing the Atlantic, when long after the ship slept, I stood on deck and saw the clear heavens. I was stunned by the simplest of truths, which overwhelmed me as I gazed at that sky.

We are the only creatures ever to inhabit the Earth who have truly seen the stars.

I thought on this and wrote a poem. Here's half:

They have not seen the stars,
Not one, not one
Of all the creatures on this world
In all the ages since the sands
First touched the wind,
Not one, not one,
No beast of all the beasts has stood
On meadowland or plain or hill
And known the thrill of looking at those fires.
Our soul admires what they
Oh, they, have never known.
Five billion years have flown
In turnings of the spheres.
But not once in all those years
Has lion, dog, or bird that sweeps the air
Looked there, oh, look. Looked there
Ah, God, the stars. Oh, look, look there!

It is as if all Time had never been.
Nor Universe or Sun or Moon
Or simple morning light.
Those beasts, their tragedy was mute and blind.
And so remains. Our sight?
Yes, ours? to know now what we are.

But think of it, then choose. Now, which?
Born to raw Earth, inhabiting a scene
And all of it no sooner viewed, erased.
As if these miracles had never been?
Vast circlings of sounding fire and frost.
And all when focused, what? as quickly lost?

Or us, in fragile flesh, with God's new eyes
That lift and comprehend and search the skies?
We watch the seasons drifting in the lunar tide
And know the years, remembering what's died.

That was as far as I got with the poem.

Returning home on the same ship was Carl Sagan, the eloquent and witty Cornell astronomer, an old friend.

I read the half-finished poem to Carl, who cried, "No, no, you're wrong! There *are* creatures in the world who have seen the stars!"

I was flabbergasted and disgruntled. Carl explained gently.

Recently a group of scientists experimented with raising a certain species of migratory bird in the closed environment of a starless planetarium. Once unshelled, the fledgling birds were raised away from their parents, so that no behavioral information could be passed from old to young.

When the young birds were ready for migratory flight, the southern constellations were projected on the interior dome of the planetarium. These projections were counter to the position of the true constellations outside in the night sky.

The birds promptly rose and flew south! False south, that is, as represented by the wrong-directional images.

So we know that these birds fly by what they see, steered by their untaught genetic intuitions.

My flabbergastedness and disgruntlement vanished. I thanked Carl Sagan and, at my typewriter, revised and finished the poem.

CONTINUED ON PAGE 114

Inventing a future required efforts to discover a past and create a present

THREE FUTURES

BY ROBERT MALONE

An awareness of the future is not a given in our universe. This concept, like the wheel, was invented. As with any invention, the future has undergone many revisions, just as the cultures it serves have themselves metamorphosed. One can, however, discern certain patterns throughout history in which our perceptions of *future* have been intimately linked with the way we regard our past.

Now late in the twentieth century, humankind is still mired in a nonvisionary rut that traces its origins to the ancient kingdom of Sumer. Our tendency to define the future in terms of our past has become more sophisticated, but the method continues to obscure the best pathways to the *real* future. And yet what the Sumerians and other early peoples called future, what we call future, and what the people of tomorrow will call future are three concepts so dissimilar that to truly get where we're going, we had better first examine the key to any understanding of *future*. That key is *time*.

Future-past does not really exist! Like Arthur Conan Doyle's famous dog that did not bark in the night, future-past is interesting precisely because of its nonexistence. Precivilization man lived without a sense of either the future or the past. He was frozen in an all-pervading present. English author J. B. Priestley refers to this kind of existence as Great Time, a nonsequential, all-at-once existence rooted in nature.

The visions we do have of these people reflect the totality of their life within Great Time, and this totality cannot be broken down and analyzed separately as art, religion, or social custom. Cave paintings and fertility figures are what they are, no more, no less. If there was any substance to their future, we may guess that it was associated with the unknowable forces of nature or the mystifying actions of those peoples' gods. The future becomes recognizable only when a society begins to record its life cycle through some form of calendar, written symbols, and a structured mythology. The mythologies of Sumer and Egypt (5000 B.C. and after), with their concept of an afterlife, were built around a glorious, though mysterious, past. The events of this super-past constituted the major body of information passed on by priests, medicine men, seers, or leaders. Similar to an ingrown hair that returns to its host, the future was in the past. Who needs a future when the past is so available and filled with wonders? Eternal life was the one condition to look forward to, but as an eternal life in an eternal past. The Egyptian culture endured this static condition not for decades but for centuries piled on centuries. The primary focus of Egyptian life was to arrange for the proper "passport" to eternity. This passport consisted of reciting essential passages from the *Book of the Dead*, which were later inscribed inside the coffin's lid (no point in taking chances). Eternity became their one vision and a substitute for any real sense of the future. The Egyptians stuck to this grave vision for thousands of years. Societies that believe that time is cyclical may be extensions of this early view of time.

American Egyptologist James Henry Breasted pinpointed the "world's first individual" as being Akhenaton (Amenhotep IV, 1388–1358 B.C.). At some point in his life, old Akhenaton (not too old, since he died at thirty like all his friends) tried to break out of the Egyptian mold by saying to himself, *I exist. I am. I am conscious. I can change things. Move men. Twist the course of events. Create a new religion if I wish.* Neither his vision nor support for his vision among his contemporaries came to pass. Akhenaton lacked a structured sense of time. Hours were not to be broken into minutes and minutes into seconds until the fourteenth century. He also had no way of knowing that he needed to invent not

PAINTINGS BY THOMAS AKAWIE

just himself but also the scientific method and thereby the key to evolutionary growth both biological and technological This was a tall order for any man especially for one whose culture steadfastly clung to that continuous best-seller *Book of the Dead* Yawn!

The future stayed put on the back burner The past flourished for the next 3,000 years as Eden Arcady and the Golden Age A place for heroic deeds A place dominated by mythology A limited day-to-day vision was sustained by reading entrails and offering sacrifices in exchange for the latest news from an oracle The future was limited to chance predictions of win place or show Even Plato's *Republic* appeared less a vision of tomorrow than a simple restructuring of the priorities of the present Plato created his own ideal vision of the present, which may have been the first step out of the past—to an intimation of the future—but the classical world of Plato was narrowed to the city-state in the everyday here and now just as Plato's Christian counterpart Augustine limited the possibilities of the future to the achievement of an eternal city of God

The Renaissance is popularly thought to be the breakout point for new ideas and new individualism Leonardo da Vinci is often considered the darling of this period and consequently, a modernist But as Freud has said, He was a man who woke too early in darkness while others were still asleep Three thousand years after Akhenaton, Leonardo tried his wings but essentially failed, for he was really grounded in the Middle Ages His visions of flying and driving unlike his public visions of equestrian figures, were private visions Leonardo's ideas were not acted upon by his contemporaries As a visionary he never made it out of the closet But he did by sheer brilliance and an imagination no one has ever equaled create on paper wondrous tools machines and architecture These were the end game of a deductive and medieval view of the world however He never made it to the scientific method and inductive reasoning; therefore he could see only the outside shell of reality and not the scientific principles underlying time and space Sweet dreams Leonardo

FUTURE-PRESENT

Francis Bacon is a man of future-present The late anthropologist Loren Eiseley said of him Bacon, more fully than any man of his time entertained the idea of the universe as a problem to be solved, examined meditated upon rather than as an externally fixed stage upon which men walked His *Novum Organum* (1620) and *The New Atlantis* (1627) were radically different from other works of his time and went a long way toward confirming the potential of the scientific method Bacon saw the universe as a demonstration of knowable laws not as an extension of mythology or fantasy The only barrier to knowledge of these laws was spiritual hesitation and an adherence to dogmatic philosophies which Bacon described as "idols of the theatre" Bacon lived in a world still dominated by dogmatic philosophies—philosophies of such power that in 1600 they could force Italian seer Giordano Bruno to be burned at the stake for expounding upon the existence of infinity Better, of course, to die for infinity than for some smaller issue Bacon's burning (no pun intended) occurred in later distortions of his thinking by otherwise noble historians But Bacon moved us from myth to fact from permanence to process from alchemy toward chemistry from squaring the circle toward calculus from astrology to astronomy, from guess-and-by-gosh to observation and disciplined reason from magic to science

Bacon was not trapped by objects He did not sit about inventing specific objects such as parachutes machine guns or submarines His attention was fixed upon the relationship between events in time and space, but the world did not get into immediate step with Bacon or the scientific method Nothing so complex could blossom all at once There were other voices retrogressive, tugging to maintain the status quo One such voice grew out of the slightly earlier visions of Sir Thomas More English writer and saint-to-be His *Utopia* (which means "no place") reintroduced Arcady with shades of the *Republic* a place of religious tolerance, an ideal state a place where all folks shared, a commune (pre-Kool-Aid)

> *Leonardo da Vinci tried his wings but essentially failed, for he was grounded in the Middle Ages; he could see only the shell of reality As a visionary, he never made it out of the closet*

Only the good guys and gals needed apply However More's utopia and most utopias since had their roots in the values of the past (a simplicity real or imagined, our 'old West' for instance) which magically circumvented lust garbage overcrowding and, most important any fully realized or individualized person In the enlightened twentieth century we've learned to have second thoughts about visions that do not include telephone bills divorce and other sticky wickets including an odd cavity or two These views, however can invariably be reduced to the Orwellian remark 'If you want a picture of the future imagine a boot stamping on the human face—forever and remember that it is forever' Is there something else?

Contrary to George Orwell's tableau, the late nineteenth to early twentieth century held firmly to a vision of the future perfumed with optimism sprinkled with the euphoria of progress, and distinguished by its mastery over nature The future was conceived as the inevitable betterment of humankind Ideally everyone had an equal chance, yet we know in retrospect that relatively few prospered Real power was gained from the scientific establishment With the development and distribution of a massive new technology the invisible power of principle was made visible in the form of goods and services

This period not only shared with Leonardo a preoccupation with objects and inventions (which lingers to our day), as typified by Jules Verne and H G Wells, but also extended More's idea of a better social world in visions like Edward Bellamy's *Looking Backward*

Future-present, therefore is dominated by measured time and is limited to an overwhelming concentration on objects mechanisms and other practical inventions Its measured time lifts out of Great Time to the first awareness of time as a three-part abstraction past present, and glimmers of a future

A more complete vision of the future depends upon a view of time that offers progression both biologically and technologically True science fiction poses fresh alternatives to the mundane constraints of future-present It enlists the underpinnings conceptual structures and facts of the scientific and industrial revolutions (notably time space causality energy and evolutionary process) to create something recognizable Fantasy on the contrary is oriented to deeds of past heroism and may be another disguise for mythology Science fiction, at the very least, wears the mask of reason

Science fiction is still with us and is now contending with the newer force of nearer-my-computer-to-thee futurists Futurists are often unable to see the future for the statistics Their statistics are a product of present readings present values and present visions Statistics too often have a homing device that mirrors what already is instead of giving a clue to what may be

Futurists are, to a person, all honorable people, but they do bear watching like those South American fish that have been observed climbing trees A bit tricky We will have more to say about the futurists in future-future

Future present has brought out, by one predictive vision or another, much that has come to pass It has also goofed outrageously Arthur C Clarke in his provocative *Profiles of the Future* writes "The facts of the future can hardly be imagined *ab initio* [from the beginning] by those who are unfamiliar with the fantasies of the past" He reviews the results and failures of both ex-

CONTINUED ON PAGE 120

Preceding page, Detail from paintings by Thomas Akwete

STAR POWER

CONTINUED FROM PAGE 46

more immediate matters Although we will certainly impress those who boast of exotic vacations, we can t help wondering whether our trip was worth $30 billion To justify the cost we ask ourselves how black holes could benefit mankind What kinds of cosmic engineering become possible when we add black holes to the toolbox?

NEW WAVE

A supersociety needs a supercommunications system Used as a transmitter of gravity waves a black hole could link up the farthest corners of a galaxy

Einstein's general theory predicted that any lump of matter when wiggled jiggled or spun will generate gravitational radiation or gravity waves Because gravity is the weakest force, no human actions can produce a detectable amount of gravitational radiation Most scientists reasoned that there was no point in building a gravity wave receiver when there was no way to transmit the waves in the first place

Joseph Weber at the University of Maryland thought otherwise In 1969 he took a one-ton cylinder of aluminum hung it in a vacuum and shielded it from electrical interference and mechanical vibrations in the environment He glued quartz crystal strain detectors to the cylinder so sensitive that they could detect a distortion one one-thousandth the size of an atomic nucleus The shielding wasn t perfect and the footsteps of marching student protesters did not aid his cause On a very limited budget that included his own meager savings he built another device hundreds of kilometers away Then he connected the two by telephone

Only an extraterrestrial signal could vibrate both aluminum cylinders at the same time Sure enough at irregular intervals averaging once every four days both detectors would respond together Weber announced that he had detected gravity waves

The scientific world did not share his enthusiasm Why? Because his measurements suggested that gravity waves came from enormous cataclysmic events involving huge masses moving at incredible speeds Everyone knew that nothing of the kind was going on in the direction his receiver indicated the center of the galaxy

In 1974 the pendulum of scientific opinion swung the other way That year Joseph H Taylor and his colleagues discovered a pulsar 15,000 light-years away in the constellation Aquila A pulsar usually results when leftover matter from a supernova explosion partially collapses into a neutron star This kind of star derives its name from the fact that a hot spinning neutron star will emit extremely regular pulses of radio waves light X rays and other radiation

The Aquila pulsar is near an invisible companion perhaps another neutron star or perhaps a black hole The two objects waltz around each other in an eight-hour orbit, moving at 0.1 percent the speed of light, According to Einstein s theory the system should radiate gravity waves

Taylor clocked the orbital period If the two objects are falling closer together the orbit should speed up by one ten-thousandth of a second each year This is exactly what Taylor found Over four years the period changed by four ten thousandths of a second While this is only indirect evidence that gravity waves exist astronomers trust orbits more than they trust Weber s gadgets Belief in gravity waves has been growing, and the budgets for developing devices that will detect them have also been growing

Today more than 20 laboratories around the world have built, or are building, gravity-wave receivers Some are variations on Weber s original model, others employ lasers Doppler tracking and microwave cavities in their designs

"Looking behind us, we see the universe speeding up But to a distant observer, it is we that are slowing down, we have put on the brakes and seem frozen forever at the edge of the black hole."

There are at least three ways to get gravity waves from a black hole We can drop something into it and get a splash of radiation We can move something in an orbit near the black hole and get a continuously changing mixture of gravity-wave frequencies We can also move the black hole itself which is easy to do if we have another black hole at hand Each of these methods might be useful to a supersociety

Dropping a planet or star into a black hole releases a flash of gravity waves that could be detected anywhere in the galaxy No radio station on Earth has a fraction of that range In contrast to electromagnetic waves gravity waves are absorbed only negligibly by interstellar dust clouds so reception is good on any planet circling any of 100 billion stars Invisible flashes of this kind can certainly attract attention, but can they be used to transmit meaningful messages?

GRAVITY TELEGRAPH

Yes, even the simple 'flash' mechanism of gravity-wave transmission can help to link supersocieties into a galactic communications network Imagine sweeping up all the odds and ends that clutter a typical solar system A collection of comets and an assortment of asteroids are easily obtained Deflect these bits of cosmic junk so that each one will fall into a black hole at a precisely timed moment Nothing more elaborate than a hydrogen bomb is needed to produce such a deflection The big pieces make big flashes as they fall into the one-way membrane The little pieces no bigger than mountains make little flashes If we have a stream of comets and asteroids some arriving every second we will get a rapid series of dots and dashes—Morse Code! Thus the simplest form of gravitational telegraph would require only rocket and H-bomb technology—and of course a black hole

In our own part of space SS433 seems to be the most promising black hole candidate for the job Recently however some scientists have argued that it is not a black hole In their view the red shift/blue shift effect could be caused by twin jets of ionized gas traveling at 25 percent the speed of light and spinning like a lawn sprinkler Even if this turns out to be true we still need not suffer a black hole crisis Dozens of other peculiar stars in our galaxy are also under investigation

A refinement to the gravity telegraph is suggested by the work of two mathematicians Reissner and Nordstrom who drew upon Einstein s theory They studied the effects of throwing energy not matter at a black hole Electromagnetic energy such as light or radio waves is partly absorbed by black holes (remember why they are called black) A large portion of the electromagnetic energy is "reflected" from the black hole, but not the way a mirror reflects The energy goes in as electromagnetic waves and is reflected as gravity waves This means that any source of electromagnetic energy can be made into a gravity-wave transmitter

Gigantic lasers have been proposed for interstellar communication Why haven t we seen any? One possibility is that lasers are in common use throughout the universe but that they are beamed into black holes and are reflected away as gravity waves A more powerful source of electromagnetic radiation is the pulsar As we have seen a pulsar is a spinning neutron star that emits beams of light, radio waves, and X rays The output of a pulsar may be converted into gravity waves by the Reissner-Nordstrom effect This produces gravity-wave signals that flicker on and off in a distinctive way The timing of the flicker is exact to a trillionth of a second

You may be wondering what happens when gravity waves are dumped *into* a black hole Does something even more bizarre emerge? Not at all Just as electromagnetic waves are reflected from black holes as gravity waves gravity waves are reflected from black holes as electromagnetic waves This indicates that a black hole may be useful not only as a transmitter but also as a receiver of gravita-

tional radiation

The ability to detect and measure gravity waves opens a new window on the universe Astronomers R.F.C. Vessot and M. W. Levine at NASA's Jet Propulsion Laboratory hope to observe gravity waves by precise Doppler tracking of a spacecraft that will be launched by space shuttle in 1987. If successful, valuable data could be gained about the violent astronomical events surrounding SS433. Commenting on this project, the scientists point out, "It will be the most important form of astronomy we're going to face, as exciting as when Galileo first turned an optical telescope on the skies." Even without using gravity waves, a black hole can help to establish two-way communications over interstellar distances. The technique is known as the gravitational lens.

Einstein described the gravitational-lens effect in 1936. The gravity field of a star, he calculated, could deflect the path of a beam of light from another star. To a properly positioned observer, several light beams may be deflected to a common focus, forming a brighter image.

Von R. Eshleman, at Stanford University, extended Einstein's concept by demonstrating how the gravity of our own sun could be used as a lens for shortwavelength radio signals. His approach entails launching a spacecraft to the "zone of focus," where signals from a target star are gravitationally deflected to a point of intense brightness. Equipped with antennas for receiving shortwave radio signals, the spacecraft should then be able to "eavesdrop for technological activity on a favorable planet." From this position, it can also transmit signals if there is reason to believe that something out there is listening.

The advantage of Eshleman's technique is an amplification at the focus by a factor of 100 million, which allows conventional equipment to transmit and receive over a distance of 350 light-years. Thousands of stars lie within that region.

There are two disadvantages. The spacecraft can be lined up with a single target star only while it is in the zone of focus. More important, the focus is beyond the limits of our solar system: hundreds of times farther away than the distance between Earth and Sun. It could take a generation to put a spacecraft at the right place. Any civilization near enough to a black hole would not encounter these problems.

Because a black hole has a more intense gravity field than our sun has, it makes a more powerful gravitational lens. Swarms of communications satellites quite close to a black hole could focus in on worlds of other stars. Owing to the smaller distances involved, the satellites could be more rapidly moved to the focus zones for other targets—including Earth, Eshleman remarked. Properly placed receivers with antennas of modest size could in principle scan the earth and discriminate between different sources, mapping such activity over the earth and learning not only about the technology of its inhabitants but also about their thoughts. "Who, or what, might be eavesdropping on us at this very moment?"

COSMIC POWERHOUSE

We have seen the application of black hole technology to communications, with gravity waves and gravitational lenses. We have hinted at the use of black hole ergospheres to slingshot spaceships at enormous speeds. Black hole technology could also furnish a fantastic solution to our energy problems.

How can we compare black holes with black coal? Consider the issue of energy efficiency. Numerous factors affect our energy situation, such as pollution, safety, development cost, and availability, but efficiency may matter most in the long run.

Once again we follow Einstein's footprints. The famous equation $E = mc^2$ tells how much energy (E) is potentially available from a given mass (m) of matter. This equation sets a limit on all energy systems, establishing a 100 percent efficiency maximum. The question is: How close to 100 percent can we get?

"30,000 light-years away, we awaken with a new worry: Has our brief encounter with the black hole catapulted us forward in time? Are we destined to become relics of an era long past?"

We have much room for improvement. The most powerful energy source currently available is the hydrogen bomb, which converts nearly 1 percent of its mass into energy. Compare this with what happens when mass is dropped into a rapidly spinning black hole. Under these conditions, Drs. Remo Ruffini and John A. Wheeler, of Princeton University, estimate gravity-wave production has an energy efficiency of 6 percent. The gravity waves may be used for communications, as in the gravity telegraph described earlier, or they may be converted into conventional electromagnetic energy by the Reissner-Nordstrom process. Supersocieties can hit two birds with one stone, disposing of garbage by throwing it into a black hole, then extracting useful energy as the garbage falls in.

Next consider what happens when two equally massive black holes collide. The details are somewhat fuzzy, but after the dust has cleared away, we have one larger black hole. Intense gravity waves scatter off at the speed of light. If the two black holes are spinning at maximum speed in opposite directions, then the total energy release includes the energy stored as angular momentum, and it is 50 percent efficient. This is 50 times better than a hydrogen bomb and fully half of the Einsteinian ultimate.

Better yet, if both black holes are carrying massive electrical charges, the electrical energy is also released, and the "black hole fusion" improves to 65 percent efficiency. This remarkable figure led Drs. Demetrios Christodoulou and Ruffini to assert in 1971 that black holes are "the largest energy storehouse in the universe."

Still 65 percent is not the maximum. The figures continue to rise like the price of gold. Charles W. Misner, professor at the University of Maryland, suggests starting with four black holes, extracting energy by fusion into two black holes, then extracting more energy by fusing those two. Or start with eight black holes, collapse to four, then two, then one. By this process of successive fusion, we can come as close as we like to 100 percent energy efficiency.

John G. Taylor, a mathematician at the University of London, has referred to the black hole fusion process as "farming." Supersocieties build or acquire a crop of large stars, already useful as sources of solar energy. They are triggered into supernova explosions, which yield more energy and leave black holes behind. These are "harvested" by pairs. A shortage of rapidly spinning stars could thus be evidence that "farming" has already taken place.

Science-fiction writer Stanley Schmidt (a Ph.D. physicist himself) suggests that the titanic explosions astronomers have observed at the cores of galaxies such as M82 might actually be "industrial accidents": black hole farming that ran amok.

DESIGNING A GALAXY

The ultimate challenge for black hole technology is to re-create an entire galaxy. N. S. Kardashev, an associate of Iosif S. Shklovsky at the Sternberg Astronomical Institute and Freeman Dyson regard black holes as crucial in the evolution of advanced societies. They divide supercivilizations into three classes on this basis.

Class I societies consume or produce an amount of energy of planetary proportions. We are at the very bottom rung of the ladder. The total amount of energy we have consumed to date is still only a tiny fraction of Earth's power resources. Until we have harnessed the weather and climate, tamed the earthquake and volcano, restructured the ocean, mined the moon, and begun to tap the spin of the earth, we will not have reached the full status of a Class I economy.

Advanced Class I's colonize solar systems, exchange information and robot ambassadors, and enter Class II when they begin to exploit the energy of a star. A stellar-energy source, for example, can be surrounded by a Dyson Sphere. All the mat-

ter in a solar system is restructured. All the planets are torn apart, transmuted and put into a thin shell around their sun. A billion billion "people" can walk, swim, fly or squiggle around the inner surface. All the starlight is used. A 100 percent solar-energy economy can then supply a culture millions of times larger and more interesting than our own. This is the "middle class" or property-owning level, of galactic civilization. Infinite wealth and power, however, can be obtained only by tackling the black hole industries.

Black hole technology is an entry point into Class III society. A Class III civilization deals with a galactic level of energy. Stars are mere tools; planets are passé. Such a civilization, by our standards, can do anything possible. They are able to restructure everything in their environment. They can grow beyond all ecological limits. They can control the destiny of island universes. By throwing stars into black holes and sucking energy from the ergospheres, of course, they also destroy 10 billion years of natural history.

Giant gamma ray bursts from a supernova remnant, N49, overwhelmed sensors on six American and three Soviet spacecraft on March 5, 1979. The signals were emitted 180,000 years ago from the Large Magellanic Cloud, a neighboring galaxy. Do Class III civilizations use giant black holes to modulate such signals and achieve intergalactic communication?

This brings us back to the question of how a galaxy should be engineered. As we have seen, the center of our galaxy is a crowded, bright, noisy, radiating neighborhood. In a mature, expanded society, the inner city declines in population. The ring of suburbs around the central city becomes a desirable place to live, even if it must be landscaped from scratch. This may also be true in the Milky Way.

A Class III civilization might see SS433 as its ticket to the suburbs. Millions of stars might be thrown in, half of them falling into the incomprehensible singularity and the other half being flung outwards in a huge smoke ring of hydrogen.

Halfway out to our dull area, the hydrogen can be collected into new supercity regions and be built into new stars. In what was once the "country." Heavy elements are also sent by black hole shuttle to the new neighborhoods and are built into planets and Dyson Spheres. Many new stars will be formed in a ring outside the galactic core, in dense new clusters, but most of the light from these stars will be used by vast and contented populations. Only the heat leaking through the Dyson Spheres will advertise their opulent presence.

Last summer a team of astronomers led by David Sanders and Nicholas Scoville announced an amazing discovery. A wide ring of giant gas clouds, 12,000 light-years thick, was detected, stretching between 12,000 and 24,000 light-years from the center of the galaxy. Ten billion solar masses of hydrogen are divided into some 5,000 clouds, each 200 light-years across. The clouds, which are held together by gravity, slowly collapse to form new stars. But not enough light can be seen to account for the expected number of stars. Only radio waves and heated carbon dioxide's infrared can be detected. Something is interfering with the natural compaction process.

"We don't completely understand what's holding up the clouds," says astronomer Philip Solomon. "Are these gas clouds, with their missing new stars, the suburban sprawl of the last 100 million years?"

We do not know how much of the architecture of the galaxy is natural and how much is the artificial product of black hole technology. Our island universe may be webbed by a communications network of gravity waves, or it may be as silent as a desert. Stars may be planted deliberately for a black hole harvest, or they may be born from dust and die in supernova glory on their own. Black holes may be railroad stations to the stars, with trains the size of planets arriving and departing from the ergospheres. Black holes may be the dynamos of demigods, or they may be untapped treasure-troves of ultimate energy.

We do not know whether black hole technology is the elaborated daydream of scientists or the lifeblood of interstellar culture. But we can look into the skies with wonder and with calculation. If there are supersocieties that have tamed the power of black holes, we must be ready to learn from them. If there are no such cosmic civilizations, then we must survive, adapt and grow until we master black hole technology and embrace the infinite. ∞

CYBERFORMS

CONTINUED FROM PAGE 55

art the video synthesizer With this apparatus an artist can draw on a television screen creating any pattern of lines forms and tones that he wishes without a camera The synthesizer can also manipulate normal TV images

An example of how the synthesizer generates artistic experience is Paik's tape of the poet Richard Ginzberg As Ginzberg speaks his synthesized image shimmers radiates and changes intensity in a way that expresses his mercurial mystical nature better than words or simple pictures ever could

The inevitable linkup between video synthesizers and satellites will make possible the instant worldwide broadcast of video art In 1978 for instance a video-arts display from the Documenta VI exhibit in Cassel West Germany was broadcast to more than 30 countries including the Soviet Union thereby reaching the largest audience ever to view a work of art simultaneously Future developments might bring video to every corner of the globe

On a more personal level Paik feels that anyone will be able within a few years to record his entire life minute for minute and store it for later viewing Just when one could play it back and how exciting it would be are moot questions but the potential for historical documentation is obvious

Even the nonvisual arts will be touched by the increasing interplay between technology and creativity Bill Chamberlain's writing for example has been significantly altered by technology The typewriter on Chamberlain's Greenwich Village desk is actually a computer printer tied to a monitor screen and a memory This system produces prose invented by RACTER Chamberlain's program for synthesized computer literature RACTER spins out limericks and suggestive short prose of a completely unpredictable—and frequently quite astounding—nature based on the vocabulary and grammatical rules that Chamberlain has given it

The mastermind sits bemused in his chair while his machine spews forth creative writing RACTER may not be ready for the Pulitzer Prize but it demonstrates the new levels of interaction that technology and creativity have achieved

Still history shows that today's conditions are not unique technology has always exerted a substantial impact on the arts consistently providing artists with new materials and better tools Gutenberg's invention of movable type transformed the book from a rarity among the rich to a commonplace among the masses Edison's phonograph made musical performances timeless Film and video have brought actors before more people in a single night than they could reach in a lifetime of live appearances

For the visual arts technology has pro-

duced long-lasting materials, such as acrylic and polymer paints, nylon brushes, and synthetic canvas. The invention of photography eliminated painting's role as the medium of portraiture and historical chronicle. More recently, video, which brought the Vietnam War into America's living rooms, has supplanted photos as our historical window, and now photography is veering toward pure art. In every age new methods of art have supplanted the traditional roles of older ones, enlarging the scope of human expression.

Yet today's integration of art and technology hasn't been entirely smooth. Artists and technicians ultimately make for a peculiar match. Though the two have much in common, they approach their systems from utterly different viewpoints. The artist is obsessed with possibility, the technician with efficiency.

Art and technology have a very close connection, Howard Wise affirms. Great artists and great scientists share many of the same qualities: tenacity, courage, and imagination. However, in practice "psychological differences between artists and technicians," as Krody calls them, "spring up when the artist attempts something beyond the accepted boundaries of a technology. The technician's natural response is, 'It can't be done.' Often this is true. Other times the collaborative efforts of artist and technician bring about an advance in the state of the technology."

Holographer Casdin-Silver recalls such an incident with technicians at American Optical Company. I came through with this crazy concept that wasn't at all possible in their heads," she says. "I wanted to use garbage light, the extra light they worked particularly hard to get rid of, to reinforce the strength of my three-dimensional images. This was the exact opposite of their procedures. But in time Casdin-Silver and the technicians produced a way of using garbage light as she wished.

In another instance, Casdin-Silver wanted to create a holographic image that would float in front of the photographic plate instead of behind it, where it had always been before. The technicians scoffed. "But I played with the problem," she recalls, "and by playing with it and feeling my way I learned how to do it. When I brought my image out front, they were totally amazed."

Rudi Stern, an artist who uses neon in totally new and different ways, has encountered similar problems with technicians. Neon formers traditionally make flat, representational signs. When Stern asked the technicians to work in three dimensions, they were reluctant, but eventually their expertise and his creative imagination united to produce striking pieces.

Acquiring sufficient technical background has proved difficult for some new-mode artists. The most effective means of instruction up until now has been informal apprenticeship. Krody for one, worked with General Electric near Cincinnati to create

his works. Other artists have varying degrees of technical skill, but few have the breadth of background in their craft that a master painter could acquire in his.

One exception is Earl Rieback, a nuclear engineer turned experimental light artist. Rieback has no art-school background and this he considers a definite advantage. "Few top artists have studied art," he maintains. "The top people in the field, the innovators like Jasper Johns, seldom have studied art. It makes them work within conventional constructs. Even when they desire to push forward, they have too many preconceived ideas."

Instead of learning art theories, Rieback believes that an artist should concentrate on learning everything about the materials and processes he is manipulating. An extensive technical grounding, he feels, is something that must become standard if tech-based arts are to achieve their full potential.

"Every artist must know his technology. It's necessary for success," he states. "What I know allows me to determine immediately how to accomplish something. My knowledge leads me correctly." Rieback makes his pieces taster more cheaply and more durably than his less well versed colleagues. For instance, his *lumina*—huge spaces that enclose patterns of swirling, shifting light—are cooled by natural convection rather than by fans, and so there is less chance of a breakdown.

As technical challenges are met and the abilities of new-form artists deepen, the synthesis of art and technology will create a universally accessible art form. "Technological art consists of movement, and movement takes the place of subject matter that we once could identify with: cows, madonnas, milkmaids," Wise says. "When art became abstract, it became less accessible to the average person. Kinetic and electronic art can be understood by everyone."

Rosemary Jackson, director of the Museum of Holography in New York City, stresses the openness of technological art. "Technology is logical, not mysterious. If you can't understand what an artist is doing, he simply hasn't done a good enough job."

The use of forms everyone can understand—a populist art for the new age—firmly reintegrates art and society. The new art's accessibility will help make our complex universe comprehensible to us again. For example, many of the programs that generate graphics in computer art are based on natural phenomena, such as atomic-particle motions, sine waves, and pendulum motion. This use of what Jackson has termed "the pulse of life" may lead us on an aesthetic journey into the new universe that science has revealed.

Years ago Buckminster Fuller's discovery and promotion of the tetrahedron as the fundamental geometric structure of material phenomena supplied us with physical models to describe the fourth dimension. Now the work of technological artists will help us understand worlds still being discovered by physicists and may ultimately give us visual analogues of a universe previously known to us only through equations.

Working with a concept that Kepes calls transference, today's artists translate conceptual information from one sense form into another. Visual information, such as geometric curves, can become analogous audio experiences or thermal experiences, all three determined by a core of generating data, such as a number series.

Astronomers have already converted radio signals into visual simulations of the big bang. When all sensory data can be similarly switched, we will have entered a new era of knowledge through the marriage of technology and art.

Originally the tools of painting were used to decorate surfaces and perform other mundane tasks. No one would have imagined that one day artists like Rembrandt, Rubens, and Picasso would express their deepest creative longings with these artisan's tools. Perhaps today's techno-artists should be considered the forerunners of tomorrow's Michelangelos and Leonardos.

The final development in technological art, according to Krody, may be the total elimination of media in favor of brain stimulation devices that generate music, colors, tastes, and tactile sensations within our minds. This will represent the true link between artist and audience—the transmission of pure creative thought.

Imagine how such an integration would affect us and our institutions.

It's 2025 and they've closed down the museums. The works of the masters lie in the darkness of subterranean storage vaults. People don't need to see them anymore. Why should they? In the privacy of their homes, they can view the entire collections of the Louvre on 3-D entertainment modules or visit Michelangelo's Florence via electronic brain stimulation. No more hassles with crowds of tourists or with pompous tour guides.

Great art no longer exists in only a few places; it has moved out of the academies and into the world, enriching both the intimacy of the home and the expanses of the sky. Cities on the ground—and in space—are now wrapped by bands of air space devoted to cultural events: massive displays of colored gases, flying sculpture, and suspended prisms, which bathe the environment in kaleidoscopic spectral rainbows.

Home computer systems craft 400-page novels in hours, suited to the owner's personal taste, or duplicate the *Mona Lisa* from recyclable materials so that only a chemist could distinguish the copy from the original. Dreams can be stored in the computer and be played back the next day for wide-awake 3-D perusal.

Is it any wonder museums have faded away? ∞

If you're too lazy to go out to the log pile, Leonard, perhaps we'd best convert back to oil heat."

INTERVIEW

CONTINUED FROM PAGE 78

eating possum all this time.

Omni: Ten thousand dollars for a genuine Big Mac?

Randi: Hell, I'll take a plain beef patty. Just a bite.

Omni: Let's look at the case of Uri Geller. A lot of people have the impression he's proved his abilities under controlled conditions. What about the scientists and journalists' treatment of him?

Randi: Well, the study at Stanford Research Institute—*not* Stanford University—by Russell Targ and Harold Puthoff was so incredibly sloppy they're embarrassed to talk about it now. They said that Geller was isolated from the target picture that he was trying to receive telepathically, but for some of the tests there was a hole in the wall between the rooms—a hole that had once carried electrical cables or something.

Omni: Didn't they use stricter controls for the later research that's described in their book *Mindreach*?

Randi: That didn't involve conscious cheating, but they still blew it. They'd have a psychic at the lab and send people out to remote locations, sometimes with walkie-talkies, to stand there getting impressions. Everything they said was transcribed, and the psychic would tape and write down his impressions. Then they'd have judges try to match up the transcripts.

Well, they used five judges, but only one of them gave significant correlations, so they reported his results. When we investigated all this later, we found that the list of targets was arranged in chronological order before it was given to the judges, and the judges were aware that this was so. Then the transcripts themselves, which Targ and Puthoff say were unedited, contained clues that referred to the targets visited the day before and to the number of tests already performed. Thus, *any* judge could easily guess which target was visited by looking for the inadvertent clues in the transcripts.

This isn't science; this is the kind of work that wouldn't earn a merit badge for a boy scout. But Targ and Puthoff have their badges, their Ph.D.'s. If someone consistently breaks the traffic laws, you can take away his driver's license, but you can't take back a Ph.D. Instead, other scientists say "tsk-tsk" and don't take the research seriously, but meanwhile the public has absorbed results that are grossly dishonest.

Omni: Back to Geller. I know people who've seen him in person and say they never took their eyes off him, yet they saw a key bend in front of their eyes.

Randi: Barbara Walters told me exactly the same thing. But when I got her to describe it in more detail, she admitted that she held the key closed in her fist. Never took her eyes off it? Then I bent her key as I bent yours, by trickery and misdirection, and she swore afterward that she never took her eyes off it.

The accounts go through a predictable transformation because people are sure they've seen something mysterious, and they don't want to dismiss it because of a technicality. So the story changes slightly from "The key bent, and I didn't see how," to "I saw it bend." That may not seem like a big step, but it is.

It's significant that Geller's appearance on the *Tonight Show* was a disaster. Johnny Carson's staff had called me before the show to ask what to watch for, and Carson himself is an amateur magician. Geller accomplished absolutely nothing, because he was being watched too closely.

Omni: Why does Geller do it?

Randi: He gets wealthy and famous. He has a big ego, and he needs to see his picture on the front of magazines.

Omni: Wouldn't you like that, too?

Randi: Sure. But Geller has done it by means that are absolutely reprehensible.

Omni: Haven't you ridden on his coattails to some extent?

Randi: I make good fees for lectures. It pays better—or more reliably—than escaping from a straitjacket over Niagara Falls. But now that Geller is generally discredited, I'm making a lot more than I was five or six years ago, when he was just becoming popular. In one year back then I lost over fifteen thousand dollars of college-lecture bookings when people backed out of contracts, saying quite openly that the students preferred to believe in Geller.

I enjoy using my special skills in showing people what is and isn't worth believing in, and I enjoy making money at it. If producers want me to do some testing for a film or a TV show, they pay my expenses, as RAI television in Italy did recently when I went over there to test Italian dowsers and psychics. But I have never taken money for investigations or for pursuing the work of the CSICOP, and I never will. In fact, it costs me money to set up the investigations.

Omni: Your ten-thousand-dollar challenge must have brought a lot of claimants.

Randi: Over the years about three hundred twenty people have applied, and I've tested fifty-five who were willing to go through with it.

Omni: What's the most common ability they want to show you?

Randi: Almost half of them say that they can go out of their bodies and visit sick people and diagnose their illnesses. The Silva Mind Control program encourages that one; of course, it doesn't encourage its graduates to check up and find out whether the illness is really there. And if they do—"Oh, you say you *don't* have lower-back pain and difficulty in breathing? Well, you may have a weakness that hasn't appeared yet. So be careful."

Omni: What about some of the others?

Randi: I'll skim through the file. Here's one. Mr. B has a daughter who spoke, via table-tipping and a Ouija board, with Karen Ann

Quinlan in her prolonged coma. His daughter made some predictions about the date of death and about a deformed bone in Quinlan's foot—both wrong. But here's the fascinating part of Mr. B.s letter. "My daughter was admitted to a hospital while my wife and I were in Europe . . . a brain tumor was suspected in the pituitary area. . . . Due to her condition she was not willing to use the Ouija board." Does it ever occur to this man that perhaps his daughter has a medical problem, that she may be very sick and just *thinks* she's in touch with Karen Ann Quinlan? Not at all.

Here's Suzy Catrell, who was able to fool Johnny Carson when she appeared on his show as a psychic. She got away with a card trick involving a top peek, a Schulein force, a false shuffle and false cut, and a few other moves. When Martin Gardner and I tested her on behalf of the committee, we caught every one of those moves on videotape.

A scientist in Philadelphia, Karen Getzler, apparently can alter the path of a laser beam. (It was reported in the *National Enquirer*, so you know it's true.) I wrote her on behalf of the CSICOP and myself offering the money and validation of her ability. Here's what I got back: "... the tone of your request was not consistent with accepted scientific courtesy and true scientific interest." That's why she didn't accept it? Bull! She simply hasn't got anything. She can't bend laser beams, and she can have my ten thousand dollars if she can.

Here's Judge Harris. According to *Ebony*, he uses the horoscopes of juvenile offenders in determining their sentences. Does that make any sense?

Omni: No.

Randi: It does if you believe in bullshit. I wrote to him for months, asking whether the magazine account was true. His replies dealt only with how esteemed his legal opinions are and how insulted he was by "sensationalization" in the mass media. What the hell is he talking about? *Ebony* had a photograph of him sitting in the courtroom with an astrology book, reading it to an offender in handcuffs. Was there a law journal hidden behind the book? Or a Bible? I'd just like to know.

Mrs. P., a lovely soul from Quebec, says that she has a power in her fingertips that affects fish in her aquarium. When she holds her fingers at one end, the fish go to the other end. She calls it psychic. I call it frightened fish. I suggested she put some opaque paper over the end of the tank, and she wrote back and said, "It's marvelous! The power doesn't penetrate brown paper!"

Omni: (laughing) Great!

Randi: Here's my Oriental Wonders file. I've had several karate students write and ask about supposed powers their instructors have. Karate is a sham the way it's often performed. The boards are cut so that you don't break across the grain; you break with the grain. And it's pine. You see how easily they break? If it were across the grain, there would be splinters.

Omni: Can you do karate?

Randi: I saw a stunt on television, and it looked so simple I wanted to try it. I went to the local lumber yard and said to the man there, "Okay, give me some pine slabs about an inch thick and twelve inches long or so," and he asked, "Are you getting them for karate?" I said, "Yeah." He said, "I think I've got some fresh karate boards out back. You can't put them aside for very long because when they dry out, they break and crack." Then he said, "I'll wrap them in string for you because if they bounce around in the back of the car, they could break very easily." I got a kid onstage, seven or eight years old, doing this stunt with a stack of boards. I made like I was giving him special instructions, but all I said was, "Hit them as hard as you can." He did, and his fist went through four boards.

Omni: Do you have any dowsers? They claim that well drillers are satisfied with their results.

> *"The winners of my Uri awards will be told of the honor by telepathy and will be free to announce their winning in advance, by precognition if they so desire."*

Randi: Here's the response of Mr. T. E. Ross, president of the American Society of Dowsers, to my offer: "I believe that I speak for the board of the ASD in saying that they do not feel the need to justify dowsing abilities to any group . . . and would feel that objectivity would be secondary to considerations of money, publicity, contention and legalisms in the plan proposed, which therefore suffers by comparison with previous exercises such as that conducted by the French biologist Armand Viré and reported to the French Academy of Sciences in 1913."

Omni: Nineteen-*thirteen*?

Randi: Yes. It's already been tested, so there's no need to check any living dowsers to see whether they can really do it.

Onward to astral projection—or, as I call it, half astral projection. Mrs. S. in Chicago is a practitioner, and I told her that I have a room upstairs—you can see the door there beyond the archway—and it's locked. There's a table in the middle of that room, and an object in the middle of the table, which I change from month to month. Mrs. S. said she saw a CB radio on the table. What was actually there was an empty flowerpot.

Omni: How can people be sure you haven't switched objects to avoid losing the money? There are those who say the most paranormal event they could imagine would be your signing over that check.

Randi: Once an official investigation is under way, it's out of my hands. I surrender the check in advance to a lawyer or notary. I'll gladly let any independent observer from *Omni* or anywhere else keep an eye on me. I'll gladly take pictures of the object and have them locked in a bank vault. There are lots of ways. Ingo Swann says he can project himself all the way to Jupiter. (Incidentally, he came back with the worst information about that planet you ever heard!) I don't ask for an astral visit to Jupiter. Just come to Rumson, New Jersey, and tell me what's on that table.

A man at the University of Texas takes Polaroid pictures with the lens cap on while projecting mental images onto the film. Occasionally he gets streaks of orange-white across the film, exactly one inch apart. Guess what the circumference of the rollers on a Polaroid camera is? Also, he says, about one time in fifty he gets a white spot surrounded by orange on the otherwise black print. I sent the prints to Polaroid and got a nice letter back, saying that occasionally these manufacturing defects occur when dust gets between the web and the film surface and that Polaroid will gladly replace the film. Ordinarily the specks don't show up in a normal photographic exposure, but Polaroid says they're present in about two percent of its film. One time in fifty-two percent. Those are what we call compatible figures.

Omni: Do you think that the people who want to take up your challenge are fakers?

Randi: No, the fakers don't write to me, because they know very well that I could catch them. Mostly these are sincere souls who really think they have a gift but haven't checked it under controlled conditions.

Omni: How do you feel about disillusioning them?

Randi: I'm well aware that it's threatening to challenge people's beliefs, which is why I try to do it with a sense of humor. Starting April 1 this year, I'll be giving out my annual Uri awards. The award is a tastefully bent stainless-steel spoon with a very transparent, very flimsy base.

Omni: What are the award categories?

Randi: First, to the scientist who says the dumbest thing about parapsychology.

Second, to the funding organization that awards the most money for the dumbest things in parapsychology.

Third, to the news organization that supports the most outrageous claim of the paranormalists.

Fourth, to the psychic who takes in the most people with the least talent.

I will take each year's nominations before a board of grade-school children, who should be able to determine easily the most deserving nominees. Then I'll seal the winners' names in an envelope and announce them blindfolded. If I make a mistake, I'll

rationalize it and dismiss it as excusable error in true parapsychological fashion The winners will be notified telepathically and they will be free to announce their winning in advance by precognition if they so desire

I think all this will be a step in giving parapsychology its due recognition It was Gardner's idea and he wanted the CSICOP to do it, but they wouldn't It's not dignified Well I'm not dignified

Omni You certainly enjoy yourself But obviously you take very seriously the harm that you say irrational belief does

Randi. Yes I do It can lead to financial loss loss of the power to reason even to death Jim Jones got a lot of people to believe in his psychic surgery and psychic healing, and they thought he was in touch with God and followed him to Guyana.

Omni Is that a fair comparison? Most psychic charlatans aren't trying to lead people into death cults

Randi Neither was Jones, until things got out of hand He just wanted to be worshiped like a god and to have people give him everything they owned And there are lots more like him

People can also become victims *after* they find out they've been fooled There was a metallurgist at Kent State University who examined spoons and a platinum ring that Geller had bent and wrote a paper declaring that the fractures could not have been caused by ordinary forces I and others wrote articles that explained how Geller had done the tricks and we showed just how the "extraordinary fractures" could be induced by perfectly ordinary means The metallurgist also discovered independently that his conclusions about the platinum ring were erroneous He felt that his reputation was ruined and he died not long afterward under conditions described as not natural

The most tragic thing was that his reputation *wasn't* ruined He was a metallurgist and nobody expected him to be an expert on conjuring

Omni Exposing Geller's fraud is one thing, but what about your attacks on spiritualists? What if your debunking destroys someone's belief in an afterlife? Do you believe in God or in an afterlife?

Randi I'm an agnostic just as I'm an agnostic about the paranormal I don't think there's any evidence for either I guess I adhere to the tenets of the Unitarians although I don't attend the local church as often as I might There's a story of a Unitarian man whose son comes home with a burnt finger crying "Oh Daddy it hurts it hurts please fix it" The man gets some ointment and just as he's about to put it on his son asks "Will it sting?" He replies, "No" His son presses him "Are you sure?" And he says "Son if I were sure of anything, I wouldn't be a Unitarian"

I wish I could sell something like that to the people who believe in an afterlife They think that not believing in it must take a lot of joy out of life Not at all because I find that I am more of a human being if I don't depend on spirits in the sky I have to depend on the guy sitting in this skin right here who gets up in the morning and scratches where it itches and looks at that terrible face in the mirror and realizes he's got to do something about that I'll take responsibility for my life on the assumption that when I die, I stop I'm going to try to do the best job I can right now and leave what I can behind me

Omni How is that attempt succeeding? Are you making a difference?

Randi I think scientists are learning something from me something about critical techniques And I get a few letters from people who say "Thank you for that book [or that lecture or whatever] With everybody around me saying that astrology and flying saucers and ESP and so on are proven facts it was just what I needed to latch on to some sanity again Thank God, there's somebody else who believes the same way I do" And I say *thank God* because those are the words they use I could argue that point but enough is enough

Omni You've said that scientists and journalists aren't competent judges of paranormal demonstrations What about science journalists?

Randi Well let's see Pick a card

THE $10 000 CHALLENGE

If you can demonstrate paranormal abilities to James Randi he'll be surprised He'll also be poorer For the past 15 years he has been offering $10 000 for such a demonstration under controlled conditions The check is in a separate billfold (encased in plastic so that it won't become dogeared) and he's good for the money Just do one or more of the following

1. Levitate yourself or otherwise move some remote object
2. Deform or break a remote object
3. Divine the contents of a sealed envelope
4. Predict an event of sufficient oddity
5. Detect an "aura"
6. Diagnose an illness remotely
7. Cure an illness by paranormal intervention
8. Divine the presence or nature of a concealed substance
9. Control the actions of a person or a machine
10. Demonstrate "out-of-body" travel or perception
11. Perform any other demonstration of paranormal powers

The feat must be performed by what may be properly described as "psychic" means rather than by trickery or by existing technical means Details on the conditions of the test may be obtained by writing to

Randi Challenge
51 Lennox Avenue
Rumson, NJ 07760

Enclose a stamped self-addressed envelope Positive results, if any, will be reported in *Omni* ∞

JERRY FAGIN

CONTINUED FROM PAGE 61

ident, Congress, the armed forces, the American people, the audience, the network, his friends, his sponsors—individually by name—his parents, and his current wife, then went on to thank the rulers of Twelve's planet, the spaceship industry there, and everyone else—right down to Newton, Galileo and Einstein—who might possibly have had a bearing on Twelve's appearance here. The only name he didn't drop was God's. Maybe he should have thrown that in.

Finally, after all the preliminaries and all the back-patting, Twelve got his chance to speak. This was the big moment, the message to humankind from outer space, the voice from the stars. Everyone listened in absolute silence.

And Twelve was boring as hell.

It's ridiculous to think that someone who has actually crossed interstellar space with word from another world could be dull, but that's what Twelve was. He may have been dynamite on his own world, but on Earth he was a dud. It wasn't entirely his fault. In his monitoring he had picked up every cliche in the English language, and he was using all of them. That burbly voice didn't help either.

By the time Twelve had assured everyone that he looked upon his mission as a great and historic challenge, that he came in hopes of establishing a lasting friendship between our two great peoples, that a new era in the history of the galaxy was dawning, and he was proud and humbled to be given the chance to serve, and so on and so on—it sounded as if he had memorized every campaign handout of the past forty years—Jerry could smell trouble. The studio audience was fidgeting noisily. People were coughing and shuffling their feet.

I caught the quick flicking of the eyes, the giveaway that Jerry was getting edgy. I could almost hear his brain going. Here was Jerry on the biggest night of his career, the biggest night in television history, and his guest was bombing. He could picture that audience of a hundred ninety-two million American viewers scratching their bellies and saying, "Hey, Honey, what do you say we switch over to the naked dancers on Channel 8?"

So Jerry made his move. If Twelve couldn't carry his weight as a guest, he'd just have to pay his passage any way he could.

Twelve was gurgling on, ending a long speech about interplanetary solidarity. I returned my attention to him. ... With shared hope for the future and with a deep and abiding faith in the basic decency and fundamental goodwill of the fine people of Earth that encourages me to predict a new age of brotherhood and justice in which races will ask not what the galaxy will do for their planet but rather what their planet can do for the galaxy," he said.

There was polite applause. Twelve looked pleased, but he wasn't in the business. The applause was the kind that sounds in every performer's ears like a death rattle.

"Gee, that's just the way my daddy used to put it," Jerry said, turning to the audience.

That drew the first laugh of the evening. Everyone recognized the tag line of one of Jerry's oldest characters, Dummy Lummox the Clumsy Cop. It gave the audience something safe and familiar to deal with. They knew how to react now.

"But in a higher sense, this night represents only the beginning of what I venture to call the Galactic Age," Twelve went on, "for there is much to be done before we march together with arms linked in friendship and trust to meet the challenge of the future."

"That sounds mighty good, but we do it

"Twelve was boring as hell. ... People were coughing. ... So Jerry made his move. If Twelve couldn't carry his weight as a guest, he'd just have to pay his passage any way he could."

different back home," Jerry said.

The audience caught that one, too, and gladdened my heart. It was the tag line of my very own character, Elmo Klunk, the Shitkicker Abroad. Elmo was one of Jerry's dependables, sure to make an appearance at least once every two weeks. The audience loosened up and laughed a bit louder and longer.

I poured another drink, a bigger one, and edged forward on my chair. It isn't every night that you get to see an alien visitor turned into a stooge.

"We're honored by your tribute, Mr. Ambassador," Jerry said, "but I'm sure you understand our audience's curiosity about your planet and its customs. For instance, I'm told that you have no comedy on your world."

"It is correct. We have no comedy."

Jerry nodded sympathetically. "I've run into the same problem. You must need new writers."

I felt that one right between the shoulders. Welcome to Pearl Harbor, this is your host, Jerry Fagin. If my glass hadn't been nearly full, I would have thrown it at the screen.

Twelve, after a pause, burbled, "It is correct. We have no writers."

"I'll let you have mine. You still won't have any comedy, but you'll be getting a great bowling team."

Again Twelve paused amid the laughter to evaluate Jerry's line and said, "I know this bowling that is the work of your Saturdays in the regressing hailumes. We have no bowling."

"No comedy, no writers, no bowling. Tell me, Mr. Ambassador, what do your people do for entertainment?"

"It is correct. We have no entertainment. I do not grasp the concept."

"It's simple. Entertainment is what you do when you're not working."

Twelve was silent for a longer time. Clearly he was having trouble with Jerry's lines, which weren't saying what they appeared to be saying. The audience tittered with anticipation. Finally, in a gurgle that already sounded to me to be a bit defensive, Twelve said, "When we are not working, we sleep."

"Like all those people who used to watch the other networks. I see. But seriously, Mr. Ambassador." And Jerry went on, a little faster now, confident, feeling the audience with him. They were laughing in the right places, waiting for the lines they knew he was going to feed his stooge from outer space.

Jerry jumped from topic to topic, always balancing the serious question with the quick punch line or asking a dumb question and then going statesmanlike until the audience was helpless and Twelve didn't know what the hell was going on. Those syrupy responses came slower and slower. Each pause was longer than the one before. Finally, when Jerry got on the subject of reproduction, Twelve gave up completely and sat very still. Except for his eyes and nose and mouth. They were crawling around his face like flies trapped in vanilla pudding.

By now Jerry was sailing. The biggest audience in TV history was watching him, and he was showing them that nobody and nothing, not even a creature from another world, could top Jerry Fagin on his own show. I caught the wild, piercing gleam of ego in Jerry's eyes as he stood up, tousled his hair and boomed out, "Well, I'll tell you the whole story, citizen, but you'll have to promise not to interrupt me. If there's one thing I can't stand, citizen, it's an interrupter."

He was slipping into a favorite character, Senator Wynn Baggs, the filibuster champion of Washington. The audience applauded and howled with delighted recognition as Jerry ranted on.

All this time Twelve sat like a statue, watching every move that Jerry made. He didn't look angry or insulted. At least nothing on that Silly Putty face suggested irritation. As far as I could read him, Twelve was fascinated. It was as if he had Jerry under a microscope and couldn't believe what he was seeing. And Jerry ate up the attention.

like a kid with a hot fudge sundae

Then Twelve threw up both his arms in a "Eureka!" gesture. I could almost see an old-fashioned light bulb go on over his head. For the first time that night his features stayed put. The audience got very quiet all of a sudden.

"This is a tohel-melox!" Twelve announced suddenly as if that explained everything.

Instinctively Jerry topped him. "If it is you'll wipe it up. But I ought to warn you—the producer's wife loves it."

Twelve worked his face around into something like an untidy smile. "Now it becomes clear what is my role in this ritual," he said. His voice sounded a little less gooey.

When Twelve began to get up, Jerry had the first whiff of trouble ahead. He bounced to his feet while Twelve was still halfway up, and with a big smile at his guest he said, "Thank you, Mr. Ambassador, for honoring us by consenting to appear on *The Jerry Fagin Show*. It's been a great pleasure and an exciting experience for all of us, and we're sorry you have to rush off, but we know how crowded your schedule is." Stepping to the forestage, Jerry began to clap. "And now let's have a big hand for the ambassador," he said to the delighted audience.

That didn't stop Twelve, who was acting like a kid who has just learned the facts of life. "In my ignorance I assumed that this was to be a hoemelus encounter. I employed my fourth voice. Had I known that it was to be a tohel-melox, I would have spoken thirdishly. Please forgive me, Mr. Jerry Fagin."

On the last few words, as Twelve took his place at Jerry's side, his voice had changed completely. It was really weird. I wondered whether Jerry had somehow shocked the alien into instant puberty. In seconds Twelve had gone from that sumpy gurgle to a flat, staccato, nowhere-in-particular accent not a hell of a lot different from Jerry's.

"Please take my wife," he said.

Nobody made a sound. They probably all thought Twelve was going out of his head. So did I, for just an instant, and then I recognized that line and had my first clue of what Twelve was up to.

I didn't believe it. It was too crazy. But when Twelve wobbled his face a little—just a little, very nervously—it all became clear. He was mugging for a laugh. This crazy-looking thing from outer space that couldn't even get a four-word one-liner straight was trying to be a stand-up comic. I felt kind of sorry for the poor blob. Imagine coming all that way and bombing on your very first appearance.

What I didn't know at the time was that Twelve learned fast.

"Thanks again, Mr. Ambassador," Jerry said, edging away. "You've been a wonderful guest, and we hope you'll visit us again whenever your demanding schedule permits."

"It's a pleasure to be here, Jerry," Twelve said, stepping in front of his host, talking directly to the audience. "I would have been here earlier, but there was a holdup in traffic. I stopped for a light, and two men held me up." He did a quick jerk of his features—eyes left, nose right. The audience laughed. They were cautious about it, but they laughed.

"We're all sorry to hear that, Mr. Ambassador. And now our next guest, the well-known—" Jerry started to say, but Twelve went right on.

"The producer took me to dinner at this place on Fifty-fourth. The salad wasn't bad, but I didn't like the little men in loincloths who kept dipping their arrows into the Russian dressing."

"—Well-known star of stage and screen, who for the past three seasons has been delighting viewers with her portrayal—" Jerry tried again, louder, pushing in front of the alien.

Twelve rolled his eyes in opposite directions and blinked his melox. I asked the waiter if the lobster Newburg was any good. He said, 'Where did you see that on the menu?' I said, 'I didn't see it on the menu. I saw it on your tie.'" The audience laughed harder and longer this time. They liked him.

> *"Twelve reeled, did a flying leap into the air, and came down in a classic pratfall with a noise like a bagpipe assaulting a whoopee cushion. The audience went wild."*

Shoving Twelve aside, Jerry snarled, "This lovely and talented lady who has won the hearts of millions of viewers with her portrayal of the zany, lovable Mrs. Pregnowski in—"

Twelve reeled, staggered back, waved his arms, did a flying leap into the air, and came down in a classic pratfall with a noise like a bagpipe assaulting a whoopee cushion. The audience went wild, applauding and cheering, drowning Jerry out completely. When Twelve climbed to his feet, his nose doing a back-and-forth crawl like a slow pendulum, he had to signal for quiet before he could be heard.

"The producer said, 'I hate to eat and run, but the way I tip, it's absolutely necessary,'" he said, spinning both forearms around like propellers.

The material was lousy, sure, but I could see that Twelve had a great natural delivery. With a good writer, he could go places. A show of his own, maybe.

What happened next, I will never believe was an accident. The camera cut to Jerry, purple-faced, restrained by four elderly security guards and a weeping producer. It held on the group. One hundred ninety-two million viewers heard Jerry scream, "Get that mush-faced interstellar son of a bitch off my stage! Shoot him! Drop a light on him! He's killing us!"

Which was an exaggeration. Twelve was doing wonders for the show. He was only killing Jerry.

We call the show *Twelve at Twelve* now, even though it still comes on half an hour before midnight. The producer felt that *Twelve at Eleven-thirty* would only confuse people.

But Twelve is a great guy to work for. It's a nostalgia trip just talking to him. During those years he was monitoring, he heard all the great ones—Berle, Gleason, Caesar, Groucho, Carson, you name them—and memorized every gag, every shtick, every bit of business. He just didn't know what the hell to *do* with his material until he saw Jerry putting it all together. Now Twelve is like a guy who's found his true calling. I think he's going to stay right here on Earth and in the business for good.

Twelve is also a very hard worker. He drops in every afternoon to run through the monologue for that night's show. We've already come up with some lines that everyone in the world recognizes. I've seen Well, wink my melox on everything from kids' lunch boxes to bikinis, and a day doesn't pass without my hearing someone say, "Please take my wife," and then seeing him collapse in hysterics. Even Henny Youngman used it when Twelve had him on the show as a guest.

We have a good running gag going on Twelve's dumb friend from home, Old Thirty-one. And if a line goes flat, all he has to do is jiggle his features and the audience breaks up.

He's even developing into a good impressionist. Some of his impressions are weird—he's the only one I know who does all the members of the Politburo while simultaneously trying to get a stuffed elk into a Honda—but his Jack Benny is nearly perfect.

What convinces me that Twelve is in the business to stay is that he's learned to be sincere. Two nights ago he graciously had Jerry back as a special guest to celebrate Jerry's new afternoon quiz show. They were hugging like a couple of high-school sweethearts.

Twelve was beautiful. A real pro. He ended the show by wiping his eyes, putting an arm around Jerry and saying, "This crazy guy is my dearest friend on your whole wonderful planet. Everything I have I owe to Jerry Fagin."

I could tell from Jerry's expression that he'd love to collect.

But my money is on Twelve. OO

EDEN

CONTINUED FROM PAGE 90

Oh, yes, perhaps some birds, some nights
Have felt those fires rise and tuned their flights
And turned toward South
Because star charts were printed
In their sweet genetic dreams—
Or so it seems

But see? But really see and know?
And, knowing, want to touch those fires,
To grow until the mighty brow
Of Man Lamarckian-tall
Knocks earthquakes, striking Moon,
Then Mars, then Saturn's rings.
And, growing, hope to show
All other beasts just how
To fly with dreams instead of ancient wings

So, think on this: we're First! the only ones
Whom God has honored with His rise of suns
For us as gifts Aldebaran, Centaun, homestead Mars
Wake up. God says. Look there. Go fetch
The stars. Oh, Lord, much thanks
The Stars!

Indeed, the stars
As for Lamarckian Man, what is he?

For those of you who do not recall the old arguments between the Darwin adherents and the apologists for Lamarck, a quick summary.

Darwin theorized that animals survived and evolved through fitness, the elimination of the sick or frail.

Lamarck said no. He, and Neo-Lamarckians in our time, claimed that animals could see an environmental problem and, in some cases, *wish* themselves into survival.

The giraffe, for instance, through the centuries, yearned for those high leaves on the unreachable trees. What to do about it? Tell the genetic data banks in charge of the neck to stretch, and so grow a proper length of spine and reach the unreachable leaves.

The argument resounds into our time. Darwin claiming you cannot change your flesh and blood with dreaming. Lamarck saying that the secret marrow has big ears, whisper to it, and grow.

Behold, wonder of wonders! Our age, with its swift technologies and incredible changes, its *Apollos* and Shuttles, partakes of *both*!

Darwin and Lamarck? you cry. You can't have both. Impossible!

Not so. We are indeed that strange, wild, happy/sad composite beast.

Once, yes, we were merely Darwin's children, sore put upon by fang and claw, by raving blood.

But when we stumbled and fell into science and picked ourselves up and shook our brains, from that time on we leaned into Lamarck.

Especially in this year, this Age, we more than survive through accidental fitness. What do we do? We tell our neck to stretch tall. And by God, the neck stretches!

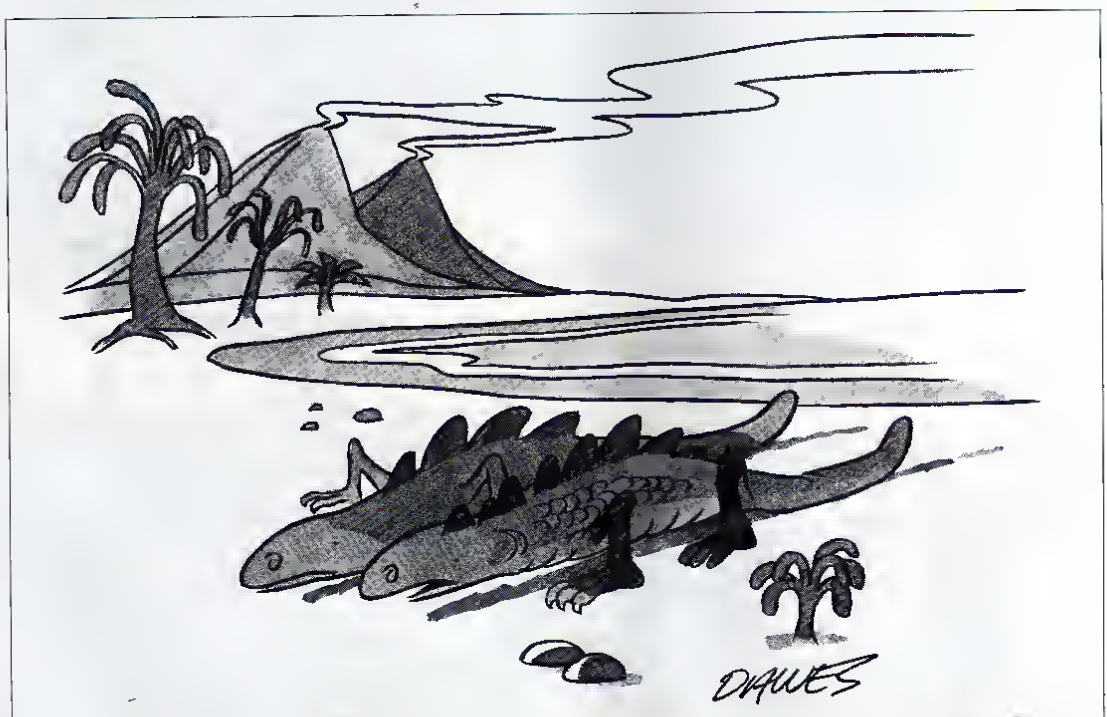
Sagan, of course, hearing me say this one night, protested again. No, no, it's *still* all Darwin! The *mind* has supplanted fang and claw. We survive because we are fit between the ears! The brain is a club with which we shall beat the Universe at its murderous games. But Lamarck? Not on your gorilla dentures!

So, score another for Darwin, via Sagan. But leave me my Lamarck for the poetic fun of it.

Meanwhile, we make wishes and build Shuttles.

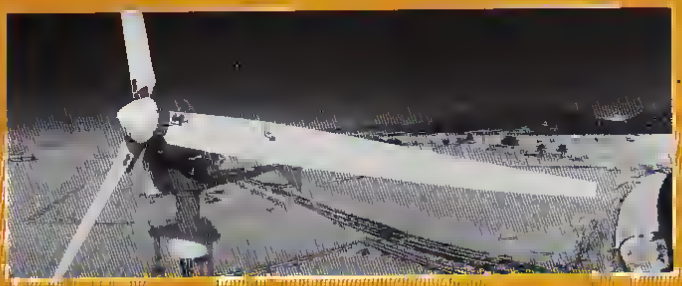
And with those Shuttles not only will we shove telescopic light harvesters up to cure our beastlike myopias, but we will finally mine the meteoroids and unfold cities in the air. The ghosts of those ancient Hanging Gardens will parade the high attics between here and Pluto and, one day beyond. Frank Lloyd Wright, Louis Henry Sullivan, and Le Corbusier will spin in their graves with anguish and envy as we rivet together such celestial towns as God might have dreamed on the evening of the Seventh Day.

And all of it will be cargoed up and fixed



Well, we may not be in a position to take over the land yet—but we'll never be in a better position to do push ups.

NEXT OMNI



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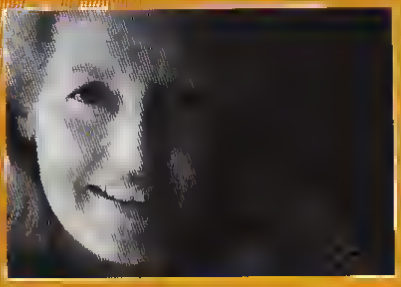

INTERVIEW

FICTION

TIME TRAVEL—Want to peer into the future? Maybe send a message to yourself today that you'll receive last month so you can cash in on the stock market and stay out of California when the earthquake comes? There's probably nothing to stop you. Physicist and science writer Robert L. Forward reminds us that time can run backward just as easily as it goes ahead, according to Einstein's theory of general relativity. All we'll have to do to harness it is build a black hole. You'll find the details—and an amazing gallery of voyagers through time—in next month's *Omni*.

BRAIN WARS—Anyone who's survived four grueling years at the California Institute of Technology deserves a few laughs. Trying to puzzle out everything from black holes to the basic structure of matter is enough to decelerate even the brainiest go-getters. So each spring the students of Caltech gather for an eccentric ritual—an intellectual field day for the geniuses who pit their considerable head muscles against one another in a bizarre tournament of wit and brawn. It's Ditch Day, the nation's "super bowl of tomfoolery," and you've got a front-row seat in the May *Omni*.

GLOBAL TECHNOLOGY 2000—Transportation, energy, space science, and defense are where America's new technology will come from, says Jerry Grey, public policy director for the American Institute of Aeronautics and Astronautics. So AIAA has called together the nation's biggest aerospace companies for a spectacular display of space hardware: blimps, wind turbines, and other devices that will shape our lives in the twenty-first century. You'll see them all in a stunning May pictorial.

SCIENCE FICTION—For May, *Omni* fiction features Thomas M. Disch's cautionary tale about Josie, a little girl who talked back to her elevator and about what happened to her as a result. David Drake tells of the self-appointed mission of three survivors of a nuclear holocaust, and François Camoin presents a grim picture of a future in which Americans have become second-class citizens in their own country.

INTERVIEW—Inflation got you down? Recession? Stagflation? Unemployment? Can't figure out what is wrong with our economy? Well, after you've read *Omni*'s interview with Hazel Henderson, you just may know some of the answers. Her daring suggestions make mincemeat out of government forecasts and Wall Street prognostications and help point the way to a new economy that can lead us through the 1980s and beyond. See this thought-provoking interview in the May issue of *Omni*.

in place by the Shuttle and its more-advanced descendants.

Tossed out of Eden, we now go to replant our Garden on God's own front lawn.

So there you have it.

We need this Orbiter, this thing that can be high and fast and beautiful, to make us believe in the possibility of dawns without destruction or midnights that might not end.

Our new breed of Darwin/Lamarck beast finds that four directions are not enough. The Shuttle adds a fifth.

If the Shuttle is flown with vigor and imagination, it will affect our hearts, our minds, our bloods, and those nervous systems that worry overmuch about our Future.

Life against Death. That's the Shuttle's payload, as I see it when I glance at blueprints and build it in my head.

If God knew what He was doing, then Man is the Essence of God.

If man, in turn, halfway knows what he is doing, then Machines (the Shuttle) are the Essence of Man.

All of the complexities, mysteries, seeming errors, supposed paradoxes that inhabit the flesh of God pass down from Him into the flesh of Man.

All of those complexities, imagined sins, incredible energies, awesome mysteries, puzzling paradoxes, and deaths and singing rebirths pass from Man into his invented children—machines.

God, Man, Machine. A strange but certainly not an unholy, Trinity.

Is that Trinity capable of failure?

Yes.

But then that gives you a Machine to tinker with, a soul to save, Universal Mystery to solve.

Not a mere life's work, but a billion-year endeavor up ahead.

God clones Himself in Man. Man clones himself in machines. Machines, if properly built, can carry our most fragile dreams through a million light-years of travel without breakage. Such machines, and the Shuttle with them, are the armor of our Life Force.

Design a light-year crest to hang over the door or print on flags and banners. On it stamp God first as symbol. Then emblazon Man upon His metaphoric breast. Finally, print cogs and wheels and radioelectronic fires upon Man's heart. There's your aegis, your crest. The Trinity.

With it we shall wrestle gravity, capture light, shrink Time, measure Space, and survive, man within machine within God.

So we speak of final Annunciations and build splendid Toys to ensure Eternity of metals that know not themselves, and Men who would try to know, and a God who knows everything and offers it like bread tossed to the white snows of a billion-year Christmas Morn, and whispers:

Be you hungry after Life? Feed!

All this from the simple Space Shuttle we set out with at the start of this treatise.

All this.

Let the Force be with it.

And the Force, of course, is *us*. ∞

ANNOUNCING THE BEST OF OMNI SCIENCE FICTION

Storied vistas of time and space unfold as THE BEST OF OMNI SCIENCE FICTION journeys to atomic microworlds and the infinite star fields of the universe. As the nexus between today's speculation and tomorrow's reality, science fiction provides multiple entries into a future of unlimited possibilities. Harlan Ellison explores the nature of time and timelessness. Isaac Asimov foretells the invasion of silicon eaters. Robert Sheckley spins a tale of new bodies for old. Alfred Bester brings us a madcap retelling of the Pygmalion myth. Other visions by established masters such as Roger Zelazny, Ben Bova, Orson Scott Card, Harry Harrison and Joe Haldeman await you. And much more. THE BEST OF OMNI SCIENCE FICTION takes you on visual voyages far beyond the worlds you know — from examinations of the structure of matter to incandescent views of distant galaxies. The artistry of H. R. Giger, Samuel Bak, and Ernst Fuchs provide the visual analogs of tomorrow shock. An exclusive interview with Arthur C. Clarke puts these far-ranging possibilities into perspective. 144 pages, 76 of them in full color! This luxuriously bound volume commemorating Omni's first year of publication will be a collector's item.

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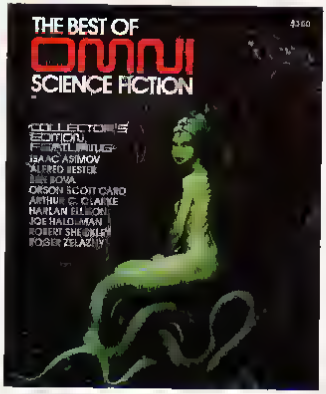

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TOTO, I'VE A FEELING WE'RE NOT IN KANSAS ANYMORE...

We're not. We're in the world of the future, a world no longer contained—or containable—on one planet.

Today we are concerned with the worlds within and the worlds beyond, because we know that this is where we'll find answers to some of the questions that haunt our curiosity. We look far into black, depthless space for definition of life and clues to its origin. We look further and further into the human psyche to try to fathom that secret universe. We look everywhere. The new pioneers are the scientists, astronomers, geologists, oceanographers, psychiatrists, chemists, physicists, and the rest, and the new frontiers they cross seem as uncrossable and improbable as America must have seemed before Columbus and space travel before the Wright brothers.

This is what OMNI magazine is all about. It was created in the spirit of this adventure. In its award-winning articles it has covered, and continues to follow, the entire science spectrum, including bionics, space travel, cloning, robotics, and even the timeless pursuit of the yeti.

OMNI publishes and interviews the greatest writers, scientists, and thinkers of our time—B. F. Skinner, Pohl, Asimov, Sagan, Toffler, Fuller, Heinlein. Regular columns on space, the arts, UFOs, and Earth keep fingers on pulses whose count is always subject to drastic change. And OMNI is the first major magazine to afford paranormal phenomena the simple dignity of a proper scientific inquiry.

There has never been a magazine like OMNI before, because there has never been an age like this one before. OMNI is on sale everywhere. But if you'd like to guarantee seeing all 12 issues for a year and save $6 from the newsstand price, then fill in the coupon below, enclose $18, and we'll start your subscription immediately.

OMNI. The magazine of tomorrow. But subscribe today because tomorrow is closer than you think.

THREE FUTURES

CONTINUED FROM PAGE 94

trapolation from known facts and speculation in an imaginative vein. We might usefully review our own list of those things that have been predicted and pulled off: automatic factories, robots, death rays, doomsday weapons, spacelight, impending solar energy, some replaceable human parts, home computers, wall-sized TV images, test-tube babies, hybrid crops, atomic energy and so on.

Yet airships have not come back, we are not living underwater or in space, private airplanes for commuting are not commonplace, and could you imagine New York or Tokyo if it were (elbow to rotorblade)? Clothing is not disposable, home-delivered everything never got beyond the Avon lady, radiant heating and present electric heating are questionable, atomic energy is by no means infinite, cheap or too readily available, cryogenic preservation is still real only in movies, domed cities do not exist, and high-speed mass transit seems more distant than near. Remember moving sidewalks and better taxicab service? Whatever happened to rotating houses, Wankel engines, monorails, picture phones, electronic newspapers, teaching machines, plug-in learning while you sleep, STOL aircraft, hovercraft on city streets, new steam-driven vehicles, electronically controlled cars on highways, and on and on?

There was a time in the nineteenth century when it was rumored that the Patent Office would close since everything that could be invented had been invented. We are no longer so naive. An object-oriented future may be as bereft of vision as one without any objects at all. The future is not a simple trick done at the end of a prediction. Still, we remain anchored in future present, thanks largely to three venerable gurus, each in his own way dominated by images and methods of future-past: Buckminster Fuller, Marshall McLuhan, and Herman Kahn. If we were to accept Fuller's image of Spaceship Earth and position our three gurus on its bridge, they might advise us of our journey into the future in the following manner.

As the ship's rigger, carpenter, plumber, and engineer, Fuller would be in charge of mechanical existence. He would advise setting a "new tension-compression mast to hold a triangular spinnaker that would..." Christopher Columbus–style sail us off to the future, using basic nineteenth- and twentieth-century technology. "When you want a new greater performance ship," he says, "you simply melt the old one—if it is made out of metals. You can use the same metals over and over again, ad infinitum." There would be Mason jars in the hold (we are reminded of the model boats in the tombs of the Egyptian dead). Mechanics are dandy, but the rum bottle had better be handy.

McLuhan, acting as the chief receptionist and assistant quartermaster, would call attention to what we received and how we perceived. When we looked ahead, he would remind us of the rear-view mirror; when we turned to the rear-view mirror, he would suggest we look ahead. "Societies have always been shaped more by the nature of the media by which men communicate than by the content of the communication," McLuhan instructs. He would tend to read all the "road" signs but help us miss the road. In a word, he would overreact to the changes in the delivery system of technology at the expense of its substance. Navigation requires knowing where you are going, not just a talent for playing with the quadrant.

Kahn, being in charge of lists, would immediately produce an Escalation Ladder (presumably our ship's condition and course is a little risky). His list: 16. Aftermath. 15. Some kind of "all-out" war. 14. Complete evacuation. 13. Limited nonlocal war. 12. Controlled local war. 11. Spectacular show of force. . . . And so it goes. We might take issue with lists that start out backward anyway. Our ship's bridge now begins to parallel the bridge of *Star Trek*'s *Enterprise*. Kahn will shift us away from the doom ahead of us to the doom within. We have a final bomb in the bilge and statistically our chances of survival are number 37. "What is supposed to be very new is often very old."

To recapitulate: Fuller offers us a technology for survival, but it is old and inadequate. McLuhan warns us that we are misreading technology and then jumps overboard. Kahn tells us that if we analyze technology properly, we can figure out a way for it to kill us. Great shipmates!

FUTURE-FUTURE

Whereas in future past there was at best a crafted magical future for pharaohs only and in future present a mixed technological bag for the right advanced cultures, future-future will surely be a time for the realization of all persons in a shared future. If as James Joyce says, "But Holy Saltmartin, why can't you beat Time?" we may have to give up trying and join it and blossom within it.

We should also acknowledge our need for a future. Without need, there is no fulfillment. As Simone de Beauvoir has said, "There is no justification for present existence other than its expansion into an indefinitely open future." An open future is one that sees time not as all-pervasive nor simply as measured, but as something whose events are created in their own particular time-space; this is a time of many tracks, many awarenesses, and many positions.

An open future means recognizing that remnants of the past will get through to the future. Some things and conditions must perform as a necessary continuity. Others

like Pompeii are accidents of capricious history. We may never know when we will be covered over by ashes and later pop up as a well-labeled exhibit in the Louvre. We will need new tools for future prediction and a revised mind-set to face the future of the future.

Photographer Barbara Morgan noted way back in 1973: "As the life-style of the space age grows more interdisciplinary it will be harder for the 'one track' mind to survive. I see simultaneous intake, multiple-awareness and synthesized comprehension as inevitable." The searches of simple speculation will give way to new forms of thinking. There is no way to deal with the combinational possibilities of the future without while actually searching, appearing to do something else, as when we are highly attracted to a sexual partner but pretend to be blasé before him or her or when we spear for a fish and have to compensate for the light diffraction.

The closest thing we can suggest at the moment is to adopt the "science" that studies the laws of creative activity, namely *heuristics*. Such an adoption means a more empirical approach to the future. Into the future with the rule of thumb. A leap of faith! We will have to seek answers that may confound our senses and mental conditioning, possibly even subvert the structure of our present minds. But isn't this what Johannes Kepler did as he substituted ellipses for "pure" circles when he calculated planetary orbits?

We must allow that part of us enriched by experience, rather than logic, to take control. To advance into the future, we should avoid projections of ourselves into "pure intelligence" or "bits of machinery." We must steer a careful course between these two extremes, as they have been articulated by Norman O. Brown and R. D. Laing. Brown has stated: "It is the essence of the scientific spirit to be mercilessly ascetic, to eliminate human enjoyment from our relationship to nature, to eliminate the human senses, and finally to eliminate the human brain. Pure intelligence is thus a product of dying, or at least of becoming mentally in-

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sensitive, and therefore is in principle madness." Steady! And Laing states: "We shall be concerned specifically with people who experience themselves as automata, as robots, as bits of machinery or even as animals. Such persons are rightly regarded as crazy." Steady again, just a little bit longer now.

We may be now and may continue to be inclined in the direction of bits of machinery and/or pure intelligence. It will be to our advantage however to accept a symbiosis of mind and matter. As part of our self-realization we will want to fill the sciences to a full rainbow rather than accept the discontinuities of today. Surely there will be closure between biology and physics. Biophysics will find itself under pressure to solve problems on the molecular level that require the combined wisdom of both former disciplines. One such problem will center upon the understanding of weightlessness in space.

As the closure occurs we will have to adapt our understanding to conform to the change. We must direct and not be directed by the consequences of the new sciences. Technology will have to be approached not as something apart from us, like a perverted and out-of-control imp, but as an extension of us. It will need our stewardship. Technology will be the means by which we make peace with the "natural" world. Man and woman are the motile tissue of the universe as we know it. Their mission is to act as the mind and nervous system for that universe.

Yet it has always been the nature of human beings to connect mind and matter. Now only the scale will change. It is scale that will take into account our new consciousness of multiple time centers and multiple constructs of space. We envision a time that folds into itself our past and present attitudes and projects them toward time and the future. The scale of time is toward infinity, the scale of space is toward infinity. We may awake ever so slowly, but we will awake. Awake to the future! In order to act on the universe we will have to leave Earth. However, two highly organized institutions will deal with those who stay: the Metropolitan Museum of Earth (under the good direction of Thomas Hoving, who will never die) and the United Sanitation Department (understaffed, of course). Everything on Earth will have become either an object of art or recyclable waste (is there anything else?), a true growth industry for curators and sanitation inspectors. Earth will be a nice place to visit or send radio messages to, but once we have reached another galaxy return calls will necessitate our having become eternal in order for us to receive them.

Our departure from Earth will be by means of an advanced Universal Turing Machine. Based upon those self-replicating machines conceived by Alan Turing 40 years ago, the Turing Machine is an automaton that is theoretically capable of reproducing itself, its offspring have similar capabilities. They do this as life does: by containing within themselves coded instructions for their own duplication. Their duplicate contains reproductive instructions as well.

In the future of the future, the Universal Turing Machine will not only self-program and self-replicate but self-grow, self-regulate (given changes in the environment), self-regenerate, and self-repair. It will be mobile, environment-sensing, and structurally adaptive. Its human cargo will not be identifiable by the untrained eye as different from the automaton. But therein will lie a continuum of coded and charged matter!

How will we create a machine of sufficient scale to hold billions of assorted people? We won't! The machines will be measured in centimeters. There is no point in using up precious fossil fuels to loft a pack of now-aging bodies (they too are art objects or recyclable waste). Those who go will go as fertilized eggs or as potential zygotes in a molecular soup. These zygotes will be birthed in the Turing Machine. The zygote, like its host, has within its nucleus a blueprint of its own: the structure of its DNA. As it grows, it will be nurtured and educated by the Universal Turing Machine. Thus the machine will grow along with the zygotes, picking up matter and energy as needed while moving out into space. In time the Turing Machine will convert itself from a ship to a city. And as its citizens get too big for one particular Machine City, it will spawn another Turing Machine. The new ship will very probably look like a radiolarian to the casual eye and make use of some form of ion engine to move itself. Its human passengers will create not a utopia but, more probably, a world like our own (with some improvements, one hopes).

Picture yourself aboard a four-dimensional version of the *Queen Elizabeth*. As we sit in the bar lounge, we spot Bucky Fuller, Herman Kahn, and Marshall McLuhan in heated debate with Woody Allen. All the futurists would be aboard in cloned-zygote form at first. They would be granted first crack and reduced rates. Even Akhenaton might be there, having been cloned from a fingernail. Laugh! Will Isaac Asimov be there? Yes, and writing more robot stories. As writer Meridel Le Sueur has said: "For none shall die who have the future in them." Future is where we will share as witnesses or participants in the big bang 2, a future where we may hold infinity in our hands. We may create a new universe through cooperative human action that combines on an infinite scale all the aspects of a fine garden. Within this garden we may act as gods fully realized in our person in time, fully realized in our person in space. We will one way or another fully realize what it is to be human! Thus, time, like so many other concepts that we accept as given, will have to be invented all over again. ∞

GAMES

CONTINUED FROM PAGE 145

READER ORIGINAL

Since a 20-foot-diameter sphere of 300 pounds would weigh less than an equal volume of air (about 339 pounds at sea level and 32°F, given pressure of 0.081 pound per cubic foot with air density at 14.7 pounds per square inch) the sphere would rise into the air. It would level off at several thousand feet and could remain there for years, riding the winds.

POTPOURRI

1. GOLDEN CHAIN. The jeweler cut all three links on one of the pieces, then used the broken links to join the other segments. He charged $6.

2. GEOGRAPHY. They are all towns in New York State. This one was sent in by Jim Lang of Columbus. That's Columbus, Indiana.

3. MATCH HOUSE.

4. WAITING GAME. Though the trains come through the station equally often, the intervals between trains are not equal. If the downtown train comes through every hour on the hour and the uptown train every hour at 20 minutes past the hour, and if the man arrives at the station at a truly random time, there is a two-to-one chance that the next train through will be going downtown.

5. MARKETING SURVEY. The salesman started with 15 copies of *Omni* at the beginning of the day.

6. SCISSORS RELEASE. Pull on the end of the loop that is knotted around the left handle. As this loop lengthens, slide it along the rest of the cord and thread it through the right scissors handle along the path of the rest of the cord. Continue lengthening the loop and, when it is sufficiently large, slip the scissors-through it, taking care not to twist the cord. Pull the scissors and they will come free.

7. TUMBLING POLYHEDRONS. No. If you could make a polyhedron that was unstable on every face, you would have created perpetual motion.

8. CLOCK PROBLEM. In one hour the hands of a clock exactly coincide with each other 11 times, not 12. Consider a 12-hour period that starts when the hands are not coincident. If you insist on starting the count at 12:00, consider several 12-hour periods in succession. You can't count each coincidence at 12 o'clock twice. The coincidence has to belong either to the hour just finished or to the hour about to commence. You can't have it both ways. The answer is 11. Case closed.

9. CLOCK PROBLEM REVISITED. 143 hours. The answer is derived from our *Clock Problem*, above.

10. CLOCK STRIKES AGAIN. The maximum wait will be 90 minutes, from 12:15 to 1:45. When you have heard the clock chime once on seven successive times, you know that in 15 minutes it will be 2:00.

LOGICAL QUICKIES

The answers to the five quickies are dedicated to the spirit of April 1.

11. DAYS. All 12 months have 28 days.

12. CAMPER'S DILEMMA. The match.

13. WINS. They weren't playing with each other.

14. DIG. There's no such thing as half a hole.

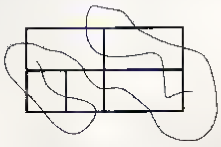
15. BASEBALL. Six. Three for each team.

OLD BUSINESS

We couldn't resist sharing with you the following letter in response to the Five Rooms Puzzle (November 1979). It captures, we think, the spirit of what Edward deBono calls lateral thinking.

Dear Omni:

I rearranged the rooms so I could do the puzzle. You didn't say that you could not



rearrange the rooms. Anyway, who would live in a house like that? Besides, nothing is impossible.

Your Disagreement,
Mary Lashway, Grade 5, Age 10
Littleton, Colo. OO

SPACE

CONTINUED FROM PAGE 22

start relocating heavily polluting industries off this planet and into space because the energy is there, the raw materials are there, and there is no biosphere to pollute with industrial waste.

When we relocate industry into space, an interesting consequence results. About 60 percent of the electric-energy output in the United States is consumed by industrial users; the other 40 percent is consumed by homes, stores, street lighting, office buildings, and so on. Therefore, as we move industry into space, the electrical demand on Earth decreases.

Not only does this mean that we can stop building nukes and fossil-fuel steam plants, but by the year 2020 or before (if we build SPS units faster), we can begin to dismantle the nukes and then the fossil-fuel plants. With industry taken off the planet, there would be electricity for all from the SPS system.

The extensive space-transportation system required to build the first 20 to 25 SPS units provides an additional spinoff. The cost of an SPS unit drops by almost an order of magnitude because its construction materials can be obtained from extraterrestrial sources. The first SPS units must be built from materials hauled up from Earth's gravitational pull, and the energy needed to transport the materials costs money. With a space-transportation system paid for in the cost of those first 25 SPS units, however, it becomes possible to get materials from the moon and the Asteroid Belt, between Mars and Jupiter—and at far less cost—because far less energy is expended to move materials around the shallow gravity fields of the moon and the asteroids.

Right now the United States, Western Europe, and Japan are energy importers whose industrial systems are based upon petroleum fuels. We face an energy crunch because we made the mistake of letting one end of a trade route get out of our control—in this case, the petroleum sources.

The solution is 36,290 kilometers above our heads. Furthermore, the output of an SPS is marketable. Whoever builds the SPS system will not only solve his energy crunch but become an energy exporter. While high technology is necessary to design, build, and operate the power satellite, the ground rectenna is a low-tech item. It can be fabricated and assembled by local labor because a rectenna is easier to construct than an office building is.

This is certainly an acceptable space program and potentially a very profitable one. The risks are high, but the up-front capital requirements are no greater than an earthbound alternative. Whoever builds the SPS system will end the energy crisis and in the process cause many of today's problems simply to go away. OO

CONTINUED FROM PAGE 73

their winghouse plant So Arca just naturally blew away The winghouses were—'

'Did Dom Felix—'

'I'm coming to that" said the old man tesfily. "The Big Chief was ready to give Dom Felix anything he wanted including his own job Dom Felix, he brought the Acceptance idea and before you know it an enclave ready to massacre itself turned into one big happy family You see, Dom Felix—'

'I know about that part Altair Tell me about the Receiver'

"Receiver yeah There was this technician genius—Kert Row was his name—and Wallich, a Mule, a theoretical synthesist best I ever saw She was also—well I had a real big thing for her for a while Well she had a lot to do with me double-tripping a whole lot later after what happened'

Patiently 'What happened?'

Dom Felix got a little winghouse out in the compound and drafted Kert Row and Wallich to help him invent the Receiver Mind you, he had no head for what it would take but he had the drive for it and the sure certain knowledge it could be done and between them Kert Row and Wallich had what knowledge and technique he didn't How hard he drove them and himself, too you wouldn't believe And Wallich pregnant at the time too He had some crazy idea it could be done some other way some way that would tear Terra apart he was afraid of that More than afraid Terrified Anyway bioenergetics was the key to it and Wallich was one of the all-time greats at that It was Wallich developed the defrosting technique with orgasm the-full organic bioenergetic field being better than anything ever invented to kick a Tripper out of stasis That's how she came to be pregnant by Dom Felix. It couldn't've happened by anyone on Medea, because she was a Mule if you know what that is"

'I know what that is Dom Felix—'

"Dom Felix was from Terra, and she had his charts down to the last molecule He was a good genetic match and she knew a lot of tricks to make it perfect She treated his sperm sample to make absolutely sure"

'Why did she do that?'

"Ah Wally she had a kink, a little neurotic kink, know what I mean? A Mule, you know I remember she said to me once Altair, oh God, what I wouldn't give to be a real woman!' I said, 'Well you are altogether through and through' And she cried and said she wasn't Well, she was Trudi She had hair like—'

'Yes, yes Still makes you cry doesn't it? Ha ha! So she thought if she had a baby she would be more real than real Now go on about the Receiver'

Okay, okay The three of them threw out the electromagnetic spectrum and the Finsteinian field complex space time, gravity, matter and started outside all that with bioenergetics as the beachhead Well it turned out not to be bioenergetics in the end but an analog of it something brand-new The vibratory—'

Yes I know how it works Everybody knows how it works I want to know how it was invented So—it was the three of them who pulled it off?

'Well no not exactly it was Dom Felix Kert Row got killed He was coming out to Dom Felix's winghouse with something Dom Felix had sent him for when an under pillar from the house fell on him Squashed his head There was a mechanic from the cycle pool started an ugly rumor about that Said the sensor chips inside the house had been tampered with made the house lift and topple the pillar Said he saw Dom Felix out there beating on Kert Row's head Don't you believe it I was out there myself not ten minutes after and saw Dom Felix working like a demon to get the pillar off him, not that it would've done any good His head was split wide open Dom Felix was crying saying over and over A way of thinking that's all it is, that special way of thinking I knew he was going to miss that special way of thinking and I bet he did but he got through anyway Maybe it could have been done only by a crazy man, and, I told you, he really was kind of crazy

Like about the baby When Wally was about to term he got the idea to deliver it himself He was still the Big Chief's superhero, mind, so he could get what he wanted Wally—I think she loved him then not later oh God no—but she was willing to do anything he wanted So he did it all by himself and it was okay And then he called the medics, and they took her and the baby inside And from that day on he never looked at either one of them, and she wouldn't even mention his name or let anyone else All she told me was he did something so disgusting that it made her too sick to think about it and it should be forgotten before the kid grew up Anyway the kid died and after that she died, too and that's all I know'

'That's all you know about the Receiver?'

That's all I know about Wally The Receiver, well you'd think without Kert Row and Wallich Dom Felix would've ground to a halt Far from it Nothing could've stopped a drive like he had and then though he had no real training maybe something of Kert Row's design genius and Wally's talent for synthesizing theories had rubbed off on him some way Anyway he did it by himself all right, and now you're talking to me and all the settlements on all the planets are tight together again Funny thing, he started out by failing Maybe that's what lit his spark'

'Failing? At what?'

Remember, I told you about Arca the Medean town or shrine or whatever it was Dom Felix went out there to bring them Acceptance and begin a new era on Medea love and brotherhood between two

different species for the very first time And that one time he sure laid a big egg One visit from him and they cut out and we never saw them again."

"I never knew Acceptance to fail."

The old man laughed. "Maybe they just wouldn't accept him. I told you he was more than a little crazy."

"One more thing, Altair. Will you give me your impression of the Receiver—how you feel about it and what it has done."

"I think it's wonderful and marvelous and a miracle and all the other stuff they say about it, and it certainly has tightened up communications, and anything that does that for humanity is something humanity needs, across space or across a room or across a bed. We are very good at talk and very bad at real communication. Everything we have ever accomplished, we have done at the price of something important. It's as if we weren't capable of seeing all the sides of any problem. Someone brought rabbits to Australia for pets, and the rabbits damn near ate up the continent. Someone found out petroleum could make a fuel, and they used it for a fuel until, one way or another, it killed more people than any war ever had. Someone found a hormone that would prevent miscarriages and produced a whole generation of women—their daughters—who would suffer with a new kind of cancer. Someone found out how to keep premature babies alive and produced a couple hundred thousand blind people. We were always like that. I guess we always will be like that."

"How do you apply that to the Receiver? Or do you?"

"Sure I do, but it's a feeling, that's all, not enough time has gone by to be sure. But you can see the signs. It's changed from a great discovery, a miracle, into a toy, same way all inventions do when they turn into entertainments. I just have this feeling about it. Don't know what makes me think about it right now, but when Dom Felix came back from Arca that time, he asked me, 'Why don't dolphins bite?' Well, that was a line I used to spout back in those days. Dolphins are carnivores with plenty of sharp teeth, plenty of strength and speed. They can even take on a shark and drive it off, and men have captured them and humiliated them and tortured them and brainwashed them, and never once has a dolphin attacked or bitten a man. They have even been known to help a man get to shore. And I used to say that it's because they know something we don't and that they're sorry for us."

"I still don't understand how that applies to the Receiver."

"Neither do I, friend, not altogether. I told you—it's just a feeling I have—that by using little parts of whole things we pass miracles that are a lot smaller than they could've been in their own time, in their own way. I see the Receiver turning into a toy, and it makes me sad."

"It takes a minimum of redesign to turn a crucifix into a pogo stick." ∞

GIANT

CONTINUED FROM PAGE 50

When the search party got to the water's edge, the black was gone. Hal was sure they were at the precise place where he had been. The blankets were still there.

The sky was clear when Hal awoke and, still in his pajamas, went straight to the terrace. They hadn't been able to find the black anywhere on the beach the night before, nor could they find any large footprints, and the ambulance attendants had finally driven away after making some comments about how booze affects not only the eyes but the brain as well. The cops had dutifully taken down Hal's story, along with Hank's words about seeing the blanket move and hearing what might have been a voice. All of this had added up to a poor night's sleep.

He saw the black as soon as he stepped outside. Although the figure was still on his back and naked, he was now lying at a point about halfway between the house and where he had first been seen at the ocean's edge. He seemed to be still smiling, although Hal wasn't certain because of the distance. The black looked larger now, however. But Hal thought the increase in size was attributable to the light.

Hal was trying to decide whether to go down to him at once or first phone the police when he saw the second black giant. He was also on his back and naked and in the same place where the first one had been seen the night before, and he seemed to be of the same size as the other. Hal couldn't tell whether he was smiling, but for some reason he had a strong feeling that he was.

Then he saw a third giant, also naked and also black, wash in from the Atlantic. He floated ashore on his back very near the other one, and he just lay there—smiling?

He's resting. Hal suddenly thought. *Of course.*

A movement brought his eyes back to the black midway between the ocean's edge and the house. The man was sitting up, and Hal could now see that he was not the same black he had seen the night before, even though he had a smile.

Hal had turned and was sprinting for the phone inside when he saw the giant black hand come over the terrace wall. Then he saw the man's face rise over it, too. It was the black he had seen the night before. He was sure of it, even though now he saw for the first time, in the early morning light, that the man had parallel rows of tiny, knife-thin scars on each cheek, and now the giant was speaking angry, unintelligible—voodoo?—words, and not smiling anymore.

As the black crested the wall, Hal found himself crazily thinking in one terrible moment, before the giant was upon him, of those words he'd said all his life. "The goddamn niggers are getting too big for themselves." ∞

CONTINUED FROM PAGE 16

Canadian nuclear-power programs. It was tested in 1974.

Pakistan either has the bomb or may soon have it. The Pakistanis have been working on their own Manhattan Project—their Karachi Project?—for some time. In 1974 a smuggling ring was uncovered that had been selling uranium stolen from India to Chinese and Pakistani agents in Katmandu, Nepal. In 1975, according to the British magazine *Eight Days*, a Pakistani physicist and metals expert, Dr. Abdul Q. Khan, breached security in the Dutch company for which he worked. Dr. Khan gained access to top-secret details of a gas centrifuge enrichment technology suitable for production of weapons-grade uranium. On being fired, he took his secrets home to Pakistan. *Eight Days* predicted in July 1979 that the first Pakistani test would occur in the fall. Perhaps that was what Vela detected in September.

It would, on first consideration, seem that the Pakistani bomb is intended as an equalizer to India's, since the two are old rivals. Two Indian defense specialists think otherwise. They have written a book, *Pakistan's Islamic Bomb*, that suggests that the bomb is intended for use against Israel. Pakistan is that great rarity, an Islamic nation without oil. Pakistan's bomb, the Indian authors suggest, would be a commercial as well as strategic enterprise. In return for sharing its bomb with other Islamic nations, Pakistan would receive oil and fighter planes.

An Islamic bomb becomes necessary, in Arab minds, because Israel probably has the bomb. Anyone arguing that Israel does not have the bomb or is not in pursuit of it would have to explain why Israeli agents hijacked 200 tons of uranium from a ship in the Mediterranean and also why the Israelis diverted weapons-grade uranium from a plant in Apollo, Pennsylvania.

Iran might not have beaten its Islamic sister states to a successful bomb design, but, until recently at least, it would have been a logical source of materials once production began. Two years ago Iran was embarking on a $30 billion nuclear-power program, the most ambitious in the Third World. The program never made any sense, since Iran floats on a sea of fossil energy. It has reserves of natural gas exceeding what it can use in 100 years, and it presently flares off much of that gas at the well. But Iran's nuclear program ran into difficulties. In 1978 Akbar Etemad, the president of the Atomic Energy Organization of Iran, resigned in order to answer charges of embezzlement and mismanagement.

Iran's nuclear-power program ended, but not because the United States and Europe sensed the coming excesses of the ayatollah and acted. It was scuttled by Iran itself. Troubled first by the rising costs of nuclear plants, then by the environmental and safety hazards, Iran's new government realized that paying interest on the two $495 million loans it would owe the German reactor builder would be un-Islamic. In May 1979 the Iranian Labor Ministry declined to renew the work permits for the 200 German engineers who were hurrying to bring the first reactors on line.

It is tempting, in thinking over nuclear matters, to take comfort from the fact that the world, after the first two angry nuclear detonations, has passed 35 years without another one. For anyone hopeful that it can continue to be so, that some human instinct for self-preservation will prevent a dazzling and thunderous climax to the madness of nuclear proliferation, it might be instructive to remember the words of Ayatollah Ruhollah Khomeini.

"We cannot control these youths," the old man said of the students who had seized American hostages. But he did not. The ayatollah added fear the consequences of his lack of control. "Why should we be afraid? We consider martyrdom a great honor. We will destroy all those who attack, and we will be killed ourselves."

Of all the dangers inherent in nuclear power proliferation is the gravest. It is remotely conceivable that we may someday learn to prevent our Three Mile Islands, that we can ship plutonium about the country without hijackings, that we will find safe places to segregate our radioactive wastes. It is *not* remotely conceivable that we can avoid nuclear war in a world where 50 nations, or 100, have nuclear bombs. Without nuclear power, proliferation is still possible, buf not nearly so easy. Nuclear power makes available technologies and raw materials that would be difficult or impossible for bomb-hungry minor powers to achieve on their own. It is no accident that the most recent proliferation followed that route. That the peaceful atom can be separated from the warlike atom is an illusion. If we don't phase out nuclear power it is likely fo phase us out. President Carter began his term in office with strong antiproliferation rhetoric, but his deeds have not matched his words. The United States continues to be a reactor vendor to the world. If we don't insist that our politicians match word and deed, proliferation will continue. If the nuclear phaseout is to happen, it must begin at home, where the trouble began.

We can always hope that Vela simply malfunctioned. Perhaps the satellite had a psychotic failure of its equipment, like Stanley Kubrick's HAL in *2001*. Perhaps it only wanted some attention after nine years of orbiting alone. Desperate, perhaps, to justify its long mission, it imagined the flash that it thought we wanted to see. Maybe, as it slipped into senescence, it had a hallucination. Maybe it was dinged by a micrometeorite and for a moment saw stars.

Let's hope the satellite was mistaken. Otherwise, what Vela saw may have been the beginning of the end of the world. ∞

BOOKS

CONTINUED FROM PAGE 28

have been Worldcons in Great Britain Australia Canada and Germany) You do not have to attend the convention to be a voting member For instance, attending membership for the 1980 convention in Boston Massachusetts Noreascon II will cost you $30 (it was $20 until last July) but a supporting membership including Hugo franchise is only $8 the cost of four paperbacks or one hardcover Nominating ballots are already out, the final ballot will be mailed out in June the winners will be announced at a special ceremony at the Worldcon

Named for Hugo Gernsback the father of magazine SF Hugos are currently awarded for the five writing and dramatic categories for which Nebulas are given and for two other professional categories Best Artist and Best Editor Since Hugos exist because fandom demanded them fandom has seen fit to reward itself There are three more Hugos for Best Fanzine Best Fan Artist, and Best Fan Writer Finally there are three non-Hugo awards which might as well be since they are voted by the same group and are announced at the same ceremony These are the John W Campbell Award for Best New Writer (privately sponsored by Conde Nast Inc publishers of *Analog*) the Gandalf Award for Best Fantasy Novel and the Gandalf Lite Award for lifetime contribution to fantasy (It might be mentioned here that the idea for the Campbell Award came from *Omni*'s own Ben Bova)

If it would be difficult to influence a Nebula vote it would be impossible to rig a Hugo in the last year for which I have accurate figures 1978 there were 540 nominating ballots and 1,246 final ballots

A modern Hugo Award consists of a silvery rocket ship on a wood (or fake wood) base The design for the 34 5-centimeter tall rocket was lifted from the hood ornament of an Oldsmobile 88 and has been standardized for over 20 years Each convention committee designs its own base and they vary widely from plank to pedestal to billboard If you take a Hugo on a long-distance plane trip as most winners do it changes from gleaming new spaceship to beat-up asteroid freighter Pressurization brings out hundreds of tiny pits on the hull surface There seems to be no way to avoid this that would not triple the per-unit cost, and why bother? A *used* spaceship is more romantic

Curiously neither of the two all-time Hugo Award winners is a professional writer Richard E Geis has won a total of 11 Hugos so far for Best Fanzine and Best Fan Writer and Kelly Freas has been named Best Professional Artist ten times The winningest professional writer depends on your point of view Fritz Leiber has won eight Hugos, Harlan Ellison has seven Hugos and two Special Committee Awards (not voted by the membership) for his anthologies *Dangerous Visions* and *Again Dangerous Visions* (Both men have three Nebulas) The late John W Campbell collected eight Hugos for Best Magazine for *Astounding* and *Analog*, Edward Ferman has won eight Best Magazine Hugos so far for *The Magazine of Fantasy & Science Fiction* Other multiple champions include Poul Anderson (seven Fiction Hugos and two Nebulas) Ben Bova (Best Editor for six of the seven years he s been eligible so far) Larry Niven (five Fiction Hugos) and Tim Kirk (five times Best Fan Artist) Samuel R Delany and Robert Silverberg are tied for most Nebulas, with four apiece

It is not at all unusual for a given story or novel to win both a Hugo and a Nebula In eight of the last ten years at least two titles made the double sweep (with some oddities A Delany story took the Novelette Nebula and Short-story Hugo so did a Sturgeon story) Note that Nebulas are dated by the year of publication Hugos by the year of award Hence a story might win say a 1977 Nebula and a 1978 Hugo

If you do not exercise your right to vote for the Hugos, you deserve the fare you are served You need not be intimately familiar with the genre to vote wisely If one book or story all year impressed you, vote for it And if *none* impressed you vote No Award

To vote for the 1980 Hugos (for works published in 1979), send $8 to NOREASCON II, PO Box 46 MIT Station Cambridge MA 02139 If you re within reach of Boston send $30 for an attending membership Noreascon II will be held August 29—September 1 at the Sheraton-Boston Hotel from my experience with New England fandom attenders are guaranteed a good time You re likely to find your favorite authors there—especially if you remembered to nominate them—and you will certainly find people willing to argue about or drink to *anything*

LOCUS AWARDS

We are not done with the major SF awards The Nebulas are strictly for writers the Hugos are for everyone The Locus awards are for those interested enough in SF to follow its intimate month by-month details be they writer fan, or interested professional (agents editors, artists) *Locus* edited by Charles N Brown is the newspaper of the science-fiction field Every month it brings genre news market reports personal notes listings of books published and conventions planned and numerous other items of interest to pros and dedicated fans (Subscriptions in North America are $9 a year $13 50 for first class mail overseas subs are $12 50 or $20 for airmail all prices payable in U S dollars only to Locus Publications PO Box 3938 San Francisco CA 94119)

Although the Locus awards enjoy nothing like the international prestige of Hugos and Nebulas they have begun in recent years to carry a similar weight with industry insiders An excellent story may fail to win a

Hugo or Nebula merely because its initial appearance was in an obscure magazine or a poorly distributed original anthology, presumably *Locus* readers are most likely to be widely read in SF By the way *Locus* itself won Charlie Brown (and ex wife Dena Brown) five Hugos before he officially withdrew it from consideration as a fanzine

HOWARDS

Those of you who are fantasy fans and who are disgruntled to find only two not-quite-Hugo categories for fantasy in the above (although fantasy is eligible for Nebulas, only four or five fantasy titles have won in ten years) can relax In the last five years fantasy fandom has achieved its own world convention, complete with annual awards The Howards are named after H P Lovecraft Although the World Fantasy conventions are currently approaching SF Worldcon size, the Howards are awarded by a six-member jury

MISCELLANEOUS

There are a host of other awards in SF regional awards such as the New England Science Fiction Association's Skylark Award (given annually at Boskone, the Boston regional convention) and assorted awards such as the Prometheus (for Libertarian SF) the Jupiter (awarded by SF teachers) the Balrogs (for fantasy) and the John W Campbell Memorial Award (for "literary merit," as defined by a jury of academics this is not to be confused with the John W Campbell Award given at the Hugo ceremony for Best New Writer)

Strictly for British works, there are the annual BSFA awards the British Fantasy awards and the British Science Fiction awards I understand that these are all one-category (Best Novel) awards the last named privately sponsored by Futura Publishers incorporates a £500 cash prize (a practical award) Australia's Ditmar awards voted by the membership of an annual national convention are given for Best International SF and for Best Australian Novel and Short Fiction

Non-English-language awards include France's Prix d Apollo, Italy's Cometa d'Argento, Sweden's Jules Verne and Japan's Seigunsho Although American SF is eligible for some of these it is eligible only in the year of translation which can be as much as ten years after publication

But it is the Hugos, Nebulas, Locus Poll winners and Howards to which American publishers and editors pay attention And you can influence at least two of these

I cannot close without noting that a great anthology could be assembled by collecting all the books and stories that ever *lost* a Hugo, Nebula, Locus or Howard For a comprehensive listing of everything ever nominated for a Hugo or Nebula or the long-defunct International Fantasy Award (given from 1951 to 1957 by a jury with superb taste) send $3 50 U S to Howard DeVore, 4705 Weddel Street Dearborn, MI 48125 ∞

Cameras, photography equipment and a vacation in Jamaica

PHOTO CONTEST

Each month *Omni* presents Phenomena, a striking photographic feature that depicts the infinite range of humanity's scientific vision (see page 142). Past examples of *Omni* Phenomena include pictures of

- Soap bubbles (Pustefix), by Ken Kay (October 1978)
- Photomicrograph of green algae in photosynthesis, by Roman Vishniac (November 1978)
- A polarized closeup of Epsom salts, by Paul Brierley (March 1979)
- Sunrise off Baja California, by Ken Kay (May 1979)
- Bighorn sheep butting heads in Canada's Banff National Park, by Marty Stouffer (October 1979)
- An Icelandic volcano, by Pete Turner (November 1979)
- Closeups of letter and number patterns observed in butterfly wings, by Kjell Sandved (January 1980)
- A computer-graphic image of a fried egg on toast, by the New York Institute of Technology (February 1980)
- Heat thermography of an Oriental dancer, by Richard Lowenberg (March 1980)
- Closeup of a seashell hundreds of millions of years old, by Robert E. Pelham (this issue)

What ties them all together? They're phenomena—visions or events of scientific interest, exceptional moments captured with all the color and brilliance photographic technology can offer.

What will catch our eye and be chosen as a Phenomena photo? It's hard to say as the list above suggests, but we'll know it when we see it. That's what this competition is about. We can't define the kind of pictures we're looking for any more precisely than to say: Look at the photos we've published in the past, and carry on.

If you have a dramatic color photograph that captures some "phenomena" of *Omni*'s world, send it in.

For this special competition we will award special prizes.

THE GRAND PRIZE WINNER will receive the 35mm SLR camera of his or her choice.

★ Canon AE-1
★ Minolta XD-11

Jamaica: a one-week vacation for two

Canon AE-1

Minolta XD 11

★ Nikon FE
★ Olympus OM-1
PLUS a one-week (eight days, seven nights), expenses-paid vacation for two in sunny, photogenic Jamaica, the arts and cultural capital of the Caribbean.

THREE RUNNERS-UP will each receive an equipment package from CPC, consisting of the following items:
★ Phase 2 leather equipment bag
★ Back-packer tripod
★ 200mm telephoto lens
★ 28–50mm wide-angle zoom lens
★ CPC Phase 2 filters

Olympus OM-1

SIX HONORABLE MENTIONS will each receive $25 in cash, an *Omni* duffel bag and an *Omni* T-shirt.

Here are the rules:
1. Photographs must be original, previously unpublished, and solely your property.
2. You may enter more than once, but each entry must be submitted in a separate envelope.
3. The competition is open to everyone except employees of Omni Publications International Ltd. and their families.
4. Color slides. Print your name and address on the slide's border as well as on an accompanying letter explaining the photo.
5. Prints. Print your name and address on a small slip of paper, and tape it to the back of the print. Put your name and address on the accompanying letter. If possible, enclose the negative as well.
6. We cannot return any photos. So send us something you can part with. If you wish to keep the original, have a duplicate of your slide or print made, and send that. If your photo is chosen for publication, we will contact you to obtain the original.
7. In order to allow extra time for you to shoot, process, and reproduce your pictures, the deadline for this contest is extended one month beyond the usual closing date for *Omni* competitions.
8. Finalists will be chosen by the Competitions editor Scot Morris, *Omni* Art Director Frank DeVino, and *Omni* Editor/Publisher, and Design Director Bob Guccione.
9. *Omni* will have the right to reproduce all entries in *Omni*, its advertising, promotion, and displays, and in shows and exhibits without limitation. *Omni* will pay its standard fees for editorial use of any entries for purposes unconnected with the contest. Winning entries will become part of a special *Omni* photo collection. Exhibits of this collection are being planned in major cities throughout the country and abroad.
10. Prize-winning contestants may not permit publication or display of prize-winning photographs without the prior written consent of *Omni*.
11. Entries must be postmarked no later than June 16, 1980 (or July 1 for entries mailed from outside the United States). Pack them carefully and send them to OMNI Photo Contest, 909 Third Avenue, New York, NY 10022.

Nikon FE

CPC equipment package

FORUM

CONTINUED FROM PAGE 14

motives and means are well within the abilities of earthly powers

Alan K. Bingham
Portland, Oreg.

Research on Humans

As a researcher and as a potential subject, I wish to comment on Dava Sobel's article "So That Others May Live" [December 1979]. What seems to be at issue is scientific freedom and accountability.

The Institutional Review Board (IRB) is painted as a bogeyman in Sobel's article—witness the language: "If these peers judge the experiment scientifically unnecessary or excessively risky, they kill it with their disapproval." And: "How likely would he [Edward Jenner] have been to get institutional approval of [his] plans . . . ?" Yet the examples of unethical research cited by Sobel cry out for some review of research involving human subjects. It is unrealistic to expect the investigator, eager and impatient to push back the frontiers of knowledge, always to be objective about the risks to subjects. Sobel also talks about the loss of federal funding if institutions flout DHHS regulations that protect human rights. IRBs seem to me a practical way of ensuring the accountability of researchers. As a taxpayer, I want to be sure federal funds for research are used for investigations that are ethically and competently carried out. As a clinical researcher I want to be sure that my investigations are above reproach. I welcome the public scrutiny and professional, scientific advice an IRB has to offer me. As a participant in research done by others (administration of, and teaching subjects about, medications) review by an IRB protects my rights as a participant and the rights of my patients. Finally, as a potential research subject, I welcome the safeguards built into the review process.

I find Sobel's comparison of the current research climate with Jenner's era simplistic. Many social changes have occurred that would make Jenner's practices unacceptable among them mass communication and federal funding for research.

What of scientific freedom? One author has suggested that the difficulties we are having stem partly from our wish to have the same scholarly freedom in our research with human subjects as has been present in research with basic science. In clinical research, the investigator-subject relationship is closely linked to the therapist-client relationship. This unique aspect of human subjects exercises [a limiting] influence on research. Talcott Parsons suggests the inclusion of a "lay" element in the professional complex (against the wishes of those scientists who insist that the public is not savvy enough about research to pronounce judgment). He says that this will preserve and strengthen the trust between researcher and subject.

I believe that scientists should be accountable for communicating with the lay community regarding the processes as well as the outcomes of research. This can foster a positive attitude toward human-subjects research and can encourage people to participate knowledgeably in such endeavors.

In the area of health and disease, funding is often determined by identified needs. Thus the passage of the National Cancer Act in 1971 provided for research to determine the causes and the treatment of cancer, which kills more Americans than any other disease except heart disease.

William McElroy writes in *American Scientist* about increasing societal imperatives to mobilize science toward solutions of environmental and social problems. Susan Gortner suggests that "we must acknowledge that ordering of research activities is inevitable, with regard to both execution and financing," and that this should be determined by the scientific societies.

Scientists and the lay public face many thorny, complex issues in the area of human-subjects research. Researchers must remove their cloak of elitism and share with the public the excitement and benefits that research offers. How we explain human-subjects research to the public determines whether scientists and subjects embark together on an adventure, a human endeavor to solve pressing human problems.

Judy Spross, R.N., M.S.N.
Mary Hitchcock Memorial Hospital
Hanover, N.H. ∞

TIME CAPSULES, TRANSLATORS

INNOVATIONS

The ubiquitous hand-held calculator is beginning more and more to resemble a portable computer. An example is Toshiba's brand-new model LC 840WA, which Toshiba has dubbed the Time Capsule. This handsomely designed black-and-silver unit features the usual calculator functions, including memory, square root, and percent. It also features a 24-hour alarm that can be preset for two different times in one day or preprogrammed up to a month in advance. A gentle little beeper sounds from hour to hour on the hour. But most of all, Toshiba's Time Capsule contains a calendar preprogrammed for 199 years (1901 through 2099) that automatically displays the current month of the current year. The current date announces itself by flashing on and off within the calendar. You can instantly call up from the calculator's memory any month from January 1901 through December 2099. This reviewer learned that 99 years from now his birthday will fall on Thanksgiving Day. That is just one example of the interesting information one can obtain by using Toshiba's Time Capsule.

Soon it will also be necessary to make room in one's pockets for hand-held electronic dictionaries. The first moves have already been made by such manufacturers as Craig and Lexicon, which have produced hand-held translators. Sharp Electronics has taken a further step. Its IQ-3000, a portable electronic unit capable of translating the average usable English vocabulary (about 2,500 words) into other languages, provides almost twice the word capacity of translating machines now on the market. This Sharp unit can also display the symbols and characters of almost every alphabet, and it operates for 1,000 hours on three silver oxide batteries.

The IQ-3000 is intended primarily for use by Japanese people learning English, and it will soon be sold in the United States. It displays 2,500 English words and 300 English compounds in the Roman alphabet and translates them into 5,000 Japanese words displayed in the Katakana alphabet. The unit has a key that will call up homonyms and synonyms and a key that tests the spelling of an English word with a reply of "good" or "wrong." Sounding more and more like a dictionary, this unit also supplies conjugations of English verbs and gives singular or plural noun forms and the adjectival form together with its comparative and superlative. Just in case you don't already have one, the IQ-3000 also functions as an eight-digit, four-function calculator with memory.

For the American market, Sharp plans to follow up this dictionary with a series of electronic translators capable of translating 3,000 words and simple phrases from English to French, German, Japanese, and Spanish. The projected units, unlike the IQ-3000, will also be equipped to handle an unlimited number of interchangeable preprogrammed modules for each language.

A new wrinkle based on old technology—using iron powder to generate heat in a hand-held pad—has been developed in Japan, according to the Metal Powder Industries Federation. By mixing iron powder with copper chloride, a chemical reaction begins that generates heat up to 50°C for approximately 24 hours. One starts the process in a 5" × 3" throwaway bag by removing it from a sealed plastic wrapper, shaking the contents, and then rubbing the sides together. Called the Hot Mini 24, the bag provides a compact, lightweight source of heat, useful to warm hands or other body parts during cold weather.

An item of interest to both the visually impaired and the conspicuously consuming is the Talking Scale, a handsomely designed unit that speaks your weight within moments of your stepping on it. Available for $1,000 from Detecto Scales (103-00 Foster Avenue, Brooklyn, NY 11236), the Talking Scale is also of possible use to those who, like us, need a few cups of coffee in the morning before our eyes will focus properly.

The Time Capsule calculator from Toshiba checks dates 79 years past or 119 years into the future.

COMMUNICATIONS

CONTINUED FROM PAGE 10

contest [January 1980]. A true case of time *travel* because just two weeks before the issue came out I saw the same observation graffitied on a wall in a men's lavatory in Big Sur, California. But you ain't heard nothin' yet. On the first page of *The Time Professor*, by pioneer scientifiction author Ray Cummings, *published in 1920*, appears the original sage observation that "time is what keeps everything from happening at once." One more proof that one of Thomas Edison's assistants, the author of *The Man Who Mastered Time*, was ahead of his time.

Forrest J Ackerman
Hollywood, Calif.

Humanizing Cyborgs

Perhaps without realizing it, I think Thomas Hoover hit a key point in his article on "Intelligent Machines" [October 1979] when he wrote that researchers in the field have "painfully discovered that our type of intelligence cannot really be isolated from the rest of human life and experience." Perhaps someday we will be able to build a thinking machine that, from the instant of its "birth," will behave as if it has "human experience." But, after all, it takes humans substantial periods of time after birth to acquire even very fundamental sorts of human reasoning. Perhaps ultimately the best way to produce a machine that can think like a human will be to allow that machine time to acquire the equivalent of human experience. For a very excellent treatment of this theme, see Otto and Earl Binder's classic science-fiction tale "I, Robot."

Brian Rattel
Sydney, Australia

Interdimensional

Your interview with Ufologist Jacques Vallee in the January issue was outstanding.

Dr. Vallee's views obviously were conceived after much thought and research. He has the insight to conclude that the UFO phenomenon is better understood by studying the observer in addition to the UFO.

Eckankar, a very old science of spiritual inquiry, teaches that UFOs are really interdimensional phenomena. These dimensions, which coexist with the physical world, often impinge on one another resulting in "sightings" by some individuals who have the ability to perceive them. This ability may vary with individuals, thereby causing confusing or contradictory reports.

The import of all this is simply that, like other psychic phenomena, UFOs will remain mysterious and inexplicable to most people until they realize that physical laws operate only in the physical universe. Our perception of the matter-energy-space-time complex must be altered if we are ever to grasp this subtlety.

D. Alan Anderson
Port St. Lucie, Fla.

COSMIC CALDRON

STARS

By Mark R Chartrand III

American Indians called it Smoking Star The eighteenth-century astronomer Charles Messier thought it was a comet, but he quickly changed his mind and tallied the observation as number 42 in his list of nonstellar celestial objects 'A cosmic cradle ' one modern astronomer has dubbed it

M42 the Great Nebula in Orion is one of the most striking sights in the heavens Through a small telescope, it is a wispy cloud of gas, slightly greenish, with four intensely blue-white stars called the Trapezium at its center Long a favorite with amateur astronomers it holds within its swirling interior some of the secrets of stellar conception and birth

A nebula like the one in Orion is a sea of dust and gas—atoms and pieces of atoms—and of radiation and magnetic fields It is not surprising that most of the material is hydrogen Most of the universe is hydrogen, next in abundance is helium Together they make up the greater portion of nebular matter We still don't know what the dust is composed of

Ionization occurs in the gas of a nebula close to very massive, hot stars Through such regions passes a tremendous flux of ultraviolet radiation, each photon of which has enough energy to strip the electron from a hydrogen atom The free protons and electrons whiz around the nebula the electrons with a speed equivalent to a temperature of 10,000 degrees Kelvin Each massive star is thus immersed in a sphere of ionized material

Recently astrophysicists have found that nebulae are much more complex and interesting than they once believed Optically invisible regions have been mapped with radio telescopes, and dark tiny globules appear in infrared light

Along with hydrogen helium, and traces of a few other elements, such as oxygen and nitrogen the dense regions of nebulae harbor vast clouds of molecules Many are familiar on Earth A few have never been seen in test tubes Among the molecules are water formaldehyde carbon monoxide and drinking alcohol, and there are more than three dozen others These molecules and the other trace elements may play an important role—even a crucial role—in the formation of stars from the nebular gas

Several astronomers at a recent meeting of the American Association for the Advancement of Science tried to elucidate the first steps of stellar genesis in nebulae Dr Frank Shu, of the University of California at Berkeley, thinks that what triggers contraction in a cloud of gas is a wave of compression that sweeps over a region of the galaxy Such a wave forms a spiral which explains why the brightest stars in some galaxies are aligned in pinwheel patterns Dr Peter Bodenheimer a colleague at California's Santa Cruz campus notes that for nebular matter to become a star its density must increase by the factor of 10^{20} (1 followed by 20 zeros) its temperature by 10 000 times

As the protostar evolves it becomes observable in various regions of the spectrum When a piece of the nebula separates from the rest of the gas it heats up and begins to radiate infrared light—higher in energy than radio waves but still less energetic than visible light The central part of this collapsing cloud contracts further and forms the nucleus of a new star This protostar continues to shrink until temperatures at its center reach several million degrees Then the fusion of hydrogen begins and the star enters its adult life During these last stages of contraction minor eruptions occur at the star's surface and some of the leftover material may condense into planets

What we see in nebulae agrees roughly with what theory tells us should occur but our calculations are far from complete There are so many complex processes going on in these cosmic caldrons that it takes many hours on the largest computers to get even sketchy results

Both calculations and observations are bound to improve as computers get bigger and more telescopes go into space This two-pronged attack will bring us new knowledge of how nebulae like the one in Orion work

It's important to know. Five billion years ago our solar system was part of such a nebula ∞

The secrets of starbirth hide in globular nebulae such as M42 the famed Great Nebula in Orion

COMPETITION

By Scot Morris

Amazing! Beautiful! Hard to believe! Those were typical reactions to entries in *Omni*'s Competition #9.

Last September we introduced the symmetrical designs and signatures (" designatures ") of Scott Kim, a Stanford University graduate student. Kim has the uncanny ability to twist words and letters so that they can be read backward, forward, upside down, in mirrors, and every other way imaginable. We asked our readers to submit their own designatures, which produced an array of incredible entries that turned our heads—literally.

Faced with the quandary (a) of printing many favorites reduced to microsize or (b) of printing the very best large enough to be appreciated, while omitting many other good entries, we decided (c) to do neither. Instead, in this issue we give you the very best, the money winners, and in the next issues of *Omni* a sampling of other favorites. The results of other ongoing competitions (#10, Prizes; #11, Anagrams; and #12, Mnemonics) will be delayed, but when you see what we've saved for next time, you won't be disappointed.

In past competitions we have sought out a guest judge to offer opinions and suggestions before we made the final choices (Isaac Asimov for Competition #4, Limericks, and I. J. Good for #6, Partly Baked Ideas). For this outing we went to Scott Kim himself. The winners were chosen by this editor after some detailed suggestions had been offered by Kim.

Judgment for submissions—sundry and various—offer hereby. I've thoroughly enjoyed going through such a wealth of entries. It was difficult to rank them. The diversity of styles was what I found most interesting. I was impressed by how consistently people were willing to go beyond the given examples into new areas of exploration. I saw many new techniques that I never would have believed would work.

Three "new techniques" that weren't quite what we asked for, but that opened our eyes to new possibilities, made the finals. KNOWLEDGE/IGNORANCE is the best example of *regrouping*. The design can be read as either word, depending on how one breaks the letters. NUMBERS is a clever use of *ambiguous shapes* that could be letters or numerals. The OMNI BUSINESS CARD is a form of stretched-out lettering called *anamorphic art*. This technique can be used on any set of letters, and so we did not consider this a truly creative entry. Yet the hidden information comes as such a surprise to those who have never seen anamorphic art that we awarded it incredible mention.

In CALIFORNIA EARTHQUAKE all the letters are right side up, but the two words are mirror images of each other.

The remaining winners are meant to be turned upside down. Three become new words when inverted: LIFE/DEATH, SANTA/CLAUS, and REALITY/FANTASY. Others stay the same: CHICAGO, JOHN WAYNE, and GALILEO. In the cover letter, I HEREBY OFFER VARIOUS AND SUNDRY—SUBMISSIONS FOR JUDGMENT every word is invertible, and the sentence itself may be read backwards. Finally, there's the figure-ground design. MERRY CHRISTMAS is in black letters. Turn it upside down and there's HAPPY NEW YEAR in white.

We judged originality, legibility, consistency of lettering style, elegance, and most important, the strength of people's reactions when we showed the drawings around. Herewith are our favorites. Next month—Honorable Mentions.

GRAND PRIZE WINNER, $100

LIFE/DEATH upside-down design by C. E. Krausie, San Francisco, Calif.

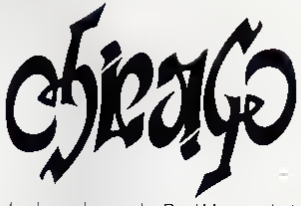
RUNNERS-UP, $25

KNOWLEDGE/IGNORANCE letter regrouping by Jeffrey Scott, Los Angeles, Calif.

MERRY CHRISTMAS/HAPPY NEW YEAR upside-down figure-ground design by Charles Montgomery (no address)

SANTA/CLAUS upside-down design by Donald Welsh, Kansas City, Mo.

NUMBERS ambiguous lettering by Bruce Goral Golden Colo



CHICAGO upside-down design by Paul Marxen Lake Zurich Ill

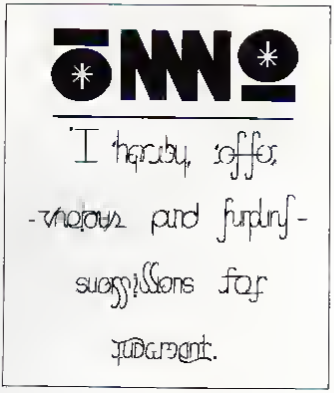
JOHN WAYNE upside-down design by Donald B Eburne Malden Mass

CALIFORNIA EARTHQUAKE, top-bottom symmetry by Frank DeJong Huntington Beach Calif

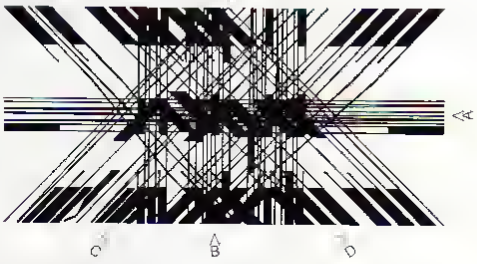
GALILEO GALILEI upside-down and ambiguous design by Dan Moran, Columbia S C

REALITY/FANTASY upside down design, by Henry M Swope Braden Tenn

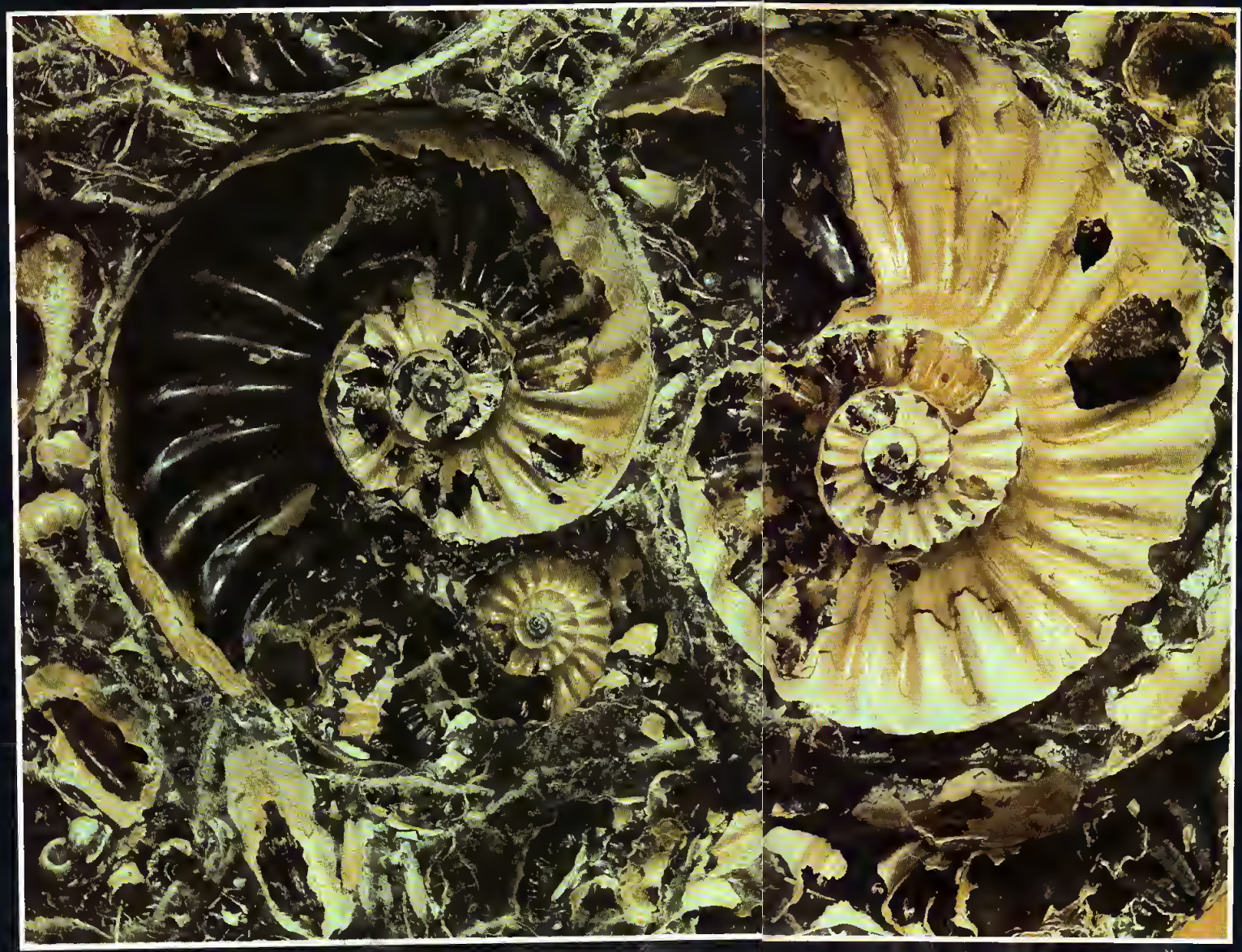
INCREDIBLE MENTION $50



COVER LETTER upside-down words by G Scott Sherman Gainesville Fla



OMNI BUSINESS CARD anamorphic art by Hermes A Salonga Sarnia Ont Canada (Lay page flat on horizontal plane and bring eye about one inch above plane Sight down lines marked A B C and D to read OMNI/909 THIRD AVENUE/N Y N Y 10022/212-593 3301)



PHENOMENA

The beginnings of modern ocean life are displayed in this remarkable photograph. These shells are specimens of *Leioceras concavum*, members of the now-extinct Ammonite subclass. Ammonites flourished during the Jurassic Period, about 150 million years ago, and are distantly related to our present-day nautilus and squid.

The shells were found in southern England, which today, of course, is land, but then was covered by warm seas. They are preserved in a limestone slab from ancient sediments; the shells themselves have been metamorphized to agate and calcite. The shell covering, known as a periostracum, is composed of opal.

Biologist Dr. William J. Tiffany and photographer Robert E. Pelham combined to obtain this photograph. They submerged the shells in water and illuminated them with 5,000° K floodlights in order to bring out the contours and then took the photograph, using a Pentax MX camera with Kodachrome 64 film at f/11 and 0.25 second.

Crabs walk sideways and a puzzle potpourri

GAMES

By Scot Morris

In this issue are winners of our competition for designatures—words and names that can be read backwards, upside down and every which way—modeled after the work of Scott Kim (see page 140). As a literary counterpoint we present "Crab Canon" by Douglas Hofstadter from his book *Godel, Escher, Bach* (Basic Books, © 1979), reprinted by permission. The dialogue has a strange symmetry reminiscent of Kim's designs.

CRAB CANON

Achilles and the Tortoise happen upon each other in the park one day

Tortoise Good day, Mr. A.
Achilles Why, same to you.
Tortoise So nice to run into you.
Achilles That echoes my thoughts.
Tortoise And it's a perfect day for a walk. I think I'll be walking home soon.
Achilles Oh, really? I guess there's nothing better for you than walking.
Tortoise Incidentally, you're looking in very fine fettle these days. I must say.
Achilles Thank you very much.
Tortoise Not at all. Here, care for one of my cigars?
Achilles Oh, you are such a philistine. In this area, the Dutch contributions are of markedly inferior taste, don't you think?
Tortoise I disagree in this case. But speaking of taste, I finally saw that *Crab Canon* by your favorite artist, M. C. Escher, in a gallery the other day and I fully appreciate the beauty and ingenuity with which he made one single theme mesh with itself going both backwards and forwards. But I am afraid I will always feel Bach is superior to Escher.
Achilles I don't know. But one thing for certain is that I don't worry about arguments of taste. *De gustibus non est disputandum.*
Tortoise Tell me, what's it like to be your age? Is it true one has no worries at all?
Achilles To be precise, one has no trets.
Tortoise Oh, well, it's all the same to me.
Achilles Fiddle. It makes a big difference, you know.
Tortoise Say, don't you play the guitar?
Achilles That's my good friend. He often plays the fool. But I myself wouldn't touch a guitar with a ten-foot pole!

(Suddenly the Crab, appearing from out of nowhere, wanders up excitedly, pointing to a rather prominent black eye.)

Crab Hallo! Hulloo! What's up? What's new? You see this bump, this lump? Given to me by a grump. Ho! And on such a fine day. You see, I was just idly loafing about the park when up lumbers this giant fellow from Warsaw—a colossal bear of a man—playing a lute. He was three meters tall. I'm a day I mosey on up to the chap, reach skyward, and manage to tap him on the knee, saying, "Pardon me, sir, but you are Pole luting our park with your mazurkas." But WOW! he had no sense of humor—not a bit, not a whit—and POW! he lets loose and belts me one smack in the eye! Were it in my nature, I would crab up a storm, but in the time honored tradition of my species, I backed off. After all, when we walk forwards, we move backwards. It's in our genes, you know, turning round and round. That reminds me—I've always wondered, "Which came first—the Crab, or the Gene?" That is to say, "Which came last—the Gene, or the Crab?" I'm always turning things round and round, you know. It's in our genes, after all. When we walk backwards, we move forwards. Ah me, oh my! I must lope along on my merry way—so off I go on such a fine day. Sing "ho!" for the life of a Crab! TATA! *(Olé!)*

(And he disappears as suddenly as he arrived.)

Tortoise That's my good friend. He often plays the fool. But I myself wouldn't touch a ten-foot Pole with a guitar!
Achilles Say, don't you play the guitar?
Tortoise Fiddle. It makes a big difference, you know.
Achilles Oh, well, it's all the same to me.
Tortoise To be precise, one has no trets.
Achilles Tell me, what's it like to be your age? Is it true one has no worries at all?
Tortoise I don't know. But one thing for certain is that I don't worry about arguments of taste. *Disputandum non est de gustibus.*
Achilles I disagree in this case. But speaking of taste, I finally heard that *Crab Canon* by your favorite composer J. S. Bach in a concert the other day, and I fully appreciate the beauty and ingenuity with which he made one single theme mesh with itself going both backwards and forwards. But I'm afraid I will always feel Escher is superior to Bach.
Tortoise Oh, you are such a philistine. In this area, the Dutch contributions are of markedly inferior taste, don't you think?
Achilles Not at all. Here, care for one of my cigars?
Tortoise Thank you very much.
Achilles Incidentally, you're looking in very fine fettle these days, I must say.
Tortoise Oh, really? I guess there's nothing better for you than walking.
Achilles And it's a perfect day for a walk. I think I'll be walking home soon.
Tortoise That echoes my thoughts.
Achilles So nice to run into you.
Tortoise Why, same to you.
Achilles Good day, Mr. T.

READER ORIGINAL

If a 20-foot diameter sphere enclosed a vacuum and weighed 300 pounds, what amazing property would it possess? (Richard Snedeker, Pittston, Pa.)

POTPOURRI

1. THE GOLDEN CHAIN. Disco Dotty has four pieces of gold chain, each consisting of three links. She wants to have the pieces joined together to make a neck-

lace, but she is afraid she can't afford it. The jeweler eyes the four pieces of chain on his workbench. "I charge a dollar to break a link and a dollar to melt it together again. To fit the pieces together,

I'll have to break and rejoin four links That will be eight dollars "

Dotty knew she had less than $7 ' I haven f enough money ' she said sadly ' I was hoping to wear the necklace to the big disco-dance contest, but I guess that s out of the question ' Disco Dotty gathered the pieces of chain and prepared to leave the shop

Just then fhe jeweler said, "Wait. I've fhought of another way" Sure enough he had. How did he do it, and how much did he charge?

2 GEOGRAPHY What do the following towns have in common Dayton Atlanta Cleveland, Philadelphia, Jacksonville Norfolk, Bangor Hartford, New Haven Phoenix, Stamford, Urbana, and Newark?

3 MATCH HOUSE Ten matches are arranged to show a charming, if drafty

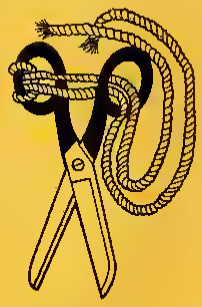
bungalow You're looking at it here from the norfhwest Move fwo matches to show what the house looks like 90 degrees away and from the northeast

4 WAITING GAME A young man has two girl fnends— Ursula, who lives uptown and Desdemona, who lives downtown He visits one of them every Tuesday, but since he likes them equally well, he lets fate decide which girl he ll visit each day He goes to a subway station at a random time and takes whichever train comes first After several weeks of this, however he realizes that he's been visiting Desdemona twice as often as Ursula He knows that as many trains go uptown as go downtown in a day He says that he does not consciously love one girl more than the other Is some unknown Cupidic force drawing him more offen to Desdemona? Could be There's a simpler explanation however What is it?

5 MARKETING SURVEY A magazine salesman is asked how many copies of *Omni* he sold on a certain day Being a Games fan he replies My cusfomers have been buying them in quantity, as gifts My first customer of the day bought half of all the *Omni*s I had plus half an *Omni* My second customer bought hall of what I had left plus half an *Omni* My third customer bought half of what I had left plus half an *Omni* My fourth customer did the same as the others—bought half of my remaining sfock plus half an *Omni* And now I m all sold out "

If the salesman didn't tear any magazines, how many *Omni*s did he have in stock at the beginning of the day?

6 SCISSORS RELEASE A pair of scissors is threaded with a cord as shown The



loose ends of the cord may be held by someone or may be tied to a doorknob Can you release the scissors without cutting the cord?

7 TUMBLING POLYHEDRONS Each face of a convex polyhedron can serve as a base when the solid object is placed on a horizontal plane With a regular polyhedron (all faces alike—a cube or tetrahedron for example) the center of gravity is always directly above the center of a face, therefore it is stable on any face Irregular polyhedrons that are unstable on certain faces are easily constructed, that is when placed on a plane with an unstable face at the bottom, the center of gravity is not directly above that base, and the polyhedron topples over

Is it possible to make a model of an irregular polyhedron fhat is unstable on every face?

8 CLOCK PROBLEM Norman Pos of San Diego says this simple question is a great one for starting arguments In 12 hours how many times are the big and little hands coincident with each other?

9 CLOCK PROBLEM REVISITED According to my watch the hour and minute hands of your watch coincide every 65 minutes, exactly In how many hours, as measured on my watch will yours gain or lose an hour?

10 CLOCK PROBLEM STRIKES AGAIN You are in a pitch-black room with a clock that chimes to tell the correct hour and chimes once each quarter hour in between (i e at 15, 30 and 45 minutes after the hour) If you hear it chime once what is the longest you may have to wait to be sure what time it is?

LOGICAL QUICKIES

11 DAYS Some months have 30 days some have 31 How many months have 28 days?

12 CAMPER S DILEMMA If you had only one match and entered a 0°C room in which there were a kerosene lamp, a fireplace and a wood burning stove which should you light first?

13 WINS Two men played checkers They played five games and each won the same number of games How?

14 DIG If it takes five men five days to dig five holes, how long will it take one man to dig hall a hole?

15 BASEBALL There are nine players on a baseball team and three strikes make an out How many outs in an inning?

Answers on page 126

LAST WORD

By Cynthia Darnell

You probably thought that after the Bermuda Triangle there was nowhere to go but down. You were right. Given the current trend of publishing fairy tales under the guise of hard fact we will undoubtedly find the following titles at our local bookstores much sooner than we would like.

The Punxsutawney Parallelogram. Since 1972 no fewer than nine automobiles and one Winnebago have vanished along an eight-kilometer stretch leading from Punxsutawney, Pennsylvania, to neighboring Chloe. Author Howard St. Phalle, intrigued by the disappearances, conducted an investigation. After careful research and some heavy soul-searching, St. Phalle concludes that the region is actually a 'Black Turnpike,' a cosmic shortcut between universes. Evidence of this includes the discovery of an ominous, perfectly square pothole. But the author's most persuasive argument is that no one with a grasp of reality, as we know it, would build a road between Punxsutawney and Chloe.

Garbage of the Gods. Swedish para-archaeologist Snorri Snorresen theorizes that modern civilization is the result of prehistoric visits from extragalactic beings. The idea came to him while he was looking at reproductions of ancient Etruscan etchings. Snorresen saw that several of the figures were carrying objects that resembled the modern-day Baggie, right down to its twister seal.

According to Snorresen's scenario, outer-space transients used Earth as a garbage dump. Man, going through one of his scavenger stages, began hanging around the dumps to see what he could scrounge. Although the aliens eventually abandoned Earth for fresher territory, human beings continued to loiter hopefully around trash heaps. Great cities ultimately arose on these sites, which explains why we have Los Angeles.

Fred Holds Forth. Until he was nine years old, Peter Grunswacken, of Westport, Connecticut, was thought to have a speech defect. But when a neighbor recorded the child's voice with the intent of getting a few laughs at a party, the tape was accidentally played backwards. The drunken revelers were astonished to hear the slurred voice of a higher life form claiming to be not Peter but Fred, who immediately accused the host of putting a French label on a bottle of Ripple and passing it off as the real thing.

Prodded by promises of Oreos, the mystical Fred began making pronouncements of a metaphysical sort. These are dutifully gathered in this book, with an Afterword promising a sequel as soon as Peter has gone through orthodontics.

The more provocative disclosures include (1) the world ended on March 3, 1898, but they haven't finished the paperwork yet; (2) television is good for you; (3) Yorkshire terriers are actually members of the insect family; and (4) Paul McCartney might be dead after all.

Food Signs. This book is an inquiry into how the astrological sign of the food we eat can affect our well-being. For example, a Libra person who ingests an Aries taco and a Pisces chili dog while the sun is in Gemini is really asking for it. This same combination, however, is perfectly safe for a Taurus, provided the taco has Saturn in the Fifth House and the Taurus, if his or her rising sign is Scorpio, exercises extreme caution in traveling by motorboat on odd-numbered days.

Appendixes provide detailed instructions on how to chart your food and offer numerous sample recipes. The Scorpio-Rising Souffle is highly recommended, although it takes several months to prepare.

The Quick-Loss Reincarnation Diet. Well-known advice columnist Dr. Gigi has come up with a simple, foolproof method for taking off weight and keeping it off. Once you have established contact with your previous incarnations (you can learn how to do this by mailing in the coupon on the flyleaf and $250), you can transfer extra calories and fat molecules onto the hips of someone you used to be. After all, he's dead. Why should he care?

The Lost Continent of Idaho. The fabled continent of Idaho has long figured in Northwestern United States folklore. Supposedly, the Lost Continent was the home of a highly developed race that invented, and lived in, condominiums. When the glaciers retreated at the end of the Ice Age, Idaho went with them for the ride but took a wrong turn somewhere around Banff and was never heard from again.

The Battle Creek Monster. Investigative reporter Brenda Khartunien went to Battle Creek, Michigan, to uncover startling new evidence. While doing that, she heard about the local monster and decided to write an 800-page opus with 700 black-and-white photographs.

"Creekie" is reputed to be 80 feet long and looks like a giant sea cucumber. She usually resides in large sewer pipes but has been sighted prowling the streets at night and knocking over mailboxes and garbage cans. Although she has done little actual damage, Creekie has been known to leave threatening notes on doorsteps. Khartunien theorizes that this accounts for the inordinate number of people who leave Battle Creek.

Curve Power. This book takes off from the premise that straight lines and angles are inherently unnatural and are thus responsible for all of us being so messed up. Mankind's only salvation lies in a return to the curve, the arc, the gentle undulation, the amorphous lump.

In a subtle dig at another popular theory, the author points out that a pyramid may indeed keep a razor blade sharp. But the razor blade itself is a product of straight-line-and-angle thinking, so who needs it? Parts of this book make a lot of sense.

As our final entry in the 1980 book list we have Joseph Turtle's *How to Build a Black Hole*. The author tells the reader how to adapt a used event horizon, provides games that can be played with your black hole, suggests how to store it, and so on. Not the least interesting feature of this book is that it will handily engulf all the other books on this list and still have enough power left to swallow itself.