02484

OMNI

OCTOBER 1979 $2.00

FIRST ANNIVERSARY ISSUE

FUTURE EVENTS:

PERSONAL PROPHECIES BY
ARTHUR KOESTLER, ISAAC ASIMOV,
RENÉ DUBOS, RICHARD LEAKEY,
RAY BRADBURY, THOR HEYERDAHL,
FRANK HERBERT, PETER GLASER,
KARL POPPER, DENTON COOLEY,
LEON LEDERMAN, AND OTHERS

FACT

BEYOND COMPUTERS:

NEW MACHINES THAT CAN
TALK, SEE, FEEL, AND REASON

ONE-MAN ROCKET:

WORLD'S FIRST PRIVATE SPACESHIP
READIES FOR LIFT-OFF

IN SEARCH OF YETI:

THE EVIDENCE MOUNTS

FICTION

ROBERT A. HEINLEIN:

HIS FIRST NOVEL IN FIVE YEARS

JEAN SHEPHERD:

ARCHAEOLOGISTS IN A.D. 5000
DISCOVER MANHATTAN

PLUS: STANISLAW LEM,
URSULA K. LE GUIN, AND
WALTER TEVIS

Austria 58 S/Belgium 109 BF
Denmark 20.00 DKr/Finland 11.80 FM
France 15.00 FrF/Germany 9.00 DM
Greece 180 Dr/Holland 7.50 Hfl
Italy 2900 L/Japan 980 Y

OMNI

OCTOBER 1979

CONTENTS

Cover art for this month's Omni is an oil painting by the American artist Peter Carras. The painting was originally commissioned for the cover of Smart *as the Devil by Felice Picano (Dell Publishing). Mr Carras has studied with Norman Rockwell and Jim Bama.*

OMNI 1979 (ISSN 0149-8711), U.S. Volume 2, Number 1.

EDITORIAL

The inane protestations of our "friends of the simple life" prove one thing—that the ultimate fallibility of man is his curious need to rationalize history

Looking back over our first year of publication, we have seen a few old barriers breached, new frontiers explored and charted, and much of the so-called impossible become commonplace. Our Tinker Toy attempt at interstellar flight, the *Voyager* probe, actually reached Jupiter, sent back an incredible gallery of photographs, and then headed bravely for Saturn and the stars. At Princeton University—for the briefest moment—a team of scientists successfully harnessed fusion, the power that drives the sun. And for the first time in the history of aviation a wispy, flying machine called the *Gossamer Albatross*, powered by human muscle alone, carried a man across the English Channel.

There was, of course, the darker side—*Skylab* came tumbling down, and at Three Mile Island, for neither the first nor the last time, we stood at the very threshold of eternity.

Yet in many ways it was business as usual. The Office of Management and Budget—referred to these days by its acronym, TOMB—announced its fiscal plans for the U.S. space program over the next four years. TOMB's resourceful forward planning called for an immediate 22-percent decrease in NASA funding. And that, of course, was without reference to inflation. It was President Carter's way of celebrating mankind's single most spectacular technological achievement to date, the tenth anniversary of our landing on the moon.

This proposed cutback in space spending, however, is only the tip of an ominous iceberg. According to the National Science Foundation, expenditures for Research and Development in the United States decreased by more than 20 percent in the years between 1968 and 1978. During that same time period, Research and Development was up 15 percent in the Soviet Union, up 16 percent in West Germany, and up 20 percent in Japan.

And all the while we hear pleas for a return to the "simple life"—a legendary state of being that occurred before the advance of technology, before pollution, and before the so-called energy crisis. These inane protestations prove one thing—that the ultimate fallibility of man is his curious need to rationalize history. Consider the "simple life" of 150 years ago.

If you worked (and almost everybody had to), you worked a 72-hour week—at the least. If you traveled (and almost nobody did), you traveled slowly and uncomfortably. The trip from Boston to New York, for example, accomplished under ideal conditions, took some 40 hours by stagecoach. If you were sick, both medicine and surgery were freely available—you simply visited your friendly neighborhood barber but didn't expect either anesthesia or antibiotics. At least you didn't have to worry about cancer or heart disease. In 1830 the average life expectancy was 38 years. Typhus, diphtheria, dysentery, cholera, tetanus, malaria, smallpox, yellow fever, or some other killer almost certainly felled you before today's major diseases had a chance to develop their symptoms. Communications meant little more than word of mouth. The Battle of New Orleans, for example, was fought 15 days after the Peace Treaty of Ghent was signed. More than 2,000 men died needlessly.

By contrast, the future from which our friends of the simple life would have us flee is one of infinite promise and hope. Many scientists today predict that the average human life span will break 100 years by the next century. Some even go so far as to claim that there are people alive today who will never die. The technology required to solve the much-touted energy crisis is already with us. All that is needed is the political and financial commitment to pursue it.

And the door to space stands wide open. A future more wondrous, more utopian than that of man traveling among the stars is unimaginable to me. TOMB, the Carter administration, and/or the delicate sensibilities of Wall Street notwithstanding, man will reach into the future with the same implacable determination with which his seed rose from the primeval slime.

As the celebrated British astronomer Sir James Jeans wrote in 1930, "We are living at the very beginning of time. We have come into being in the fresh glory of the dawn, and a day of almost unthinkable length stretches before us with unimaginable opportunities for accomplishment. Our descendants of far-off ages, looking down this long vista of time from the other end, will see our present age as the misty morning of human history. Our contemporaries of today will appear as dim, heroic figures who fought their way through jungles of ignorance, error, and superstition to discover truth."

This month *Omni* celebrates its first anniversary. The groping infant has become an eager child. We have learned much in the past year, the need to look ahead, to determine the social, environmental, and economic impact of future technology on all our tomorrows. We have learned, once again, that nothing is so constant as change. Yet our pledge to you remains the same as it was a year ago: to stand at the frontier of intellectual and philosophical inquiry, to chart the course of human progress into the twenty-first century and beyond, to welcome the future.

CONTRIBUTORS

OMNIBUS


SHEPHERD


HEINLEIN


LEM


LE GUIN


HOOVER

This month marks the completion of *Omni*'s first year of publication. Coming soon will be the end of a tumultuous decade and the beginning of a promising, though uncertain, new one. To help us articulate the key developments of the decade past and their impact on the years ahead, *Omni* went to the world's leading figures in science and technology. The end result is "Decades of Decision" (page 96), in which *Isaac Asimov*, *René Dubos*, *Masters and Johnson*, *Arthur Koestler*, and many others share personal insights on topics ranging from possible breakthroughs in their own specialities to humankind's changing role within the cosmos.

Robert A. Heinlein, author of the classic *Stranger in a Strange Land*, joins *Omni*'s anniversary celebration with an exclusive excerpt from his first novel in five years. Truly one of the legendary writers of this century, Heinlein has been a dominant figure in the SF field since the appearance of his first work, *Lifeline*, back in 1939. He has won many Hugo awards. His explorations are universal, reflecting his interest in politics, religion, and sociobiology. Certain to be a best-seller, *The Number of the Beast* should be on the stands sometime in 1980. *Omni* readers can find it beginning on page 66.

Other fiction this month includes an excerpt from Polish writer *Stanislaw Lem*'s newest novel, *Tales of Pirx the Pilot*, due to be released in book form this month.

Lem, whose novels have been translated into nearly 30 languages, has been for the past four decades one of Europe's most prolific writers. Cofounder of the Polish Astronautical Society and member of the Polish Cybernetic Association, he has written, most notably, *The Investigation*, the classic *Solaris*, *The Cyberiad*, and his most recent work, *The Chain of Chance*. For a passage from his latest novel, see "The Test" on page 86.

Walter Tevis concludes this month's fiction with "Rent Control" (page 114), a story of time, love, and consequence by the author of *The Hustler* and *The Man Who Fell to Earth*.

Thomas Hoover, whose fascinating study on intuition appeared in our first issue (October 1978), returns to examine the other side of the mind, the process of pure reason, in "Intelligent Machines" (page 60). From the leading artificial intelligence (AI) laboratories across the nation, Hoover reports on both the progress and the dilemmas emerging from efforts to teach computers human skills. Hoover's startling conclusion is that AI researchers are well on the way to evolving a new species of intelligence, entirely alien to that of living organisms. No stranger to the computer console himself, Hoover has also explored Eastern thought in *Zen Culture* (Random House, 1978).

Jean Shepherd must be considered one of America's most versatile humorists, having performed on stage, in night clubs, and on television and radio. His best-selling novels *In God We Trust* and *Wanda Hickey's Night of Golden Memories and Other Disasters* have become prescribed reading in many American literature courses throughout the world. His short stories have won the highly coveted Playboy Humor Award four times, a record unequaled by any other writer. Shepherd's contribution to *Omni*, "The Lost Culture of Deli," can be found on page 104.

The noted English explorer and mountaineer *Lord John Hunt* trails the "Abominable Snowman" in an entertaining article entitled "Unseen Yeti." Hunt, who took part in man's first successful ascent of Mount Everest in 1953, provides evidence that he hopes will someday prove the existence of this legendary creature. See page 108.

Ursula K. Le Guin ponders the distressing problem of time shortage in this month's Last Word. Le Guin has repeatedly won Hugo and Nebula awards for her novels and short stories. She edited the Science Fiction Writers of America annual anthology *Nebula II*, and coedited a collection of original fiction, *Interfaces*, with Virginia Kidd, which will be published later this year. "Where Does the Time Go?" is found on page 178.

Last, *Omni* associate editor Kathleen Stein presents a profile of Bob Truax, who claims he will launch the first private astronaut into space with his "Volksrocket X-17." Who will be the honored pilot of the vehicle? The first person to come up with $1 million. See page 70.

OMNI

BOB GUCCIONE
editor & publisher

KATHY KEETON
associate publisher

OMNI INTERNATIONAL LTD.

THE CORPORATION

Bob Guccione, *(chairman and president)*
Kathy Keeton *(senior vice-president)*
Irwin E. Billman *(executive vice-president)*
Anthony J. Guccione *(secretary-treasurer)*

EDITORIAL

Editor in Chief: Bob Guccione, *Executive Editor:* Frank Kendig, *Managing Editor:* J. Anderson Thomson, *Senior Editors:* Dick Teresi, Scott Morris, *Articles Editor:* Edward Rosenfeld, *Fiction Editor:* Ben Bova, *Humor Editor:* Bill Lee, *European Editor:* Dr. Bernard Dixon, *Associate Editors:* Owen Davies, Karl Sabbagh, Stein, *Assistant Editors:* Richard Levitt, Kathleen Mo[illegible], Eric Rosen, *Copy Chief:* Gina E. Grant, *Copy Editors:* Robert Boylan, Charles J. Attardi, *Editorial Assistants:* Suzanne Stoessel, Christine Pulte, Susan Caputo, Kieran A. Gallanaugh, *Contributing Editors:* Monte D. vis, Dr. Christopher Evans, Dr. [illegible] Hook, Moore, OBE, Clark Pearson, Sandy Shakocius, William K. Stuckey

ART

Art Director: Frank DeVino, *Associate Art Director:* Lynda Chyhal, *Designer:* Marian Levine, *Photo Editor:* Hildegard Kron, *Staff Photographer:* Pat Hill

ADMINISTRATIVE

VP/Director of Advertising: Beverley Wardale, *VP/Public Relations Director:* Alma Moore, *VP/Administrative Services:* Jen Winston, *VP/Production Director:* John Evans, *VP/Circulation Marketing and Promotion:* Bob Guccione Jr., *VP/General Counsel:* Joseph M. Kraft, *Midwest Advertising Manager:* Norm Kamikow, *Southern Advertising Director:* Peter Goldsmith, *Controller:* Marc Bender, *Nat'l Marketing Manager:* Ralph Perricelli, *Nat'l Sales Operation Manager:* Richard Fogel, *Nat'l Circulation Manager:* Robert Castaldi, *Newsstand Distribution Manager:* Vincent DaLisi, *Direct Sales Manager:* Jeff Giannone, *Liquor Sales Manager:* Paula Fresman, *Advertising Production Director:* Toni Wagner, *Advertising Administration Manager:* Inge S. Schmidt, *Editorial Production Associate:* Linde Bogdanoff, *Research Director:* Carol Rossant

ADVERTISING OFFICES

New York (Beverley Wardale) Omni Publications International Ltd., 909 Third Avenue, New York, N.Y. 10022. Tel. (212) 593-3301. Telex no. 237128. *Midwest* (Norm Kamikow) Omni Publications International Ltd., 111 East Wacker Drive, Suite 2036, Chicago Ill. 60601. Tel. (312) 565-0466. *South* (Peter Goldsmith) Omni Publications Int'l Ltd., 1707 H St. N.W. Washington D.C. 20006. Tel. (202) 296-6050. *Detroit* (Christine Meyers) Omni Publications International Ltd., 950 E. Maple, Suite 204, Birmingham Mich. 48011. Tel. (313) 646-3646. *West Coast* (Isabel R. Kilcgman) Omni Publications International Ltd., 8732 Sunset Blvd., Los Angeles Calif. 90069. Tel. (213) 652-8070. *U.K. & Europe* (Eleanore Graham) Omni Publications Ltd., 68 Upper Berkeley St., London W1H 7DH. Tel. (01) 262 0331. Telex no. 919865

EDITORIAL OFFICES

New York 909 Third Avenue, New York, N.Y. 10022. Tel. (212) 593-3301. Telex no. 237128. *West Coast* 8732 Sunset Boulevard, Los Angeles Calif. 90069. Tel. (213) 652-8070. *London* 2 Brambur Road, West Kensington, London W14 9PB, England. Tel. (01) 385-6181. Telex no. 919865

U.K. & European Editions

Managing Director: Alan Root, *Advertising Director:* Eleanore Graham, *Public Relations:* Molly McKellar, *Editorial Assistant:* Andie Burland

BUREAUS

Washington D.C.: William R. Corson, 1707 H St. N.W. Washington D.C. *Berlin:* Hans Honn, Enzianstrasse 1, Berlin 45. *Rio de Janeiro:* Andre Fodor 96 Rua Mexico, 15th floor, Rio de Janeiro ZC39. *Budapest:* Paul Kirilyhedgyi, 5 Regi posta utca, Budapest 5, Hungary. *Zagreb:* Cedomir Kornijanovic, Strebrnjak 96, Zagreb, Yugoslavia.

OCTOBER

LETTERS

COMMUNICATIONS

Solipsism Syndrome?

Douglas Colligan, writing about space colonies in the May *Omni* [Continuum, page 35], discusses the long-term effects on humans spending lengthy periods in space. He brings up the "Solipsism Syndrome" (when people lose their sense of reality) and goes on to write: "It's a real condition often seen on Earth in the citizens of Lund, Sweden, during their long (18 hours at times) winter nights."

As a citizen of Lund, I strongly object to this statement. Something similar appeared some years ago in the NASA study "Space Settlements," which presumably was Mr. Colligan's source. The reason Lund was mentioned appears to be that it had figured in connection with some neurosis shown in one of Ingmar Bergman's movies! The NASA study was quoted in the Lund University newspaper, arousing some amusement. However, its perpetuation and amplification in *Omni* cannot remain undisputed.

Lund is an old (almost 1,000 years) town in the very south of Sweden, with a climate similar to that of the northern United States. It features an old cathedral and a university with some 20,000 students. Come and join us among blooming magnolias in the euphoria of the springtime student carnival. Losing a sense of reality? Maybe at times. But solipsism syndromes? Good grief!

Dainis Dravins
Lund, Sweden

Douglas Colligan replies: *My source for the Solipsism Syndrome reference to Lund was indeed the NASA study "Space Settlements." I decided to go back and reread it after seeing Mr. Dravins's letter. There's no author cited for this particular section, nor any specific reference explaining how NASA reached its conclusions about Lund. But it might be interesting to see what the study says in part: "In the small town of Lund, Sweden, the winter days have 6 hr [sic] of daylight and 18 hr of darkness. Most of the people live under artificial light, so that life acquires a special quality. Ingmar Bergman's film* Wild Strawberries *expresses this feeling very well." The implication here is that future astronauts might go to a Bergman film festival as part of their orientation for living in space. Admittedly, the study did give the people of Lund a raw deal if its solipsism diagnosis is based solely on the conclusions of some NASA film buff. If it's any consolation, NASA also managed to insult citizens in its own country as well. Just a few pages after the Lund passage, the study goes on to say: "What would probably make life in an extraterrestrial community 'harder' than life in Minnesota or California (?) is isolation from the earth and smallness of the environment. In these two aspects, an extraterrestrial community resembles Hawaii rather than Alaska." I guess what this all means is that the simplest way of simulating life in space is to go see* Wild Strawberries *in Honolulu. I for one would rather take my chances on the springtime student carnival in Lund.*

Maze

I enjoyed working the "Sky Pipes Maze" on page 119 of your July issue. I had never seen a three-dimensional maze like this one before. Who drew it?

Deborah Gilbert
Detroit, Mich.

Larry Evans, who has several maze books. The latest, 3-Dimensional Maze Art, *was published this month by Troubador Press.* —Ed

Amazing Plot

I feel that I must comment on "How to Write a Science-Fiction Novel" [June 1979, page 107].

What we have here is a remarkable simplification of the plot development of most major and minor SF stories. For example: "Earth is struck by a giant comet. Not destroyed, but almost everyone dies (the end)." You have just stated in wonderfully simple terms 640 (paperback) pages of brilliant SF. Larry Niven's *Lucifer's Hammer* and Jerry Pournelle's *Amazing*.

This is wonderful! No longer will I have to plod through every word of a story. All I

"PHONE THING"

Make it. Use it. And save up to 60% on interstate calls.

Do you know when you can save 35%, or even 60%, on out-of-state phone calls? "Phone Thing" has all the answers when it comes to saving money on direct-dial calls. Just put it all together, check "Phone Thing" before you make your next call, and start saving every time you reach out and touch someone.

Bell System

Is your "Phone Thing" gone? If so, we'll send you one! Write "Phone Thing" P.O. Box 602 Broomall, PA 19008

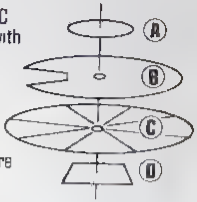
TO ASSEMBLE:

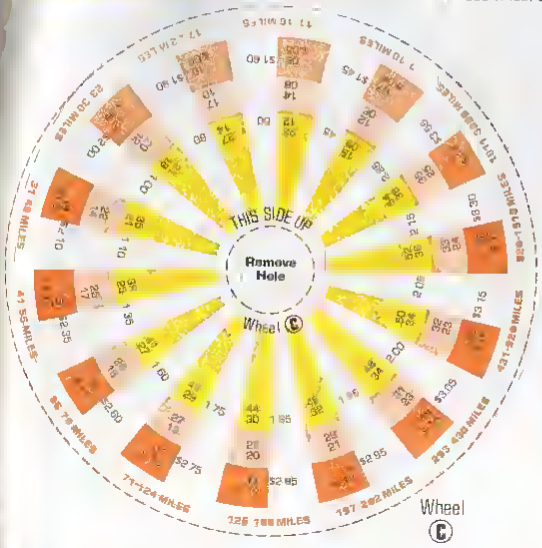
First...

— tear out 4 pieces A B C & D
— remove center holes from wheels B & C

Now...

1. Place square piece D flat on table with D facing up
2. Place wheel C over piece D
3. Place wheel B over wheel C with center holes in line with each other
4. Moisten adhesive on small round piece A
   press and rub firmly over center hole of wheel B
   let dry for 10 seconds before turning wheel





have to do is read the synopsis of *TV Guide*. Why this method far outstrips speed reading. You could read 10 to 20 books in the store itself and never have to buy them!

I can see a whole new industry springing up out of this. Whole books on one page, a whole library in one looseleaf notebook. The saving alone in royalties to authors would justify it from the start.

I, of course, have the first of these "new wave" stories for inclusion in an upcoming edition of *Omni*. Happy reading:

... a team of editors ... invent ... giant icky things ... which misunderstand us ... and cannot be killed by a crowd of authors. The (happy) end.

Stephen R. Chambers
Annandale, Va.

Hard to Believe

I just read Gerald Maxson's letter in your July issue. Maxson is correct in pointing out the fact that Arcturus is in Bootes, not in the Dipper. However, he also writes that an observer traveling faster than light could, upon reaching his destination, stop, turn around, and watch himself coming. He says he finds this difficult to believe, and I'm afraid I do also. The traveler would not see himself coming. Instead, he would witness the apparent receding of his image, as if a film of his voyage were being played in reverse. In effect, he would see himself *going*. This is due to the fact that light from the beginning of his journey would take longer to reach him than light from the miles he had just covered.

In relation to sound, this phenomenon is already well known because of supersonic aircraft, and in the case of light, it brings up another interesting matter. If such a "tachyon traveler" existed, not only would he appear to go backwards in space, but he would be going backwards in time. And I find *that* difficult to believe!

Bill Goodwin
Los Angeles, Calif.

Remark on Ark

In response to the letter written by Tom Gale to *Omni* [June 1979], I, too, am convinced that within the next 15 years the human race, as we know it, will be defunct. It is extremely fortunate that there are people like Gale who take "the end of the world" seriously for "Gale's Ark" may be our only hope.

I'd be most appreciative if *Omni* would furnish me with a way of contacting Mr. Gale as soon as possible. After all, we don't have forever!

Regina E. Towers
West Chester, Pa.

All mail to Mr. Gale should be sent to Tom Gale, 186 Evelyn Avenue, Apartment 2, Toronto, Ont., Canada. —Ed.

Splashdown

I heartily regret the downfall of one of humankind's greatest achievements—*Skylab*—yet I can only wonder what effect this will have on future research. Perhaps the American people will realize that a successful space program depends on the amount of government money allotted to it. However, it is more likely that *Skylab*'s demise will have an adverse effect, and instead the American public will retreat into their ever-present shell of scientific ignorance.

Lorraine Souza
Chicago, Ill.

The Hunt

After reading Kenneth Brower's article "As Go the Whales" [July 1979], I felt there was something drastically lacking in his factual stating of the pro- and anti-whaling standpoints, and so I write to you.

Whales are not just pieces of meat, nor are they merely numbers, they are intelligent, loving people, more sophisticated than humans in that they coexist with their environment instead of changing it.

I found his talk of 'numbers' and 'quotas' sickening—reminiscent of black slavery in America, where the slaves were only animals to be used. The idea that thousands of whales are mass-murdered each year for such things as margarine, soap, and cosmetics is disturbing and repulsive.

One of the main problems is education. Most people don't realize the intelligence of the whales. I truly wish you would do an article on the studies showing how incredibly sensitive dolphins and other cetaceans are.

Doug Alemanne
Hastings, N.Y.

Bugged by Bugs

The reference to the primitive ants as being "Australian bugs" in the "Oldest Ants" item in Continuum [May 1979, page 30] somewhat grated on my entomological nerves. Although most insects and other similar "creepy crawlers" are collectively referred to as "bugs" by the layman, I would like to point out that only 2 of the 26 recognized insect orders are classified as true "bugs": Hemiptera and Homoptera. It may seem like a minor point, but I feel a magazine such as *Omni* should not be encouraging the unfounded use of such a popular misnomer.

Paul Heels
Victoria, B.C.
Canada

Exploration a Necessity

It is truly incredible, if not downright hypocritical, that your June issue extols the virtues of space exploration in one article ("Eye in the Sky") and in another ("Phoenix of Crested Butte") condemns exploration for one of the minerals, molybdenum, that help make such ventures as the space telescope possible. Are your writers naive enough to believe that, without the utilization of the earth's natural resources, we could continue to develop technology that will propel man to the outer reaches of the universe and publish magazines such as *Omni*?

The simple fact is that we can't have one without the other.

Jory L. Laine
Denver, Colo.

Radioactive Garbage?

I read with dismay Ben Bova's column in *Omni*'s July issue [First Word] about storing radioactive waste in space.

We have always used a solution such as this to get rid of wastes: only to have to live with them at some future time. We have buried garbage and dangerous chemicals: only to have them seep into our lives at a later date. We have dumped tons of chemicals and waste into the oceans, and now we are reaping the pollution that threatens our own lives just as it threatens marine life forms.

Flying waste into space and storing it doesn't solve the problem. If we live long enough on this planet to explore the outer reaches of space, we'll meet up with our waste once again.

Science has no idea what repercussions might occur if nuclear wastes are introduced into an environment still alien to us. What if other beings live in space? How would their lives be affected by our radioactive garbage?

I think Mr. Bova's idea is inhuman and inhumane. A more creative solution would be to eliminate the cause of the waste in the first place, rather than concern ourselves with zero-defect technology.

Sidney Summers
Boulder, Colo.

Ben Bova's suggestion that we should use zero-defect technology as a solution for the prevention of nuclear-plant disasters is more of the same old double-talk that has been dished out to the public over the past 20 years of nuclear-fission history. Has Mr. Bova forgotten that it was NASA's zero-defect technology that killed three Apollo astronauts in 1967?

I, for one, do not wish to sail on your *Titanic*.

Stephen Goodfellow
Highland Park, Mich.

Ben Bova replies: *No person or organization or technology is perfect. But nuclear power is needed now. It exists now. Sometime in the future we may not need nuclear-power plants. Sometime in the future we will have solar energy, synthetic hydrogen fuels, and ultimately fusion power. Wonderful. But until then we will need uranium-fueled nuclear-power plants, and we should take the steps necessary to make them as safe, efficient, and low in pollution as possible. To do otherwise would be to take a step backward: this would damage our economy, our way of life, and our freedoms.*

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, N.Y. 10022.*

From Transylvania, with Love

It was nearly enough to rouse me before my accustomed nightfall when, among the cards and letters that have been wending their way here for the last oh, 600 years or so, came the June issue of *Omni*, with word of my supposed affliction reported by Bruce Wallace. If it could, my blood would have curdled.

So now it is rabies that drives me to seek my lovely victims? Rabies? How plebeian! Your Mr. Wallace should stay home at night, with his doors bolted, if he can't tell the difference between me, the Prince of Walachia, and my old friend Jack Homolupus. Hirsute as he is, Jack is best known as the Woltman, and it is he who has rabies. A mild case, though. Louis Pasteur wouldn't even take him as a patient. But I digress.

I, the most prominent inhabitant of Transylvania, have never in my life foamed at the mouth. It would be ludicrous to suppose that I had. The foam would obscure my two-inch-long canine teeth, one of my most recognizable features, and that would be a pity, don't you agree? As for biting indiscriminately, I can only suggest that you review my history. I prefer women or, as you call them these days, liberated women, of good breeding and translucent skin. These ephemeral qualities have always appealed to me. Perhaps I inherited this taste from my mother.

From my father, though, I inherited my fondness for the night and my desire for the jugular, a vein of singular quality as it courses so conveniently up the neck, warm and blue. I become enraptured just thinking about it. You see, my father, and his before him, and his before him—and I could go on, but I don't wish to drive myself batty this early in the day—had a slight ailment, a condition that we don't boast about, which the first king of your country had. It is called porphyria. Mary, Queen of Scots passed it to King George III. When I knew her, Mary had a lovely neck. Porphyria is mainly an inherited metabolic disorder in which a bodily pigment is overproduced, but I shan't bore you with the details. Let it be that the disorder makes my skin sensitive to the light, and I prefer the night, naturally. Over the years, and particularly from the exposure of full moonlight, some porphyrins have leached into my bones and teeth and, in regard to the latter, have caused erythrodontia, a reddish staining on my rapier canines. I rather fancy the effect.

If you are interested, erythrodontia shows up best under long-wave ultraviolet rays, but few people care about this anymore, alas.

Count Dracula
Whereabouts withheld

Bruce Wallace replies: *Poor old Count mouthing (if he will pardon the expression) predestination, like a devout Calvinist. Porphyria inherited from a remote ancestor has led to erythrodontia! Indeed, as every Walachian immigrant to these shores has learned, it is the grime of New York's Rabid Transit System that discolors the teeth of those who are entombed nearby and that sets them on edge, as well.*

Intellectual Brilliance

When my wife saw your "World's Hardest I.Q. Test" introduced by Scot Morris in the April issue of *Omni*, she challenged me to prove, once and for all, the intellectual brilliance I had always claimed for myself. With feigned confidence, I took the test and several days later I sent off the form and my $2.50. Finally, after much too long a time, my results have arrived, and they confirm my suspicions in every respect. Thanks!

Clifford Walton
Greencastle, Ind.

Scot Morris replies: *We apologize to those readers who took "The World's Hardest I.Q. Test" in April and had to wait three months or more for their scores. The Four Sigma Society, which drew up the test, was swamped with more than 10,000 entries in the first month alone. Problems in hiring people to open the volume of mail and in acquiring a new computer to process all the entries delayed the mail response much longer than had been anticipated. Those of you who have put off taking the test may now expect to receive a computerized I.Q. score and analysis within four weeks of sending in the completed form.*

Progressive Censorship

The prior restraint used against the *Progressive* deserves far more comment than the brief Continuum note in *Omni*'s July issue.

The government's action against this small political magazine is the most blatant un-American act of censorship in the entire history of the United States. Years of censorship of so-called pornography set the government's precedent for destruction of the First Amendment. Now that censorship has attacked political publications, the destruction of our basic right of free expression is complete.

As a Guccione publication, you should be well aware of the problems of

CONTINUED ON PAGE 174

IN WARM BLOOD EARTH

By Kenneth Brower

Where did we go wrong? It is apparent that it happened someplace, that in our relations with the Mother Planet we took a wrong turn. Was it at Alamogordo? The A-bomb's escalation of our war against Earth was certainly loud and spectacular. The blinding flash and big boom may be the ultimate symbols of what we've been up to. But it is clear that things began to go sour long before that.

Was it Detroit? Of late, that seems increasingly likely. Perhaps we diverged from the sensible path there, blinded not atomically but just by the gleam in Henry Ford's eye. Beyond Detroit our wrong path became a paved road. It straightened, losing its comfortable country-lane curves, and it broadened, becoming multilaned. The asphalt metastasized, appearing suddenly everywhere, as parking lots in apple orchards, as cloverleafs where corn once grew. In my own hometown a quarter of the land has been sacrificed to the automobile. Each citizen here has 2.13 square meters of parks to himself. Each car has 87.12 square meters of streets. To support my car in the manner to which it is accustomed, on that vast estate I have ceded to it, I, like other average Americans, must work one fourth of my life.

With the automobile have come suburban sprawl, 50,000 deaths a year, a lacework of off-road tire tracks across the desert, and hatred of the Arabs. Sixty percent of all pollutants in U.S. air (10,800 metric tons a day in the air above Los Angeles alone, and in the lungs of that city's schoolchildren) rumble forth from the internal-combustion engine. "The current American way of life is founded not just on motor transportation," Lewis Mumford wrote more than 20 years ago, "but on the religion of the motorcar, and the sacrifices that people are prepared to make for this religion stand outside the realm of rational criticism." Mumford had yet to see gasoline shortages or those lines in which angry motorists sacrificed one another's lives. (The cars of the slain drivers continue to idle over their fallen owners. Over their fallen servants, rather, for in truth the car was owner of the man. The idling engines were making a sound if only we had ears for it, very much like a chuckle.)

But by now everyone has seen the monster in the Model-T, and the problem is older than that.

Was it in the well-intentioned work of men like Hippocrates, Joseph Lister, and Jonas Salk? Having depressed the human death rate, medicine has released the grim potential in human fertility. At our present rate of growth, as I. J. Cook has pointed out, everything in the known universe will be converted into humans in a few thousand years, and the ball of humanity will be expanding outward at the speed of light. (In trying to trace our wrong turn, it is tempting to look for some startling new phenomenon, and the one Cook describes certainly would fill the bill—a squirming mass of people expanding outward at the speed of light.)

Or is our problem with numbers less medical than philosophical? Did it begin in the Judeo-Christian ethic, in the biblical injunction to multiply and subdue? The Bible, with its radical new doctrine that this planet was God's gift to man, certainly didn't help. Our attitude toward Earth was healthier when we were pagans who believed that spirits resided in everything, that man and beast were on equal footing—bears becoming men, occasionally men becoming owls—and that a tree had to be placated before you chopped it down.

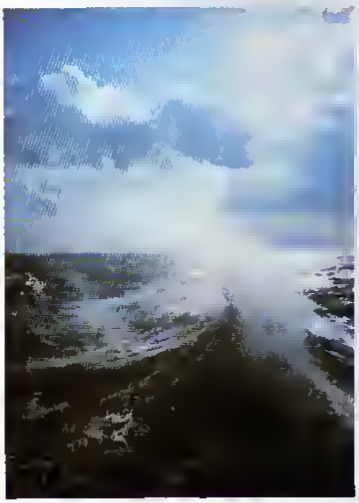
But it's unfair to blame the Bible. Hindus and Buddhists have proved that they can breed and subjugate as efficiently as Jews or Christians can.

Was our mistake, then, the invention of agriculture? With agriculture, human numbers made their first big lurch forward, and transformation of the planet's vegetation by human agency accelerated.

But that transformation had begun earlier, of course. Hunters were torching the grass to drive game long before farmers learned to burn the woods so they could make their clearings. Maybe the bad invention was fire.

Or perhaps it was the tool. The stone-tipped spear, clasped by the hairy and opposable thumb, appears to have been an instrument of extinction of a caliber formerly wielded only by God. There is much speculation, and some evidence, that hunter gatherers had profound effects on earthly faunas long before agricultural advancement ever allowed men to settle in cities. Paleolithic man in Europe and North America may have helped exterminate the megafauna of those continents, the mammoths and giant bison. We were, then, working at the eradication of huge animals millennia before the invention of the exploding harpoon and the factory ship. We were deforesting the Near East long before the chainsaw. We were extending the borders of North African deserts long before the dune buggy.

The question of where we went wrong is as problematic as that of determining at what point hominids became men. Perhaps it's the same question.



Our relatives in the sea may provide an answer

We may need to backtrack further, however. Back to a time before we became

properly us far back along those converging roads where cat and man and weasel must leap into a single shape as Loren Eiseley has put it Maybe the mistake was that first primitive mammal Maybe the bad invention was fire all right—the metabolic kind Perhaps our error was endothermy

The endotherm the "warm-blooded" animal generates in each of its cells about four times the chemical heat that the ectotherm or "cold-blooded" animal generates The endotherm's insulation in the form of fur or feathers is superior While the ectotherm's workday begins only when the sun has warmed it the endotherm's begins anytime the mood strikes The new system inaugurated in the Triassic conferred a great competitive advantage on its converts It opened up higher latitudes colder seasons, and the night It was a prerequisite on this planet at least for high intelligence It looked awfully good

But it had a high cost The energy budget for a population of endotherms is 10 to 30 times higher than for a population of ectotherms of the same weight

When Victorian zoologists first dissected Nile crocodiles they were amazed to find that the stomachs of most were empty The discovery did not seem to jibe with the monster's crooked and toothy smile its voracious reputation The true monster was not the croc of course but the bespectacled apparently mild-mannered scientist peering into its stomach (If some intelligent extraterrestrial lizard had dissected a sampling of Victorian zoologists it would have been appalled by the evidence of real voracity—the crumpets marmalade and kidney pie in each stomach.)

We endotherms are the gas guzzlers of the animal kingdom We are the double-carburetored fuel-injected muscle cars of the phylum Chordata Auto makers are mistaken in naming their economy vehicles Rabbit and Colt More appropriate would be Salamander Frog Scorpion Iguana We have pulled out and roared past the oxcart of the ectotherms but the planet is paying the price

A star is a planet whose inhabitants experimented with nuclear power Alan Watts once said inventing an improbable cosmology to make a good point Maybe Watts's axiom could be amended A star is a planet where life experimented with endothermy The intense dazzling liberation of energy in the fission bomb is perhaps just a sublimation an inevitable product of the chemical liberation that occurred in the cells of the first endotherm And it is possible too that endothermy—or its equivalent in a life system based not on carbon but on silica or something else—is inevitable barring cosmic accident once life has begun

Whether or not stars arise from intelligent tinkering—and it seems unlikely on local evidence that there was ever that much brainpower in the universe—still there may be, in stellar evolution a fuzzy analogue at least Shortly after the life of a planet enters the endothermic stage things may always become white-hot

Two years ago at a conference on the biology of marine mammals I heard a lecture given by a marine scientist who entertained some doubts about endothermy The scientist—I have forgotten his name—suggested that endothermy in the sea in the forms of cetacean and seal might not have been a good idea He was being deliberately heretical The conference hall was full of young biologists who had become whale advocates which seems to be a nearly inevitable development among whale researchers His purpose was mostly playful to shake up his colleagues

But his point was interesting The ocean as he reminded the gathering is an ecosystem of peculiar interdependencies a country where the sheep eat the litters of the wolves The reproductive method of marine mammals—a method land-evolved—was a totally foreign introduction With sea mammals a single calf or pup is reared carefully by its mother and its tribe There are no millions of translucent little porpoise fry no sea-lion fingerlings left over to feed the fish on which adult porpoises and sea lions feed Marine mammals take a lot from the sea and give back little Throughout long lifetimes they eat tons of fish and squid burn a lot of calories to keep warm, and generally have a good time They return only their excrement and finally their cadavers

> *"Our attitude toward Earth was healthier when we were pagans who believed that spirits resided in everything, that man and beast were on equal footing, and trees had to be placated before cutting"*

Anyone who has seen the fearlessness and speed with which the dorsal fin of a killer whale cuts the surface then slices through a school of ectothermic salmon, anyone who has watched dolphins spend the whole morning leaping and playing their time freed by having echo-located their prey so efficiently the previous night—that person must have sensed the possible truth in what the scientist suggested that these animals are just a little too good

But marine mammals have a convincing defense They have passed with high grades the test of time Whales have practiced their style of endothermy in the ocean for 60 million years seals for 30 million From all the evidence they and the ocean have mutually adjusted In the Miocene 20 million years ago the whale brain achieved nearly its present form making whales the brightest creatures on this planet Somehow they passed on an intact and bountiful ocean to their descendants They moderated their numbers They have not become a blubbery mass occupying all the known universe and expanding outward at the speed of light

The problem then must be in the appendage we have in place of a flipper The human hand deceptively clammy at high-school dances, but endothermic at its core is the culprit The notion is hardly original with me Peter Sellers for one knew it consciously or not in his portrayal of Dr Strangelove We are all Dr Strangelove as portrayed by Sellers Strangelove's hand has a life of its own saluting the Führer at unexpected moments fidgeting spasmodically despite its owner's desperate efforts to control it lulling him and trying to escape in a fingerwalk down the armrest We must master our hands obviously and far better than Strangelove did in the movie

It is too late to grow flippers It is *not* too late to learn to communicate with cetaceans There have been a number of previous arguments for trying to do so One is for the sake of the cetaceans "I look at language as a weapon in the long-term fight for whales" Jean-Paul Fortom-Gouin of Florida's Delphic Research Institute told me last year "If you can prove they can talk—if you even think they can talk—then the only ethical position is to stop killing them until you can find out A second argument is for the sake of humans that we might experience intelligent companionship on an earth where the opportunities for that companionship are few It is worth at least a wistful thought Loren Eiseley writes that someday the porpoise may talk to us and we to him It would break perhaps the long loneliness that has made man a frequent terror and abomination even to himself A third argument is for expanding human horizons "We can hear whales singing" writes Joan McIntyre of Project Jonah "If we pay attention and let them live, perhaps we will hear them speak in their own accents their own language It would be an extravagant reward to experience, by empathy a different band of reality" But an even stronger argument might be made for our very survival If we can somehow bridge the 60 million years of cultural separation discovering a language intelligible to both sides, we humans might learn the cetaceans' secret how a smart hot-blooded animal can amuse itself for millions of years without burning the place up ∞

JUPITER JOURNEY

SPACE

By Mark R Chartrand III

It has always been easy to speak in superlatives about the planet Jupiter the largest in the solar system being more than 11 times the size of Earth the heaviest with 318 times Earth's mass—more than the sum of all the other planets combined the fastest-rotating requiring only ten hours to make one complete turn the most colorful with belts and bands and spots and accompanied by the greatest number of satellites 13 (and another is suspected)

This year such superlatives have been all but exhausted as astronomers and laymen alike have seen close up not only Jupiter itself but the five inner satellites Though the man in the street might well argue that the spectacular photographs sent back by the Voyager program justify the few dollars they cost each U.S citizen planetary scientists expect far more They now have a new astrophysical laboratory that may tell us more about meteorological and geological processes than we could get by studying conditions here on Earth

What we see of Jupiter—either from Earth or by spacecraft camera—is not a solid surface but the top of a swirling cloud cover If Jupiter has a solid surface at all it lies deep beneath the clouds

Because of Jupiter s fast rotation the gases at its equator are traveling at about 46 000 kilometers an hour The clouds do not rotate in unison as a solid body would Each latitude rotates at a slightly varied speed This shearing tears the clouds and atmospheric features as they slide past one another

The visibility of the cloud features and the speed and scale of their activity make Jupiter's atmosphere a testing ground for meteorologists theories Although it would be unfair to suggest that the Voyager mission will soon provide better weather forecasts on Earth the studies will enhance our knowledge of how planetary atmospheres work

With the earlier Pioneer missions as a hint we expected to obtain breathtaking pictures of Jupiter The surprises came from the surface details of some of Jupiter s satellites Each of the large moons is a world in its own right We have discovered a mini-solar system

Io—in mythology one of the god Jupiter s many paramours—proved to be the most dramatic Io has at least six or seven volcanoes erupting most of the time altering the surface covering any craters and spewing gases that fly into orbit around Jupiter Even in the few months that elapsed between the *Voyagers* Io s surface changed Io may be the most active solid body in all the solar system

Europa appeared only at a distance during the *Voyager 1* flyby With *Voyager 2* came the discovery that this moon may be the flattest member of the sun s family Europa has few craters but many curious wrinkles These show up as dark lines on the surface but there is little vertical relief They re almost as flat as if they were painted

Ganymede is Jupiter s largest moon and the second-largest in the solar system after Saturn s Titan The most beautiful of mortals Ganymede was taken to Mount Olympus to serve the gods His namesake may end up serving as another planetary laboratory for plate tectonics Ganymede s surface is pocked with recent craters scoured with ridges and grooves and spotted with large light and dark areas which are not yet understood

Callisto named for an Arcadian nymph is probably the most heavily cratered body in the solar system The pictures taken of Callisto remind me of a rural road sign full of bullet holes Callisto may preserve a billion-year record of the last stages in the accretion of the planets from the debris that formed the solar system

The planet Jupiter—along with its retinue—has certainly lived up to its eponym s mythological reputation as the source of human happiness if you happen to be a planetologist We eagerly await the next phase of the Voyager mission a rendezvous with Saturn in 1980 Voyager's cameras have 100 times the resolution seen in this September's *Pioneer 11* photographs of this photogenic planet

The prospect is enough to make even the most saturnine scientist jovial

Europa's dark lines shot by Voyager 2 from 246 000 km may be huge cracks in a thin ice crust

THINKING OF CANCER

LIFE

By Dr. Bernard Dixon

A decade ago any suggestion that the mind could influence cancer growth invariably triggered derisive dismissals from medical scientists. Today many physicians recognize that our mental state does much to govern our susceptibility to malignant disease. This is now a respectable field of research—one that has already yielded encouraging results.

One of the people most responsible for this shift in opinion is Dr. Steven Greer. Over the past five years Dr. Greer and his colleagues at King's College Hospital, London, have made painstaking progress with a problem that is extraordinarily difficult to investigate. Their findings were published recently in *Psychological Medicine* (Vol. IX, p. 81). One of their major discoveries came from personality studies among women who were having a lump in the breast investigated by biopsy. When compared with the general population, more of these women listed "suppression of anger" among their behavior traits.

This interested me because it supports work done in Britain several years ago by David Kissen, whose Medical Research Council unit on the psychosomatic aspects of cancer was closed down after he himself died of the disease. Dr. Kissen's investigations yielded highly suggestive evidence that cancer and the patient's psychological condition are closely linked. One of his most persuasive studies compared smokers suffering from lung cancer with a matched group of cancer-free smokers. Personality tests showed that the patients included an unusual proportion who repressed their emotions, keeping them severely in check. A later study showed that lung-cancer victims who smoked were less self-assertive than smokers in general.

Such revelations are not as surprising to nonscientists as they are to "experts." We all know of people who have developed cancer shortly after retiring, for example, or closely following bereavement—cases in which it's been difficult to resist the obvious conclusion. Why have the medical and scientific establishments been so ready to dismiss such stories?

Orthodox practitioners, I believe, resisted evidence that the mind affects malignancy simply because they could see no possible explanation for such an influence. What could the mechanism be? Lacking even the tiniest clue, they quietly set aside Kissen's pioneering work and declined to mount further research. Greer is an exception, and he appears to be gaining converts.

We now have a little evidence about the link between what goes on in the brain and what goes on in the body's tissues. The immune system, which not only repels invading microbes but probably watches for the appearance of malignant cells and combats their growth, may well be the answer. Dr. Paul Rosch, president of the American Institute of Stress, gave one example recently in *The Lancet* (1979, Vol. I, p. 1302). One especially stressful experience, the death of a husband or a wife, is associated with an increased incidence of malignancy. It is also accompanied by what Dr. Rosch calls "a prompt and impressive decline in immune function." For the time being, we have no absolute proof that this loss of immunity makes cancer cells begin to proliferate. But the correlation is impressive.

There's another objection. Maybe certain psychological characteristics—depression, say, and the suppression of emotion—are a result rather than a cause of cancer. This seems implausible, particularly in the case of bereavement. The only way to settle the issue is to conduct prospective, rather than retrospective, studies. By assessing the personalities of many people and watching their health for years, it should be possible to identify any associations between the mind and cancer.

Drs. C. B. Thomas and R. L. Greenstreet reported virtually the only research of this sort ever carried out, in 1974, after three decades of monitoring the health of students from Johns Hopkins Medical School. Every year from 1945 on, the students completed psychological questionnaires. The results were striking. The personality profiles of those who later developed cancer revealed them as little given to expressing their emotions.

Serious scientific investigation of the mind's influence on cancer is still in its infancy. Yet there is one important practical lesson we've already learned. If certain psychological states reduce our vulnerability to the disease, perhaps we can mobilize our mental resources to fight cancer. Drs. O. C. and S. J. Simonton, a husband-and-wife team, have been training patients to visualize their body defenses fighting their tumors. When used with orthodox treatment, the technique certainly seems to increase life expectancy (*Journal of Transpersonal Psychology*, Vol. VIII, p. 29). And last year Dr. Y. Ikemi and his colleagues reported that belief was a major factor in the spontaneous remission of cancer (*Journal of Behavioural Medicine*, 1978, Vol. I, p. 45).

The fact that such claims are now being published in conventional scientific journals shows that research on a psychosomatic causation of cancer is acquiring respectability. The potential dividends are incalculable.

VENUS GLOW

STARS

By Patrick Moore

I have always been fascinated by the story of Franz von Paula Gruithuisen, a German astronomer who became prominent early in the nineteenth century. He was a fairly good observer who concentrated on the moon and the planets, but his imagination was, to put it mildly, somewhat vivid. For instance, he discovered what he believed to be an artificial structure on the moon and described it as "a collection of dark gigantic ramparts . . . a work of art." Unfortunately, there's nothing there but a few haphazard ridges.

It was in observing Venus that Gruithuisen really outdid himself. He put forward a theory to explain the so-called ashen light that caused his more sober contemporaries to raise their eyebrows.

Look at our crescent moon, and you can often see the unlighted side faintly shining. There is no mystery about this. The glow is caused by light reflected from Earth to the moon—as Leonardo da Vinci recognized long ago. But through the telescope, the same sort of radiance has been seen on Venus, where it is known as the ashen light. On Venus, it is not so easy to explain. Venus has no moon, and the earth could not illuminate it perceptibly.

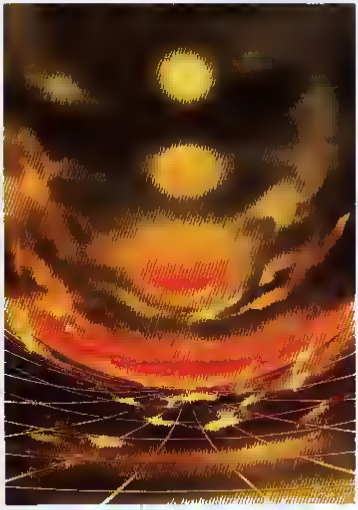
Gruithuisen thought he had found an explanation. He noted that the light had been observed in 1759 and again in 1806, after an interval of 47 terrestrial and 76 Venusian years. He concluded: "If we estimate that the ordinary life of an inhabitant of the planet lasts 130 Venus years, which amounts to 80 Earth years, the reign of an emperor of Venus might well last for 76 Venus years. The observed appearance is evidently the result of a general festival illumination in honour of the ascension of a new emperor to the throne of the planet."

Later Gruithuisen had second thoughts. He wondered whether the light might be due to the burning of large stretches of jungle to produce new farmland. He added that "large migrations of people would be prevented, so that possible wars would be avoided by abolishing the reason for them. Thus the race would be kept united."

There are objections to both of Gruithuisen's theories, and the ashen light itself remains controversial. Some astronomers have dismissed it as a mere effect of contrast. I have not. Though it is always elusive, I have seen it myself on quite a number of occasions. To see it properly, one has to fit a special "occulting bar" into the telescope eyepiece to hide the bright crescent of the planet. And, of course, one can never see Venus well against a really black sky, because it is always too low over the horizon.

Among possible explanations for the ashen light, astronomers have suggested fluorescence in the planet's seas, auroras and lightning flashes. It now looks as if the lightning theory may be correct.

As many people will recall, a fleet of spacecraft approached Venus last December. There was, for instance, the *Pioneer* multiprobe from the United States. And a couple of Russian *Venera*s made controlled landings, though without sending back pictures, as their predecessors had done. Many strange surface features were discovered. Most notable was a huge rift valley 5 kilometers deep, 280 kilometers wide, and stretching at least 1,440 kilometers, apparently with no sudden beginning or end. This remarkable valley dwarfs even the Valles Marineris on Mars and makes our own Grand Canyon seem like a mere mud crack.



Artist's conception portrays sunset on Venus

Just as interesting was the revelation that there is continuous lightning up to 32 kilometers above ground level. Both the *Venera* and the *Pioneer* orbiters detected as many as 25 discharges per second. An observer on Venus would see what appeared to be a continuous, eerie glow and would hear ceaseless thunder.

There is also a second glow, thought to be caused by chemical reactions in the superheated atmosphere close to the planet's surface. This glow seems to start about 16 kilometers above ground level and it may well combine with the lightning to make up the ashen light, an effect that has been seen by nearly all serious Venus watchers.

Less than two decades ago it seemed probable that Venus was covered by oceans, with a surface temperature we would find quite tolerable. By last December, we were resigned to finding a carbon dioxide atmosphere about 90 times as dense as our own, clouds containing sulfuric acid, and a surface temperature above 450°C.

The new findings make Venus an even more peculiar world than we expected. Any traveler incautious enough to step outside his spaceship to admire the view would be simultaneously poisoned, squashed, fried, and corroded. It now seems that he might also be deafened. The thunderclaps on Venus must be vastly louder than anything we hear on Earth.

Over the years, many people have suggested that we seed the atmosphere of Venus with bacteria to break up the carbon dioxide molecules and release free oxygen in order to prepare the planet for colonization. It now seems unlikely that such plans will ever be practical. In many ways, then, Venus has been a disappointment. Yet it remains one of the most fascinating bodies in our solar system.

OFFICIAL CIRCLES

By William K. Stuckey

Can President Howard Baker be beaten in 1984? Will Vice-President General Alexander Haig remain on the ticket? Will Tom Hayden of California and Representative Albert Gore, Jr. of Tennessee succeed in their separate efforts to wrest the Democratic party leadership away from Senator Edward M. Kennedy?

Or will Big Brother cancel the election all of the above and you?

The underlying premise of such questions, as you've guessed by now, is that the 1980 presidential election is already over for all practical purposes and very few of the now and future candidates (excepting perhaps Kennedy and young Gore) have shown any ability or inclination to use political savvy—and technology—to fend off the long-feared Orwellian Dictatorship.

Wait a minute. Technology? Isn't that supposed to be the demon that will hurl us into a polluted, computerized prison? Not necessarily. Technology has just as much potential to deliver us into a decentralized Jeffersonian utopia—if only some candidate would pay attention. Here is the scenario.

By late 1979 President Carter is achieving remarkable success in making Jerry Ford look good. Politically, he can still count on the votes of the boat people. Ted Kennedy has become leader of the American parliament and de facto prime minister. Ham Jordan is picking gung from between his toes and unwisely flipping it toward Speaker of the House Tip O'Neill. Ronald Reagan is saying that he might even pick some issues to talk about, while Jerry Brown is quoted as saying, "Issues are the last refuge of a scoundrel." Hayden, the reformed founder of the Students for a Democratic Society, is building a powerful California grass-roots organization stressing local autonomy, solar energy, Naderian anticorporate theology and no-more-nukes. He is preparing to run for Senator Sam Hayakawa's seat in 1982. John Connally sponsors a political thunder dance, but nobody comes. General Haig returns from NATO, dazzles the Soviet-hating oligozillionaires, is described by Jack Anderson as the man best qualified for the presidency and siphons off much of the support of George Bush, Reagan and Connally. Baker nails down the position of Washington's Wiliest Pol, delighting the left by voting to cut loose the Panama Canal and proposing to nationalize the oil companies, curtsying to the right by opposing SALT II, looking more and more like a 1980 winner even over Fritz Nice Guy and Ted Kennedy.

And young (early thirties) Albert Gore, Jr. is preparing, even if he doesn't know it, to come out of nowhere.

Gore is the rep-tied, squeaky-clean Harvard-trained epitome of the idea that all presidential candidates should look like Jack Kennedy. He is the son of a famous senator from Tennessee (which is emerging as a key border state in national election matters), a liberal-but not wild devotee of individualism, fusion power, science, and futurology, and an otherwise pragmatic supporter of the still-controversial Ovshinsky photovoltaic approach to solar energy. He and Representative George Brown, of California, are probably the most future-oriented members of the House Committee on Science and Technology. Finally, Gore has the potential of making even Jerry Brown look like a Victorian fudd through his newly acquired chairmanship of Congress's science-fiction branch, the Congressional Clearinghouse of the Future. And oh, yes, his college studies ranged from law to religion (perhaps attractive to former Carterians), and he wrote a thesis on the impact of television on the presidency. Gore's a textbook example of a political comer, as long as his closet is skeletonless.

Albert Gore, Jr., Head of Congress's SF branch

The time may be right for a Gore-like candidate. Forgetting about the future for a moment and getting back to present reality, remember that 1979 was the year when Bell Labs announced the development of the one-million-bit magnetic bubble memory which should give computers unprecedented new snooping and storage power; the year when congressional investigators were saying that Washington's data banks were being illegally pilfered not only by credit bureaus, insurance companies, and other corporations, but also by Communist nations and the Mafia; and the year when some of us concluded that the only protection the individual would have against a digital Big Brother was massive decentralization of political and corporate structures—and neighborhood or home computer terminals, which would assist us in bugging the bastards back, right down to President Carter's daily memos.

The anti-Orwellian candidate committed to avoiding 1984 disaster would want to make neighborhoods self-sufficient in food and energy, to train an entirely new class of political managers who understand how to use standard and appropriate technology to strengthen neighborhood security and educational programs, and perhaps to amend the Constitution requiring every candidate for national office to have such experience.

It will be fascinating to see whether that liberty-loving, Big Brother–loathing 1984 presidential candidate will be a bright new face from Tennessee. ∞

TELEVISION

THE ARTS

By James Deison

The 1978–79 television season was the most competitive the medium ever saw. It was a year in which the major networks tried out and canceled shows at the drop of a rating point.

The pressures of prime time will continue unabated this season, with CBS and NBC trying desperately to catch up with the now-established ratings leader, ABC. As a result, science and science fiction shows, perennial chance items whose costs often exceed their earnings, will not be as prominent as they were last season. But public television's excellent programming and selected syndicated shows—from children's programming to specials, docudramas, and documentaries—will continue to take up the slack left by the networks. Presented here is a wrap-up of the past season's programming and a look at what's ahead in science and science fiction.

DRAMA '78–'79

Although ABC's *Battlestar Galactica* promised to draw and hold vast audiences with its ultrasophisticated special effects, even the most enthusiastic viewers soon discovered that they were watching the same effects over and over each week. As state-of-the-art as these effects may have been, how many times could three Cylon Raider spacecraft zoom away and bank to the side before fans turned back to reruns of *Star Trek* and *Space 1999*? Though *Galactica* was touted as one of the most expensive series ever made, only the production values showed where the money went. It is hoped that the show's failure will not undercut the chances of further efforts in the big-budget SF adventure/hardware field.

Most of '78–'79's SF drama series were simplistic cartoons aimed at a lowest-common-denominator audience. *Fantasy Island* (ABC), *Supertrain* (NBC), and *Time Express* (CBS) had science-fiction elements in their basic concepts, but relatively few in their week-to-week stories. *The Incredible Hulk* (CBS) and *The New Adventures of Wonder Woman* (CBS) were drawn from comic-book characters and remained on that level. *The New Avengers* (syndicated) was a weak reminder of its earlier incarnations. However, reruns of *The Prisoner* (syndicated) and the debut of *Doctor Who* (Time-Life), both more than a decade old, proved audience pleasers.

Project U.F.O. (NBC), canceled at mid-season, dealt with reported sightings taken from U.S. Air Force records. Though it was too skeptical for the mass audience, fine model work for the alien spacecraft and some serious questions about extraterrestrial life were featured. And in mid-season came *Salvage 1* (ABC). Claimed by Robert Truax to be based on his real-life situation, the show starred Andy Griffith as a space-age junkman who built his own rocketship for galactic salvage jobs. (Truax is profiled on page 70.)

DRAMA '79–'80

Though such syndication favorites as *Star Trek* (Viacom), *Space 1999* (ITC), *Doctor Who*, and *The Twilight Zone* (Viacom) will continue in many cities across the country, only two network shows, *Fantasy Island* and *The Incredible Hulk*, returned this fall. Joining them will be two new dramatic series. *Buck Rogers* (NBC), a space opera with special effects, and *Tales of the Unexpected* (produced by Anglia Television, in England), an anthology of Roald Dahl stories previewed in the September issue of *Omni*.

COMEDY '78–'79

The surprise hit of the past season was *Mork and Mindy* (ABC), a sitcom about an alien's misadventures on Earth. While *Close Encounters* may have allowed extraterrestrials to land on Earth in peace, Mork made one want to take him home for supper. *Starstruck* (CBS) was a pilot show about a stopover for space travelers between Earth and Pluto.

The Muppet Show (ITC) still features the *Pigs in Space* segment, a swipe at space operas that stood just ahead of *Galactica* on the believability scale.

COMEDY '79–'80

Both *Mork and Mindy* and *The Muppet*

Carl Sagan will explore the origin and fate of the universe on the new show Cosmos *on PBS in 1980.*

Show are back on the air this fall, though Conrad Janis and Elizabeth Kerr (Mindy's father and grandmother) have been dropped for the new season. A pity. They added a certain air of believability to an otherwise unbelievable situation.

DRAMATIC SPECIALS/TV MOVIES '78–'79

Several science and science-fiction dramas were shown this season in movie format. The varied field included a cartoon-inspired superhero (*Captain America*, CBS), a villain threatening to destroy the earth's ozone layer (*Billion-Dollar Threat*, ABC), a woman's adjustment to her mastectomy (*First You Cry*, CBS), a biochemist who clones 13 replicas of himself (*The Clone Master*, NBC), an update of H. G. Wells's *The Time Machine* (NBC), a man capable of projecting electric waves from his hands (*The Power Within*, ABC), and the best of the lot, the story of an astronomer's attempts to warn officials of the imminent collision of Earth and a comet in its path (*A Fire in the Sky*, NBC).

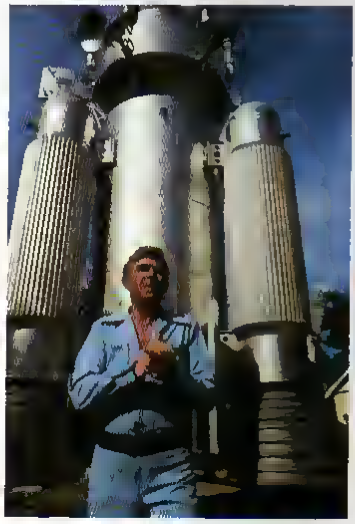
DRAMATIC SPECIALS/TV MOVIES '79–'80

Upcoming drama productions for the new season include *Brave New World* (NBC), a novel for television based on Aldous Huxley's story of a dystopian society; *Flash Gordon* (NBC), an animated version of the comic-strip character from the Filmation Studios; *Frodo: The Hobbit II*, a sequel to the '77–'78 animated *Hobbit* from the Rankin/Bass Studios; *The Martian Chronicles* (NBC), a novel for television based on Ray Bradbury's book; and *Vampire* (ABC), the story of a present-day billionaire throat-rapper.

SCIENCE SPECIALS '78–'79

An unprecedented number of science specials, mostly documentary in nature, were aired in the past season. PBS alone presented 20 different programs, several of which were multipart in format. The major networks had a sprinkling of shows on newsworthy items, such as the Jupiter flyby and Einstein's hundredth birthday, but each one presented only a single major science special of any consequence.

The landmark list of PBS shows included *All for One*, a documentary about the Lamaze method of childbirth; *Defusing Cancer's Time Bomb*, concerned with short-term tests for chemical carcinogens; *Do I Look Like I Want to Die?*, a debate over nuclear power; *Eclipse! The Astronomers Are Coming, the Astronomers Are Coming!*, a documentary on the last eclipse to occur over the United States in this century; *The Energy War*, a 3-part, 5-hour series on the Senate debate over President Carter's natural-gas bill; *The Fight for Food*, a 3-part, 3½-hour Global Paper on the world food shortage; *Findhorn*, a study of a successful communal society in Scotland; *Fluorocarbons: The Unfinished Agenda*, showing the potential environmental hazards of their use; *Generation of the Wind*, a documentary on building the world's largest privately funded electricity-generating windmill; *I Was Born at Home*, which traces the growing trend to allow midwives to deliver babies in the home; *Jupiter Watch*, a 4-hour live show on the *Voyager 1* spacecraft as it neared its closest point of contact with Jupiter on its way to Saturn; *Opium*, a 3-part documentary on the international network of crime surrounding heroin; *Paul Jacobs and the Nuclear Gang*, a documentary exploring the



Andy Griffith as R. C. Truex in ABC's Salvage-1

effects of low-level radiation; *A Place of Dreams*, the history of flight, narrated by Cliff Robertson; *Pompeii: Frozen in Fire*, a visit to the traveling Pompeii exhibit; *They Said It Wouldn't Happen*, a report on nuclear accidents following the Three Mile Island incident; *The Thieves of Time*, illegal archaeological excavations and their effect on preserving America's historical heritage; *The Three Mile Island Mishap: An Update*, a live program on the reasons for and the threat caused by the accident; and *To Mrs. Brown: A Daughter*, a program on the first test-tube baby.

Locally originated science specials included *A Death in the Family* (WCCO-TV, Minneapolis), a program about the effects on five families of having to give up watching television for a month; and *No Way to Treat a River* (WAVE-TV, Louisville), an examination of the Ohio River, its beauty and its pollution.

Network science specials in the past year were very disappointing. ABC presented *Infinite Horizons: Space After Apollo*, a documentary marking the tenth anniversary of the moon landing and looking forward to the benefits and hazards of future efforts to conquer space. CBS presented *Universe*, a pilot for a *60 Minutes*–type science series; and *A Star Wars Christmas*, in which Wookies proved they need George Lucas to make them more than lovable walking carpets.

SCIENCE SPECIALS '79–'80

PBS will present shows on the famous Dionne quintuplets, man's threat to the ecological balance of Africa's Okavango Swamp, North American predators and the possible results of their threatened extinction, and the potential and actual uses of outer space for military bases.

NONFICTION SERIES '78–'79

PBS led the field again, with four of five series. The only network attempt, and a brave one at that, was *Lifeline* (NBC), a short-lived series of *cinéma vérité*–like views of real medical operations. On PBS *Marie Curie* traced the life and work of the two-time Nobel Prize–winning scientist; *The Cousteau Odyssey* returned with shows on Easter Island, the recovery of poisonous chemicals off the coast of Italy, lost treasures off the coast of Greece, and the pollution problems of the Mediterranean; *The National Geographic Specials* presented programs on gold, Hong Kong, the plight of elephants in Kenya, and the voyage of Thor Heyerdahl across the Persian Gulf and Indian Ocean in a Sumerian reed craft.

NONFICTION SERIES '79–'80

The new season's offerings are PBS-dominated, with a new series of *The Cousteau Odyssey* that covers man's increasing intrusion on the Nile River and other similar subjects. *The National Geographic Specials* offer programs on exotic deep-sea life forms, the brain and its wonders, a study of microscopic life forms, and a visit to the *Queen Elizabeth II*.

Entirely new programming on PBS features *The Voyage of Charles Darwin*, a 7-part docudrama on Darwin's life, from the university to his expedition aboard HMS *Beagle* and the controversy surrounding his revolutionary theory of evolution.

3-2-1 Contact will be a daily show designed to introduce children to science. In production, to be aired sometime in 1980, is *Cosmos*, Carl Sagan's long-awaited series that explores space and time in the same format used so well in *The Ascent of Man*. Topics to be covered by Sagan include missions of discovery to other planets, black holes, the origin of matter, the human brain, alternate universes, time travel, communication among whales, the death of the sun, extraterrestrial life, Hindu cosmology, cosmic catastrophes, the *Voyager 1* interstellar message, Martian canals, robots, cosmic influences on the origins of life, the collisions of continents, space voyages of exploration by sailing ships, the deciphering of Egyptian hieroglyphics, contact with other civilizations in outer space, the birth and death of stars and galaxies, the future of Earth, and other questions concerning the origin and fate of the universe. If he pulls it off, it will make a great birthday present for the new decade. ∞

Painting by Robert Rauschenberg

The future is coming. And with it will come great benefits for mankind. And a whole new set of problems. Beceuse we ere e forest products company, and plant seeds thet take up to 50 yeers to become meture trees, Champion Internationel hes to think e lot ebout the future. We'd like to share some of the things we've learned with you—to help you meke intelligent choices in the yeers to come. Here is something you might want to think about.

In the future, incredibly expensive technology could enable a few people to live for 200 years or more. Who will be chosen? And, who will choose?

If life-extension becomes a national priority like the space program, if high-technology countries like America, Russia, Germany and Japan could work together, if there were a multi-billion-dollar, multi-discipline assault on aging and death, we could produce dramatic results within the foreseeable future.

That's the opinion of many futurists and scientists. A cooperative program like this between nations could put such a dent in aging and death we might create a whole new world of healthy, hearty 'Methuselahs'. And it would probably cost no more than we are all now spending on maintaining our old-age homes and other geriatric institutions.

Within the next few decades, a lifespan of 100, 200, 400 years and up may become a part of Homo Sapiens' on-going evolutionary destiny.

Right now, researchers are working on several approaches to longevity, which include:

Transplantation, which might allow us to continue replacing organs until almost our entire bodies are new.

Regeneration, a process by which deactivated genes are switched back on to renew cell tissue.

The Prevention of Lipofuscin Build-Up. Lipofuscins are a form of destructive cellular garbage produced by the body, and are thought by many scientists to contribute to aging.

Restricting Diet, which in the young, delays maturity and increases longevity; and in the middle-aged seems to rejuvenate the immune system.

Prosthetics and Cyborgs, machine-human combinations of which the '$6,000,000 Man' is an almost credible preview.

Lowering Body Temperature, which alone might add many years to human life.

The future of life-extension is very promising. To many scientists, there is no question that the problem of aging will be solved within the next few generations—even without an all-out program.

That brings up two questions. If life-extension becomes commonplace, what will we do with all those great-great-great-great-great-great-grandparents? Will they hold onto their jobs forever? If they don't, who'll support them?

On the other hand, what if the first technology to prevent aging is incredibly expensive?

Will that mean that only the wealthy will be able to turn back the clock, or that the government will select the future 'Methuselahs', based on its own criteria—intelligence, race, talent, or perhaps, even political affiliation?

That is an untenable solution. But what are the alternatives? How can the people have a say in the matter? We *all* bave a lot of things to think about.

But if you'd like to do more than just think about it, if you'd like to be able to make intelligent choices for tbe future, write for more information to:

Champion International Corporation, Box 10125, 1 Landmark Sq., Stamford, Ct. 06921.

Looking into the future *now* may help you prevent future shock later.

Champion, a forest products compeny with its roots planted firmly in the future.

We are in the forest products business. We plant trees and harvest trees. We make wood and paper. And we make things out of wood and paper.

Because we make our living from the forest, our success depends, in one way or another, on the future. These are our operating divisions that are planning for the future.

CHAMPION TIMBERLANDS
CHAMPION BUILDING PRODUCTS
CHAMPION PAPERS
CHAMPION PACKAGING (HOERNER WALDORF)

Champion
Champion International Corporation
Planting seeds for the future

THE ARTS

By Tom Johnson

As I walked through the door of the Arras Gallery in the heart of New York's Fifty-seventh Street gallery district, I was greeted by a phrase of electronic music. The sound seemed to be coming from a wall hanging, located to my left: a neat arrangement of wires, resistors, a three-inch loudspeaker, and other electronic paraphernalia. There was no one else around. So I figured that I must somehow have triggered the sound myself when I entered.

The music stopped suddenly. I went back toward the entrance and tried to trigger it again, but nothing happened. I looked at the floor, thinking I might find a switch of some sort, but I couldn't see or feel anything. I looked around for video cameras or photoelectric beams, but I couldn't find any.

The little atonal phrase erupted again. I looked toward the circuitry and noticed that the shadow of my head was sharply outlined against its convolutions. There must be, I thought, a little photocell somewhere in the circuitry itself. I tried standing still, not moving my shadow, to see whether the music would continue. It ended after about ten seconds, just as before.

I stepped aside and then returned to my position to see whether I could trigger the music again. It worked. This small success encouraged me to study the configuration of the circuitry more closely. I began to develop some working theories about which of the hundreds of little pieces in this electronic puzzle was the light-sensitive trigger. I felt I was getting somewhere.

Then a new thought bothered me. I realized that the phrase was a little different this time than it had been before. I had been so busy psyching out the basic situation that I hadn't listened closely to the music, but now I began to see this curious wall hanging, netted with attractive circuitry, as a pretty smart machine. It always blipped and slid around the same basic atonal progression, but the pitches came out a little differently each time. Perhaps I was observing a very sophisticated circuit that programmed its own variations. More likely the machine was relatively simple and the variations just took care of themselves as the circuitry heated and cooled off in various places. Either way, it was an ingenious device that could easily have held my attention for another ten minutes. But I was becoming impatient to investigate the 20 or 30 other "cybernetic objects" of Peter Vogel, which were hanging on the walls and standing on pedestals around the room. I decided to move on.

Most of Vogel's cybernetic objects looked and sounded similar to the one that had perplexed me at the entrance, but each had a different twist. In one case, I cast my shadow on an object, heard nothing, determined that it was not in working order, went on to the next one, and then heard the music a little later. The circuit involved a delay mechanism.

Another wall hanging included four separate circuits, and it was possible to play rather dense, intricate musical textures by moving my hands in front of the four photocells in various combinations. Some of the machines always sounded about the same, and some varied their musical material. Some played discrete phrases and then stopped; others played continuous lines for as long as someone cast a shadow on them. Some were rhythmic in character. Some sounded almost plaintive. Several of these curious electronic sculptures had me completely baffled until I noticed a sign on the gallery wall that explained that they were sound-sensitive rather than light-sensitive. They would respond only when someone triggered off certain other sounds in the vicinity.

Peter Vogel's cybernetic object that sings

From a purely musical standpoint, none of the machines could be compared with the technical perfection, careful control, and intricate sound colors that can be produced on today's large synthesizers and computer-music operations. But that is not Vogel's concern. He works with relatively simple self-contained systems, and his music is as exposed as the circuitry that produces it. His cybernetic objects are not big, elaborate, expensive electronic instruments that attempt to do everything. They are just nifty little machines, and their only purpose is to do their own nifty little things. There is something appealingly intimate about them. Since they play only when someone is standing right there listening, and since they cannot be heard clearly unless one is standing quite close, listening to Vogel's cybernetic objects is a very private experience. With a little imagination one might even make friends with one of them, at least for a few minutes.

Vogel's work is unlike anything I have encountered before, but it is not unrelated. Many other visual artists, who normally work in museums and galleries, have also used sound tracks, tape loops, or audio circuitry of some sort to extend their exhibitions in an aural dimension. However, many composers, who normally work in concert halls, have sought out galleries or museum spaces to put their music in a place where listeners can come and go, where sounds can go on endlessly, where one is free to stay for as short or long a time as one wants, and where it becomes possible to present many kinds of audience-participation music.

CONTINUED ON PAGE 175

TUNGUSKA

UFO UPDATE

By James Oberg

A genuine UFO appeared over Siberia in 1908, startling thousands of witnesses before it exploded with a thunderous detonation whose echoes still reverberate around the world. Tens of thousands of trees were flattened by the tremendous blast. Many theories have bitten the dust as scientists sought to explain what happened that day in June near the Tunguska River.

The Tunguska event, as it has come to be called, produced an explosion comparable to that of an H-bomb. More puzzling, the blast occurred high in the air, leaving no craters on the ground and no recognizable traces. Weird scenarios of antimatter meteors, miniature black holes, lithium asteroids, fiery whirlwinds, ball lightning, and other exotic phenomena have all been proposed as scientific explanations for the Tunguska event. The favored hypothesis today is that the blast was caused by the collision of Earth with a small comet, probably a chunk off a dying "space snowball" named Encke's comet.

But many ufologists have adopted the Tunguska event as proof not of our limited scientific knowledge of natural phenomena but of a visitation to Earth by an alien space probe, which accidentally destroyed itself in a thermonuclear immolation. Opinions differ as to whether the explosion was a deliberate signal or an accidental overload of the starship's propulsion system. The fact of the explosion itself is thought to be convincing proof for the existence of extraterrestrial nuclear-powered "flying saucers."

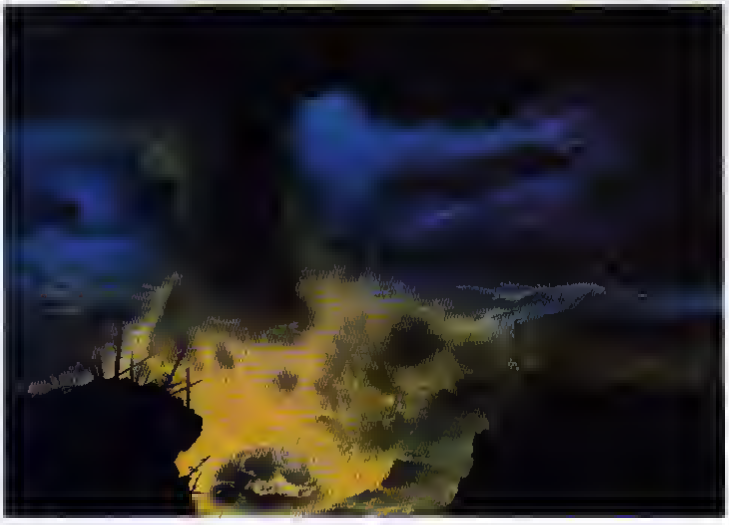
Narrating against a background of a man-made nuclear explosion, Leonard Nimoy told viewers of the television documentary "In Search of the Siberian Fireball" that the evidence now indicates that a nuclear explosion may have occurred on Earth as early as 1908. The show, produced by Alan Landsburg Productions and first televised in November 1978, interviewed some scientists who supported the comet theory, but clearly the program's sympathies were with more exciting suggestions. Thomas Atkins, coauthor of *The Fire Came By* (Doubleday, 1976), and Henry Gris, coauthor of *The New Soviet Psychic Discoveries* (Prentice-Hall, 1978), both argued that an alien spaceship had caused the Tunguska event.

There is evidence, Atkins wrote, "to indicate that an extraterrestrial vehicle may explain the Siberian explosion. Though the proof is neither complete nor absolutely conclusive, the theory appears increasingly acceptable."

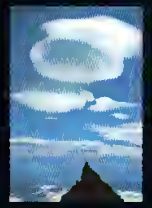
Gris, who refers to the object as the "Tungusky [*sic*] Miracle," quotes extensively from the testimony of Alekseï Zolotov, a Russian college professor whose frequent visits to the blast site have convinced him that the object was not of this world. Zolotov told Gris in Moscow in 1977: "When you hear the descriptions, you cannot help forming the opinion that this was no meteorite, but a giant UFO. The explosion [people in the area] saw was a perfect duplicate of what a nuclear blast looks like. . . . Everything points to a nuclear origin. . . . I have no doubt it was sent by inhabitants of outer space to attract our attention."

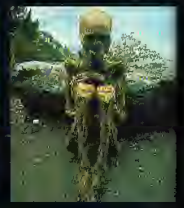
Zolotov often talks with Western reporters and is widely quoted in the Soviet press (the possibility that the first space visitors *chose* to land in *Russia* warms the hearts of all true patriots). Zolotov and the USSR's chief UFO expert, Feliks Zigel, take turns enthralling bored and news-hungry Western journalists in Moscow with their latest proof that the blast at Tunguska was produced by an object traveling here from outer space. It's a good story that piques the interest of the wire services and TV news producers about once a year.

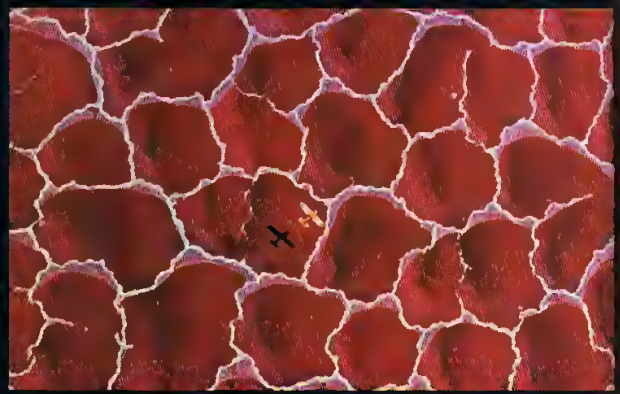
The nuclear-blast theory favored by ufologists owes its origins to traces of radiation found near the site and to the fact that plant mutations and accelerated plant growth were detected by biologists (these effects have also been observed following H-bomb tests). A mysterious glowing cloud from the explosion drifted over northern Europe for several days, baffling scientists who were unaware of



The Tunguska event, visualized here by artist Christopher Foss, has lost much of its mystery.

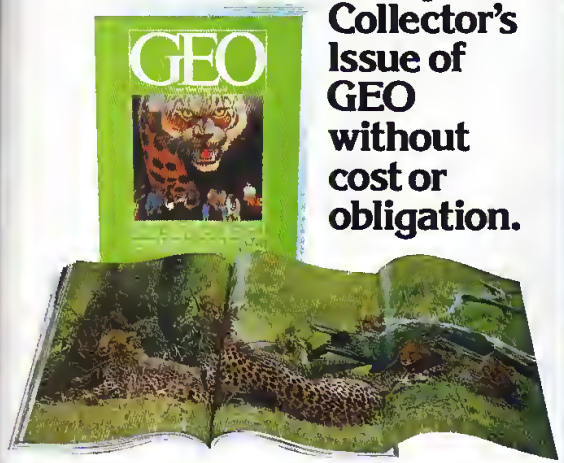






THE EARTH ACCORDING TO GEO

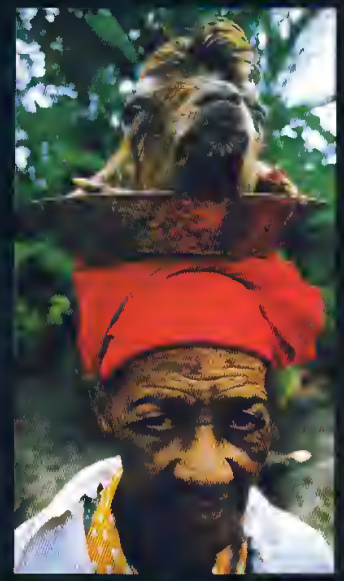
You are invited to accept the Collector's Issue of GEO without cost or obligation.

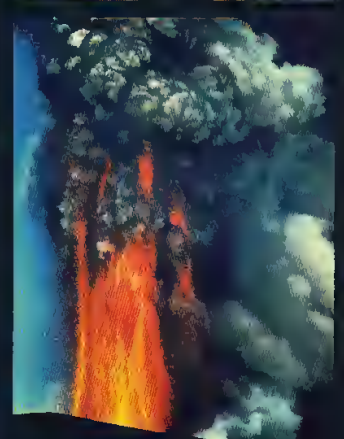


You're about to be catapulted into the world as you've never seen it before. So hang on to your nerve endings—and let GEO take you into paradise, and hell…limbo, and nirvana…into the GEO experience.

You'll begin with the Collector's Issue, a dazzling demonstration of what happens when the world's greatest writers and photographers are given carte blanche—all the time, freedom and resources they need to live each story at its source. Not available on newsstands, the Collector's Issue is offered to you as a gift—a powerful persuader loaded with glorious color photography and boldly original writing.

Take the plunge. You'll come up gasping for more. And you can get it at our special Charter Rate: $36 for 12 issues, saving $12 on the newsstand price. But whether or not you subscribe, the Collector's Issue is yours to keep as a gift. See attached postpaid card for details. If card is missing, write to: GEO, P.O. Box 2552, Boulder, Colo 80322.





the Siberian blast. The strange shape of the site itself suggested to some researchers that the explosion took place inside a superstrong hull and was directed outward. Testimony of eyewitnesses describes a cylindrical object that changed course several times before heading toward an uninhabited region just before the explosion.

A czarist expedition seems to have reached the site shortly after the event, but all of its records were obliterated along with the personnel of the expedition in the ensuing Bolshevik revolution; only tantalizing secondhand and thirdhand accounts have survived. An expedition arrived at Tunguska in 1928, after several years of scouting around the remote Siberian forest-swamp region. The expedition leader, a meteorologist named Leonid Kulik, persuaded the Communist government to finance the trip on the grounds that vast quantities of meteoric iron were probably lying around on the ground and could prove useful to Soviet industry.

Imagine Kulik's discomfiture when he arrived at ground zero and found thousands of hectares of flattened trees but not one fragment of iron! Decades later, analysts discovered microscopic spherules in the local soil, but there is still a dispute as to whether these are in any way connected with the 1908 explosion. Kulik had some explaining to do when he got back to Moscow.

Years later, while surveying the atomic-bomb damage to Hiroshima, Russian science writer Aleksandr Kazantsev saw enough similarities with Tunguska to theorize that the Siberian explosion, too, had been nuclear in nature. He embellished this notion into a science-fiction story, published in 1946, which suggested that the explosion had been caused by a crippled spaceship from Mars, seeking to obtain fresh water from nearby Lake Baikal. The "Tunguska UFO" was born and has been thriving ever since.

As might be expected, traditionalist scientists do not subscribe to this theory. Even leading astronomers and space geologists in the Soviet Union tend to favor the comet hypothesis, leaving Tunguska to the private endeavors of Zigel' Zolotov and other writers who try to give the impression that the UFO theory is the official Soviet version of the event. It is far from it.

American meteor experts, for example, may have uncovered new evidence linking the blast to a comet's impact. Ronald Oriti, a researcher with the Griffith Observatory in Los Angeles (who was interviewed on the *In Search of* program), vehemently rejects the spaceship theory. In 1975 he published a new analysis of the Tunguska event, drawing attention to parallels with a similar but smaller midair blast over Revelstoke, Canada, in 1965. That blast was in the kiloton range, yet it left no craters. Fortunately, investigators at the scene noticed a thin layer of soot on some newly fallen snow. Laboratory analysis showed that the material was of meteoric origin, testifying to the complete pulverization of the meteor following its explosion. The explosive force was accounted for entirely by its kinetic energy and atmospheric friction, no chemical or nuclear fuels were needed.

Use of the word *fireball* to imply that the Tunguska blast resembled a hydrogen bomb is false. Oriti claimed in an interview late in 1978: "Those of us familiar with meteor reports know that the term should properly be applied to the flaming objects crossing the sky, not to the final explosion."

Nor are the reports of radiation any more reliable. Although the UFO press quotes many prominent scientists as testifying to the nuclear nature of the blast, a more careful check of their opinions reveals a different picture. Willard Libby, father of the carbon-14 dating technique and a Nobel Prize winner, supervised tests of tree rings conducted after the 1908 explosion. Although he found trace fluctuations of radiation, he computed that an actual nuclear blast would have left residues at least seven times as strong as those that were found.

"Weird scenarios of antimatter meteors, tiny black holes, lithium asteroids, ball lightning, and other exotic phenomena have all been proposed as scientific explanations for the blast."

Our test ruled out any such large nuclear reaction," Libby commented to an interviewer from *Astronomy* magazine late in 1976. When told that pro-UFO spokesmen were quoting his tests as having proved the existence of a nuclear blast at Tunguska, Libby objected: "No, it proves nothing of the sort. We found nothing to indicate a nuclear explosion of that size, and we had calculated that if a nuclear reaction had occurred, we *would* have found clear indications."

In support of Libby's claim of proof of the *absence* of any nuclear blasts on Earth in 1908, Norwegian chemists recently published the results of their own tree-ring tests. They showed no trace of any radiation.

UFO books suggest that the glowing skies over Europe were caused by radioactive clouds, yet the explanation for this phenomenon is much simpler. Dust thrown up from an explosion in Siberia would have been carried by the stratospheric winds eastward, not in the opposite direction toward Europe. But had the object been a small comet, its tail would have been pointing downsun, toward the west, at the moment of the dawn impact. That direction would have placed the dust right over northern Europe.

Earlier this year a Czechoslovak astronomer repeated an earlier suggestion that the Tunguska object was a fragment from Encke's comet. Professor L. Kresak of the Slovak Academy of Sciences asserted that the blast occurred during a meteor shower that is associated with debris from the comet and that the computed direction of the object's trajectory coincides well with the comet theory.

Skeptics of the comet theory have asked why the fireball would not have been seen before impact. Astronomers counter that it was probably a very small comet, which was also located in the daytime sky during most of its approach to Earth.

Aerodynamics experts in Moscow conducted an experiment about 20 years ago in an effort to simulate Tunguska's blast patterns. The scientists used a charge of explosives suspended over a board covered with miniature trees, represented by matchsticks. In addition to the single blast point, a string of smaller charges were added to reproduce the hypersonic shock wave of the object's ballistic passage through the upper atmosphere.

When the explosives were triggered, a blast pattern strikingly similar to the "butterfly" pattern of the actual Tunguska site was created in the matchstick forest. Although this experiment conclusively demonstrated that the strange pattern was due entirely to a large object that exploded naturally, the experiment's results were still being misinterpreted or misquoted years afterward. According to a 1978 *In Search of* program, "The evidence supported the Soviet contention that Tunguska was the result of a nuclear holocaust," a conclusion directly counter to that of the experimenters themselves and a statement that falsely implies that Soviet scientists in general contended that the event was nuclear in origin.

The most frightening aspect of the comet hypothesis, which is gaining in credibility, is that the natural phenomenon that leveled the forests of Siberia 71 years ago could happen again—at any moment. On a more densely populated Earth and in a political climate in which nations have constructed their own nuclear arsenals to retaliate at a moment's notice if attacked, the idea of another Tunguska-like blast is a part of our future we might prefer to avoid.

CONTINUUM

THE H_2INDENBURG SOLUTION

In 1937, outside of Lakehurst, New Jersey the German zeppelin *Hindenburg* filled with hydrogen suddenly burst into flames. The disaster did two things. It killed 35 people. And it gave hydrogen a bad name.

With visions of the fiery *Hindenburg* dancing in your head, consider the following scenario. The year is 1986. You leave your hydrogen-powered home to get into your hydrogen-fueled car to pick up a package arriving on a hydrogen-fueled jet.

If this sounds scary, it shouldn't. Or so says a group of hydrogen advocates who have banded together to form the H_2indenburg Society (H_2 is the formula for molecular hydrogen). The group's purpose is to allay the public's fears over a substance that could turn out to be a very good multipurpose fuel and help to solve the energy crunch.

Hydrogen has a lot going for it, claim its advocates. It generates almost no pollution. In liquid form, it makes a potent jet fuel, producing almost three times the energy per pound of conventional fuel. In hydride form, it can serve as an efficient—and safe—fuel for automobiles. And, perhaps best of all, it's plentiful. Hydrogen is the most abundant element in the universe. On Earth we find it mostly tied up in water. True, coaxing the H_2 away from the O in H_2O is presently an expensive process (electrolysis), but new and cheaper methods are being developed. That hydrogen is the fuel of the future is supported by the fact that in some places it is already the fuel of the present. For instance:

• Provo, Utah. After converting a Model A Ford to burn hydrogen, Roger Billings, president of the Billings Energy Corporation, has since converted two buses, a small tractor, the home he now lives in (both heat and power), and—believe it or not—a Dodge Omni to run on hydrogen.

The Billings Corporation has also created an iron/titanium hydride that when powdered and placed within a pressure tank allows the tank to soak up hydrogen like a sponge. The company tested the safety of the material by inviting some army personnel to fire a round of armor-piercing incendiary bullets into a container filled with hydrogen-soaked hydride. It didn't explode. In fact, the hydride is so safe for cars, claims Alene Bentley, of Billings, that even if you were in an automobile accident and the tank ruptured, "the hydrides would just spill out like face powder."

• West Berlin. Inspired by Mercedes-Benz, which is running experimental buses in Stuttgart on metal-hydride-contained hydrogen, the city of Berlin will soon be running its own fleet of hydrogen-fueled vehicles.

• Chicago, Illinois. At the Institute of Gas Technology researchers have built an experimental coffee warmer using a hydrogen catalytic heater. (But can they make a good cup of coffee?)

• Stuttgart, West Germany. At a four-day meeting of fuel and aeronautics experts this September, a German-sponsored group discussed the possibility of developing a small fleet of experimental liquid-hydrogen-fueled wide-body jets to be put into air-freight service by 1986. The specific aircraft to be converted is the Lockheed L-1011, now a widely used passenger jumbo jet. Though hydrogen is expensive to produce, G. Daniel Brewer of Lockheed, pointed out before the meeting that "hydrogen aircraft are much more efficient than aircraft using other fuels. And [this efficiency] more than makes up for the difference in cost." William J. D. Escher of Escher Foster Technology Associates in St. Johns, Michigan, agrees. "The only way we could have a supersonic transport that could cross the Pacific is by going to hydrogen. Jet fuel simply can't make it."

With all of these projects going on, why aren't there thousands of people rushing to get on the hydrogen bandwagon? The answer is that many are resisting hydrogen partly because they don't realize what an efficient fuel it is and partly because of the legacy of Lakehurst. But when handled properly, emphasize its advocates, hydrogen can be a safe fuel that could help us make the transition from the dwindling fossil fuels of today to the renewable, clean fuels of the future.

In a town of 4,000 people in Iowa that transition is already happening. Forest City is about to become the first to be totally converted to hydrogen fuel before 1984. The Billings Corporation, which is designing a coal-gasification plant for the town, estimates it can produce the hydrogen it needs at a cost equivalent to paying 50 cents a gallon for gasoline. (Coal gasification is another way of making hydrogen.)

But if the future has caught up with this midwestern town, the people there are still suffering from the shock. "The biggest problem, in all honesty," says Doug Eddy, a Forest City councilman, "is that the people will not even believe it. It's too damn good to be true."

—KENNETH JON ROSE

CONTINUUM

THE NAZI PAPERS

A key point in President Carter's energy program is the development of synthetic liquid fuel. Now it appears

Hitler's war machine ran partially on synthetic fuel. America hopes Nazi secrets will fuel our own blitzkrieg against gas shortages

the United States may get a helping hand from an odd source: Nazi Germany.

Cut off by Allied forces from oil supplies toward the end of World War II, German scientists undertook a crash program to develop synthetic oil from coal. The project, actually begun in 1933, grew in importance as Nazi war fortunes worsened and the Allied stranglehold tightened. At the peak of production, Germany's 25 plants were churning out thousands of barrels a day.

When the war ended, the United States took possession of some 500,000 documents relating to the synthetic-fuel program. They are now stored at Texas A&M University, where they are being studied by Dr. Kurt Irgolic, professor of chemistry and associate director of the university's Center of Minerals and Resources.

They grabbed everything. "Dr. Irgolic says, blueprints, drawings, product analyses, even memoranda. These were brought to the United States and microfilmed.

Irgolic and his staff are abstracting and indexing this mass of material, which could cut two to three years off the time required for the United States to develop its own synthetic-fuel program. They are also tracking down and interviewing German scientists who were involved with synthetic fuels. Only two countries have been able to develop successful synthetic-fuel technologies: South Africa, in the mid-1950s, and Nazi Germany. Of the two, Irgolic says, the German technology is far simpler and more productive.

—Douglas Colligan

"We have to face the fact that one day humanity will disappear. There is no escaping that fact. The question is, When?"
—Richard Leakey

GREEN HAIR

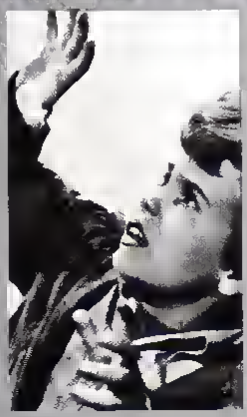
Shortly after moving to Columbia, Maryland, Peggy Fenzel, a natural blonde, noticed something odd. Her hair was changing color. Weeks later, her friends confirmed her suspicion. She had green hair.

So did other adults and children with white or light hair in the neighborhood where she lived. In fact, some children, like the main character in the movie *The Boy with Green Hair*, were having hard times in school because their classmates made fun of them. "I thought I was going crazy," Mrs. Fenzel said.

What began as a strange and annoying problem—"I couldn't wash out the green"—became more serious once the source of the problem was uncovered. Mrs. Fenzel's housing development is serviced by a private water company that draws its supplies from a large underground well. It turns out the water is highly acidic, so much so it dissolves minute quantities of copper from the plumbing in the houses.

After weeks of drinking and washing with the copper-rich water, Mrs. Fenzel and others absorbed some of the metal into their systems. And copper, when ingested by some people, has the peculiar property of turning their hair color to green.

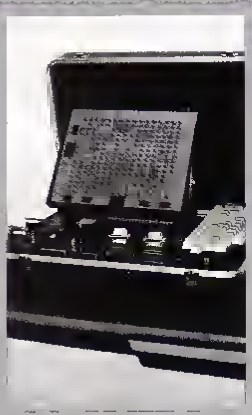
The copper discovery has given the Fenzels and other families more than green pates to worry about. Now, Mrs. Fenzel says, she's concerned about the effect of large amounts of copper on her and her family. Even before the copper discovery, when her baby was eight months old, she had stopped using the water to mix formulas for the child, who was always getting sick. The family has now switched to bottled water for drinking and cooking and uses the well water only for washing. In the meantime, Mrs. Fenzel and her husband are suing the water company and the Maryland Health Department to make the water clean, not green. —D.C.



Dean Stockwell starred in The Boy with Green Hair *(1948)*

SIGHT TYPING

Now it's possible to type with your eyes Dr George Rinard of the University of Denver Research Institute



Dr Rinard's 'sight typewriter" Operated with eye movements

has invented a typewriter—intended for use by stroke, palsy and arthritis victims—that can be operated solely by eye movements

To work the typewriter currently being tested by quadriplegics at Denver's Craig Rehabilitation Hospital, the user wears a pair of special glasses with nine dots on one lens The dots are used to code letters of the alphabet punctuation marks and spaces between words Each code consists of two or three dots with the center dot being the last dot in each code For example, to type the letter *E* the user first looks at the middle left dot and then at the center dot For a *W* the user first looks at the lower left dot, then at the lower right dot and finally at the center dot There are 64 codes so that the user can designate several for commonly used words

The special glasses have a tiny camera fastened to the earpiece a tiny flashlight located on the nosepiece and an infrared mirror—invisible to human eyes—in the dotted coding lens The flashlight's infrared light bounces off the user's eye and is reflected by the mirror into the camera In this way the camera tells the typewriter where the user is looking and what key to strike

The computerized typewriter is only in the prototype stage but it is made from standard readily available parts that cost about $2 000 unassembled Fully assembled mass-produced typewriters will probably cost slightly more

The English language has been broken down into 64 separate sounds so the 64 code system could be programmed to speak as well as type The special glasses can also be hooked up to control a wheelchair

—Lois Wickstrom

"We must have respect for both our plumbers and our philosophers, or neither our pipes nor our theories will hold water"

—John W Gardner

"As for man he doesn't even consider himself an animal—which, considering the way he considers them, is probably, all things considered, the only considerate thing about him"

—Cleveland Amory

PROOF OF AGE

Some say it's the yogurt that keeps the Soviet Georgians living as long as 168 years Others say it's the environment Still others say it's bunk—that the claims of longevity are totally unsupported But scientists at the Scripps Institution of Oceanography in San Diego say there's a way to tell for sure The residents of Abkhazia in Soviet Georgia can prove their age by showing their teeth

Jeffrey L Bada and Patricia M Masters have adapted dating techniques they developed for judging the antiquity of fossils into a new procedure for determining the ages of living animals By examining proteins in the teeth or the lenses of the eyes they say it is possible to calculate the year of birth with only a 10-percent margin of error

The teeth and the lenses contain proteins synthesized early in life Bada and Masters explain These proteins are not broken down and replaced with new proteins as happens elsewhere in the body

Recently visiting gerontologists from the USSR brought the Scripps team a tooth from a Soviet Georgian woman whose birth date was documented The dating analysis put the woman's age at ninety-nine only three years off from her known age ninety-six The close call has prompted the Russians to offer additional tooth samples and any lenses that may be removed in cataract operations from other long-lived Georgians

—Dava Sobel

"Nothing is impossible for the man who doesn't have to do it himself"

—Weller's Law

Soviet Georgians claim a life span of up to 168 years Now American scientists will attempt to prove or disprove those claims

CONTINUUM

METEOR!

An idea that started out as a classroom challenge at the Massachusetts Institute of Technology 12 years ago is making it as a movie and a topic for junior high school and high-school classes all over the country.

The movie is *Meteor*, a disaster flick starring Sean Connery, Natalie Wood, and a wayward hunk of space rock that threatens to smash into Earth with planet shattering speed.

The basis for the movie's plot began at MIT in 1967 when Professor Paul E. Sandorff offered an advanced space systems engineering course entitled "Mission to Icarus." The course centered on keeping a mile-wide asteroid named Icarus from colliding with Earth.

In fact, the following year 1968, a real asteroid named Icarus was due to interact with Earth's orbit at a speed of up to 100,000 feet per second. It missed Earth by a scant 4 million miles. But had it hit, disaster would have resulted. It would have shaken the ground with the explosive equivalent of 500,000 megatons of TNT, triggered tidal waves worldwide, and thrown enough dust into the atmosphere to change our climate.

The solution Dr. Sandorff's students worked out was to hit Icarus with nuclear-warhead-armed Saturn 5 rockets to knock the asteroid off its collision course with our planet.

To help teachers capitalize on the interest in sky objects by students who see the movie, American International Pictures has prepared a teaching kit on meteors, asteroids, and comets, complete with reading lists, suggested quizzes, and activities. The kits are being sent to science teachers all over the country. Those teachers who have not yet received a kit should write to: Meteor, American International Pictures, Inc., 9033 Wilshire Boulevard, Beverly Hills, Calif. 90211. —D.C.

Sean Connery stars in the forthcoming movie Meteor

"We have probed the earth, excavated it, burned it, ripped things from it, buried things in it. That does not fit my definition of a good tenant. If we were here on a month-to-month basis, we would have been evicted long ago."

—Rose Elizabeth Bird (first woman chief justice of California)

PERSONAL SECURITY

If you're a woman living alone who's pestered by sinister midnight phone callers, there's good news for you in the futuristic world of electronic security.

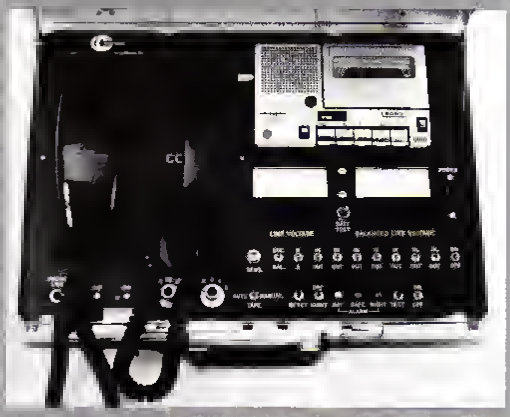
A New York–based firm, Communication Control Systems (CCS), is marketing a special telephone called an Electronic Voice Handkerchief (or Secure Communication Control) for $2,650. All you do to deter a heavy breather is say, "Just a minute. I'll put my two-hundred-fifty-pound husband on the line," flip a switch, and—presto—your own voice sounds like a man's.

Or say you're a high-powered businessman with a taste for James Bondian highjinks. You can disguise your voice by lowering the pitch to basso profundo and find out whether your supplier is quoting the same price to competitors. (The latter class of customers is commoner than the former, CCS security experts say.)

CCS puts out an array of exotic gadgets for use in industry, law enforcement, and private security and investigation. A Voice Stress Analyzer—which comes in a phone model and a smaller cigar-box-size version—can administer a lie-detector test (without the subject's knowledge) by recording slight voice modulations. (Most law enforcement organizations, however, consider this device unreliable.)

The company also carries a full line of bug- and wiretap-alert devices.

—Judith Hooper



CCS's secure communication control center is a portable system that includes a tap alert, wiretap defeat, and telephone scrambler.

Hot-air ballooning. Where you land is where you work."

—Johnny Carson's solution to the gasoline shortage, on the Tonight Show, *May 18, 1979*

EGYPTIAN REMEDIES

King Tutankhamun and his contemporaries in Egypt around 1350 B C knew many of the ills that continue to

King Tut. What was he doing with all those acacia leaves?

plague modern man — and many of the remedies that are still in use The enema for example and opium from poppy seeds were standard treatments the young pharaoh may have tried

Preparations made from acacia leaves were known to soothe hemorrhoids and prevent pregnancy 15 centuries before Christ Today's hemorrhoidal ointments and contraceptive foams work on the same principles containing oily substances or acids that mimic the acacia leaf s natural properties

Even surgery was in vogue, according to Fernando G Vescia M D of the Stanford University school of medicine The Egyptians knew how to extract human internal organs, but they practiced this art only on the dead Living patients were treated with herbal remedies Dr Vescia, a medical historian as well as a gastroenterologist, says that more evidence of this rational medical system may emerge as physicians and linguists study the few papyri on this subject that have survived from ancient Egypt

Fuller understanding of Egyptian herbals could lead modern doctors to drugs they may want to prescribe or synthesize — some beneficial substance that may have been forgotten during the many intervening centuries — D S

"We can easily forgive a child who is afraid of the dark the real tragedy of life is when men are afraid of the night'

—Plato

FALLOUT

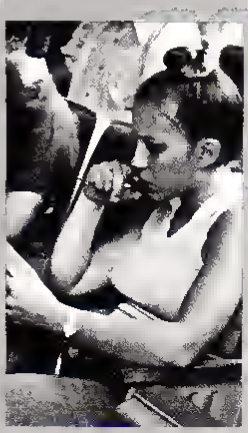
Post-Hiroshima science-fiction movies usually depict nuclear-fallout victims as a race of monstrous mutants but the real-life "mutants" may turn out to be merely a generation of dummies

A study by University of Pittsburgh School of Medicine professor Ernest J Sternglass — whose field is the effects of radiation on the developing fetus — has turned up a startling correlation between declining high-school Scholastic Aptitude Test (SAT) scores and A-bomb-test fallout in the 1950s and early 1960s

The average SAT score which had been falling since 1966 hit bottom in 1975 — which just happens to be when children born in the peak fallout years 1957–58 took the test as high-school seniors

The low-SAT/high-fallout link holds up year by year and region by region says Dr Sternglass, and also coincides with higher infant-mortality rates Areas with heavy rainfall recorded the sharpest drops in test scores for instance the Pacific Northwest where Pacific A-bomb radiation came down with the rain while the future test takers were in the womb and New England New Jersey and New York which got a dose of Nevada-test fallout carried by the jet stream

Sternglass who urged mass evacuation from the vicinity of Three Mile Island warns that while the grosser effects of radiation like cancer and obvious birth defects are well recognized subtle damage to fetuses is more widespread — and more ominous for humanity



Students taking SAT Now a new theory for falling scores

"We aren t aware of the damage being done because these children look normal and seem normal" he notes But hidden damage to the thyroid — where radioactive iodine accumulates — slows growth physical *and* mental growth

We re destroying our species most precious resource — our intelligence Sternglass warns — J H

"Walking on water wasn't built in a day

—Jack Kerouac

LASER DETECTOR

Take a football field Cover it with sand to a depth of 18 feet and then locate one particular grain of sand

This in effect is what Dr Howard Reiss professor of chemistry at the University of California at Los Angeles has done He can detect one sulfuric acid molecule mixed with 10 trillion molecules of a different kind

Dr Reiss developed a technique combining a cloud chamber with a laser beam to detect particles by the way they scatter light

With it he and associates can study how sulfur dioxide is converted into polluting sulfuric trioxide and sulfuric acid This could help regulatory agencies make sound judgments over controlling the level of hazardous sulfates in the air

—Alton Blakeslee

CONTINUUM

REDOX

NASA has developed a new storage system to make solar and wind power commercially cost efficient NASA spokesman Phillip Stone estimated that the battery, called Redox will cut energy-storage costs (considered the major cost of solar- and wind-power use) by 60 to 75 percent

The main difference between Redox (an acronym for reduction oxidation) and the conventionally used lead-acid battery is that the latter uses solid material for storage purposes while Redox uses liquid There is a lot of futzing around with standard storage batteries Stone said but with the Redox system the only maintenance would be to add a bit of fluid or replace a pump Overall, it s fairly maintenance-free

The theory behind storage is to achieve what utilities call load leveling Simply, this is storing energy when demand is low to be used later when demand is high thus leveling out punishment on delicate power equipment Eventually, Stone said individual factories can install private Redox systems to store energy at low-demand periods when utilities charge less for use at high-demand periods (normally during the day) when utilities charge more Utilities can use the same system on a larger scale to lessen storage and maintenance costs

The problem for NASA has been that utilities and foreign countries have shown interest but "we don t have much down in writing" Stone said He thinks that if the system is to be developed to its full capabilities the Department of Energy (DOE) will have to intervene to get the ball rolling DOE is picking up half the Redox tab but NASA hopes the Energy Department will invest more Energy is DOE s territory Stone said "I don t feel there are any problems with Redox It s just getting the dumb thing out into the field "—Steve Le Vine

COBRAS

Cobras have slithered their way into south Florida s ecosystem There is now a very real danger that the snakes could breed a colony of deadly serpents according to some of Florida s professional reptile researchers

Unknown numbers have escaped after importation from abroad for sale to U S research institutions and private collectors The hooded snakes—dead and alive—have been found in the Miami area and near Lake Okeechobee Most experts believe they either escaped private collections or were intentionally released by their owners

Are fugitive snakes breeding a secret colony in Florida?

Occasionally, cane cutters working in fields along U S 27 near Lake Okeechobee report cobra sightings usually dismissed by supervisors as "wild tales Florida s herpetologists agree there s no tangible evidence of breeding but they hold divergent views on whether cobras could establish a beachhead on the North American mainland

It's clearly possible " said Dr Roy McDiarmid of the University of South Florida who believes a breeding population could be established with only 25 fugitive snakes "There's no evidence they wouldn't take hold "

For many years several cobra species native to Asia and Africa have been brought into Florida in sizable numbers Only in recent years has the sale been regulated It remains legal to buy cobras in Florida but prospective buyers must now obtain a permit

—Jim Ball

They never will try to steal the phonograph It is not of any commercial value '
—Thomas Edison

"Basic research is what I am doing when I don't know what I am doing "
—Wernher von Braun

TONGUE TWISTER

Can you roll your tongue into a lengthwise tube? Whether you can or can't is a genetically determined trait—a fact known for some years Now however researchers in the genetics department of Swansea University in Wales have discovered that people who have this ability are likely to have another accompanying characteristic the kind of personality that suits them to the study of the life sciences

Omni editor displays prodigious proof of proclivity for science

The British geneticists found that 80 percent of life scientists surveyed could roll their tongues while only 65 percent of the school's art students had this genetic skill They concluded therefore that there is a relationship between the genes that encourage people to become scientists and those that control tongue rolling

A quick survey through

the *Omni* offices revealed that 72 percent of the editorial staff can perform the tongue-rolling trick—a score almost exactly midway between those of Swansea's scientists and its art students. Obviously this is proof positive that *Omni* is a perfect blend of art and science.

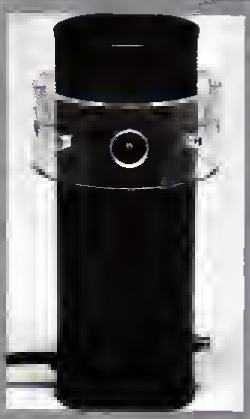
ION GENERATORS

The federal government should keep its eye on ions—or at least regulate the sale of those much-debated air-ion generators, says a leading authority on electrostatic energy. Though ion generators are beneficial, according to University of Michigan engineering professor emeritus A. D. Moore, poorly built ones may be emitting poisonous ozone.

Dr. Moore's caveat is just the latest instance in a controversy that has raged since the 1950s, when some aficionados' extravagant claims—that negative ions would cure everything from arthritis to cancer—gave the gadgets a quackish reputation.

Air ions (air molecules that have acquired either a positive or a negative electrical charge) are constantly being created by the earth's radioactivity and by cosmic rays. Though ions make up only a tiny fraction of air components, too high a concentration of positive small ions, say ion-generator proponents, and a negative-ion generator can restore the balance.

Pollution, hermetically



Ion generators claimed to enhance health and relaxation

sealed, air-conditioned buildings, and even some synthetic fabrics are all said to deplete negative ions. Animal studies, particularly those by Albert L. Krueger, a bacteriologist at the University of California, have linked negative ions to increased relaxation and resistance to infection, among other things.

But because of the absence of clinical research, the Food and Drug Administration prohibits ion generator manufacturers from making medical claims; they may only tout 'clean air.'

A small, battery-operated portable ion generator sells for about $150, while a conference-room model goes for about $650.—J. H.

How can we have any new ideas or fresh outlooks when 90 percent of all the scientists who have ever lived have still not died?'
—Alan L. Mackay, 1969

YOGIS

An Indian yogi who regularly has himself buried in a pit for days at a time has agreed to visit Stanford University where U.S. scientists will study his quasi-hibernation state. They suspect that his extraordinary breath and pulse control may have a message of life-and-death importance for Westerners with hypertension.

"This man seems capable of controlling bodily systems that we consider autonomic," says Craig Heller of Stanford. "If such control is possible to learn, then we hope it could be taught as an alternative therapy to hypertensives who now rely on dangerous medications to achieve the same effect."

Heller says that the first goal of the investigation is to determine whether the yogi can suppress his metabolism to an extreme degree. Heller suspects he can, based on data he gathered during a recent six-week trip to India. His next task will be to determine whether the reduction is consciously attained and, if so, how. Is it by lowering body temperature? Or by redistributing the flow of blood?

While in India, Heller found the resting metabolic rates of several willing yogis to be below the predicted values for Western men of the same age, height and weight. What interested him more, however, was that the yogis already low rates were as much as 50 percent lower during meditation.

The yogis meditate sitting up, Heller adds. Yet their metabolic rates then are lower than during the rest tests taken while they're lying down. That's why I think there's conscious control involved.—D. S.

How do yogis control their metabolism? No one's quite sure, but Stanford scientists think they may hold treatment for hypertension

CONTINUUM

CARDIAC KIDS

If you wait until you re thirty to worry about cholesterol you're 25 years too late A recent study has found six-year-olds to be high-risk candidates for coronary heart disease

Children are transported to and from school and fo extracurricular and even sports activities explained University of Michigan professor Thomas Gilliam They sit for long hours watching television and consume lots of high-calorie junk food

'As a result children are showing increasing evidence of high cholesterol high blood pressure obesity and other conditions associated with heart disease in adults

In a study of 400 Michigan schoolchildren almost 50 percent showed one or more risk factors for heart disease

By age ten every child has a certain degree of arteriosclerosis Gilliam said

If we can do something at a very young age we can reduce the danger in the future

According to Gilliam children need vigorous activitres with heart rates up to 180 to 190 beats per minute He exposes his subjects to 25 minutes of intense exercise four days a week

'As a result he said we saw some nice changes in the blood profiles

Gilliam s goal is to change attitudes so children will choose more strenuous activities

Cholesterol levels over two hundred milligrams per cubic centimeter and triglycerides over one hundred are no good he said whether you are six or thirty' —David Lewis

Electrode bedecked six year-old was part of Michigan study

DRUNKEN ANIMALS

If you want to see intoxicated elephants visit South Africa There elephants occasionally eat the yellow plum-sized fruit of the marula tree and then engage in noisy drunken brawls Ineffectually charging at one another

The marula is one of many fruits and berries that ferment—either on the vine or branch or in an animal s stomach—producing drunkenness and disorientation In Sweden birds stagger around on road shoulders affer eating fermented rowanberries In Florida robins that eat ripe pyracantha berries crash into telephone poles or into one another Robins have even been known to interrupt their migration for a few drunken days in Nevada

Bees sometimes drink a little too much overripe nectar and then bumble around wildly Wasps that sip sweet tree sap become so uncoordinated they can t fly at all Butterflies become so docile on a man-made banana and-sugar concoction that they can easily be caught by collectors

The National Wildlife Federation which has done a survey of inebriation among nonhumans found that animals usually don't know they are going to get drunk when they imbibe In the case of one animal the environmental organization reports the habit has been particularly beneficial On the island of Mauritius in the Indian Ocean a pink pigeon is carefully avoided by hunters because the plant that makes it drunk also makes its flesh poisonous for people to eat The poison —cyanide—innocuous to the bird is formed when water in the bird s system reacts with chemicals in the plant —S D

African elephants entangle themselves after inebriated charge Eating fermented fruit from the marula tree often leads to noisy brawls

"It suddenly struck me that that tiny pea pretty and blue was the earth I put up my thumb and shut one eye and my thumb blotted out the planet Earth I didn t feel like a giant I felt very very small

—Neil Armstrong (returning to Earth on Apollo 11)

We think so because other people all think so or because after all we do think so or because we once thought so and think we must think so or because we once thought so and think we still think so or because having thought so we think we will think so '

—Henry Sidgwick

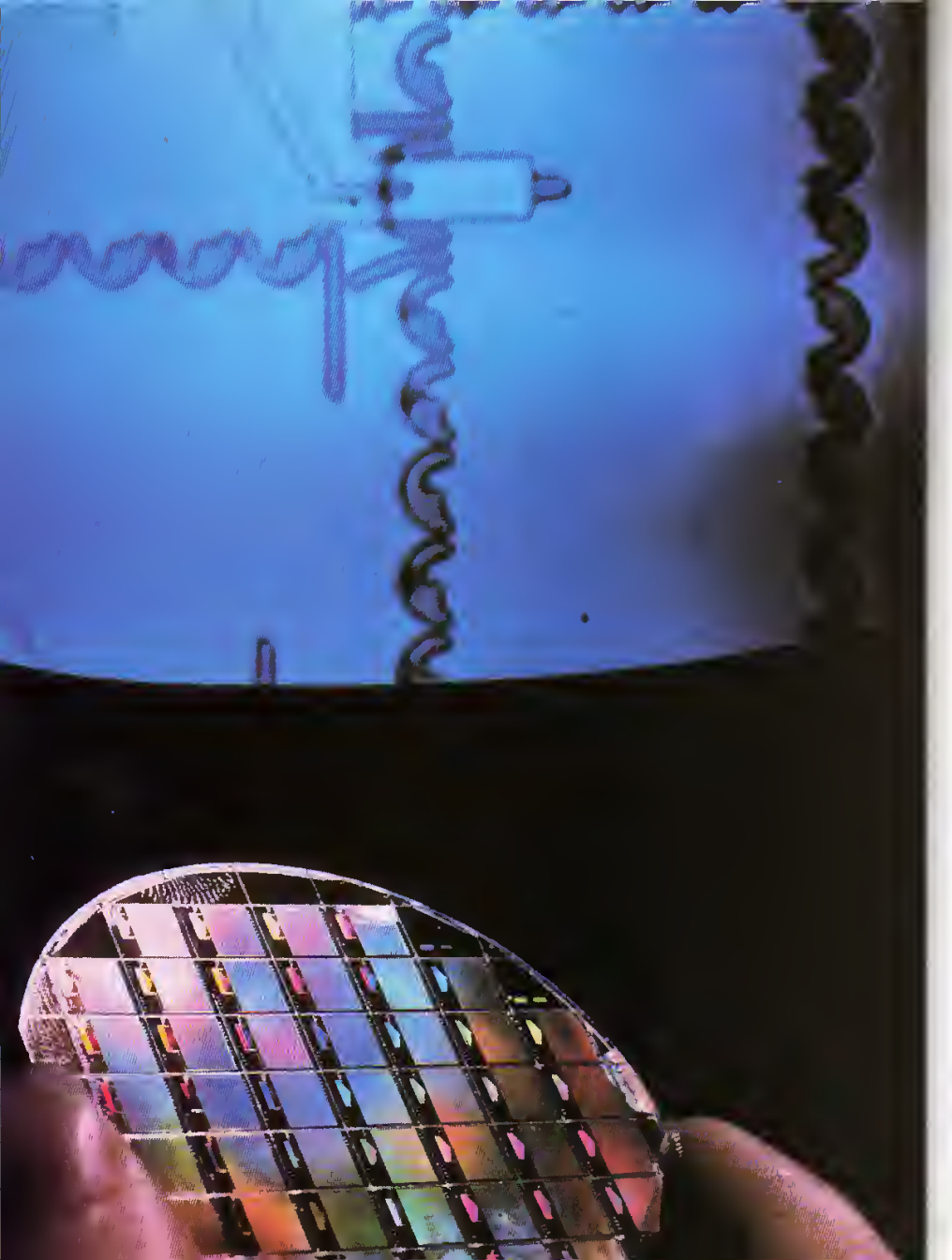
INTELLIGENT MACHINES

Wanted: electronic minds that rival our own

BY THOMAS HOOVER

HAL, the sentient computer of *2001: A Space Odyssey*, murdered most of the spaceship crew it was built to aid and protect. The idea of a superintelligent machine turning on its human masters is one of the oldest in science fiction. But science fiction is finding it increasingly hard to stay ahead of science fact, and nowhere is this more true than in the field of machine intelligence. For example, how far into the future would you

PHOTOGRAPHS BY DAN McCOY/RAINBOW



Consider the Kurzweil Reading Machine
It can recognize words, apply phonetic rules,
and read aloud as it goes along

place beneficent, seemingly intelligent computers that

- Converse with people over the telephone, using properly grammatical synthesized speech,
- Interview a physician about a patient's symptoms and either make a diagnosis or recommend further medical tests,
- Clean up in a poker game by analyzing each human player's style to decide when to bluff and when to call or close out their hand?

If you plunked these scenes squarely in the present, you're right. Our smart machines are still a long way from seeing, speaking, and scheming as HAL did, but they do exist, and they're beginning to change our lives. They're all part of the world of artificial intelligence (AI), described by MIT's Marvin Minsky, one of its founders, as "the science of making machines do things that would require intelligence if they were done by men."

We have always assumed that humans alone are capable of unlimited speech. We have credited this unique ability partly to our physical design and partly to a brain that can handle abstractions. Running a slow third comes the sometimes questionable assumption that we have something to say. It appears, however, that remembering and reproducing words are not really all that hard for machines, either.

Computers, it turns out, can talk very nicely. Researchers have figured out how to translate sounds into digital form—a technique that has many uses. Since strings of numbers can easily be stored on an integrated circuit chip, computers can now pack away an extensive vocabulary. Talking timepieces and hand calculators are already on the market, and Texas Instruments has brought out Speak and Spell, a device that pronounces words and asks the user to type in the spelling. Speak and Spell stores over three minutes of speech on two tiny memory chips, and two new language translators can spout some 500 words. The inexpensive storage and processing chips developed for these devices underscore the imminence of widespread talking computers.

Repeating words doesn't take all that much intelligence, but what about reading aloud? If a computer could pronounce words that weren't already programmed into it, would that show intelligence?

Consider the Kurzweil Reading Machine. It can scan a page, recognize letters and words, apply phonetic rules, discern phrase boundaries from syntactical and vocabulary knowledge, figure out where stress and accent should go, and finally synthesize it all into words and sentences as it goes along. Priced under $20,000, the device has been a great help to the blind. What's more, if given a little practice, people find it just as understandable as a human reader's voice.

The Kurzweil machine uses the same knowledge of pronunciation we do (whether we are aware of it or not) to turn print into speech, and it performs about as well. Synthesized speech is one of the more successful areas of AI research. And yet, impressive as the Kurzweil device is, its performance still falls far short of true intelligence.

Like many people, computers find it harder to listen than to talk. So far, most commercially available devices force you to pause slightly between words so the computer can detect word boundaries. Almost all computers must get to know you. You have to train them by repeating each word several times to form a personalized "template" of your voice characteristics. Thereafter the computer simply compares each word with the vocabulary in its memory until it finds an acceptable match.

Word-recognition devices are faster and more congenial than standard computer terminals, and new uses for them are springing up all around. People are now telling computers to sort packages, fill out forms, and keep track of stock-and-bond transactions. A system now being tested will enable pilots to talk with in-flight computers. But perhaps the most rewarding application will be their use as an aid to the handicapped, allowing people without the use of their hands, for example, to tell a robot arm to do their bidding.

The next step beyond "discrete-utterance recognition"—and it's more like a giant leap—is the computer's ability to understand continuous speech. When you want a computer to pick out individual words in rapid-fire colloquial speech (we don't really say, "Did you?" We say something like 'Didja?') the machine has to start looking beyond mere acoustic matching. Enter artificial intelligence.

One approach is to teach the computer to figure out what you probably would have said by using its understanding of grammar, context, and logic. AI researchers call these three types of computer knowledge syntactic, semantic, and pragmatic.

Scientists at Bell Labs are trying to produce a computer that can take airline reservations over the phone. Their work provides a good example of how this secondary information can be used. When you ring up the airline computer, a synthesized voice asks for your identity number and poses a series of questions, including where and when you wish to fly.

Pragmatic knowledge tells the computer you will be talking mostly about places and dates. So it doesn't have to compare questionable nouns against everything in the dictionary. Semantics tells it that when you say, "The day I want to travel is mumble," the mumble isn't going to be the name of a city. Syntax dictates that after the verb you will probably use a noun, a preposition, or an article, not another verb. In noisy surroundings we often rely on such cues ourselves.

Using these techniques, the computer can apply its sense of what you probably said to help sort out and identify the individual words. Since our mind most likely does something similar, this simplified linguistic analysis represents a kind of low-level artificial intelligence—probably the only true "intelligence" achieved to date.

Where is this route to AI leading? Well, work at IBM's Yorktown

MIT's computer-analyzed photo (above) duplicates three types of data our eyes instantly extract from a scene. Silicon wafer (left) carries Bell's magnetic-bubble memory chips, seen highly magnified in background.

Heights Research Center in New York may produce a "voice-driven" typewriter. The research at this lab is by far the most ambitious in the field. IBM scientists are trying to recognize natural grammar-based speech, using concepts from information and communication theory as well as acoustic processing. IBM's speech-processing consultant Rex Dixon says that IBM's is the only research now grappling with totally unconstrained, natural language. All other work has been on grammars contrived to aid speech recognition.

Pressed to predict when voice-driven typewriters will appear, Dixon ventures: "If funding is maintained at a fairly high level, we can reasonably expect to have usable continuous-speech-recognition systems working with all talkers, natural grammar and large vocabularies in fifteen or twenty years. In case you're counting, that's before the year 2001."

As desirable as spoken input is, all it really amounts to is a new medium for the same message. As long as we talk with computers on their own terms, we'll always be limited in our ability to communicate with them. So why don't we just teach them to understand everyday English?

That innocent-sounding question catapults us out of applications and back into academia's basic research, where AI experts have been stymied by the complexities of language. The problem is that natural languages tend to be ambiguous, something we instinctively compensate for with our firsthand knowledge of the world.

When we say, "I drove the car into the garage and it died," we know that "it" refers to the car, not to the garage. To interpret this sentence as easily, a computer would have to know something about cars and garages. Understanding requires at least some knowledge of the subject.

Because AI researchers couldn't wait for the development of a worldly-wise computer, they have created some clever ways to get around the problem. Joe Weizenbaum, of MIT, hit on the idea of teaching a computer to bluff its way through a conversation by assuming the role of a "nondirective" psychotherapist, leading patients to understand their problems by asking for repeated explanations and clarifications.

In the exchange below, the computer is interviewing a troubled young woman who began with a common complaint:

Human: "Men are all alike."
Computer: "In what way?"
Human: "They're always bugging us about something or other."
Computer: "Can you think of a specific example?"
Human: "Well, my boyfriend made me come here."
Computer: "Your boyfriend made you come here?"
Human: "He says that I'm depressed much of the time."
Computer: "I am sorry to hear that you are depressed."
Human: "It's true. I am unhappy."
Computer: "Do you think coming here will help you not be unhappy?"
Human: "I need some help. That much seems certain."
Computer: "What would it mean if you got some help?"
Human: "Perhaps I could learn to get along with my mother."
Computer: "Tell me more about your family."

The program has mastered the vocabulary of psychiatry just well enough to pick up on key words. For example, it recognized "depressed" as an undesirable state and knew that "mother" referred to family. When it draws a blank, it simply changes pronouns and rephrases the statement as a question with an implied "hmm."

Weizenbaum intended to use the program for language research, and he was disturbed when people started taking it seriously. Some even demanded to be alone with the terminal in order to pour out their troubles. His dismay at human gullibility transformed him into a crusader against the potential misuse of AI.

Terry Winograd, now of Stanford University, takes a completely different approach to the problem. Early in this decade, he devised a program capable of extended conversations by the simple expedient of giving the computer something to talk about. He created a "microworld" peopled by colored blocks, pyramids and boxes on the computer's TV screen. He told the program everything it needed to know about this world: the relative size of the objects, their shapes, colors and so on. He could then command the program in simple English to move the items around on the TV screen with a simulated robot hand. (He also taught the program enough grammar for it to reply in reasonably high-quality typed English.) A sample:

Human: "Pick up a big red block."
Computer: "Okay."
Human: "Find a block which is taller than the one you are holding and put it into the box."
Computer: "By 'it,' I assume you mean the block which is taller than the one I am holding."
Human: "Okay."
Computer: (hand sets down the block it is holding and picks up a taller one, putting it into the box)
Human: "What does the box contain?"
Computer: "The blue pyramid and the blue block."

It's hardly something we'd care to discuss over brandy on a cold winter evening, but at least the computer had full command of its topic.

Winograd's work proved that computers could carry on a conversation on a limited subject, and language research blossomed in several directions. UCLA psychologist Kenneth Colby followed Weizenbaum's techniques, but he decided to take

CONTINUED ON PAGE 161

FICTION

The aliens killed them twice over; so they had to flee this universe

THE NUMBER OF THE BEAST

BY ROBERT A. HEINLEIN

He's a mad scientist and I'm his beautiful daughter.

That's what she said: the oldest cliché in pulp fiction. She wasn't old enough to remember the pulps.

The thing to do with a silly remark is to fail to hear it. I went on waltzing while I took another look down her evening formal. Nice view. Not foam rubber.

She waltzed well. Today most girls who just attempt ballroom dancing drape themselves around your neck and expect you to shove them around the floor. She kept her weight on her own feet, danced close without snuggling, and knew what I was going to do a split second before I did it. A perfect partner—as long as she didn't talk.

"Well?" she persisted.

My paternal grandfather—an unsavory old reactionary, the FemLibbers would have lynched him—used to say, "Zebadiah, the mistake we made was not putting shoes on them or teaching them to read; we should *never* have taught them to talk!"

I signaled a twirl by pressure, she floated into it and back into my arms right on the beat. I inspected her hands and the outer corners of her eyes. Yes, she really was young—minimum eighteen (Hilda Corners never permitted legal "infants" at her parties), maximum twenty-five, first approximation twenty-two. Yet she danced like her grandmother's generation.

"Well?" she repeated more firmly.

This time I openly stared. "Is that cantilevering natural? Or is there an invisible bra, you being in fact the sole supporter of two dependents?"

She glanced down, looked up, and grinned. "They do stick out, don't they?

PAINTING BY LES EDWARDS

Your comment is rude, crude, unrefined, and designed to change the subject."

"*What* subject? I made a polite inquiry you parried it with amphigory."

"Amphigory," my tired teet! I answered precisely.

"Amphigory." I repeated. "The operative symbols were *mad, scientist, beautiful,* and *daughter.* The first has several meanings, the others denote opinions. Semantic content: zero."

She looked thoughtful rather than angry. "Pop isn't rabid, although I did use *mad* in ambivalent mode. Both *scientist* and *beautiful* contain descriptive opinions, I stipulate. But are you in doubt as to my sex? If so, are you qualified to check my twenty-third pair of chromosomes? With transsexual surgery so common, I assume that anything less would not satisfy you."

"I'd prefer a field test."

"On the *dance floor*?"

"No, behind the bushes back of the pool. Yes, I'm qualified—laboratory or field. But it is not your sex that's in question, that is a fact that can be established, although the gross evidence is convincing. I—"

"Ninety-five centimeters isn't gross! Not for my height. One hundred seventy barefoot, one hundred eighty in these heels. It's just that I'm wasp-waisted for my mass—forty-eight centimeters versus fifty-nine kilos."

"And your teeth are your own, and you don't have dandruff. Take it easy, Deedee; I didn't mean to shake your aplomb"—*or those twin glands that are not gross but delicious. I have an infantile bias and have known it since I was six, six months, that is*—"but the symbol *daughter* encompasses two statements, one factual, sex, and the other a matter of opinion even when stated by a forensic genetohematologist."

"Gosh, what big words you know, Mister. I mean Doctor."

"*Mister* is correct. On this campus it is swank to assume that everyone holds a doctorate. Even I have one, Ph.D. Do you know what that stands for?"

"Doesn't everybody? I have a Ph.D. too. 'Piled Higher and Deeper.'"

I raised that maximum to twenty-six and assigned it as second approximation. "Phys ed?"

"Mister Doctor, you are trying to get my goat. Won't work. I had an undergraduate double major, one being phys ed, with teacher's credentials in case I needed a job. But my real major was math, which I continued in graduate school."

"And here I had been assuming that *Deedee* meant Doctor of Divinity."

"Go wash out your mouth with soap. My nickname comes from my initials, *D. T.* Or Deety. Dr. D. T. Burroughs, when I'm being formal as I can't be 'Mister' and refuse to be 'Miz' or 'Miss.' See here, Mister, I'm supposed to be luring you with my radiant beauty, then hooking you with my feminine charm. But I'm not getting anywhere. Let's try another tack. Tell me what you piled higher and deeper."

"Let me think. Flycasting? Or was it basketweaving? It was one of those transdisciplinary things in which the committee simply weighs the dissertation. Tell you what: I've got a copy around my digs. I'll find it and see what title the researcher who wrote it put on it."

"Don't bother. The title is *Some Implications of a Six Dimensional Non-Newtonian Continuum.* Pop wants to discuss it."

I stopped waltzing. "Huh? He'd better discuss *that* paper with the bloke who wrote it."

"Nonsense. I saw you blink. I've hooked you. Pop wants to discuss it, then offer you a job."

"*Job!* I just slipped off the hook."

"Oh, dear! Pop will be *really* mad. Please? Please, sir!"

"You said that you had used *mad* in ambivalent mode. How?"

"Oh. Mad-angry because his colleagues won't listen to him. Mad-psychotic in the opinions of some of his colleagues. They say that his papers don't make sense."

> *"Fights were no novelty at Hilda "Sharp" Corners's parties. Her food and liquor were lavish . . . her guests were often eccentric but never dull . . . a . . . hypergolic mixture."*

"Do they make sense?"

"I'm not that good a mathematician, sir. My work is usually simplifying software. Child's play compared with *n* dimensional spaces."

I wasn't required to express an opinion; the trio started "Blue Tango," and Deety melted into my arms. "You don't talk if you know tango."

Deety knew. After an eternity of sensual bliss, I swung her out into position precisely on coda; she answered my bow and scrape with a deep curtsy. "Thank you, sir."

"Whew! After a tango like that, a couple ought to get married."

"All right. I'll find our hostess and tell Pop. Five minutes? Front door, or side?"

She looked serenely happy. I said, "Deety, do you mean what you appear to mean? That you intend to marry *me*? A total stranger?"

Her face remained calm, but the lights went out, and her nipples went down. She answered steadily, "After that tango, we are no longer strangers. I construed your statement as a proposal—no, a willingness—to marry me. Was I mistaken?"

My mind went into emergency reviewing the past years, the way a drowning man's life is supposed to flash before his eyes (how could anyone know that?), a rainy afternoon when my chum's older sister had initiated me into the mysteries, the curious effect caused by the first time strangers had shot back-at me, a twelve-month cohabitation contract that had started with a bang and had ended without a whimper, countless events that had left me determined never to marry.

I answered instantly, "I meant what I implied: marriage in its older meaning. I'm willing. But why are *you* willing? I'm no prize."

She took a deep breath, straining the fabric, and—Allah be praised!—her nipples came up. "Sir, you are the prize I was sent to fetch. When you said that we really ought to get married—hyperbole, and I knew it—I suddenly realized, with a deep burst of happiness, that *this* was the means of fetching you that I wanted above all."

She went on. "But I will not trap you through misconstruing a gallantry. If you wish, you may take me into those bushes back of the pool and *not* marry me." She went on firmly. "But for that whoring, my fee is for you to talk with my father and to let him show you something."

"Deety, you're an idiot! You would ruin that pretty gown."

"Mussing a dress is irrelevant. Besides, I can take it off. There's nothing under it."

"There's a great deal under it!"

That fetched a grin, instantly wiped away. "Thank you. Shall we head for the bushes?"

"Wait a half! I'm about to be noble and regret it for the rest of my life. You've made a mistake. Your father doesn't want to talk to *me*. I don't know anything about *n*-dimensional geometry. *Why do I get these attacks of honesty? I've never done anything to deserve them.*

"Pop thinks you do, that is sufficient. Shall we go? I want to get Pop out of here before he busts somebody in the mouth."

"Don't rush me. I didn't ask you to rassle on the grass. I said I wanted to *marry* you. But I want to know why you are willing to marry *me*. Your answer concerned what your father wants. I'm not trying to marry your father, he's not my type. Speak for yourself, Deety. Or drop it." *Am I a masochist? There's a couch for sunbathing back of those bushes.*

Solemnly she looked me over, from my formal tights to my crooked bow tie and on up to my thinning brush cut—a hundred ninety-four centimeters of big, ugly galoot. "I like your firm lead in dancing. I like the way you look. I like the way your voice rumbles. I like your hairsplitting games with words—you sound like Whorf debating Korzybski with Shannon as referee." She took another deep breath, finished almost sadly. "Most of all, I like the way you smell."

It would have taken a sharp nose to whiff me. I had been squeaky-clean ninety minutes earlier, and it takes more than one waltz and a tango to make me sweat. But

Deety's remark had that skid in it that she put into almost anything. Most girls when they want to ruin a man's judgment squeeze his biceps and say "Goodness, you're strong!"

I grinned down at her. "You smell good, too. Your perfume could rouse a corpse."

"I'm not wearing perfume."

"Oh. Correction: your natural pheromone. Enchanting. Get your wrap. Side door. Five minutes."

"Yes, sir."

"Tell your father we're getting married. He gets that talk free. I decided that before you started to argue. It won't take him long to decide that I'm not Lobachevski."

"That's Pop's problem," she answered, moving. "Will you let him show you this thing he's built in our basement?"

"Sure, why not? What is it?"

"A time machine."

II

Zeb

Tomorrow I will seven eagles see, a great comet will appear, and voices will speak from whirlwinds, foretelling monstrous and fearful things. . . This universe never did make sense, I suspect that it was built on government contract.

"Big basement?"

"Medium. Nine by twelve. But cluttered. Workbenches and power tools."

A hundred eight square meters. Ceiling height probably two and a half. Had Pop made the mistake of the man who built a boat in his basement?

My musing was interrupted by a high-pitched scream. "You overeducated, obstipated, pedantic ignoramus! Your mathematical intuition froze solid the day you matriculated!"

I didn't recognize the screamer but did know the stuffed shirt he addressed. Professor Neil O'Heret Brain, head of the department of mathematics—and God help the student who addressed a note to "Professor N. O. Brain" or even "N. O'H. Brain." "Brainy" had spent his life in a search for The Truth—intending to place it under house arrest.

He was puffed up like a pouter pigeon with his professional pontifical pomposity reeling. His expression suggested that he was giving birth to a porcupine.

Deety gasped, "It's started," and she dashed toward the two men. Me, I stay out of rows. I'm a coward by trade and wear fake zero-prescription glasses as a buffer. When some oaf snarls, "Take off your glasses!" that gives me time to retreat.

I headed straight for the row.

Deety had placed herself between the two, facing the screamer, and was saying in a low but forceful voice, "Pop, don't you dare! I won't bail you out!" She was reaching for his glasses with evident intent to put them back on his face. It was clear that he had taken them off for combat, he was holding them out of her reach.

I reached over their heads, plucked them out of his hand, gave them to Deety. She

CONTINUED ON PAGE 116

America has two manned spaceships. One is the shuttle. And the other . . .

A ROCKET FOR THE PEOPLE

BY KATHLEEN STEIN

The man stands there in his driveway a crazy glint in his eye. "The way I see it," he says, "NASA will be trundling out its first space shuttle to the launch, but the radio and TV announcers will be saying, 'Meanwhile, back at the ranch Bob Truax is wheeling out his Volksrocket X-17—that's seventeen launches—to the pad.' Mine could be the first real working space shuttle. If not the first, the cheapest."

Captain Robert C. Truax, U.S. Navy (retired), is running some kind of horse race against the monoliths, and if fortune favors him, he just may be the first to ship a person up into space and back, and do it again and again in the same rocket. He plans to open space not only to private enterprise but to the kid next door.

When the rocket engineer first made his standing offer to shoot anybody 50 miles up into the stratosphere for a bargain-basement $1 million, most people thought he was a nut. So Truax set about to restore the American nut to his rightful position in society. "What's the difference between a visionary and a man of vision?" he asks. "A man of vision is a visionary who gets his vision to work successfully."

In some ways Truax is a throwback to an earlier era, when free enterprise was a gambling man's venture and profit meant risk. His rocket—small, reusable, cheap, made out of spare parts—evokes that slightly disconsolate American muse of self-sufficiency.

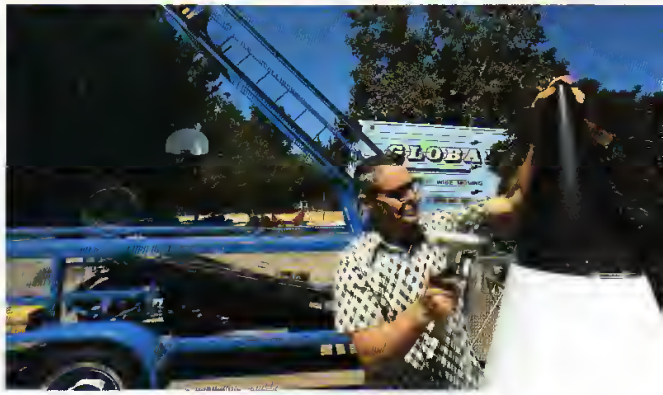
Two years, $100,000 in surplus machinery, and much publicity later, Truax has completed the final valve work and plumbing on the Volksrocket X-1 and begun static-firing tests on her motors. And it looks as if he'll get the money to send her up, thanks to the backing of two potential astronauts—one the stage manager of a famous rock-and-roll group, the other a Peruvian tortilla factory owner who wants to confront his destiny as a flying Incan Rosicrucian businessman.

The Volksrocket is not Truax's first venture into the zone where showmanship, technology, and weird desires occupy identical space. This scientist who headed the military's top secret space program in the 1950s, who came up with the Polaris missile concept, who gave the Mercury program its initial thrust is also the man who designed and built the rocket-powered Sky-cycle that was supposed to propel Evel Knievel over the Snake River in 1974. It didn't (not Truax's fault). But when Knievel wiped the river mud off his U.S.-flag jumpsuit and said, "This is going to be a hard act to follow," Truax responded, "This is nothing. Next I'm going to put you in orbit."

Knievel dropped out of the project, a media persona non grata after "playing baseball without the ball," Truax theorizes. But Truax kept on, ever alert to the

PHOTOGRAPHS BY DOUGLAS KIRKLAND

"Assembled from government surplus, it will lift a man to the edge of space."



treasures of the government's surplus catalogs and junkyards, a practice that eventually made him the prototype hero of ABC's TV series *Salvage I*, the *Sanford and Son* of space. "Yeah, ABC got it from me," he growls. "They knew what I was doing. Pure imitation."

Armed with a $3,000 pilot study fund (from Knievel), Truax worked on the rocket design and scrounged for backers. He mortgaged his house and advertised for finances in papers such as *The Wall Street Journal*. "Wanted: risky capital for risky project." He appealed to the adventurous spirit of the rich. "Man or woman interested in becoming the world's first private astronaut—must be in reasonably good health and able to produce $100,000 in spendable money."

Offers poured in—pilots in the Royal Australian Navy who had read about him in the Sydney tabloids, kids, unemployed mechanics. One millionaire came down to Truax's Saratoga, California, garage-hangar and offered to foot the whole bill. "He said he wanted to invest in the future of mankind," commented Truax, but he was never heard from again. Daily crank calls, but no money. "I tell 'em all the same story," he says. "The first one to come up with the hundred thousand dollars goes to the head of the list. But it seems people would rather risk their lives than their money." By that time Truax was almost broke. He did every thing but shoot 200 pounds of pot over the Mexican border. Meanwhile, work had almost come to a halt.

A break in the clouds came sometime around the beginning of 1979. One 'Ramundo'—aka Ray Upton, stage manager for the Beach Boys and self-proclaimed superstuntman—decided that taking a short ride in the Volksrocket would make spectacular publicity.

When I arrived chez Truax, two of his 'boys' were banging away on a dummy Volksrocket for Ramundo, which the rock-and-roller will ride above the waterfronts of major cities, sitting astride it on a saddle, a la Strangelove, and performing occasional acrobatics. This, according to Ray Upton, "is the first stage of my plan to establish the world-renowned character Ramundo the Great."

Around the same time, Daniel J. Correa, the tortilla maker, arrived on the scene with several thousand dollars as a down payment on the stratosphere. "He seems to have the ability to make money," says Truax. "So if he comes through with the rest of the megabucks, he goes up." Correa arrived in the United States a few years ago with $150 in his pocket and started selling tortillas on a commission basis to supermarkets and Taco Bell restaurants. "He sold so many," says Truax, 'that now he owns the whole damn factory. He's a pilot and a sky diver, and he looks like he's in pretty good shape.' 'Yes, but can he roll a taco in zero-g?" one joker remarked.

The rocket's specifications: Twenty-four feet long, 3,100 pounds at lift-off. It is a single-stage, liquid-fueled, completely reusable vehicle, assembled mainly from government surplus parts. It is capable of lifting the astronaut in a near-vertical trajectory to the edge of space.

The rocket will be launched near a large body of water, probably the Pacific Ocean, and a recovery team—two 125-foot cutters, two helicopters, a medical team and frogmen—will be waiting at the splashdown site. The rocket will put out 4,000 pounds of thrust to achieve the necessary 37,000 foot-per-second escape velocity. Its parabola will be tracked by an AN/MPQ-10 radar used in conjunction with a transponder in the rocket.

Truax readies Volksrocket (left) in its launcher/erector, made to order and donated by K and G Custom Trailers. This structure holds the rocket in position for both static firings and actual launch. Truax puts finishing touches on electrical guidance system (top) and hammers on nose cone of the demonstration model (below).

Burnout will occur at 113 000 feet The rocket will coast to a maximum apogee in excess of 50 miles then descend to about 100 000 feet at which time a drogue chute will be released automatically from the nose cone At 20 000 feet the main canopy will be deployed reducing splashdown speed to 45 feet per second Total trip time One hell of a ten-minute ride '

The rocket will be recovered intact towed to land dried and sent back up

If the flight details have not prepared you for the mix of the mundane and the bizarre that make up this true account then a visit to Truax Engineering Inc will Nestled serenely in the peaceful Santa Clara Valley (Silicon Valley) Truax s ranch house is located on a cul-de-sac Rocket parts are strewn around the drive and the front yard The rocket s engine is mounted on a block in front of the two car garage In the backyard the obligatory swimming pool shaped like the state of California if you re lying on the bottom lies basking in the sun

There is Mrs Truax Sally rangy bignatured She met Bob at the Pentagon and clearly knows all there is to know about rocketmen They have two sons Dean two will count down on demand Four three two one BLASTOFF! He's probably performed that stunt a dozen times for the TV crews Scott eleven is boisterous and volatile like his father His homework an essay lies on the kitchen table What You Need for Success Intelligence Good Looks and a Sense of Humor

Let me give you the Cook s tour of the works here Truax says He looks like a former astronaut his graying hair cut in a crew cut his face a combination of controlled determinism and mischievous glee his body that of an athlete or a troubleshooter not tall not short without excess weight He looks forty-five but is in fact pushing sixty-one with a short stick

The trip through the shop exposes the exoticism indeed the eroticism at the heart of the garage We know from his history to expect something less than earthbound his story is the history of rocketry in America Truax grew up at a time when rockets usually exploded on their stands or within a few hundred feet of lift-off when the Hungarian Oberth the Russian Tsiolkovsky and the American Goddard formed the space industry s shamanistic triumvirate witch doctors who tried to coerce massive conflagrations to be contained in small tanks They all lived with an obsession to escape Earth s gravitational well and Truax was obsessed too

As a boy he fished around trash barrels behind theaters for celluloid movie film (highly flammable) which he stuffed into tooth-powder cans to make crude rockets He liked playing with fire in enclosed places trying to peer into the future that lies in the contours of a rocket Rocketry inspires an almost religious enthusiasm he comments This understatement masks the possibility that the rocket is the most powerful totem in the country today an archetype perhaps formerly represented by the thunderbolt of Zeus the cross or the automobile It could be a sublimation of the unmanageable violence of humanity or a celebration of limitless glories

In 1936 as a plebe at Annapolis Truax started his own rocket lab conducting controlled experiments monitoring chamber pressures fuel flow rates and acceleration In that year he wrote to Robert Goddard Who knows The day may come when I shall be as active in the development of the rocket as you yourself are

Ensign Truax headed the navy's first jet propulsion office where he conceived organized and directed the navy s first rocket projects During World War II he rose quickly through the ranks and went on to dominate rocket development in the military expanding significantly rocket and missile capability ICBMs IRBMs ground-to-air and surface missiles He planned sold and directed Thor the first of the large surface missiles as well as the Samos Midas and Discoverer programs Owing largely to his efforts the navy was selected to manage the first artificial satellite launcher, and all the while Truax was calling for a nonmilitary peacetime space program

He headed the air force s space program a project so hush-hush that once when he was talking to the newly Americanized Wernher von Braun and the V 2 man wistfully expressed his dream that the U S have a space program I had to jam my fist in my mouth to keep from telling him that the air force already had one

Truax has his degrees one in mechanical and one in aeronautical engineering He holds a master s in nuclear engineering In 1957 he was president of the American Rocket Society a collection of astrocrazies who explored the farthest reaches of the demon rocket There was Bob Bussard with his ramjet (There s no limit to his imagination) and there were photon rockets solar sails giant nuclear-powered interstellar tankers The critics said the nuclear rocket was too expensive to develop too dangerous It had to be handled by remote control he smirks *Oh yes we're all descended from that lost ship/ Wand'ring forever thru space/Trying to shut down our reactors*

In the Sixties Truax retired from the military and became director of advanced development for Aerojet General And when efforts were devoted to simplifying the complexities caused by larger and larger turbo-pump-pressured rockets Truax pushed for the big dumb booster concept an enormous cheap rocket whose propellants were fed to it by the pressure generated by its acceleration He solved the launching problem by having it float vertically in the ocean from where it could take off without the need for complex massive launch facilities More important the *Sea Dragon* as he called the huge vehicle could be recovered at sea and reused The

mammoth prototype for his Volksrocket. It was, in 1963, a workable shuttle. "I'm always getting into things too early," he complains. "I spent a couple million dollars of Aerojet's money and developed a simple reusable rocket. It was my contention that we could lower development costs, save test vehicles, but no, my ravings fell on deaf ears."

To him the current NASA shuttle is a monster. "Look at its tremendously complex landing system. It flies like a brick and has a dead-stick [unpowered] landing, the most difficult of all landings. After I developed the *Sea Dragon*, NASA did a hundred-eighty-degree turn and opted for the much more complex winged system. If I'd been in my grave, I'd have rolled over. It's an unparalleled money sponge. It makes about as much sense as requiring an airplane to be able to land at railroad stations." But he sighs, "What are you going to do. *Mitzi and Ritzi want to go to the stars/ Do you grab a screwdriver or a wrench?*"

He makes odd sense. This rocket honcho—tough Glenn Ford jaw, steely eyes—spouting weird lyrics. He lives with phrases like transponders, servoactuators, inertial platform gyros, and sees the solenoid valve as an objet d'art. Yet the time spent in his garage is conventional, practical, productive as any other cottage industry in the suburbs. After all, the rocket is a very ancient device—a chamber with a hole in it. And even with the advent of electronic telemetry it remains, nonetheless, a bomb with a little brain at the tip. The delicacy is in the containment of the fuels.

What does the Volksrocket look like? A shark, as slender as an arrow. Toothpaste tube. Truax begins his tour at the nose cone. It is small, about the size of a hot-water heater. As with 80 percent of the ship, it came from the friendly junkman. The forward six-foot piece was originally the tail section of a "tip tank" from a Grumman Albatross. It was an old practice on extended patrol missions to add an extra fuel tank to the tip of the wing, one that could be dropped when the fuel was expended. The streamlined object on the tail is just the right size for a nose cone. "You can pick up the whole tip tank for a hundred bucks," he says with pride.

The cone, made of 6062 aluminum, has in its first two feet the drogue and main chutes, without them the rocket would turn into a fiery cinder on reentry. It also contains a floating radio beacon and a dye marker. The "command module," barely large enough for a person to sit in, is pressurized to "a shirt-sleeves atmosphere." Truax tested it to two atmospheres. There was no leakage.

The astronaut in the top of the stack doesn't have to do anything but squat in a prayerful attitude until the craft hits the water. Ha, ha. I'm giving him plenty of time to get cold feet." As for Truax, he'll be operating the automatic system from the blockhouse. "I'm chicken." Ha, ha.

There are some contingency manual

CONTINUED ON PAGE 139

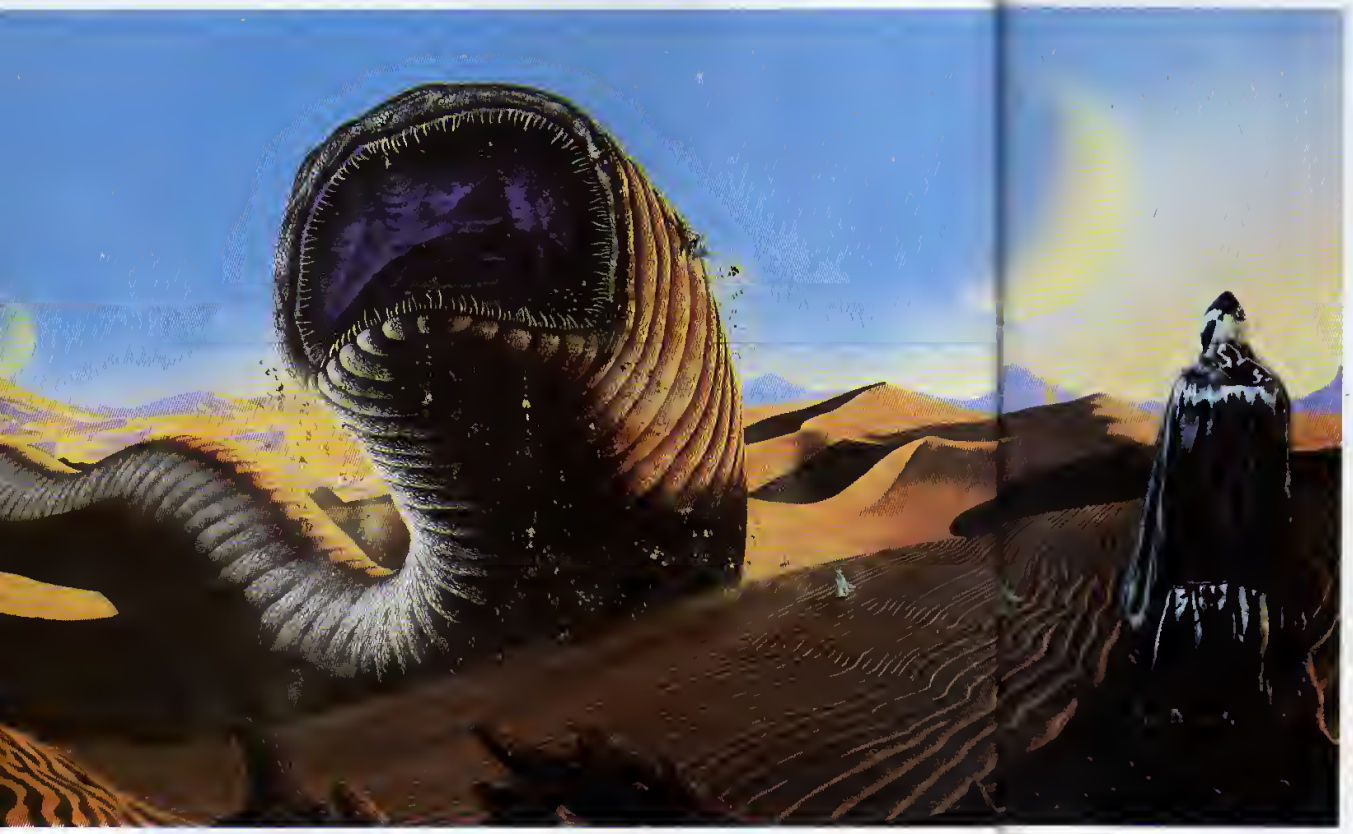
ALIEN LANDSCAPES

Science-fiction classics, as envisioned by talented visual artists, show four worlds of imagination

THE TIME MACHINE

"The Time Traveler ... led the way down the long, draughty corridor to his laboratory. ... We beheld a larger edition of the little mechanism we had seen vanish before our eyes. ... Cut by the horizon lay the huge hull of the sun, red and motionless. The sky overhead was no longer blue. ... I cannot convey the sense of abominable desolation that hung over the world."—*H. G. Wells*

"Paul looked down and saw sand spewing out of the metal and plastic beneath them like a . . . tan and blue beetle."



DUNE

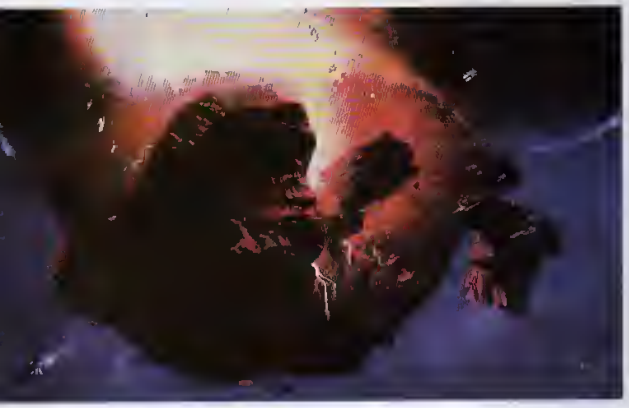
"Flecks of dust shadowed the sand around the crawler now. The big machine began to tip. . . . A gigantic sand whirlpool began forming. . . . Then they saw it! A wide hole emerged from the sand. Sunlight flashed from glistening white spokes within it. The hole's diameter was at least twice the length of the crawler. . . . 'Gods, what a monster!' muttered a man beside Paul. . . . The men crowded around him, staring fearfully."—*Frank Herbert*

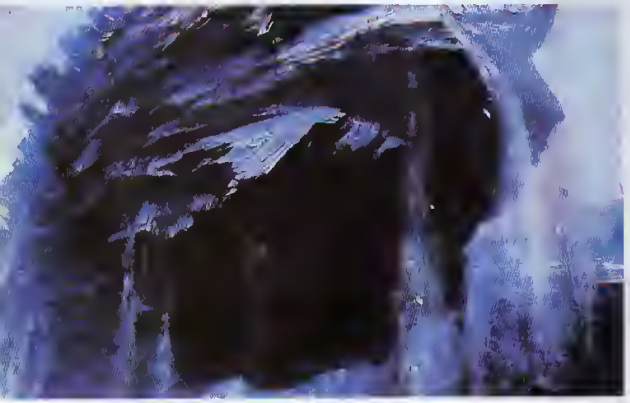
MISSION OF GRAVITY

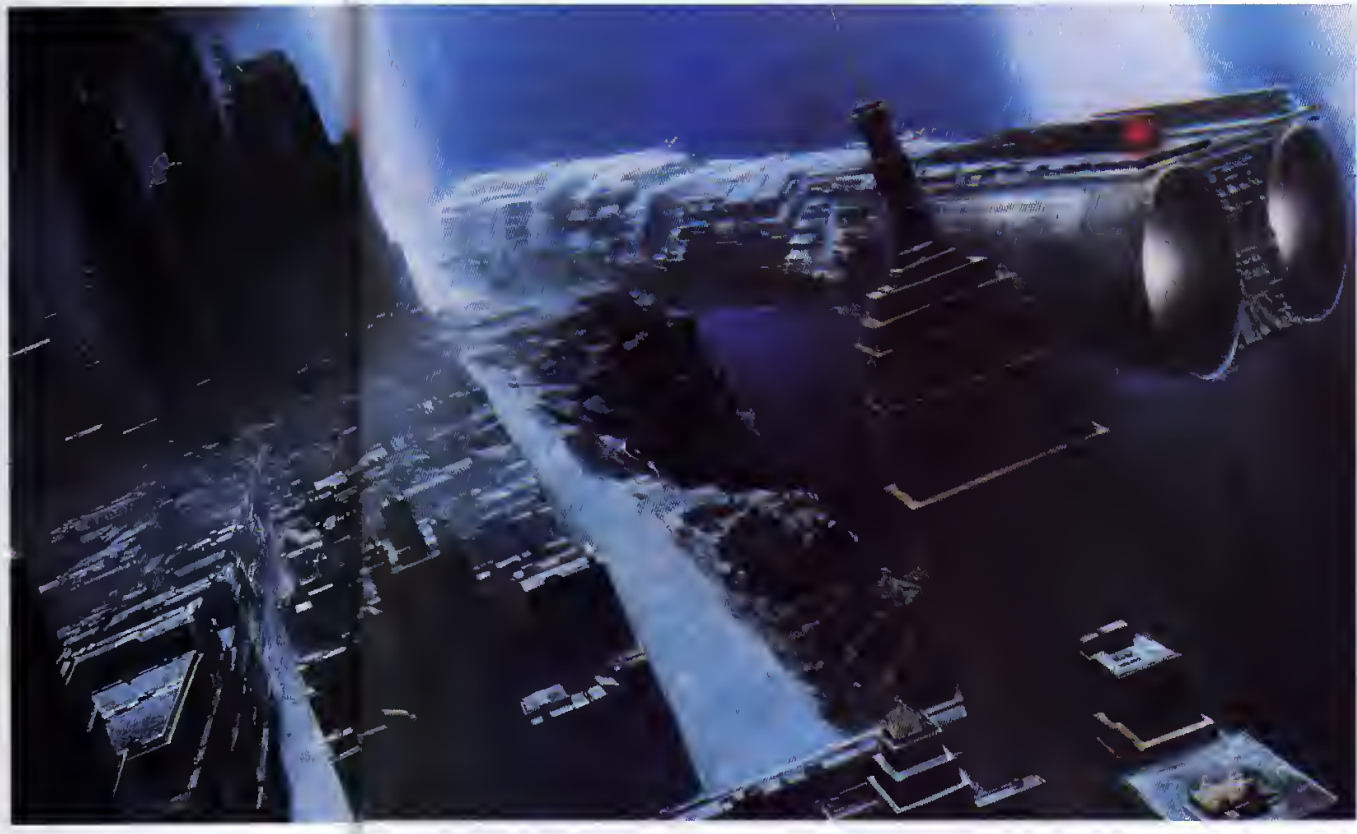
'The world [Mesklyn] is rather surprising in several ways. Its equatorial diameter is forty-eight thousand miles. From pole to pole it measures nineteen thousand. It rotates on its axis making the day some seventeen and three quarter minutes long. At the equator I would weigh about four hundred eighty pounds; at the poles I'd be carrying something like sixty tons. A large part of the southern hemisphere will receive no sunlight for fully three quarters of the year and should in consequence develop frozen methane at the expense of the oceans. Tremendous storms rage across the equator carrying methane vapor; while the southern regions warm up for creatures with liquid methane in their tissues.' —*Hal Clement*

"The Earthman began to realize just what the winds of Mesklyn could do even in this gravity. . . ."

"From an embankment of the railroad, Chris sat silently watching the city of Scranton . . . preparing to take off."







CITIES IN FLIGHT

"There was no longer any reason why a vehicle to cross space needed to be small, cramped. . . . The most massive and awkward object could be lifted and hurled off the earth and carried almost any distance once antigravity was an engineering reality. . . . Whole cities could be moved."—*James Blish*

Illustrations from the book *Alien Landscapes* by Robert Holdstock and Malcolm Edwards. Published in the U.S. by Mayflower Books (New York) and in the U.K. by Pierrot Publishing Ltd.

FICTION

Before he could qualify as a space pilot, Cadet Pirx had to prove his skills, his courage, and his luck

THE TEST

BY STANISLAW LEM

"Cadet Pirx!"

Bullpen's harsh voice snapped him out of his daydreaming. He had just had visions of a two-crown piece lying tucked away in the fob pocket of his old civvies, the onas stashed at the bottom of his locker. A jingling, shiny silver coin—all but forgotten. A while ago he could have sworn nothing was there, an old mailing stub at best, but the more he thought about it, the more persuaded he was that one *might* be there, so that by the time Bullpen called out his name, he was absolutely sure of it. The coin was now sufficiently real that he could feel it bulging in his pocket, so round and sleek to the touch. There was his ticket to the movies, he thought, with half a crown to spare. If he settled for some newsreel shorts, that would leave a crown and a half, of which he'd squirrel away a crown and blow the rest on the slot machines. Oh, what if the machine suddenly went haywire and coughed up so many coins into his waiting hands that he couldn't stuff his pockets fast enough? Well, why not? It happened to Smiga, didn't it? Pirx was already reeling under the burden of his unexpected windfall when Bullpen roused him with a bang.

Folding his hands behind his back and shifting his weight to his good leg, his instructor asked, "Cadet Pirx, what would you do if you were on patrol and encountered a ship from an alien planet?"

Pirx opened his mouth wide, as if the answer were there and all he had to do was to force it out. He looked like the last person on Earth who knew what to do when meeting up with a vessel from an alien planet.

"I would maneuver closer," he answered, his voice muted and strangely hoarse.

The class froze in welcome anticipation of some comic relief. They weren't disappointed.

"Very good," Bullpen said in a fatherly sort of way. "Then what would you do?"

"I would stop." Pirx blurted out, sensing that he was drifting off into realms that lay vastly beyond his competence. Furiously he racked his empty brains in search of the appropriate paragraphs from his Space Manual, but it was as if he had never laid eyes on it. Sheepishly he lowered his gaze, and as he did so, he noticed that Smiga was trying to prompt him—with his lips only. One by one he deciphered Smiga's words and repeated them out loud, before he had a chance to digest them fully.

"I'd introduce myself."

A howl went up from the class. Bullpen struggled for a moment, then he too exploded with laughter, only to assume a serious expression once again.

"Cadet Pirx, you will report to me tomorrow with your navigation textbook. Cadet Boerst!"

Pirx sat down at his desk as if it were made of uncongealed glass. He wasn't even sore at Smiga, that's the kind of guy he was, always one to play a joke. He didn't catch a word of what Boerst was saying. Boerst was trying to plot a graph while Bullpen was up to his old trick of turning down the electronic computer, leaving the cadet to get bogged down in his computations. School regulations permitted the use of a computer, but Bullpen was of a different mind. "A computer is only human," he used to say. "It, too, can break down." Pirx wasn't sore at Bullpen either. Fact is, he wasn't sore at anyone. Hardly ever. Five minutes later he was standing in front of a shop window on Dyerhoff Street, his attention caught by a display of gas pistols, good for firing blanks or live ammo, a set consisting of one pistol and a hundred cartridges priced at six crowns. Needless to say, he

PAINTING BY DON MAITZ

only imagined he was window-browsing on Dyerhoff Street.

The bell rang and the class emptied, but without all that yelling and stampeding of lower classmen. No, sir, these weren't kids anymore! Half of the class meandered off in the direction of the cafeteria because, although no meals were being served at that time, there were other attractions to be had—a new waitress, for example (word had it she was a knockout). Pirx strolled leisurely past the glass cabinets where the stellar globes were stored, and with every step he saw his hopes of finding a two-crown piece in the pocket of his civvies dwindle a little more. By the time he reached the bottom of the staircase, he realized that the coin was just a figment of his imagination.

Hanging around the lobby were Boerst, Smiga, and Payartz. For a semester he and Payartz had been deskmates in cosmodesy, and he had Payartz to thank for all the inkblots in his star atlas.

"You're up for a trial run tomorrow," Boerst let drop just as Pirx was about to overtake them.

"No sweat," came his lackadaisical reply. He was nobody's fool.

"Don't believe me? Read for yourself," Boerst said, tapping a finger on the glass pane of the bulletin board.

Pirx had a mind to keep going, but his head involuntarily twisted around on its axis. The list showed only three names—and there it was, right at the top, as big as blazes: Cadet Pirx.

For a second his mind was a total blank.

Then he heard a distant voice, which turned out to be his own.

"Like I said, no sweat."

Leaving them, he headed down a walkway lined with flower beds. That year the beds were planted with forget-me-nots, artfully arranged in the pattern of a descending rocket ship, with streaks of now-faded buttercups suggesting the exhaust flare. But right now Pirx was oblivious of everything—the flower beds, the pathway, the forget-me-nots—and even of Bullpen, who at that very instant was hurriedly ducking out of the Institute by a side entrance, and whom Pirx narrowly missed bumping into on his way out. Pirx saluted as they stood cheek to jowl.

"Oh, it's you, Pirx," said Bullpen. "You're flying tomorrow, aren't you? Well, have a good takeoff. Maybe you'll be lucky enough to, er, meet up with those people from alien planets."

Once inside his room—it was too cramped to serve as anything but a single—he debated whether he should open the locker. He knew exactly where his old pants were stashed. He had held onto them, despite the fact that it was against the rules—or maybe *because* of that—and even though he had hardly any use for them now. Closing his eyes, he crouched down, stuck his hand through the crack in the door, and gave the pocket a probing pat. Sure enough, it was empty.

He was standing in his unpressurized suit on the metal catwalk, just under the hangar ceiling, and with neither hand free was bracing himself against the cable railing with his elbow. In one hand he held his navigation book; in the other the crib sheet Smiga had lent him. The whole school was alleged to have flown with this pony, though how it managed to find its way back every time was a mystery all the more so since, after completing the flight test, the cadets were immediately transferred from the Institute to the north, to the base camp, where they began cramming for their final exams. Still the fact remained. It always came back. Some claimed that it was parachuted down. Facetiously, of course.

So Pirx stood on the metal catwalk and

"He was standing in his unpressurized suit on the metal catwalk. In one hand he held his navigation book, in the other the crib sheet. . . . The whole school had flown with this pony."

waited for the CO to show up in the company of both instructors. *What is keeping them?* he wondered. Lift-off was scheduled for 1940 hours, and it was already 1927. Suddenly he heard footsteps approaching from the other end, but in the dark under the hangar ceiling it took him a while before he could make out who it was.

All three were looking very spiffy. As was customary on such occasions, they were decked out in full uniform—especially the CO. Even uninflated, however, Pirx's space suit looked as graceful as twenty football uniforms stuck together, not to mention the long intercom and radiophone terminals dangling from either side of his neck-ring disconnect, the respirator hose bobbing up and down near his throat, and the reserve oxygen bottle strapped tightly to his back—so tightly that it pinched.

Suddenly the whole catwalk began to undulate as someone came up from behind. It was Boerst. He was wearing the same kind of space suit, and he gave Pirx a stiff salute—mammoth glove and all—and went on standing in this position as if just aching to knock Pirx overboard.

When the others had gone ahead, Pirx asked somewhat bewilderedly, "What're *you* doing here? Your name wasn't on the flight list."

"Brendan got sick. I'm taking his place."

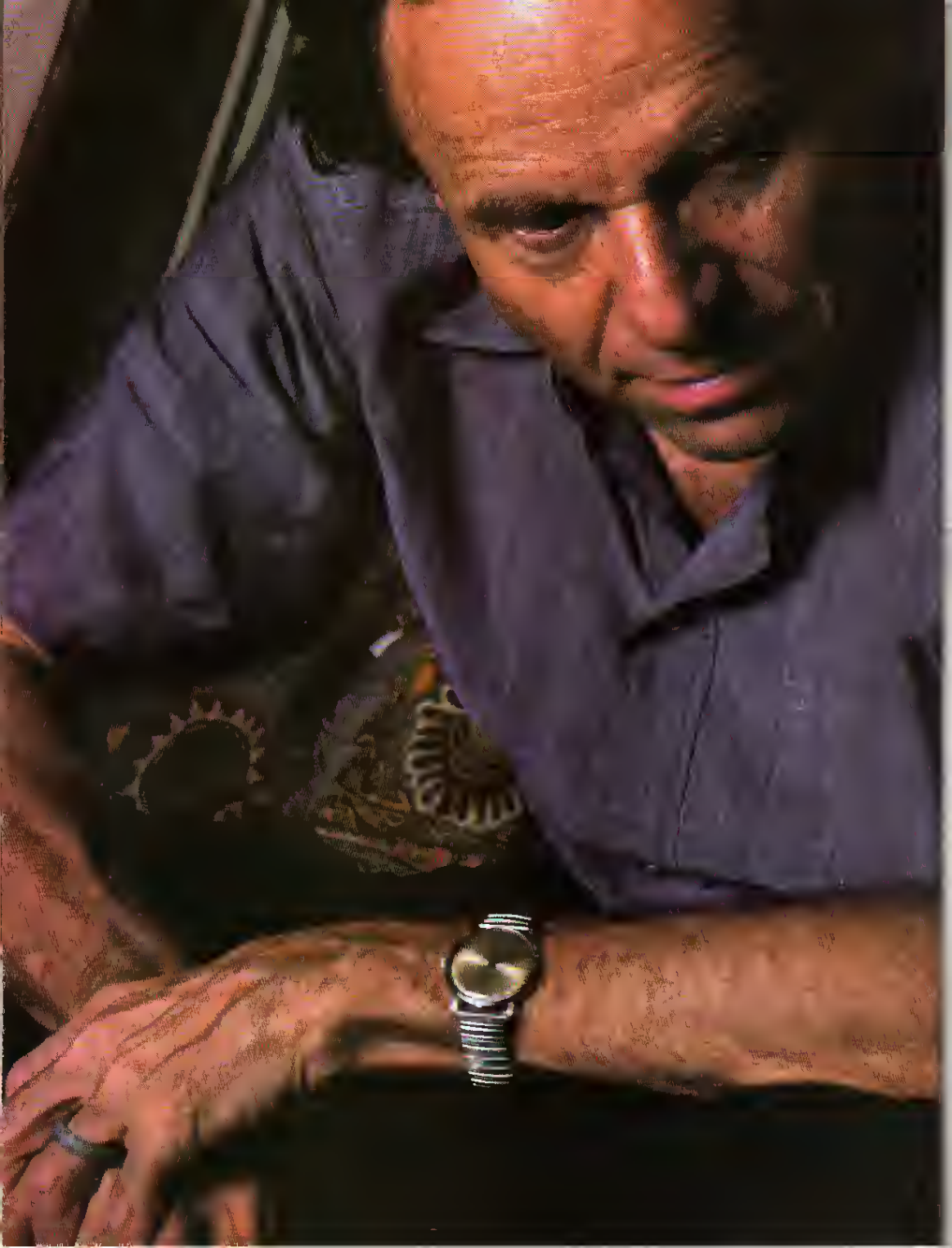
Pirx was momentarily flustered. This was the one area—the one and only area—in which he was able to climb just a millimeter higher, to those empyreal realms that Boerst seemed to inhabit so effortlessly. Not only was Boerst the brightest in the program, for which Pirx could fairly easily forgive him—he could even muster some respect for the man's mathematical genius, ever since the time he had watched Boerst take on the computer, faltering only when it came to roots of the fourth power—and not only were his parents sufficiently well-heeled that he didn't have to bother dreaming about two-crown pieces lying tucked away in the pocket of his civvies, but he was also a top scorer in gymnastics, a crackerjack of a jumper, a terrific dancer, and, like it or not, he was handsome to boot. Very handsome, in fact—something that could not exactly be said of Pirx.

They walked the distance of the catwalk, threading their way between the girders, filing past the rockets parked next to one another in a row, before emerging in the shaft of light that fell vertically through a two-hundred-meter sliding panel in the ceiling. Two cone-shaped giants—somehow they always reminded Pirx of giants—each measuring forty-eight meters in height and eleven meters in diameter in the first-stage booster section, stood side by side on an assembly of concrete exhaust deflectors.

The hatch covers were open and the gangways already in place for boarding. At about the midway point the gangways were blocked by a lead stand, planted with a little red pennon on a flexible staff. He knew the procedure. Question: "Pilot, are you ready to carry out your mission?" Answer: "Yes, sir, I am"—and then, for the first time in his life, he would proceed to move aside the pennon. Suddenly he had a premonition. During the boarding ceremony he saw himself tripping over the railing and taking a nose dive all the way to the bottom. Accidents like that happened. And if such accidents happened to anyone, they were *bound* to happen to Pirx. In fact, there were times when he was apt to think of himself as a born loser, though his instructors were of a different opinion. To them he was just a moron and a bumbler, whose mind was never on the right thing at the right moment. Granted, he had no easy time of it when it came to words, between his thoughts and his deeds there yawned—well, if not an abyss, then at least an obstruction, some obstacle that was forever making life difficult for him. It never occurred to Pirx's instructors—or to anyone else, for that matter—that he was a dreamer, since he was judged to be a man without a brain or a thought in his head. Which wasn't true at all.

Out of the corner of his eye he noticed

CONTINUED ON PAGE 148



Introducing a high-energy thinker whose ability to fuse the cosmic with the terrestrial places him in the forefront of theoretical science

INTERVIEW

PHILIP MORRISON

Twenty years ago Philip Morrison revived the age-old dream of communication with extraterrestrial intelligence. He coauthored an article in *Nature* that proposed a systematic search for radio signals from "civilizations with scientific interests and technical possibilities much greater than those now available to us." Entire books, scholarly symposia, and the beginnings of an actual search for distant signals have grown from that suggestion. Always active, this celebrated scholar, philosopher, physicist, Institute Professor at MIT, and interpreter of science to the lay public is now a leading advocate of arms control.

Born in Somerville, New Jersey, in 1915, Morrison graduated from the Carnegie Institute of Technology in 1936. He took his doctorate in theoretical physics from the University of California at Berkeley. He worked on the Manhattan Project from 1943 to 1946. After the war, Morrison's interests turned to astrophysics, a field in which he later became widely known for his explanation of supernovas, cosmic rays, solar neutrinos, and the formation of galaxies.

Anyone who talks with Morrison at his home in Cambridge, not far from the Harvard Observatory, is invariably impressed by the range and diversity of his interests and by his remarkable ability to find relationships between the microscopic and the macroscopic, the past and the present, the terrestrial and the cosmic. Asked what it might be like to receive a message from the stars, he replies, "By analogy we do it all the time, for example, in studying the writings of the great philosophers and playwrights. We can't ask Socrates what he meant. So we study the texts and argue about them. Now, this is exactly what we may get from any long-enduring signal from space, a tremendous treasury of what they know, think, and do."

Small in stature, articulate, and acerbic, Morrison reveals his enthusiasm through bright eyes and an animated voice that belie his sixty-four years.

Omni's interviewer, writer-editor Eileen Zalisk, began by asking him what first drew him to science.

Morrison: I can't really remember. I was always interested in science. The first thing I can recall is a big, thick chemistry book I understood very poorly. I also had a chemistry set. And a spark coil. And a radio transmitter. I also made gunpowder in the basement. The usual things—funny colors, funny odors. It all seemed fascinating.

When I got to Carnegie Tech, I was determined to become a radio engineer. I had become very much involved in amateur radio. But to be frank, electrical engineers were so dull, and their interests so narrow, that I realized the physics department was where I wanted to be. Even if physicists didn't know how to make a radio, they understood deeply what was behind it, and they wanted to know more. And that was what I wanted to do, too. So I gradually drifted into theoretical physics.

Omni: As one of the physicists working on the Manhattan Project, you rode in the back seat of an automobile with the first bomb's plutonium core from Los Alamos to the test site. How did you feel after the test?

Morrison: Curiously enough, for all of us involved in the Manhattan Project, the culmination at the test site had a double meaning. One was that the challenge, the intellectual concerns, the sense of urgency and all those things were released with the explosion, because it demonstrated that our efforts had paid off. The other was that we were ahead of everybody. And the new world—good, bad, or indifferent—would begin.

This is what the physicists were about. The actual application of all this to war, the use of the bomb on Japan, came as a kind of strange anticlimax with which the physicists had little to do.

Omni: You later refused to participate in work on the hydrogen bomb. What brought about the change in your attitude?

Morrison: The war. I mean, one war was enough. We saw that bombs would now be made not by the ones but by the thousands. We saw this terrible catastrophe coming. Obviously, the world would not survive these things. So it seemed to me that the thing to do was to get out of the situation in which World War II had thrust us. I've been trying to do that ever since.

Omni: You have written about how science and peacetime industry could utilize atomic energy. Do you still believe that?

Morrison: Well, yes. I think I generally do. However, I am rather dissatisfied with the large proliferation of the light-water-reactor design in the United States, which I think is not the best reactor design. The most suitable design now is the Candu design, the Canadian heavy water moderated reactor with natural uranium. The Candu design does not depend on gaseous diffusion plants to produce enriched uranium. Once you've decided to have gaseous diffusion plants, and you've made that investment, it upsets the economy because gaseous diffusion plants use a great deal of energy. In fact, it's not easy to see if the whole system is a net producer or a net user of energy.

Also, the Candu reactors have a much smaller power density. As a result, they don't produce in a small area as much heat as other nuclear reactors do. Therefore the dangers of meltdown and all those terrible loss-of-containment dangers are considerably reduced. That's not to say they are absent, but they are a good deal less.

In addition, the Candu-type reactor seems to me to be a less finicky design that is probably easier to make on a large scale and to maintain and operate without as much trouble as the Americans have had.

Omni: How did the United States become committed to the light-water-reactor design?

Morrison: The American light-water plants depend primarily upon big military capitalizations to make uranium-235, mostly for submarine reactors and for bombs. It was one of those things that was not clearly thought through. So now the peacetime use of nuclear-power plants in a way reflects investments made for very different primarily military purposes.

> *"Galaxies are now flying apart. If you go backward far enough, you see that they merged. Go back even more and you find a kind of lumpiness appearing out of a gaseous background."*

Now that often happens. For instance, the most successful jet airplane, the 707, was a direct consequence of the C-135 air force tanker development. It's a wonderful airplane that has flown all over the world for twenty-five years and is only gradually becoming obsolete. That's a case in which the military investment really paid off in the civilian world.

But, in my opinion, the military investment has not paid off in the civilian world in terms of reactors. And I think it's just a mistake, an error of judgment and investment, that we're so heavily committed to this one reactor design.

Omni: After the bombing of Hiroshima, your interests moved from theoretical physics and its practical applications to astrophysics. How did that come about?

Morrison: I was, frankly, having a rather hard time settling down to do academic research because of the political situation at the time. I had a year off from Cornell, so I came here to MIT to work with Professor Rossi, whom I knew very well from Los Alamos days and admired very much. He was a cosmic-ray physicist. So I became interested in cosmic rays.

In those days, the cosmic-ray physicists were the leaders in particle physics because they had the only high-energy beam—the natural cosmic ray. However, it was at exactly the same time, in the early 1950s, that the high-energy accelerators became capable of producing mesons. As a result, the cosmic ray people were competed with right out of existence. They would go up on a mountain and get a few particles a day and wouldn't know when the particles were coming or from which direction. But the accelerators could produce a million particles in a second. And so my interest, with that of many cosmic-ray people, shifted from cosmic rays as laboratory items to cosmic rays as astronomical phenomena.

Then the radio astronomers showed, most surprisingly, that low-frequency radio was associated with high-energy particles. That really began the interest in what one would call high-energy astrophysics. I think the phenomenon of high-energy astronomy is still one of the most interesting things we've ever seen outside the laboratory. And so I'm still involved in it.

Omni: Can you talk a little bit about some of the tools and current directions of the new astrophysics that interested you?

Morrison: The thing to realize, of course, is that the cutting edge of the contact between physics and astronomy was the rise of the understanding of thermonuclear reactions inside the sun.

It was pretty clear by the mid-1950s that we had a good understanding of the interior of the stars, based on nuclear physics. It was also clear that we had a very poor understanding of such strange high-energy phenomena as cosmic rays. Then the radio astronomers showed us that there were gigantic cosmic-raylike sources in the galaxies, in quasars. The whole thing just burst in a new experimental way.

The tools of the new astrophysics are essentially radio astronomy, X-ray astronomy and excellent new physical instruments that provide the optical astronomers with much better spectroscopy. For example, the flashing on and off of the pulsars was just a revelation. There inside the Crab Nebula something was happening at thirty times a second. Nobody had ever seen that on a solar scale before.

These are the things that have led astronomers into absolutely new domains. As a result, we understand the universe much better than we did before.

Omni: How do you view the current theories on the origins of the universe?

Morrison: My colleagues, especially the younger theorists, are very enthusiastic about what they think they know, because there is a beautiful theory by Einstein and by Friedman that can be modified and that has had superb success in explaining such things as the universal thermal-microwave background. But I still have certain doubts.

I think we know pretty well what hap-

CONTINUED ON PAGE 146

DECADES OF DECISION
ALTERNATING CURRENTS

Science is caught on the horns of a dilemma—the dire need to exploit all available energy sources versus the necessity to preserve the fragile balance of nature The life of the planet is at stake, and the debate rages on.

To celebrate our first anniversary, Omni went to the leading figures in science and technology for their comments on the decade now closing We asked them about breakthroughs, disasters, implications for the future The response was voluminous and varied, reflecting a diversity of thought concerning where we've been and where we're going Herewith, an exclusive sampling

Through the excessive destruction of tropical forests and other habitats rich in local endemic species we are stripping the earth of genetic diversity Future generations will be able to correct our mistakes in energy use and materials allocation but I do not expect them to forgive us for the erasure of a large fraction of the species of plants and animals—an unnecessary wastage of their heritage, which will undoubtedly be ranked as the worst error committed during the twentieth century —*E. O. Wilson, sociobiologist*

We should bear in mind the possibility that remarkable truths might still be discovered on this planet we're likely to find more amazing things at the bottom of the sea than on all the surfaces of the rest of the planets —*Thor Heyerdahl, explorer*

The great problem of the future is excess energy . . . We could do lots of damage with it damage to our environment to ourselves I happen to be against nuclear reactors, not so much out of fear of radioactive contamination but that they will impose more social organization, more centralization —*René Dubos, microbiologist, Pulitzer Prize winner*

We are slowly accepting the reality that the search for nonrenewable fuels can only hasten the day of their ultimate exhaustion . . . At the present time we are using only a fraction of the solar energy we can ultimately expect to use in a wide variety of applications Breakthroughs in the next decade will develop thin-film solar cells that use only a fraction of the photovoltaic materials now employed This could permit the use of such materials as gallium, tellurium, and indium in suitable chemical formulas —*Peter E. Glaser inventor of the solar-power satellite*

As the petroleum age ends and we stand at the dawn of the solar age we're beginning to see more and more clearly how much we let petroleum do our thinking for us . . . The first conceptual breakthrough of the coming era will be that we don't need an inexhaustible supply of new energy Like fusion If we did manage to find it socially speaking, we would probably electrocute ourselves I believe the trial by entropy we are going through now is the best thing that has ever happened to us . . . in terms of rethinking a global order —*Hazel Henderson economist, author of* Creating Alternative Futures

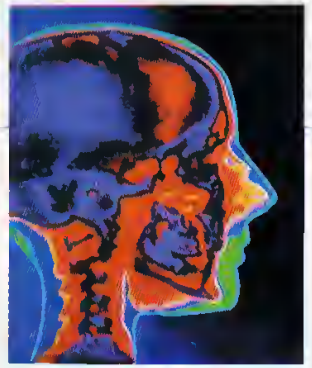
We have the potential of fusion power—a great potential Fusion power could give us almost unlimited energy, if we can bring it to the point of feasibility —*Carl Walske physicist, president of Atomic Industrial Forum*

The most annoying occurrence of recent years is all these knuckleheads running around protesting nuclear power—all these stupid people who do no research at all and who go out and march pretending they care about the human race and then go off in their automobiles and kill one another —*Ray Bradbury, author*

CONTINUED ON PAGE 144

PHOTOGRAPHS BY
PETE TURNER

DECADES OF DECISION
LIFELINES



Gene splicing, coronary-bypass surgery, and opiates found in the brain are only a few of the biomedical breakthroughs of the 1970s. The 1980s? A dramatic increase in life expectancy and perhaps an understanding of the mind's inner workings.

The physiology of female sexual responsivity makes it impossible to deny that women are sexual beings beyond their reproductive capability. If women and the society in which they live can begin to realize that this female sexual potential is inherently neither a threat nor a burden—to women or to the men with whom they interact—the possibilities for sexual sharing are enormous. First, however, it is necessary to perceive female sexuality as a birthright, expressed as an option, not an obligation. —*William Masters and Virginia Johnson, sex therapists*

The most important advance in biology will be the discovery of the ways in which human heredity affects cultural evolution and culture affects genetic evolution. When this is understood, biology and the social sciences will be truly joined . . . and the nature-nurture controversy will become a historical curiosity. —*E. O. Wilson, sociobiologist*

One of the most significant discoveries in molecular biology has been that of intervening sequences in at least some of the genes in higher organisms . . . Nobody predicted this, and it raises a host of new, but unanswered, questions about evolution and origins. —*Sidney Brenner, molecular biologist*

There have been two significant developments within my own field. One is neurochemical: the discovery of internally secreted opiates in different parts of our brain. Just the idea that we handle pain in a homeostatic fashion and that the substance is so closely akin to morphine opens an incredible new frontier.

The other development has to do with sensation. The cerebral cortex is coming to look more and more like a resonator that encodes frequencies. In the auditory mode, that's been known for a hundred years. Von Bekesy, by making a model of the ear, showed that it's also true for tactile sensation. And now, in the past ten years, at Cambridge University, Berkeley and here, it has been shown that the visual system analyzes spatial configurations in the same fashion. We're beginning to think of the cortex as being sensitive to different vibes, as it were. —*Karl Pribram, professor of neuroscience at Stanford University*

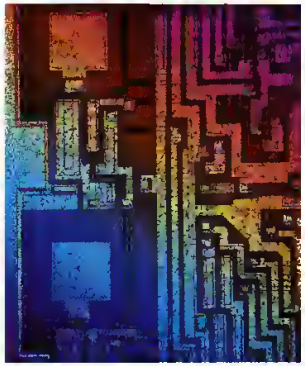
A development I welcome is greater public and political debate about science. The question of genetic engineering is an outstanding example. The new debates in the future are going to be about . . . the politics of cancer and whether its epidemiology can be established. The large numbers of new carcinogenic agents now being introduced are startling, and we are going to have to look at that very hard indeed. —*Clive Jenkins, leading British trade unionist, representing scientific workers*

Unquestionably, the opportunity to do genetic engineering has been the most important breakthrough. With recombinant DNA techniques, it is now possible to develop clones that will form large amounts of hormone-receptor molecules and to use the trick of genetic engineering to sequence very large proteins. Using the methods available at the beginning of the Seventies, it probably would have taken 100 man-years to accomplish this. Now it's possible to envision this being done in less than a year. —*Floyd Bloom, director, Salk Institute's Center for Behavioral Neurobiology*

CONTINUED ON PAGE 144

PHOTOGRAPHS BY
HOWARD SOCHOUREK

DECADES OF DECISION
MICRO/MACRO



The 1970s will be remembered as the decade in which many frontiers were breached On the one hand, science has penetrated the microworld of the atom. On the other, man has opened the door to the macroworld of space, the first step to the stars.

Microcomputers make it possible to proceed with the total computerization and automation of society therewith removing the necessity for humans to indulge in dull and repetitious labor that blunts the mind and stultifies the spirit —*Isaac Asimov, author*

The door to space can lead practically rather than just philosophically to opportunities for solving those technological and social problems that today seem insurmountable —*Eugene A Cernan, Apollo astronaut*

An ultraintelligent machine is the invention that will end invention. By definition, an ultraintelligent machine can perform every intellectual activity better than any man. If such a machine has been invented, it must be secret, because I haven't been told about it —*I. J. Good, mathematician*

In the entire history of the world, I can't think of anything as important as space travel. To me it's commensurate with the birth of Jesus, Buddha, or Muhammad. Pick your religion. —*Ray Bradbury, author*

The development of the microprocessor has been immeasurably significant for the space program. The microprocessor allows much greater technology to be packaged in much smaller volumes and weights and allows finer precision control. We might not be in space to any extent without it. —*Judith Resnick, mission specialist, NASA shuttle program*

The past five years in physics have been extremely exciting. That has to do essentially with the firm establishment that quarks do exist. We now have a new, basic candidate for the elementary particle if we could understand how the quark forces, which are strong, relate to the weak and electrical forces.... *that* would be a breakthrough—a breakthrough, let me say with limited imagination. It's a breakthrough you can get out of anybody hot in the field, obsessed by today's journals. A more interesting breakthrough for me would be one in which some kid in our laboratory discovers something outside the realm of anyone's thinking, something undreamed of in our philosophy. Horatio. —*Leon Lederman, director of Fermilab*

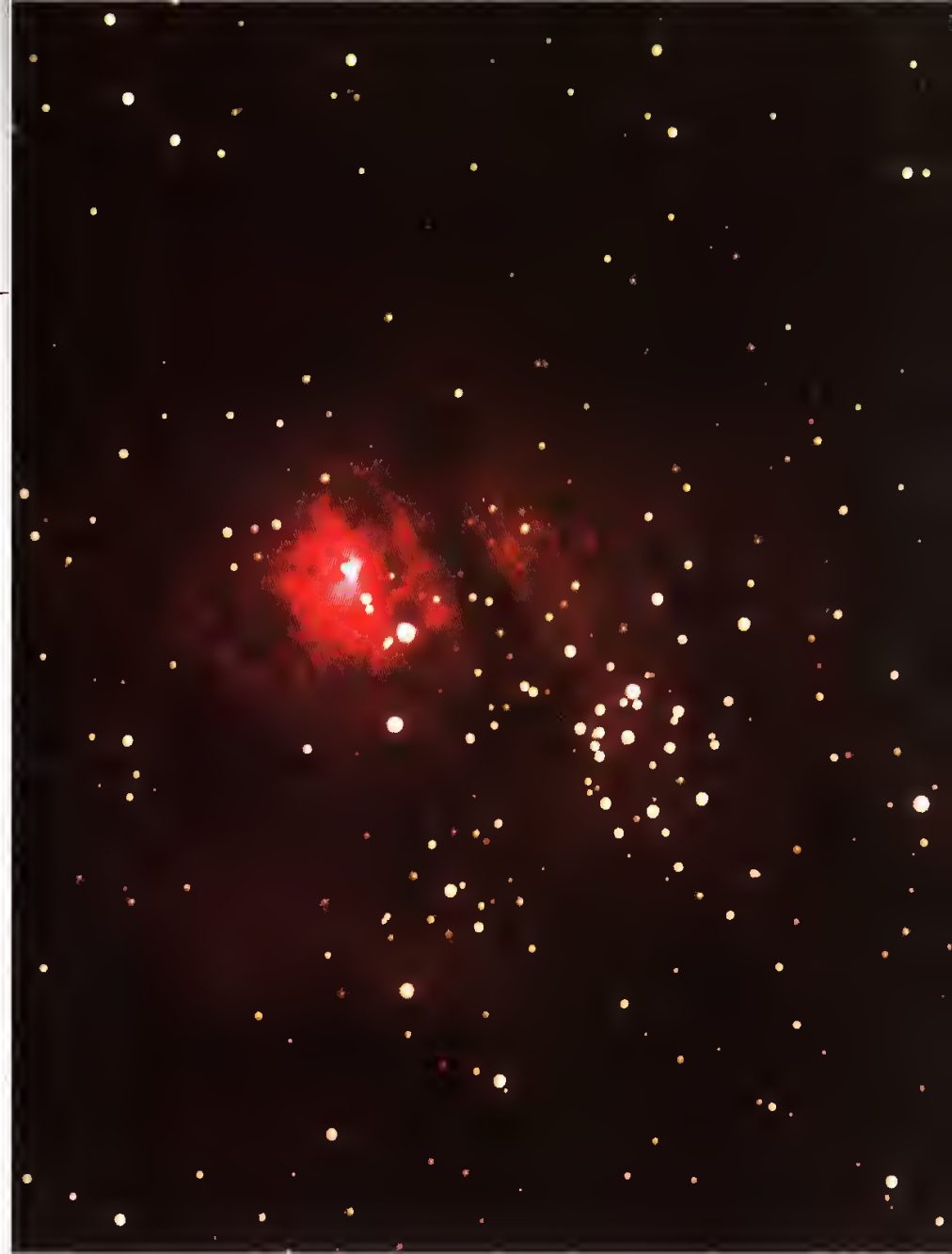
The microprocessor has finally repealed the labor theory of value; there is really no possibility now of maintaining the fiction that human beings can be paid in terms of their labor. The link between jobs and income has been broken.... The whole game of world trading patterns based on comparative advantage may be finished off by the microprocessor. —*Hazel Henderson, economist, author of* Creating Alternative Futures

IBM tried to control the computer market by keeping computers complex and difficult for people to use. But now many are being simplified, and this is going to arm many individuals with machines as powerful as the monsters in corporate hands. —*Frank Herbert, author*

The most exciting breakthrough of the decade is the convincing evidence for the origin of the universe in the big bang and the ensuing explanations of the present and future states of the cosmos. The origin of the cosmos in one great cataclysmic event is of immense importance not only to cosmology but also to the contingent relation of man's origin and place in nature. It gives rise to questions of meaning and purpose. —*Sir John Eccles, Nobel laureate in physiology and medicine*

CONTINUED ON PAGE 144

PHOTOGRAPH BY
PHILLIP HARRINGTON



DECADES OF DECISION
THE HUMAN FAMILY

Watergate, dwindling energy supplies, giant leaps in technology, and a deep suspicion of the motives of science are the hallmarks of the 1970s. Nonetheless, the human species continues to flourish

The most significant event of the last decade in science seems to have been a general, accelerating trend away from the naive reductionism inherited from the last century toward an updated form of holism. . . . Obviously, the worst development was the widening of the fatal gap between mankind's genius in conquering nature and its incapacity to resolve conflicts on the local or the global level. —*Arthur Koestler, philosopher of science*

It is now clear that all races of human beings have a common heritage. It is also clear that extinction has occurred to other prehistoric species of man and could so affect our own in the future. —*Richard Leakey, anthropologist*

Watergate! That and the squalid ending of the Vietnam War have totally destroyed Americans' faith in their government. If America crumples through despair and loathing, there are other nations willing to take the lead. —*Isaac Asimov, author*

Watergate was important because it showed that even the President has limits to his power. —*Frederik Pohl, author*

I see little chance of evolution affecting us in the Darwinian sense, but social evolution, I see no end to that. To advances in technology and ways of thinking, I see no limits. —*René Dubos, microbiologist, Pulitzer Prize winner*

The new cosmologies that are growing out of physics . . . are leading to a much more sophisticated, indeterminate view of reality. We're no longer looking for immutable facts and immutable objects the way we were during the Cartesian-world-view era of the past 300 years. We're learning that uncertainty is the only certainty, and we're learning a happier view of uncertainty. . . . Everything could change in the twinkling of an eye. —*Hazel Henderson, economist and author of* Creating Alternative Futures

The worst thing has been the swing in public opinion from an undue reverence for science and technology to a deep suspicion of it all. —*Jocelyn Burnell, codiscoverer of pulsars*

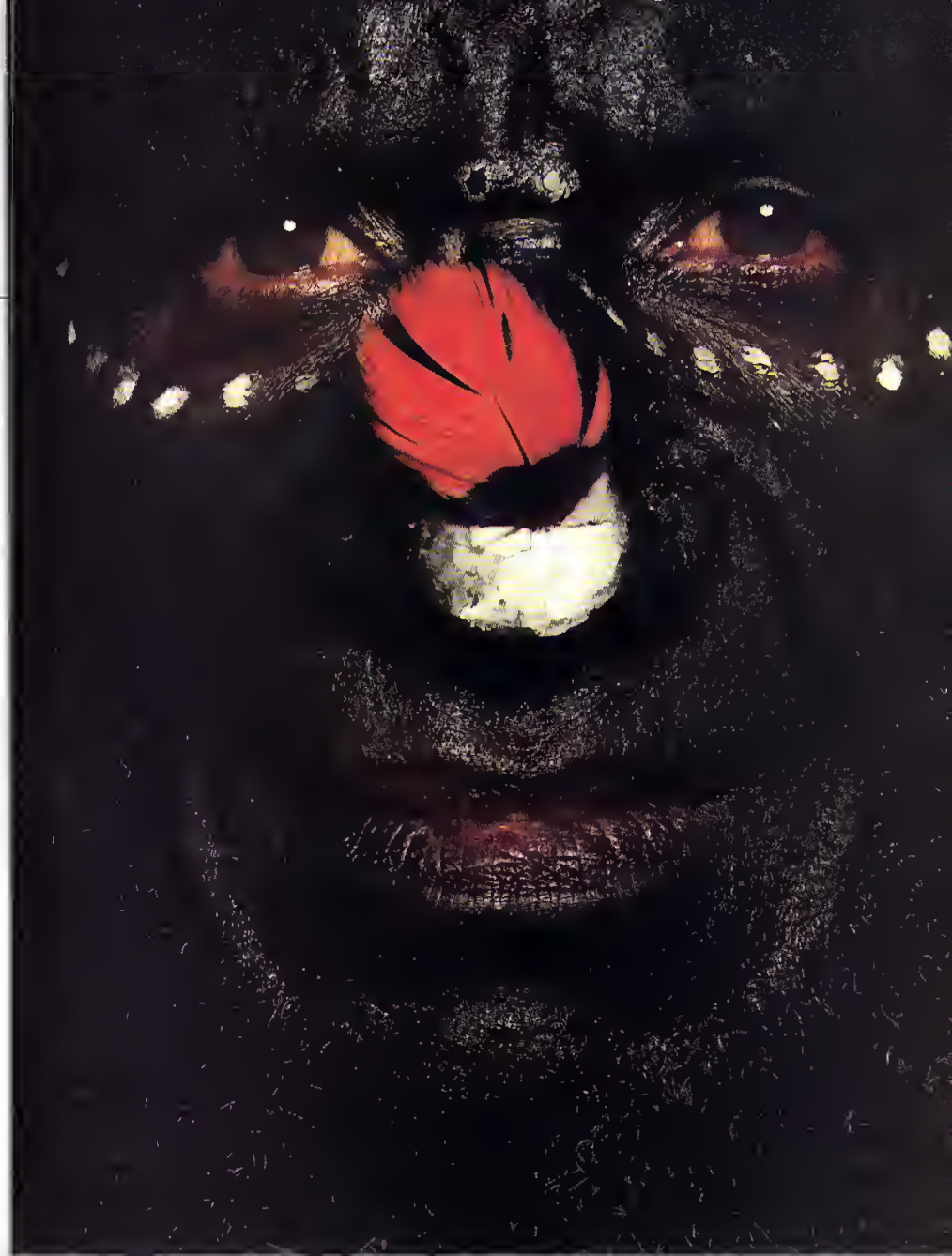
I'm very much afraid we've already reached the point where it's going to take one of the Four Horsemen, and maybe all four of them, to solve the population problem. —*Robert A. Heinlein, author*

I would like to see architecture move toward the aesthetic rediscovery of symbolism in design. Decoration is okay, and the appearance of a building need not fit its use. —*Robert Venturi, architect*

In the past decade science has been dominated by a materialistic ideology, the assumption that the concepts of value, meaning, and purpose have no place in the description and understanding of nature. . . . This ideology has had a contaminating influence on the minds of scientists and reduces the degree to which science follows lines that are good for humankind. —*B. D. Josephson, Nobel laureate in physics*

I predict that the 1980s will see us relieved of the burdens of astrology, flying saucers, Jeane Dixon, the Bermuda Triangle, and other idiocies. —*James Randi, magician, investigator of psychic phenomena* ◻◻

PHOTOGRAPHS BY
MALCOLM KIRK



HUMOR

THE LOST CULTURE OF DELI

BY JEAN SHEPHERD

Inside the gray metal vault
was the key to this extinct civilization

PAINTING BY DONALD ROLLER WILSON

The expedition had been working the site, with minimal success, for some time. Tempers were frayed. Even the most civilized and erudite members of the party were nipping at one another. The rains, alternating with the searing heat, had worn down all of them. That, and of course the looming sense of failure. None of them, in spite of earlier optimism, had the vaguest idea that they were about to make a strike that would rival, and indeed surpass, the discovery of the fabled Rosetta Stone of millennia past.

Little was known of the area where the expedition was working. The few facts, only partially substantiated, were that thousands of years or more in the opaque past a great city had flourished on the site. The area had been under the sea for centuries during the last Ice Age and had only reemerged in recent geological time.

There was much dispute and there were many theories about what this settlement had once been called. A few hints were available to scholars who could decipher and understand the scarce archaeological references, which were all in an ancient, dead language. One school maintained that the area had once been known to its inhabitants as New Amsterdam. The spelling was variable, sometimes NIEUW Ammsterdamme, other times N-E-W Amsterdam. Another faction held that the site had been known as the Big Apple, which led to a theory

since it was known that *apple* referred to some sort of fruit, that the place had been devoted to agriculture. A small but vocal element of academics, admittedly unorthodox in their views, had recently unearthed a reference or two among the fragmentary records of the past to something called Fun City. The translation of the word *city* was sure, meaning "a large organized gathering of creatures," but a battle was still raging over the meaning of the word *fun*. Some felt that it was used in reference to a religion of the time. Others scoffed, maintaining that the civilization being studied had no discernible religion and hence "Fun" was just a meaningless proper name of no significance. Then, of course, there had been the discovery of that curious, deeply buried monolith that read QUEENS PLAZA IND, which, according to a recent treatise, pointed to the conclusion that the settlement had been some sort of matriarchy if in fact there had been any form of government at all.

But to the members of this expedition, all such views were merely speculative. What was real was the mud, the boredom, and the lack of rest. The leader had considered closing out the operation and, in fact, had already begun to compose in his mind the message that he would send back to headquarters, informing those in control of his decision, when the big strike occurred, a find that was to open up the truth of this ancient, lost civilization in all its bizarre, romantic glory and barbaric splendor, far more revealing than any of the poor fables and tepid myths of what these peoples had left behind, which they called Art and Literature. These childish scrawls had dealt mainly with the endless pursuit of something they termed sex or, even more curious, self-fulfillment. Little was ever mentioned about the actual life, the day-to-day existence of those bygone times. But today's epic discovery would change all that.

Like many significant finds, this strike came about as a result of a fortuitous accident, deep in the tunnel that had so far yielded nothing but disappointing bits and pieces of incomplete artifacts, although one curious, perhaps meaningful, minor find had been made. A number of small plates bearing the enigmatic inscription IBM SELECTRIC had surfaced. According to the leading technicians, these plates had apparently been attached to some kind of machine, although its use was not known.

The machines themselves had long since largely disintegrated. Only a few cogs and wheels had survived the millennia. One small container made of an unknown, flexible substance had been found. It bore the inscription DANNON YOGURT, which was obviously the proper name of some long-dead native who had used this receptacle for some purpose or other as yet not established. Other digs had unearthed quantities of these containers, which indicated that YOGURT was a very numerous tribe, rivaled only by one that appeared to be called DELI and a third named, enigmatically, DIXIE. Did the reels hold the answer?

A brace had given way, causing a large section of the tunnel wall to collapse, partly blocking the passageway. Members of the expedition quickly moved to clear away the mud and other debris, suddenly they beheld a sight that none of them would ever forget. A great, gray metal vault gleamed dully under the lights. The leader was summoned immediately. The very air was charged with excitement as he peered at the mysterious discovery. A small, attached label bore the inscrutable letters BBD&O and, in smaller script, TV 60 SEC COMMERCIALS.

With a sense of scientific history being made, the cabinet, after being suitably measured and photographed, was carefully opened. The interior revealed row upon row of reels wound with a sort of film. The lowermost compartment contained, in absolutely perfectly preserved condition, a device that was obviously to be used in conjunction with the mysterious reels. The

> *"A close-up of one crazed native caught him frantically sucking at some sort of small urn or container. His frenzy increased as he was joined by a female, sucking a similar container."*

party was jubilant, but even in their joy they had little appreciation as yet of their stupendous find.

Months later, in the laboratory, all the work and disappointment paid off. A new, startling vision of this ancient, extinct civilization burst upon the scholars and scientists like a thunderbolt. For months there had been intensive research into the connection between the mysterious machine and the reels, and at long last, through a series of keen deductions, it had been found that the device had been used to project images from the reels so that they could be viewed.

A carefully selected group of high-level personages had assembled for the first viewing of one of the reels. The lights were dimmed. There was absolute silence as each observer waited for a true vision of the past. Then there came a whirring sound from the rear of the room. Ancient symbols flashed on the screen: X-X-X-8-7-6-5-4-3-2-1. And then it happened. A spectacular scene so stupefying in its effect as to boggle the mind blazed forth before them. A dozen figures, dressed in colorful, crisp uniforms, danced and cavorted wildly, their teeth flashing, their footwork remarkable. High above them, gleaming in the brilliant sunlight, were two Olympian golden arches. As they danced, their rhythmic chant, pulsing with primitive vigor and abandon, boomed deafeningly.

We do it all for yoo hoo hoo
We do it all for yoo hoo hoo!

The scene quickly changed, and a manic, wild crowd of natives, who appeared to be arranged in family groupings of various colors, their teeth sparkling, eyeballs rolling, consumed vast quantities of mysterious, round, spongy objects. The dancers in their uniforms reappeared, intoning *We do it all for yoo hoo hoo*. The family members, many of whom appeared to be immature or possibly a subspecies, grew more agitated as they ate voraciously. The arches suddenly reappeared, then darkness.

The observers sat in stunned silence. At last, pandemonium broke loose. The leading scholar of them all lurched upright. His voice quavering with feeling, he blurted: "Nothing we have studied even *hinted* at what they were really like! None of their famous authors or artists even suggested anything like this!" He sat shaking with emotion, unable to speak further.

"More! More!" they shouted. No longer was this a solemn gathering of minds.

"More! More!"

Again the machine whirred in the darkness. The numbers came and went. Another horde of celebrants appeared, if anything even more manic and wildly contorting than the previous tribe. They seemed to be at the seaside, on a sandy beach, dressed in outlandish pagan costumes of staggering immodesty. They leaped about madly, striking balls with extreme, childish delight. Again a deafening chorus intoned another chant:

Join the Pepsi Generation, come alive, come alive!

A sudden close-up of one crazed native caught him frantically sucking at some sort of small urn or container. His frenzy increased as he was joined by a female, also sucking a similar container.

Come alive, come alive
Join the Pepsi Generation

The sea crashed noisily as the scene ended.

One of the scholars hissed in the stunned silence, "Is it possible that it was a whole damned civilization that worshiped *food*?"

Another voice cut in. "Don't jump to conclusions. We haven't even scratched the surface."

A third: "I wonder what 'Pepsi' was."

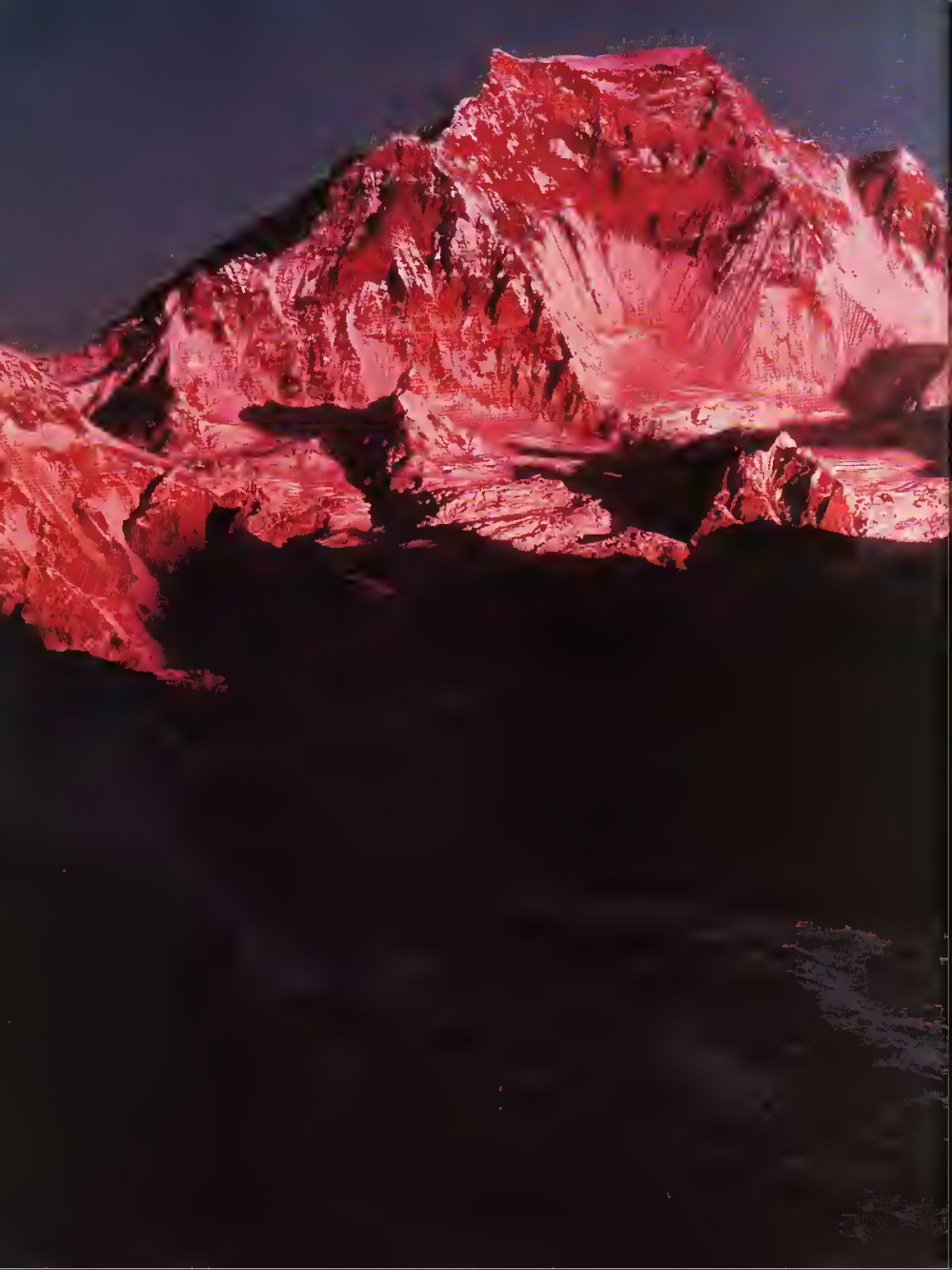
A fourth: "What about those arches? Now *that's* significant."

The leader spoke. "Easy now, let's not get excited. The only thing sure is that these things they call commercials are far more important than anything else they ever did. By the way, I agree with you about the arches."

Another voice, choked with emotion: "Those dancers were young females."

CONTINUED ON PAGE 166

Painting by Donald Roller Wilson, courtesy of Smithsonian Institution, Hirshhorn Collection



UNSEEN YETI

A famed mountaineer tells of his encounters with the unknown

BY LORD JOHN HUNT

There is some indefinable mystery about the higher elevations of vast mountain ranges. As you penetrate these uninhabited regions, you become conscious of a peculiar atmosphere, strange and almost forbidding. There is a silence, a sense of isolation, that engenders awe, even fear. In such environments it is not difficult to contemplate the existence of bizarre creatures rarely seen by man. With respect to the yeti, I now believe the evidence, from many observers, is unquestionable.

Belief in the existence of the yeti is widespread.

PHOTOGRAPH BY
YOSHIKAZU SHIRAKAWA

Reports suggest that a primate with human characteristics survives in areas still remote from human activity. Accounts of such beasts have been recorded in mountainous regions of China and the Soviet Union and on the entire length of the Himalayan range, in the Karakoram, northern Burma, and Bhutan. There are also stories of a large biped in the forested mountains of Oregon and British Columbia. Despite the absence of communication between the inhabitants of these widely separated areas of Asia and North America, descriptions of the beast display a remarkable similarity.

My own experiences convince me that these reports are not without substance. My latest encounter with yetis occurred last November, when with other members of the 1953 Everest expedition and some of our wives I was again in the Khumbu district of Nepal. We had trekked 320 kilometers across eastern Nepal from Darjeeling to mark the twenty-fifth anniversary of the first ascent of the mountain.

Some of the party had reached the head of the Tehola Khola, a high valley that runs parallel to, and to the west of, the Khumbu Glacier. From our camp at 5,000 meters we climbed to about 5,900 meters in the following days. My wife and I set off to cross a col (a mountain pass) and descend into the upper Dudh Kosi, to complete a circuit of the magnificent peaks of Taboche and Jobo Laptshang.

It was an exciting moment when, on a moraine ridge not far from our camp, we came upon a line of large, oval footprints in the frozen snow. They were very similar to some of those that Eric Shipton had photographed on the Menlung Glacier in 1951. I discovered later that these tracks were within one kilometer of almost identical footprints recorded by John Jackson when he, too, was climbing from the Tehola Khola, during Ralph Izzard's yeti expedition, organized by the *Daily Mail* in 1954.

My wife and I found more tracks at several points along our route. The last ones we came across—they were also the biggest and most recently made—were just outside a yakherd's hut on an alp named Drangnag, high in the Dudh Kosi glen, where we spent the night. They were about 35 centimeters long and 18 centimeters in width, and the animal had sunk into a heavy snow crust. For this reason, I do not believe that their size and shape had been distorted by the sun.

That evening, just as it was getting dark, both the Sherpas who were with us heard what they were convinced was a yeti calling. They said nothing about it at the time, but when, two days later, they reported the incident to our sirdar, Pinju, it confirmed my impression and my wife's that we, too, had heard a cry at that time.

We went to pay our respects to the head lama at Tengboche before leaving the district on our way home. We had stayed at the famous monastery in April 1953, during the first successful ascent of Everest, for a period of training and acclimatization, and my companions and I had called on the acting abbot. Sitting beside the old man as we partook of light refreshments, I asked him about the yeti. The effect was dramatic. He set aside his dignified demeanor and became decidedly animated.

Pointing out the window toward some rhododendron bushes that fringed the alp on which we had camped, he described how two years before, as he was sitting in the same upper room, a yeti had emerged, standing on two legs and scratching its armpits. Some zoologists see this as a sign of nervousness among the ape family, but the lama colony was decidedly alarmed. They fetched their cymbals, conch shells, and long bass horns and made such a din that the creature disappeared into the bushes. The abbot's account was convincingly told in every respect.

Now, 25 years later, we met with the successor to the man who had been head lama during our first visit. I told him about the tracks we had seen and asked for his views. He evinced no surprise. For him it was a matter of course. He told us, as had our old friend Dawa Tenzing during supper at his house the previous evening, that yetis regularly cross into Khumbu from Tibet in the early part of the winter and travel northward again in the spring.

Both the tracks reported by many travelers in the Himalayas and elsewhere in Asia since at least the beginning of this century and the descriptions of the creatures tally quite remarkably. Photographs of footprints, in particular one of those taken by Shipton in 1951 and also those by Frank Smythe in 1937, closely resemble the tracks of a large primate. The prominent sideways-pointing thumb is a telling feature. Other photographs also taken by Shipton and by Jackson and members of Izzard's expedition, leave room for more doubt.

My own sightings in 1937 and 1978 suggest the possibility that a bear or even a large snow leopard, might have been responsible for them. But I have seen and photographed tracks of European brown bears in the Pindus Mountains of central Greece, and I do not believe that those my wife and I saw in the Khumbu district were bear tracks.

Local people with whom I have spoken deny that bears are to be found in these places. They insist that the tracks are those of a biped whom they know as a man-beast (yeti). Others speak of a *mi-gó* or *mi-teh* (wild man), a *kang admi*, *kang mi*, or *almas* (snow man), or a *van manas* (forest man). Smythe was told in Garwhal that they are *mirka*. The Lepchas of Sikkim speak of the *harram-mo*, and there is a variety of nomenclature in several republics of the Soviet Union and in western provinces of the People's Republic of China.

My first introduction to the yeti occurred in 1937. Taking part in an expedition in north Sikkim that November, I was floundering through crusted snow in the upper reaches of the Zemu Glacier, beneath the east face of Kanchenjunga. My companion was Pasang, a young Sherpa who later achieved fame as one of the foremost climbers of his race. We were heading for the Zemu La, a narrow gap at 5,800 meters that separates Kanchenjunga from a neighboring summit named Simvo. It was exhausting and monotonous work.

Suddenly we came across two lines of tracks, one larger than the other, side by side, leading either from or toward our destination over the heavily crevassed part of the glacier. Although they were clearly imprinted and raised above the surrounding surface by wind action, their shape was indefinite. The size of the larger tracks, about 33 centimeters long and very broad, and the placing of the feet gave the impression of a two-legged creature of human proportions.

My reaction was one of disappointment. I assumed that these were the tracks of a German party we had encountered a few weeks earlier in a village below the glacier. I'd been forestalled in my hope to record the third ascent of the Zemu La.

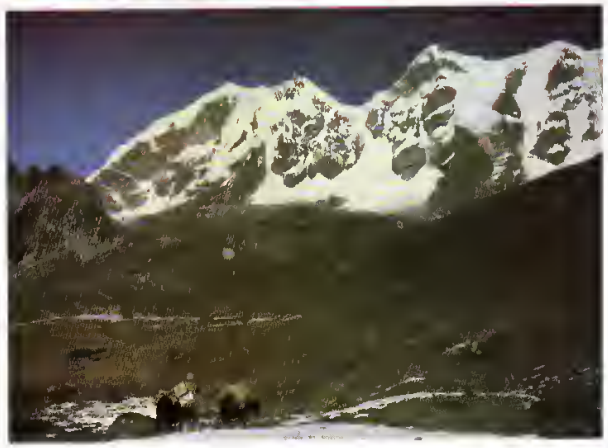
Pasang's response was very different. Although highly intelligent, he showed signs of great anxiety. "Those are yeti tracks," he said.

He believed, as other Sherpas still do, that calamity overtakes those who have the misfortune to catch sight of a yeti. His fear stemmed from the deaths of a German climber and a Sherpa who had fallen from the nearby northeast spur of Kanchenjunga during an expedition six years earlier. The Sherpa was reputed to have seen a yeti close to where we stood a few days before he died.

I paid scant attention to Pasang's story at the time. But my incipient belief in the yeti derives from the moment when, after our own expedition, the German party assured me that they had never been anywhere near the Zemu La. There were, in fact, no other explorers in the area during that winter.

A year later H. W. Tilman, who crossed the col to the Tangshyong Glacier from the Zemu Basin, saw similar tracks of a single beast leading up to the Zemu La. We both observed that the tracks led over the col, despite considerable technical difficulties in the descent on the south side. Many years after these sightings the German mountaineer G. O. Dyrenfurth, who had led an expedition to Kanchenjunga in 1930, told of two Norwegians who claimed to have encountered two yetis beneath the Zemu side of the col.

There is one more piece of evidence relating to the Zemu area. Twelve years before my own experience N. A. Tombazi, a Greek zoologist, told me of sighting a yeti after he had crossed the Zemu Glacier. In thick rhododendron scrub he caught a fleeting glimpse of "a human figure" several hundred meters away, moving around and apparently pulling up roots. His observation was limited by the setting sun, which silhouetted the apparition. On examining



On his return to Khumbu, Everest mountaineer Charles Wylie (top) interviewed a Sherpa yakherd who confirmed that yetis inhabit the Amai Dablang Glacier, where Lord Hunt first saw their tracks 2 years earlier. Valleys flanking Taboche and Jobo Laptshang (above) contained mysterious footprints found by the author last year, matching his earlier find and many of the tracks seen by others (right).

the area he found fresh footprints much like others described by many people in many different places. His Sherpas had no doubt that the creature was a yeti. When I met Tombazi in Athens years later, he still held firmly to his conviction that he had seen a biped.

Don Whillans, the famous British mountaineer who was a member of two Everest expeditions (in 1970 and 1972), reported a sighting very similar to Tombazi's, in the Khumbu district of Nepal. No one who knows the phlegmatic and down-to-earth Whillans would accuse him of flights of fancy.

Nor are these sightings exceptional. Reports of the yeti have been made regularly for at least 200 years. The Soviet Union has found these reports substantial enough that in 1971 it appointed Professor Boris Porshnev to head a commission to investigate alleged sightings in Siberia. Two years later a yeti reportedly walked past the tent of members of a zoological expedition from the United States to eastern Nepal. Publicity about the yeti was so widespread during this period that when Robert McNamara, then president of the World Bank, went to the Muktinath region of Nepal for a hiking vacation, in November 1973, he felt compelled to announce to the press that he was not searching for the legendary beast.

My interest in the yeti, aroused by the Zemu episode, was further whetted by the mountaineer Frank Smythe. He had photographed and followed tracks in Garwhal in the summer of 1937, and his pictures corresponded to the tracks I had seen.

World War II placed all opportunities to pursue the matter further into cold storage for a while. It was not until 1953 that I was able to obtain further testimony in our visit to the head lama at Tengboche. Ten days after that conversation I had camped with some of my team beside the Amai Dablang Glacier, where we were continuing our training before the whole expedition moved up to establish a base camp at the foot of the Everest icefall. As the light failed that evening, I heard some high-pitched, yelping cries from the far side of the glacier several hundred meters away. When I turned to one of the Sherpas, he said confidently, "That is a yeti."

To this slender shred of evidence I was able to add a further strand 20 years later. My wife and I, with two of my Everest companions, Alf Gregory and Charles Wylie, were camped beside the yakherds' huts at Bibre, in the upper Imja Basin, under the shadow of Amai Dablang. A lone herdsman occupied one of the huts, and Wylie asked him about the yeti. Like other Sherpas with whom I have spoken, he expressed complete assurance on the topic. "Of course they exist," he said, and he went on to relate his own alleged sightings over the border in Tibet. Asked whether there were yetis in our vicinity, he immediately pointed across the valley to the Amai Dablang Glacier. "Yes, over there," he said. It was the exact place where I had heard those cries 20 years earlier.

The general impression conveyed by numerous descriptions through history is that of a large, long-armed, slouching, apelike creature, frequently adopting an erect posture, capable of turns of speed, sure-footed on steep and difficult ground. The skin is described as dark or gray, partly covered by long body hair, gray or, more commonly, reddish and particularly thick on the back. Extreme ugliness by human standards is often mentioned, but the creature's face is also described as more human than simian. Yetis are said to be shy and not gregarious, moving singly or in pairs.

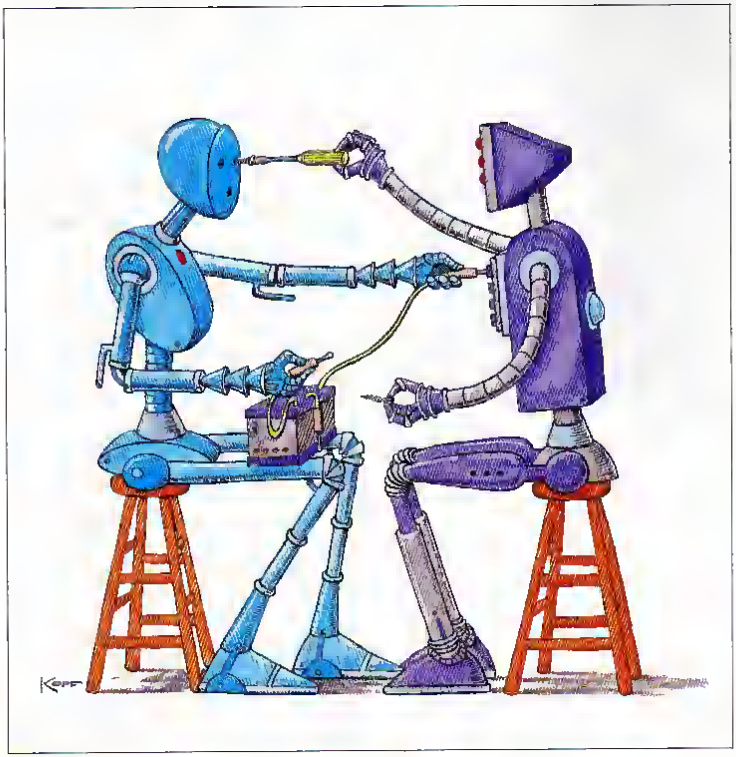
The yeti is variously claimed to be both carnivorous and herbivorous. Droppings believed to be those of the creature contained evidence of a small, tailless Tibetan rodent, the *pikka*, which is commonly found in Khumbu. There are also some unlikely tales of yetis killing or stealing horses and cattle.

Some of the stories date from many years ago and have been retold from one generation to the next. They include accounts of yetis that were captured and kept in a semidomesticated state. Recurrent finds of fresh tracks in mud or snow, some of which resemble those of no known animal, and the few reports of sightings within the past 20 years or so refuse to permit the Snowman to be dismissed as being nothing more than mere folklore or a figment of a runaway imagination.

There are accounts of more tangible evidence, most of them secondhand. Relics such as skins and scalps are said to be preserved in lamaseries. There are scalps in both Pangboche and Khumjung in the Khumbu district, and researchers have even viewed dried hands. One scalp, taken by Sir Edmund Hillary from Khumjung, was examined by the Chicago Natural History Museum, the Musée de l'Homme in Paris and the British Natural History Museum. At all three institutions the artifact was pronounced to be a skullcap made from the skin of a serow, a mountain goat commonly found in Khumbu.

False trails, exaggerated stories and absurd nicknames (Abominable Snowman was invented by Colonel Howard Bury, who found footprints in 1921, which his porters attributed to a *metch kang-mi*) have added to the doubts about the yeti. To date, nobody has brought in a corpse or a captive for scientific investigation. There is no photograph of a live specimen that could prove the creature's existence.

Neither the tracks nor the assurance with which the Sherpas and other mountain peoples in China and the Soviet Union profess their knowledge of a "wild man" surviving in a primitive state despite the march of civilization can be discounted or convincingly explained away. The real question is not whether yetis exist. It is how long they will continue to evade our attempts to locate them. ∞



FICTION

RENT CONTROL

Lovers dream of making time stand still, so they learned how to stop the clock

BY WALTER TEVIS

"My God," Edith said 'that was the most *real* experience of my life.' She put her arms around him, put her cheek against his bare chest, and pulled him tightly to her. She was crying.

He was crying, too. "Me too, darling," he said, and he held his arms around her. They were in the loft bed of her studio apartment on the East Side. They had just had orgasms together. Now they were sweaty, relaxed, blissful. It had been a perfect day.

Their orgasms had been foreshadowed by their therapy. That evening, after supper, they had gone to Harry's group, as always, on Wednesdays, and somehow everything had focused for them. He had at last shouted the heartfelt anger he bore against his incompetent parents; she had screamed her hatred of her sadistic mother, her gutless father. And their relief had come together there on the floor of a New York psychiatrist's office. After the screaming and pounding of fists, after the real and potent old rage in both of them was spent, their smiles at each other were radiant. They went afterwards to her apartment, where they had lived together half a year, climbed up the ladder into her bed, and began to make love slowly, carefully. Then frenetically. They were picked up bodily by it and carried to a place where they had never been before.

Now, afterwards, they were settling down in that place, huddled together. They lay silently for a long time. Idly she looked toward the ledge next to the mattress, where she kept cigarettes, a mason jar with miniature roses, a Japanese ashtray, and an alarm clock.

"The clock must have stopped," she said.

He mumbled something inarticulate. His eyes were closed.

"It says nine-twenty," she said. "and we left Harry's at nine."

"Hmmm," he said, without interest.

PAINTING BY GEORGE TOOKER

She was silent for a while, musing. Then she said, "Terry, what time does your watch say?"

"Time time," he said. Watch watch." He shifted his arm and looked. "Nine-twenty," he said.

"Is the second hand moving?" she asked. His watch was an Accutron, not given to being wrong or stopping.

He looked again. "Nope. Not moving." He let his hand, tall on her naked behind, now cool to his touch. Then he said, "That is funny. Both stopping at once." He leaned over her body toward the window, pried open a space in her Levolor blinds, and looked out. It was dark outside, with an odd shimmer to the air. Nothing was moving. There was a pile of plastic garbage bags on the sidewalk opposite. It can't be eleven yet. They haven't taken the garbage from the Toreador. The Toreador was a Spanish restaurant across the street they kept promising they would eat there sometime but never did.

"It's probably about ten-thirty," she said. "Why don't you make us an omelet and turn the TV on? Make mine with cheddar. And three eggs."

"Sure, honey," he said. He slipped on his bikini briefs and eased himself down the ladder. Barefoot, he went to the tiny Sony near the fireplace, turned it on, and padded over to the stove and sink at the other end of the room. He heard the TV come on as he located the omelet pan, which he had bought her under the sink, nestling between the Bon Ami and the Windex. He got eggs out, cracked one, looked at his watch. It was running. It said nine-twenty-six. "Hey, honey," he called out. "My watch is running."

After a pause she said, her voice slightly hushed, "So is the clock up here."

He shrugged and put butter in the pan and finished cracking the eggs, throwing the shells into the sink. He whipped the eggs with a fork, then turned on the fire under the pan and walked back to the Sony for a moment. A voice was saying, "... nine-thirty." He looked at his watch. Nine-thirty. "*Jesus Christ!*" he exclaimed.

But he had forgotten about it by the time he cooked the omelets. His omelets had been from the beginning one of the things that made them close. He had learned to cook them before leaving his wife, and it meant independence to him. He made omelets beautifully—tender and moist—and Edith was impressed. They had fallen in love over omelets, had called themselves the Cholesterol Kids, eating them after making love, eating them on Sundays. He cooked lamb chops too, and bought things like frozen cappelletti from expensive shops, but omelets were central.

They were both thirty-five years old, both youthful, good-looking, smart. They were both Pisces, with birthdays three days apart. Both had good complexions, healthy dark hair, clear eyes. They both bought clothes at Bergdorf Goodman and Saks and Bloomingdale's, they both read the Sunday *Times*, spoke fair French, and watched *Nova*, and each had read *The Stories of John Cheever*. He was a magazine illustrator; she a lawyer. They could have afforded a bigger place, but her studio was rent-controlled and had a terrific Midtown address. It was too much of a bargain to give up. "Nobody ever leaves a rent-controlled apartment," she told him. So they lived in one and a half rooms together, and money piled up in their bank accounts.

They were terribly nervous lovers at first, too unsure of everything to enjoy it, full of explanations and self-recriminations. He had trouble staying hard; she would not lubricate and could excite herself only with his hands on her. She was afraid of him and made love dutifully, often with resentment. He was embarrassed by his unreliable member, sensed her withdrawal from his ardor, was afraid to tell her so. Often they were miserable.

But she had the good sense to take him to her therapist, and he had the good sense to go. Finally, after six months of private sessions and of group, it had worked. They had had the perfect orgasm, the perfect release from tension, the perfect intimacy.

Terry touched Edith again, this time laying his hand gently on her bare back. Outside everything stopped. It was as if an image on a movie screen was stilled for that moment.

Now they ate their omelets in bed from Spode plates, using his mother's silver, forks. Sea salt and Java pepper. Their legs were entwined as they ate.

They lay silent for a while afterwards. He looked out the window. The garbage was still there, there was no movement in the street, no one was on the sidewalk. There was a flatness to the way the light shone on the buildings across from them, as if they were painted—some kind of a backdrop.

He looked at his watch. It said nine-forty-one. The second hand wasn't moving.

"Shit!" he said, puzzled.

"What's that, honey?" Edith said. "Did I do something wrong?"

"No, sweetie," he said. "You're the best thing that ever happened. I'm crazy about you." He patted her ass with one hand and gave her his empty plate with the other.

She set the two plates on the ledge, which was barely wide enough for them. She glanced at the clock. "Jesus," she said, "that sure is strange."

"Let's go to sleep," he said. "I'll explain the theory of relativity in the morning."

But when he woke up, it wasn't morning. He felt refreshed, thoroughly rested; he had the sense of a long and absolutely silent sleep, with no noises intruding from the world outside, no dreams, no complications. He had never felt better.

When he looked out the window the light from the streetlamp was the same and the garbage bags were still piled in front of the Toreador and—he saw now—what appeared to be the same taxi stood motionless in front of the same green station wagon in the middle of Fifty-first Street. He looked at his watch. It said nine-forty-one.

Edith was still asleep, on her belly, with one arm across his waist, her hip against his. Not waking her, he pulled away and started to climb down from the bed. On an impulse he looked again at his watch. It was nine-forty-one still, but now the second hand was moving.

He reached out and turned the electric clock on the ledge to where he could see its face. It said nine-forty-one also, and when he held it to his ear he could hear its gears turning quietly inside. His heart began to beat stronger and he found himself catching his breath.

He climbed down and went to the television set and turned it on again. The same face appeared as before, he had slept, wearing the same oversized glasses, the same bland smile.

Terry turned the sound up, seated himself on the sofa, lit a cigarette, and waited.

It seemed a long time before the news program ended and a voice said, "It's ten o'clock."

He looked at his watch. It said ten o'clock. He looked out the window; it was dark—evening. There was no way it could be ten in the morning. But he knew he had slept a whole night. He knew it. His hand holding the second cigarette was trembling.

Slowly and carefully he put out his cigarette, then climbed back up the ladder to the loft bed. Edith was still asleep. Somehow he knew what to do. He laid his hand on her leg and looked at his watch. As he touched her the second hand stopped. For a long moment he did not breathe.

Still holding her leg, he looked out the window. This time there was a group of people outside, they had just left the restaurant. None of them moved. The taxi had gone and with it the station wagon, but the garbage was still there. One of the people from the Toreador was in the process of putting on his raincoat. One arm was in a sleeve and the other wasn't. There was a frown on his face visible from the third-story apartment where Terry lay looking at him. Everything was frozen. The light was peculiar, unreal. The man's frown did not change.

Terry let go of Edith, and the man finished putting on his coat. Two cars drove by in the

CONTINUED ON PAGE 164

What's so hard about building a Heathkit product?

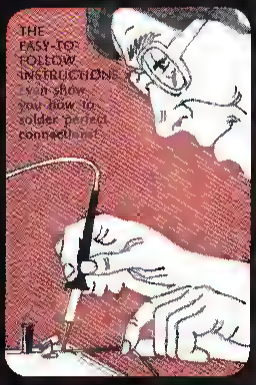
nothing!

JUST PICK A KIT...ANY KIT. Whether you're a beginner or an experienced kit builder, you'll find it's easier than you'd dreamed!

STEP-BY-STEP, CHECKING AS YOU GO—you can't go wrong when you do one step at a time and check your work!

GET STARTED

ALL THE PARTS ARE INCLUDED — even solder — so all you need are a soldering iron, wire cutter, pliers and a screwdriver!

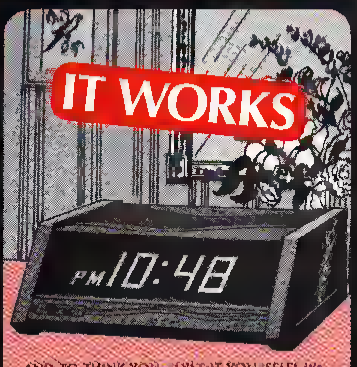


THE EASY-TO-FOLLOW INSTRUCTIONS even show you how to solder perfect connections!

ALL FINISHED

ONE LAST CHECK that all the connections are made right, and you're ready to turn it on...

IT WORKS



AND TO THINK YOU BUILT IT YOURSELF! It's a great feeling. You saved money — you enjoyed it — and you ended up with a great, hand-crafted product!

You can start right now...fill in the coupon and mail it today!

FREE HEATHKIT® CATALOG

Heathkit products are displayed, sold and serviced coast-to-coast at Heathkit Electronic Centers (Units of Schlumberger Products Corporation). See the white pages of your phone book for the store nearest you.

If coupon is missing, write:
Heath Company, Dept. 002-580
Benton Harbor, MI 49022

Read about nearly 400 money-saving, easy-to-build electronic kits — stereo, color TV, clocks and weather instruments, auto and aircraft accessories, Amateur Radio Equipment, Personal Computer Systems and much more! Simply remove the card along the perforated line, fill in and mail today.

HEATH
Schlumberger

Heath Company, Dept. 002-580
Benton Harbor, MI 49022

Please send me my FREE Heathkit Catalog.
I am not now receiving your catalogs.

Name_____

Address_____

City_____ State_____

CL-719 Zip_____

BEAST

CONTINUED FROM PAGE 69

flashed me a smile and put them back on her father. He gave up and let her. She then took his arm firmly. "Aunt Hilda!"

Our hostess came running over. "Yes, Deety? Why did you stop them, darling? You didn't give us time to get bets down." Fights were no novelty at Hilda 'Sharp" Corners's parties. Her food and liquor were lavish, the music always live, her guests were often eccentric but never dull. I had been surprised at the presence there of N. O. Brain.

I now felt that I understood it: a planned hypergolic mixture.

Deety ignored Hilda's questions. "Will you excuse Pop and me and Mr. Carter? Something urgent has come up."

"You and Jake may leave if you must. But you can't drag Zebbie away, Deety. That's cheating."

Deety looked at me. "May I tell?"

"Eh? *Certainly!*"

That blifty Brainy picked this moment to interrupt. "Mrs. Corners, Dr. Burroughs can't leave until he apologizes! I insist. My privilege!"

Our hostess looked at him with scorn. "*Merde*, Professor. I'm not one of your teaching fellows. Shout right back at Jake Burroughs if you like. If your command of invective equals his, we'll enjoy hearing it. But just *one more word* that sounds like an order to me or to one of my guests, and out you go! Then you had best go straight home; the Chancellor will be trying to reach you." She turned her back on him. "Deety, you started to add something?"

Sharp Corners can intimidate Internal Revenue agents. She hadn't cut loose on Brainy—just a warning shot across his bow. But from his face one would have thought she had hulled him. However, her remark to Deety left me no time to see whether he would have a stroke.

"Not Deety, Hilda. Me. Zeb."

"Quiet, Zebbie. Whatever it is, the answer is no. Deety? Go ahead, dear."

Hilda is related to that famous mule. I did not use a baseball bat because she only comes up to my armpits and grosses forty-odd kilos. I picked her up by her elbows and turned her around, facing me. "Hilda, we're going to get married."

"Zebbie darling! I thought you would *never* ask."

"Not you, you old harridan. Deety. I proposed, she accepted. I'm going to nail it down before the anesthetic wears off."

Hilda looked thoughtfully interested. "That's reasonable." She craned her neck to look at Deety. "Did he mention his wife in Boston, Deety? Or the twins?"

I set Hilda back on her feet. "Pipe down, Sharpie; this is serious. Dr. Burroughs, I am unmarried, in good health, solvent, and able to support a family. I hope this meets with your approval."

"Pop says yes," Deety answered. "I hold his power of attorney."

"You pipe down, too. My name is Carter, sir. Zeb Carter. I'm on campus; you can check my record. But I intend to marry Deety at once, if she will have me."

"I know your name and record, sir. It doesn't require my approval. Deety is of age. But you have it anyhow." He looked thoughtful. "If you two are getting married at once, you'll be too busy for shoptalk. Or would you be?"

"Pop, let it be. It's all set."

"So? Thank you, Hilda, for a pleasant evening. I'll call you tomorrow."

"You'll do no such thing, you'll come straight back and give me a full report, Jake. I heard you. You are *not* going on their honeymoon."

"Aunt Hilda, please! I'll manage every thing."

We were out the side door close on schedule. At the parking lot there was a bobble. Which heap, mine or theirs? Mine is intended for two but can fake four. The rear seats are okay for two for short trips. Theirs was a four-passenger family saloon, not fast but roomy, and their luggage was in it.

> *"I have no precognition for harmless events. But this split-second knowledge has kept me alive when I need it... in an era when homicide kills more people than cancer."*

"How much luggage?" I asked Deety while I visualized two overnight bags strapped into one backseat with my prospective father-in-law stashed in the other.

"I don't have much, but Pop has two big bags and a fat briefcase. I'll show you."

Damn. "Perhaps you'd better. Where?"

"Over in the far corner. I'll unlock it and turn on the lights." She reached into the inside pocket of her father's jacket and took out a Magic Wand.

"Wait for baby!"

The shout was from our hostess. Hilda was running down the path in front of her house, purse clutched in one hand and about eight thousand newdollars worth of sunset mink flying like a flag from the other.

So the discussion started over again. Seems Sharpie had decided to come along to make certain that Jake behaved himself, and she had taken just long enough to tell Max (Hilda's bouncer-butler-driver) when to throw the drunks out or cover them with blankets, as needed.

Hilda listened to Deety's summary, then nodded. "Got it. I can handle your car, Deety. Jake and I will go in it. You ride with Zebbie, dear." She turned to me. "Hold down the speed, Zebbie, so that I can follow. No tricks, Buster. Don't try to lose us, or you'll have cops busting out of your ears."

I turned my sweet innocent eyes toward her. "Why, Sharpie darling, you know I wouldn't do anything like that."

"You'd steal City Hall if you could figure a way to carry it. Who dumped that load of lime Jello into my swimming pool?"

"I was in Africa at that time, as you know."

"So you say. Deety darling, keep him on a short leash and don't feed him meat. But marry him; he's loaded. Now where's that radio link? And your car."

"Here," said Deety, pointing the Magic Wand and pressing the switch.

I gathered all three into my arms and dived. We hit the ground as the blast hit everything else. But not us. The blast shadow of other cars protected us.

III

Zeb

Don't ask me how. Ask a trapeze artist how he does a triple 'sault. Ask a crap-shooter how he knows when he's hot. But don't ask me how I know it's going to happen just before it hits the fan.

It doesn't tell me anything I don't need to know. I don't know what's in a letter until I open it (except the time it was a letter bomb). I have no precognition for harmless events. But this split-second knowledge when I need it has kept me alive and relatively unscarred in an era when homicide kills more people than does cancer, and the favorite form of suicide is to take a rifle up some tower and keep shooting until the riot squad settles it.

I don't *see* the car around the curve on the wrong side. I automatically hit the ditch. When the San Andreas Fault cut loose, I jumped out a window and was in the open when the shock arrived—and didn't know why I had jumped.

Aside from this, my ESP is erratic. I bought it cheap from a war-surplus outlet.

I sprawled with three under me. I got up fast, trying to avoid crushing them. I gave a hand to each woman, then dragged Pop to his feet. No one seemed damaged. Deety stared at the fire blazing where their car had been; face impassive. Her father was looking at the ground, searching. Deety stopped him. "Here, Pop." She put his glasses back on him.

"Thank you, my dear." He started toward the fire.

I grabbed his shoulder. "*No!* Into my car—*fast!*"

"Eh? My briefcase... could have blown clear."

"Shut up and move! All of you!"

"Do it, Pop!" Deety grabbed Hilda's arm. We stutted the older ones into the after space, I shoved Deety into the front passenger seat and snapped, "Seat belts!" as I slammed the door, then was around to the

left so fast that I should have caused a sonic boom. "Seat belts fastened?" I demanded as I fastened my own and locked the door.

"Jake's is fastened, and so is mine, Zebbie dear," Hilda said cheerfully.

"Belt tight, door locked," Deety reported.

The heap was hot. I had left it on trickle. What use is a fast car that won't go *scat*? I switched from trickle to full, did not turn on the lights, glanced at the board, and released the brake.

It says here that duos must stay grounded inside city limits, so I was lifting her nose before she had rolled a meter, and she was pointed straight up as we were clearing the parking lot.

Half a klick straight up while the g meter climbed—two, three, four—I let it reach five and held it, not being sure what Pop's heart could take. When the altimeter read four klicks, I cut everything—power, transponder, the works—while hitting a button that dropped chaff, and let her go ballistic. I didn't *know* that anyone was tracking us. I didn't want to find out.

When the altimeter showed that we had topped out, I let the wings open a trifle. When I felt them bite air, I snap-rolled her onto her belly, let wings crawl out to subsonic, and let her glide. "Everybody okay?"

Hilda giggled. "Whoops, dearie! Do that again! This time, somebody kiss me."

"Pipe down, you shameless old strumpet. Pop?"

"I'm okay, son."

"Deety?"

"Okay here."

"Did that fall in the parking lot hurt you?"

"No, sir." I twisted in the air and took it on one buttock while getting Pop's glasses. "But next time put a bed under me, please. Or a wrestling mat."

"I'll remember." I switched on the radio, but not the transponder, and tried all police frequencies. If anyone had noticed our diddoes, they weren't discussing it on the air. We were down to two klicks. I made an abrupt wingover to the right, then switched on power. "Deety, where do you and your Pop live?"

"Logan, Utah."

"How long does it take to get married there?"

"Zebbie," Hilda cut in, "Utah has no waiting time—"

"So we go to Logan."

"—but does require a blood test. Deety, do you know Zebbie's nickname around campus? The Wasp. For 'Wassermann positive.' Zebbie, everybody knows that Nevada is the only state that offers twenty-four-hour service, no waiting time, no blood test. So point at Reno and sign off."

"Sharpie, darling," I said gently, "would you like to walk home from two thousand meters?"

"I don't know. I've never tried it."

"That's an ejection seat . . . but no parachutes."

"Oh, how romantic! Jake, darling, we'll sing the *Liebestod* on the way down. You'll sing tenor, I'll force a soprano, and we'll die in each other's arms, Zebbie could we have more altitude? For the timing."

"Dr. Burroughs, gag that hitchhiker. Sharpie, '*Liebestod*' is a solo."

"Picky, picky! Isn't dead on arrival enough? Jealous because you can't carry a tune? I *told* Dicky Boy that that should be a duet, and Cosima agreed with me—"

"Sharpie, button your frimpin' lip while I explain. One, Everybody at your party knows why we left and will assume that we headed for Reno. You probably called out something to that effect as you left—"

"I believe I did. Yes, I did."

"Shut up. Somebody made a professional effort to kill Dr. Burroughs. Not just kill, but overkill; that combo of high explosive and Thermit was intended to leave nothing to analyze. But it is possible that no one saw us lift. We were into this go-wagon and I was goosing it less than thirty seconds after that booby trap exploded. Innocent bystanders would look at the fire, not at us. *Guilty* bystanders . . . There wouldn't be any. A professional who booby-traps a car either holes up or crosses a state line and gets lost. The party or parties who paid for the contract may be nearby, but if they are, Hilda, they're in your house."

"One of my *guests*?"

"Oh, shut it, Sharpie, you are never interested in the morals of your guests. If they can be depended on to throw custard pies or do impromptu strips, or some other prank that will keep your party from growing dull, that qualifies them. However, I am *not* assuming that the boss villain was at your party. I am saying that he would not be lurking where the Man might put the arm on him. Your house would be the best place to hide and watch the plot develop."

"But, guest or not, he was someone who *knew* that Dr. Burroughs would be at your party. Hilda, who knew that key fact?"

She answered with uncustomary seriousness. "I don't know, Zebbie. I would have to think."

"Think hard."

"Mmm, not many. Several were invited because Jake was coming. You, for example—"

"I became aware of that."

"—but you weren't told that Jake would be present. Some were told—N. O. Brain, for example—but I can't imagine that old fool booby-trapping a car."

"I can't, either, but killers don't look like killers, they look like people. How *long* before the party did you tell Brainy that Pop would be present?"

"I told him when I invited him. Mmm, eight days ago."

I sighed. "The possibilities include not only the campus but the entire globe. So we must try to figure probables. Dr. Burroughs, can you think of anyone who would like to see you dead?"

"Several!"

"Let me rephrase that Who hates your guts so bitterly that he would not hesitate to kill your daughter as long as he got *you*? And also bystanders such as Hilda and me Not that we figure, save to show that he didn't give a hoot who caught it A deficient personality Amoral *Who is he?*"

Pop Burroughs hesitated "Dr Carter, disagreement between mathematicians can be extremely heated and I am not without fault" *You're telling me Pop!* But these quarrels rarely result in violence Even the death of Archimedes was only indirectly related to his—our—profession To encompass my daughter as well No, even Dr Brain, much as I despise him does not fit the picture."

Deety said 'Zeb could it have been *me* they were shooting at?

You tell *me* Whose dolly have you busted?

'Hmm I can't think of anyone who dislikes me even enough to snub me Sounds silly but it's true'

'It's the truth' put in Sharpie "Deety is just like her mother was When Jane—Deety's mother and my best friend until we lost her—and I were roommates in college I was always getting into jams and Jane was always getting me out and never got into one herself A peacemaker So is Deety"

"Okay Deety, you're out of it So is Hilda, and so am I as whoever placed that booby trap would not predict that either Hilda or I would be in blast range So it's Pop they're gunning for Who we don't know why we don't know When we figure out why, we'll know who Meantime we've got to keep Pop out of range I'm going to marry you as fast as possible not only because you smell good but to give me a legitimate interest in this fight

So we go first to Reno."

'Shut up Sharpie We've been on course for Reno since we leveled off' I flipped on the transponder, but to the left not to the right It would now answer with a registered legal signal—but not one registered to my name This cost me some shekels I did not need but that were appreciated by a tight-lipped family man in Indio Sometimes it is convenient not to be identified by sky cops every time one crosses a state line

But we aren't going to Reno Those cowboy maneuvers were intended to deceive the eye radar and heat seekers The evasion against the heat seekers—that rough turn while we were still in glide—either worked or was not needed, as we haven't had a missile up the tail Probably wasn't needed; people who booby-trap cars aren't likely to be prepared to shoot a duo out of the sky But I couldn't be certain so I ducked We may be assumed to have died in the blast and fire, and that assumption may stand up until the mess has cooled down and there is daylight to work by Even later it may stand up, as the cops may not tell anyone that they were unable to find organic remains But I *must* assume that Professor Moriarty isn't fooled that he is watching by repeater scope in his secret HQ that he knows we are headed for Reno, and that hostiles will greet us there So we won't go there Now quiet please, I must tell this baby what to do"

The computer-pilot of my car can't cook but what she can do she does well I called for display map changed scale to include Utah, used the light pen to trace route—complex as it curved around Reno to the south, back north again made eastward over some very empty country and passed north of Hill Air Force Range in approaching Logan I ted in height-above-ground while giving her leeway to smooth out bumps and added one change in speed-over-ground once we were clear of Reno radar "Got it, girl?" I asked her

"Got it Zeb"

"Ten-minute call please"

"Will call you ten minutes before end of routing!"

"You're a smart girl Gay"

"Boss I bet you tell that to all the girls Over"

"Roger and out, Gay The display faded

Certainly I could have programmed my autopilot to accept a plan in response to a punched "Execute" But isn't it pleasanter to be answered by a warm contralto? But the 'smart girl' aspect lay in the fact that it took *my* voice to make a flight plan operative A skilled electron pusher might find a way to override my lock, then drive her manually But the first time he attempted to use autopilot the car not only would not accept the program but would scream for help on all police frequencies This unnerves car thieves

I looked up and saw that Deety had been following this intently I waited for some question Instead Deety said, 'She has a very pleasant voice, Zeb"

"Gay Deceiver is a very nice girl Deety"

"And talented Zeb I have never before been in a Ford that can do the things this car—Gay Deceiver?—can do

"After we're married I'll introduce you to her more formally It will require reprogramming."

"I look forward to knowing her better"

"You will Gay is not exactly all Ford Her external appearance was made by Ford of Canada Most of the rest of her once belonged to Australian Defence Forces But I added a few doodads The bowling alley The powder room The veranda Little homey touches."

"I'm sure she appreciates them Zeb I know I do I suspect that had she not had them, we would all be as dead as canasta"

"You may be right It so, it would not be the first time Gay has kept me alive You have not seen all her talents"

"I'm beyond being surprised So far as I can see, you didn't tell her to land at Logan"

"Logan seems to be the next most likely place for a reception committee Who in Logan knows that you and your father were

going to visit Hilda?"

"No one through me."

"Mail? Milk cartons? Newspapers?"

"No deliveries to the house, Zeb." She turned her head. "Pop, does anyone in Logan know where we went?"

"Dr. Carter, to the best of my knowledge, no one in Logan knows that we left. After having lived many years in the buzzing gossip of academe, I have learned to keep my life as private as possible."

"Then I suggest that you all ease your belts and sleep. Until ten minutes before reaching Logan there is little to do."

"Dr. Carter—"

"Better call me Zeb, Pop. Get used to it."

"Zeb it is, son. On page eighty-seven of your monograph, after the equation numbered one-twenty-one, in your discussion of the rotation of six-dimensional spaces of positive curvature, you said, 'From this it is evident that,' and immediately wrote your equation one-twenty-two. How did you do it? I'm not disagreeing, sir. On the contrary! But in an unpublished paper of my own I used a dozen pages to arrive at the same transformation. Did you have a direct intuition? Or did you simply omit publishing details? No criticism. I am impressed either way. Sheer curiosity."

"Doctor, *I* did not write that paper," I told Deety so.

"That *is* what he claimed, Pop."

"Oh, come now! *Two* Drs. Zebulon E. Carter on one campus?"

"No. That's not my name. I'm Zebadiah J. Carter. Zebulon E.-for-Edward Carter, and called Ed, is my cousin. While he is probably listed as being on campus, he is in fact doing an exchange year in Singapore. It's not as improbable as it sounds. *All* male members of my family have first names starting with Z. It has to do with money and a will and a trust fund and the fact that my grandfather and his father were somewhat eccentric."

"Whereas *you* aren't," Hilda said in her sweetest voice.

"Quiet, dear." I turned foward Deety. "Deety, do you want to be released from our engagement? I *did* try to tell you that you had trapped the wrong bird."

"Zebadiah—"

"Yes, Deety?"

"I intend to marry you before this night is over. But you haven't kissed me. I want to be kissed."

I unfastened my seat belt, started to unfasten hers, found that she had done so.

Deety kisses even better than she tangos.

During a break for oxygen, I asked her in a whisper, "Deety, what do your initials stand for?"

"Well . . . please don't laugh."

"I won't. But I have to know them for the ceremony."

"I know. All right, *D. T.* stands for Dejah Thoris."

Dejah Thoris—Dejah Thoris Burroughs—Dejah Thoris *Carter*! I cracked up.

I got it under control after two whoops. Too many. Deety said sadly, "You said you wouldn't laugh."

"Deety darling, I wasn't laughing at *your* name. I was laughing at *mine*."

"I don't think Zebadiah is a funny name. I like it."

"So do I. It keeps me from being mixed up with the endless Bobs and Eds and Toms. But I didn't tell my middle name. What's a funny name starting with *J*?"

"I won't guess."

"Let me lead up to it. I was born near the campus of the university Thomas Jefferson founded. The day I graduated from college I was commissioned as a second lootie, Aerospace Reserve. I've been promoted twice. My middle initial stands for John."

It took not quite a second for her to add it up. "Captain . . . John . . . Carter . . . of Virginia."

"A clean-limbed fighting man," I agreed. "Kaor, Dejah Thoris. At your service, my princess. Now and forever!"

A skilled electron pusher might find a way to override my lock, then drive her . . . But the car . . . would scream for help on all police frequencies. This unnerves car thieves.

"Kaor, Captain John Carter. Helium is proud to accept."

We fell on each other's shoulders, howling. After a bit, the howling died down and turned into another kiss.

When we came up for air, Hilda tapped me on a shoulder. "Would you let us in on the joke?"

"Do we tell her, Deety?"

"I'm not sure. Aunt Hilda talks."

"Oh, nonsense! I know your full name, and I've never told anyone. I held you at your christening. You were wet, too. At both ends. Now give!"

"All right. We don't have to get married. We already *are*. For years. More than a century."

Pop spoke up. "Eh? What's this?" I explained to him. He looked thoughtful, then nodded. "Logical." He went back to some figuring he was doing in a notebook, then looked up. "Your cousin Zebulon, is he in the telephone book?"

"Probably not, but he lives at the New Raffles."

"Excellent. I'll try both the hotel and the university. Doctor . . . son . . . Zeb, would you be so kind as to place the call? My Comcredit code is Nero Aleph eight zero one dash seven five two dash three nine three two Zed Star Zed." (Zed Star Zed credit rating—I was not going to have to support my prospective father-in-law.)

Deety cut in. "Pop, you must *not* call Professor Carter—Zebulon Carter—at this hour."

"But, my dear daughter, it is not late at night in—"

"Of course it isn't. I can count. You want a favor from him. So don't interrupt his after-lunch nap. 'Mad dogs and Englishmen—'"

"It isn't noon in Singapore. It's—"

"Siesta time, even hotter than noon. So wait."

"Deety is right, Pop," I interrupted, "but for the wrong reasons. It doesn't seem to be a matter of life and death to call him this minute. Whereas it might be a matter of life and death—ours, I mean—to make a call from this car, especially with your credit code. Until we find out who the Boys in the Black Hats are, I advise that you place calls from the ground and from public phones that you can feed with newdollars instead of your code. Say a phone in Peoria. Or Paducah. Can it wait?"

"Since you put it that way, sir, yes, it can wait. Although I have trouble believing that anyone wishes to kill me."

"Available data indicate it."

"Agreed. But I have not yet grasped it emotionally."

"Takes a baseball bat," said Hilda. "I had to sit on him while Jane proposed to him."

"Why, Hilda my dear, that is utterly unfactual. I wrote my late beloved a polite note saying—"

I let them argue while I tried to add to available data. "Gay Deceiver."

"Yes, Boss?"

"News, dear."

"Ready, Boss."

"Retrieval parameters: Time: since twenty-one hundred. Area: California, Nevada, Utah. Persons: your kindly boss, dear Jacob Burroughs, Dr. D. T. Burroughs, Miz Hilda Corners." I hesitated. "Professor Neil O'Heret Brain." I felt silly adding Brainy but there had been a row between Pop and him, and years earlier my best teacher had said, 'Never neglect the so-called trivial roots of an equation,' and had pointed out that two Nobel prizes had derived from 'trivial' roots.

"Parameters complete, Boss?"

Dr. Burroughs touched my shoulder. "Can your computer check the news, if any, on your cousin?"

"Mmm, maybe. She stores sixty million bytes, then wipes last-in-last-out everything not placed on permanent. But her news storage is weighted sixty-forty in favor of North America. I'll try. Smart Girl."

"Holding, Boss."

"Addendum: First retrieve by parameters given. Then retrieve by new program: Time: backwards from now to wipe time. Area: Singapore. Person: Zebulon Edward Carter aka Ed Carter aka Doctor Z. E. Carter aka Professor Z. E. Carter aka Professor or

Dr Carter of Raffles University"

"Two retrieval programs in succession Got it, Zeb"

"You're a smart girl, Gay"

"Boss I bet you tell that to all the girls Over"

"Roger Gay Execute!"

San Francisco (AP) A mysterious explosion disturbed the academic quiet of " A story ending with the usual claim about an arrest being expected momentarily" settled several points All of us were believed dead Our village top cop claimed to have a theory but was keeping mum—meaning that he knew even less than we did Since we were presumed dead and since the news said nothing about an illegal lift-off and other capers that annoy sky cops I assumed that police radar had not been looking at us until after we had become just one more blip behaving legally The lack of mention of the absence of Gay Deceiver did not surprise me as I had roaded in and had been last or nearly last to park and could have arrived by taxi by public capsule or on foot Dr Brain was not mentioned and there was nothing about the row Guests had been questioned and released Five cars parked near the explosion had been damaged

"Nevada null retrieval Utah Salt Lake City (UPI) A fire near Utah State University campus in Logan destroyed " Blokes in black hats again and Deety and her Pop were dead twice over, as they were presumed to have been overcome by smoke unable to escape No one else hurt or missing Fire attributed to faulty wiring 'End of first retrieval, Zeb Second retrieval starting " Gay shut up

I said soberly "Pop somebody doesn't like you

He groaned "Gone! All gone!"

"No copies of your papers elsewhere? And your gadget?"

'Eh? No, no! It's *much* worse! My irreplaceable collection of pulp magazines *Weird Tales*, *Argosy*, *All-Story*, the early Gernsbachs *The Shadow Black Mask—oooooh!*'

"Pop really does feel bad" Deety whispered and I could manage tears myself I taught myself to read from that collection *War Aces*, *Air Wonder*, the complete Clayton *Astoundings* It was appraised at two hundred thirteen thousand newdollars Grandpop started it, Pop continued it I grew up reading them"

"I'm sorry Deety' I hugged her "They should have been microfiched"

They were But that's not like having the magazines in your hands

'I agree Uh, how about the you know, thing in the basement?'

'What thing in the basement?" demanded Sharpie 'Zebbie, you sound like H P Lovecraft '

Later, Sharpie Comfort Jake, we're busy Gay!"

Here, Zeb Where's the riot?

"Display map please " We were midway over northern Nevada Cancel routing and cruise random Report nearest county seat

"Winnemucca and Elko are equidistant to one percent Elko closer by ETA as I am now vectored eleven degrees north of Elko bearing

"Deety, would you like to be married in Elko?"

"Zebadiah, I would love to be married in Elko "

"Elko it is, but loving may have to wait Gay vector for Elko and ground us, normal private cruising speed Report ETA in elapsed minutes "

"Roger Wilco, Elko Nine minutes seventeen seconds "

Hilda said soothingly "There there Jake darling Mama is here," then added in her top-sergeant voice "quit stalling Zebbie! What thing in which basement?"

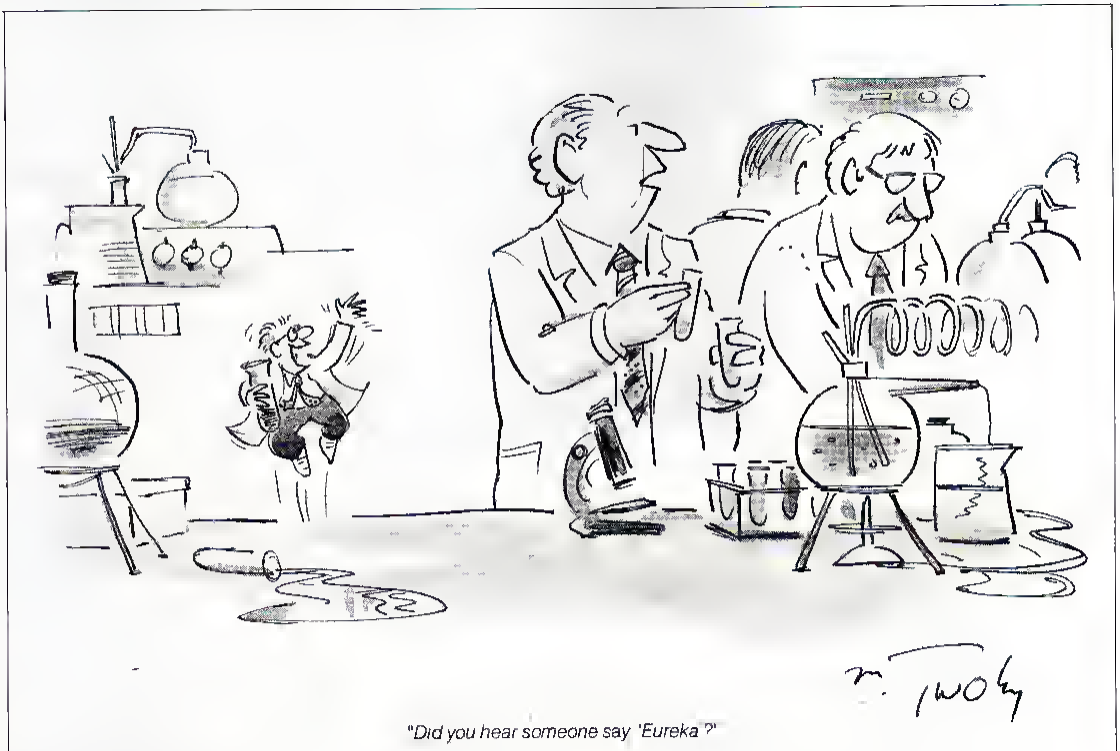
"Sharpie you're nosy It belonged to Pop and now it's destroyed and that's all you need to know"

"Oh, but it wasn't, Dr Burroughs said "Zeb is speaking of my continua craft, Hilda It's safe Not in Logan"

"What in the name of the dog is a continua craft?"

"Pop means," Deety explained, "his time machine '

"Then why didn't he say so? Everybody savvies *time machine* George Pal's *Time Machine*—a classic goodie I've caught it



"Did you hear someone say 'Eureka'?"

on the late-late early show more than once."

Second retrieval complete. Gay Deceiver reported. Holding.

Report second retrieval, please."

Singapore (Reuters). The Marston expedition in Sumatra is still unreported, according to authorities at Palembang. The party is thirteen days overdue. Besides Professor Marston and native guides and assistants, the party included Dr. Z. E. Carter, Dr. Cecil Yang, and Mr. Giles Smythe-Belisha. The minister of Tourism and Culture stated that the search will be pursued assiduously. End of retrieval."

Poor Ed. We had never been close, but he had never caused me grief. I hoped that he was shacked up with something soft and sultry, rather than losing his head to a jungle machete, which seemed more likely. "Pop, a few minutes ago I said that somebody doesn't like you. I now suspect that somebody doesn't like *n*-dimensional geometers."

"It would seem so, Zeb. I do hope your cousin is safe—a most brilliant mind! If not, it would be a great loss to all mankind."

(And to himself, I added mentally. And to me, since family duty required that I do something about it. When what I had in mind was a honeymoon.) "Gay."

"Here, Zeb."

"Addendum. Third news retrieval program. Use all parameters second program. Add Sumatra to area. Add all proper names and titles found in second retrieval. Run until canceled. Place retrievals in permanent memory. Report new items soonest. Start."

"Running, Boss."

"You're a good girl, Gay."

"Thank you, Zeb. Grounding Elko two minutes, seven seconds."

Deety squeezed my hand harder. "Pop, as soon as I'm legally Mrs. John Carter, I think we should all go to Snug Harbor."

"Eh? Obviously."

"You too, Aunt Hilda. It might not be safe for you to go home."

"Change in plans, dear. It's going to be a double wedding. Jake, Me."

Deety looked alert but not displeased. "Pop?"

"Hilda has at last consented to marry me, dear."

"Rats," said Sharpie. "Jake has never asked me in the past and didn't this time. I simply told him. Hit him with it while he was upset over losing his comic books and unable to defend himself. It's necessary, Deety. I promised Jane I would take care of Jake, and I have—through you, up to now. But from here on, you'll be taking care of Zebbie, keeping him out of trouble, wiping his nose. So I've got to hog-tie Jake into marriage to keep my promise to Jane. Instead of sneaking into his bed from time to time as I've done in the past."

"Why, Hilda dear, you have never been in my bed!"

"Don't shame me in front of the children, Jake. I gave you a test run before I let Jane marry you, and don't you dare deny it."

Jake shrugged helplessly. "As you wish, dear Hilda."

"Aunt Hilda, do you love Pop?"

"Would I marry him if I didn't? I could carry out my promise to Jane more simply by having him committed to a shrink factory, Deety. I've loved Jake longer than you have. *Much!* But he loved Jane, which shows that he is basically rational despite his weird ways. I won't try to change him, Deety, I'm simply going to see to it that he wears his overshoes and takes his vitamins, as you've been doing. I'll still be Aunt Hilda, not Mother Jane was and *is* your mother."

Thank you, Aunt Hilda. I thought I was as happy as a woman can be, getting Zebadiah. But you've made me still happier. No worries."

(I had worries. Blokes with black hats and no faces. But I didn't say so, as Deety was snuggling closer and assuring me that it was all right because Aunt Hilda wouldn't fib about loving Pop, but I should ignore that guff about her sneaking into Pop's bed—on which I had no opinion and less interest.) "Deety, where and what is Snug Harbor?"

"It's a nowhere place. A hideout. Land Pop leased from the government when he decided to build his time twister instead of just writing equations. But we may have to wait for daylight. Unless... Can Gay Deceiver home on a given latitude and longitude?"

"She certainly can! Precisely."

"Then it's all right. I can give it to you in degrees, minutes, and fractions of a second."

"Grounding," Gay warned us.

The Elko County clerk did not object to getting out of bed and seemed pleased with the century note I slipped him. The county judge was just as accommodating and pocketed her honorarium without glancing at it. I stammered but managed to say "I, Zebadiah John, take thee, Dejah Thoris." Deety went through it as solemnly and perfectly as if she had rehearsed it, while Hilda sniffled throughout the ceremony.

A good thing that Gay came home on a pin point, I was in no shape to drive, even in daylight. I had her plan her route, too, a dogleg for minimum radar and no coverage at all for the last hundred odd kilometers to this place in the Arizona strip north of the Grand Canyon. But I had her hover before grounding—I being scared silly until I was certain there was not a third fire there.

A cabin, fireproof, with underground parking for Gay. I relaxed.

We split a bottle of chablis. Pop seemed about to head for the basement. Sharpie tromped on it, and Deety ignored it.

I carried Deety over the threshold into her bedroom, put her gently down, faced her. "Dejah Thoris—"

"Yes, John Carter?"

"I did not have time to buy you a wedding

present but I do have something for you."

"I need no present from my captain."

"Haar me out, my princess. My Uncle Zamir did not have as fine a collection as your father had, but may I gift you with a complete set of Clayton *Astoundings*—"

She suddenly smiled.

"—and first editions of the first six *Oz* books, quite worn but with the original color plates? And a first in almost mint condition of *A Princess of Mars*?"

The smile became a grin, and she looked nine years old. "Yes!"

"Would your father accept a complete set of *Weird Tales*?"

"Would he! *Northwest Smith* and *Jirel of Joiry*? I'm going to borrow them, or he can't look at my *Oz* books. I'm stubborn, I am. And selfish. And *mean*!"

"Stubborn stipulated. The others denied."

Deety stuck out her tongue. "You'll find out." Suddenly her face was solemn. "But I sorrow, my prince, that I have no present for my husband."

"But you have!"

"I do?"

"Yes. Baautifully wrapped and making me dizzy with heavenly fragrance."

"Oh." She looked solemn but very happy. "I would like my husband to unwrap me. Please?"

I did.

That is all anyone is ever going to know about our wedding night.

IV

Deety

I woke early as I always do at Snug Harbor, wonderad why I was ecstatically happy then remembered and turned my head. My husband—*husband!*—what a heart-filling word—my husband was sprawled facedown beside me, snoring softly and drooling onto his pillow. I held still, thinking how beautiful he was, how gently strong and gallantly tander.

I was tempted to wake him, but I knew that my darling needed rest. So I eased out of bed and sneaked noiselessly into my bathroom—*our* bathroom!—and quietly took care of this and that. I did not risk drawing a bath although I needed one. I have a strong body odor that calls for at least one sudsy bath a day; two if I am going out that evening, and this morning I was certainly whiff as a polecat.

I made do with a stand-up bath by letting water run in a noiseless trickle into the basin. I would grab that proper bath after my captain was awake, meanwhile. I would stay downwind.

I pulled on shorts, started to tie on a halter, stopped, and looked in the mirror.

Suddenly I wondered why I was putting on a halter. The day was going to be hot. While Pop is so cubical about some things that he turns up at the corners, skin is not one of them. (Possibly he had been, then Mama had gently gotten her own way.) I like to be naked and usually am at Snug Harbor, weather permitting. Pop is almost as casual. Aunt Hilda was family-by-choice; we had often used her pool and never with suits (the pool was screened for that purpose).

That left just my lovely new husband, and if there was a square centimeter of ma he had not examined (and praised), I could not recall it. Zebadiah is easy to be with in bed or out. After our hasty wedding I was slightly tense lest he ask me when and how I had mislaid my virginity. But when the subject could have come up, I forgot it and he apparently never thought about it. I was the lusty wench I have always been, and he seemed pleased—I *know* he was.

So why was I tying on this teat hammock? I was—but *why*?

Because two things equal to the same thing are never equal to each other. Basic mathematics. If you select the proper sheet of postulates. People are not abstract symbols. I could be naked with any one of them but not with all three.

I felt a twinge that Pop and Aunt Hilda might be in the way on my honeymoon, but then I realized that Zebadiah and I were just as much in the way on theirs. So I stopped worrying. It would work itself out.

Took one last look in the mirror, saw that my scrap of halter, like a good evening gown, made me nakeder than skin would have. My nipples popped out. I grinned and stuck out my tongue at them. They stayed up. I was happy.

I went through and closed after me two soundproof doors, then no longer had to keep quiet. Pop does not tolerate anything shoddy; if it doesn't work properly, he fixes it. Pop's B.S. was in machanical engineering, his M.S. in physics, his Ph.D. in mathematics; there isn't *anything* he can't design and build. A second Leonardo da Vinci—or a Paul Dirac.

No one in the everything room. I decided not to head for the kitchen end yet; if the others slept a bit longer, I could get in my morning tone-up. No violent exercise this morning; mustn't gat more whiff than I was—just controlled limbering. Stretch high, then palms to the floor without bending knees—ten is enough. Vertical splits, both legs; then the same to the floor with my forehead to my shin, first right, then left.

I was doing a back bend when I heard, "Ghastly. The battered bride Deety, stop that!"

I continued into a backwards walkover and stood up facing Pop's bride. "Good morning, Aunt Hillbilly!" I kissed and hugged her. "Not battered. Bartered, maybe."

"Battered,' she repeated, yawning. "Who gave you those bruises? What's his name?—your husband."

"Not a bruise on me, and you've known his name longer than I have."

"Mmm, a futile discussion. So my problem child is adequate?"

"Well . . . he's not a member of the Ku Klux Klan—"

"I never thought he was! Zebbie isn't that

sort of person anyhow"

"—but he's a wizard under a sheet!"

Aunt Hilda looked startled, then guffawed. "I surrender. We're both the happiest women in the world."

And the luckiest. Aunt Nanny Goat that robe of Pop's must be too hot. I'll get something of mine. How about a tie-on fit anybody bikini?"

"Thanks, dear, but you might wake Zebbie." Aunt Hilda opened Pop's robe, held it wide, and fanned herself with it. I looked at her with new eyes. She's had three or four term contracts; no children. At forty-two her face looks thirty-five, but from her collarbones down she could pass for eighteen. Little bitty teats—I had more at twelve. Flat belly and lovely legs. A china doll makes me feel like a giant.

She added, "If it weren't for your husband, I would simply wear this old hide. It *is* hot."

"If it weren't for *your* husband, so would I," I retorted.

"Jacob? Deety, he changed your diapers. I know how Jane reared you. True modesty, no false modesty."

"It's not the same, Aunt Hilda. Not today."

"No, it's not. You always did have a wise head, Deety. Women are tough-minded, men are not, we have to protect them while we pretend to be fragile ourselves, to build up their fragile egos. But I've never been good at it. I like to play with mafches."

"Aunt Hilda, you are *very* good at it, in your own way. I'm certain Mama knows what you've done for Pop and blesses it and is happy for Pop. For all of us—all five of us."

"Don't make me cry. Deety. Let's break out the orange juice, our men will wake any time. First secret of living with a man: Feed him as soon as he wakes."

"So I know."

"Yes, of course you know. Ever since we lost Jane. Does Zebbie know how lucky he is? Does he have any idea?

"He says so. I'm going to try hard not to disillusion him."

V

Jake

I woke in drowsy euphoria, became aware that I was in bed in our cabin that my daughter calls Snug Harbor, then woke completely and looked at the other pillow—the dent in it. Not a dream! Euphoric for the best of reasons!

Hilda was not in the bath, but my toothbrush was damp. I smiled at this. Logical, as Hilda now had any germs I was harboring. And Hilda, for all her playfulness, is no-nonsense practical. She faces danger without a qualm (had done so last night), but she would say, "*Gesundheit!*" to an erupting volcano even as she fled from it.

I showered, shaved, and brushed my teeth in nine minutes and dressed in under nine seconds as I simply wrapped around my waist a terry-cloth sarong Deety had bought for me. The day promised to be a scorcher. Even that hip wrap was a concession to propriety. That is, I did not know my new son-in-law well enough to subject him abruptly to our casual ways. It might offend Deety.

I was the last up and saw that all had made much the same decision. Deety was wearing what amounted to a bikini minimum (indecently decent!) and my bride was dressed in a tie on job belonging to Deety. The tie-ties had unusually large bows. Hilda is tiny, my daughter is not. Zeb was the only one fully dressed: an old pair of working shorts a worn-out denim shirt Deety had confiscated, and his evening shoes. He was dressed for the street in any western town save for one thing. I'm built like a pear, Zeb is built like the Gray Lensman.

My shorts fitted him well enough—a bit loose—but his shoulders were splitting the shirt's seams. He looked uncomfortable.

I took care of amenities—a "good morning" to all, a kiss for my bride, one for my daughter, a handshake for my son-in-law—good hands, callused. Then I said, "Zeb, take that shirt off. It's hot and getting hotter. Relax. This is your home."

"Thanks, Pop." Zeb peeled off my shirt.

Hilda stood up on her chair, making her about as tall as Zeb. "I'm a militant women's-rights gal," she announced, "and a wedding ring is not a ring in my nose—a ring that you have not yet given me, you old goat."

"When have I had time? You'll get one, dear—first chance."

"Excuses, excuses! Don't interrupt when I'm orating. Sauce for the gander is no excuse for goosing the goose. If you male chauvinist pigs—I mean goats—can dress comfortably, Deety and I have the same privilege." Whereupon my lovely little bride untied that bikini top and threw it aside like a stripper.

"What's for breakfast?" asked Pooh." I misquoted.

I was not answered. Deety made me proud of her for the nth time. For years she had consulted with me, at least with her eyes, on policy decisions. Now she looked not at me but at her husband. Zeb was doing Old Stone Face, refusing assent or dissent. Deety stared at him, gave a tiny shrug, reached behind her, and untied or unsnapped something and discarded her own top.

"I said, 'What's for breakfast?'" I repeated.

"Greedy gut," my daughter answered.

What we were offered, as fast as Deety could pour batter and Hilda could serve, was a gourmet specialty that would enrage a *cordon bleu* but that, for my taste, is ambrosia: a one-eyed Texas stack—a tall stack of thin, tender buttermilk pancakes to Jane's recipe, supporting one large egg, up and easy, surrounded by hot sausage and the edifice drowned in melting butter and hot maple syrup, with a big glass of orange juice and a big mug of coffee on the side.

Zeb ate two stacks. I concluded that my daughter would have a happy marriage.

VI

Hilda

Deety and I washed dishes, then soaked in her tub and talked about husbands. We giggled and talked with the frankness of women who trust each other and are sure that no men can overhear. Do men talk that openly in parallel circumstances? From all I have been able to learn in after-midnight horizontal conversations, all passion spent, men do *not*. Or not men I would take to bed. Whereas a perfect lady (which Jane was, Deety is, and I can simulate) will talk with another 'perfect lady' she trusts in a way that would cause her father, husband, or son to faint.

We quit yakking and looked for our men. Deety said that they were certain to be in the basement. "Aunt Hilda, I don't go there without invitation. It's Pop's *sanctum sanctorum*."

"You're warning me not to risk a faux pas?"

"I'm his daughter, you're his wife. Not the same."

"Well, he hasn't told me not to, and today he'll forgive me, if ever. Where do you hide the stairs?"

That bookcase swings out.

"Be darned! For a so-called cabin, this place is loaded with surprises. A bidet in each bath didn't startle me. Jane would have required them. Your walk-in freezer startled me only by being big enough for a restaurant. But a bookcase concealing a priest's hole . . . As Great-Aunt Nettie used to say, I do declare!"

"You should see our septic tank—yours, now."

"I've seen septic tanks. Pesky things—always need pumping at the most inconvenient time."

"This one won't have to be pumped. Over three hundred meters deep. An even thousand feet."

"For the love of . . . *Why?*"

"It's an abandoned mine shaft below us that some optimist dug a hundred years back. Here was this big hole, so Pop used

"Poor Ed. We had never been close, but he had never caused me grief. I hoped that he was shacked up with something . . . sultry, rather than losing his head to a machete."

it. There is a spring farther up the mountain. Pop cleaned that out, covered it, concealed it, put pipe underground, and we have lavish pure water under pressure. The rest of Snug Harbor Pop designed mostly from pretab catalogs: fireproof and solid and heavily insulated. We have—you have, I mean—this big fireplace and the little ones in the bedrooms, but you won't need them other than for homeyness. Radiant heat makes it skin-comfortable even in a blizzard."

Where do you get your power? From the nearest town?"

Oh, no! Snug Harbor is a hideout, nobody but Pop and me, and now you and Zebadiah, knows it's here. Power packs. Aunt Hilda and an inverter in a space behind the back wall of the garage. We bring in power packs ourselves and take them out the same way. Private. Oh, the leasehold record is buried in a computer in Washington or Denver, and the federal rangers know the leaseholds. But they don't see us if we see or hear them first. Mostly they cruise on past. Once one came by on horseback. Pop fed him beer out under the trees. From outside this looks like just a pretab, a living room and two shed-roof bedrooms. Nothing to show that important parts are underground."

Deety, I'm beginning to think that this place—this *cabin*—cost more than my townhouse.

"Uh . . . probably."

"How do you swing back this bookcase?"

Switch on the cove lights, then turn on the cold water at the sink. Then switch off the cove lights, then turn off the water—in that order."

"Curiouser and curiouser," said Alice."

The bookcase closed behind us and was a door with a knob on the upper landing side. The staircase was wide, treads were broad and nonskid, risers gentle, guard rails on both sides—not the leg breakers most houses have as cellar stairs. Deety went down beside me, holding my hand like a child needing reassurance.

The room was beautifully lighted, well ventilated, and did not seem like a basement. Our men were at the far end, bent over a table, and did not appear to notice us. I looked around for a time machine, could not spot it—at least, not anything like George Pal's or any I had ever read about. All around was machinery. A drill press looks the same anywhere, and so does a lathe, but others were strange—except that they reminded me of machine shops.

My husband caught sight of us, stood up, and said, "Welcome, ladies!"

Zebbie turned his head and said sharply, "Late to class! Find seats, no whispering during the lecture, take notes, there will be a quiz at eight o'clock tomorrow morning. If you have questions, raise your hands and wait to be called on. Anyone who misbehaves will remain after class and wash the chalk boards."

Deety stuck out her tongue, sat down quietly, I rubbed his brush cut and whispered an indecency into his ear. Then I kissed my husband and sat down.

My husband resumed talking to Zebbie. "I lost more gyroscopes that way."

I held up my hand. My husband said, "Yes, Hilda dear?"

"Monkey Ward's sells gyro tops. I'll buy you a gross."

"Thank you, dearest, but these weren't that sort. They were made by Sperry Division of General Foods."

"So I'll get them from Sperry."

"Sharpie." Zeb put in, "you're hankering to clean the erasers, too."

"Just a moment, son. Hilda may be the perfect case to find out whether or not what I have tried to convey to you—and which really can't be conveyed save in the equations your cousin Zebulon used—a mathematics you say is unfamiliar to you—"

"Completely unfamiliar!"

"—but which you appear to grasp as mechanics. Would you explain the concept

"I stopped worrying. It would work . . . out. Took one last look in the mirror, saw that my scrap of a halter, like a good evening gown, made me nakeder than skin would have . . ."

to Hilda? If she understands it, we may hypothesize that a continua craft can be designed to be operated by a nontechnical person."

"Sure," I said scorntully. "poor little me with a button for a head. I don't have to know where the electrons go to use holovision. I just twist knobs. Go ahead, Zebbie. Take a swing at it. I dare you."

"I'll try." Zebbie agreed. "But Sharpie, don't chatter, keep your comments to the point, or I'll ask Pop to give you a fat lip."

"He wouldn't dast!"

"So? I'm going to give him a horsewhip for a wedding present—besides the *Weird Tales* Jake you get those, too. But you need a whip. Attention, Sharpie."

"Yes, Zebbie. Same to you, doubled."

"Do you know what *precess* means?"

"Certainly. Precession of the equinoxes. Means that Vega will be the North Star when I'm a great grandmother. Thirty thousand years or some such."

"Correct in essence. But you're not even a mother yet."

"You don't know what happened last night. I'm an expectant mother. Jacob wouldn't dare use a whip on me."

My husband looked startled, but pleased, and I felt relieved. Zebbie looked at his own bride. Deety said solemnly, "It is possible, Zebadiah. Neither of us was protected, each was ovulating or close to ovulation. Hilda is blood type B Rhesus positive and my father is AB positive. I am A Rhesus positive. May I inquire yours, sir?"

"I'm O positive. Uh, I may have shot you down the first salvo?"

"It would seem likely. But . . . does this meet with your approval?"

"Approval!" Zebbie stood up, knocking over his chair. "Princess, you could not make me happier! Jake! This calls for a toast!"

My husband stopped kissing me. "Unanimous! Daughter, is there champagne chilled?"

"Yes, Pop."

"Hold it!" I said. "Let's not get excited over a normal biological function. Deety and I don't *know* that we're caught; we just hope so. And—"

"So we try again." Zebbie interrupted. "Deety, what's your cycle?"

"Twenty eight and a half days, Zebadiah. My rhythm is pendulum steady."

"Mine's twenty-seven. Deety and I just happen to be in step. But I want that toast at dinner and a luau afterwards. It might be the last for a long time. Deety, do you get morning sickness?"

"I don't know. I've never been pregnant before."

"I have and I do, and it's miserable. Then I lost the naked little grub after trying hard to keep it. But I'm not going to lose this one! Fresh air and proper exercise and careful diet and nothing but champagne for me tonight, then not another drop until I know. In the meantime, Professors, may I point out that class is in session? I want to know about time machines, and I'm not sure I could understand with champagne buzzing my buttonhead."

"Sharpie, sometimes you astound me."

"Zebbie, sometimes I astound myself. Since my husband builds time machines, I want to know what makes them tick. Or at least which knobs to turn. He might be clawed by the Bandersnatch, and I would have to pilot him home. Get on with your lecture."

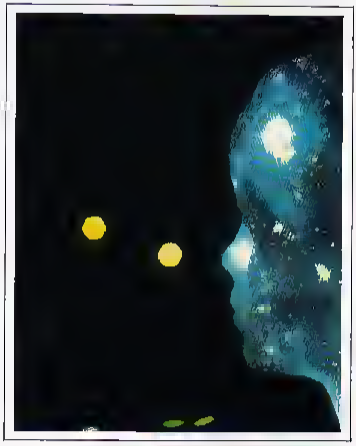
"I read you loud and clear."

Class resumed. "Sharpie, can you explain precession in gyroscopes?"

"Well, maybe. Physics One was required, but that was a long time ago. Push a gyroscope and it doesn't go the way you expect, but ninety degrees from that direction so that the push lines up with the spin. Like this—" I pointed a forefinger like a little boy saying, *Bang!* You're dead!"

"My thumb is the axis, my forefinger represents the push, the other fingers show the rotation."

"Go to the head of the class. Now—think hard!—suppose we put a gyroscope in a frame, then impress equal forces at *all three* spatial coordinates at once, what would it do?"



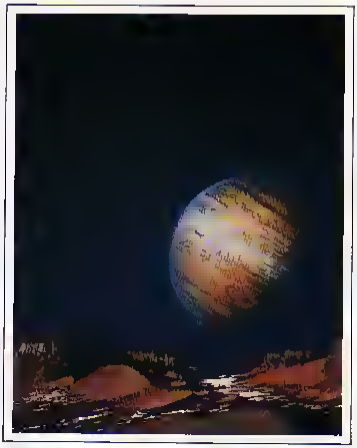
Would it be worth a thousand dollars? A million? Could you put a price on it? Now with OMNI, the first magazine of the future you can! And the price ($18 for 12 incredible issues) is right. OMNI not only keeps you up with the times, it keeps you ahead of them!

It's astonishing to think that the science fiction of your childhood is the science fact of today. Through the pages of OMNI you'll probe the unfolding wonders of tomorrow's world and behold a breathtaking vision of the future. Your future. Subscribe today!

HOW MUCH WOULD YOU PAY TO SEE THE FUTURE?

"I am vitally interested in the future because I am going to spend the rest of my life there."

—Charles F. Kettering



OMNI

Subscription Dept.,
P.O. Box 908, Farmingdale, N.Y. 11737

Yes! I want to see the future and save $6 on the newsstand price. Here's my ☐ check ☐ money order of $18 for a one-year subscription (12 issues).

Name _____

Address _____

City _____

State _____ Zip _____

Rates for U.S., APO and FPO addresses. Canada and elsewhere add $6 per subscription. Allow 6-8 weeks for shipping of first issue. Payment must accompany order. 80675

I tried to visualize it. I think it would either faint or drop dead.

"A good first hypothesis. According to Jake, it disappears."

They *do* disappear, Aunt Hilda. I've watched it happen several times."

"But where do they go?"

"I can't follow Jake's math. I have to accept his transformations without proof. But it is based on the notion of six space-time coordinates: three of space, the usual three that we see—marked *x*, *y*, and *z*—and three time coordinates, one marked *t*, like this (*t*), one marked *tau*, Greek alphabet (τ), and the third from the Cyrillic alphabet, *teh* ($\overline{m}$)."

"Looks like an *m* with a macron over it."

"So it does, but it's what the Russians use for *t*."

"No, the Russians use *chai* for tea. In thick glasses with strawberry jam."

"Stow it, Sharpie. So we have *x*, *y*, and *z*, *t*, *tau*, and *teh*, six dimensions. It is basic to the theory that all are at right angles to each other, and that any one may be swapped for any of the others by rotation, or that a new coordinate may be found (not a seventh, but replacing any of the six) by translation, say *tau* to *tau prime* by displacement along *x*."

"Zebbie, I think I fell off about four coordinates back."

My husband suggested, "Show her the caltrop, Zeb."

"Good idea." Zeb accepted a widget from my husband and put it in front of me. It looked like the jacks I used to play with when I was a little girl, but there were not enough things sticking out—four instead of six. Three touched the table, a tripod; the fourth stuck straight up.

Zeb said, "This is a weapon invented centuries ago. The points should be sharp, but these have been filed down." He flipped it, let it fall to the table. "No matter how it falls, one prong is vertical. Scatter them in front of cavalry and the horses go down—discouraging. They came into use again in World Wars One and Two against anything with pneumatic tires—bicycles, motorcycles, trucks, and so forth. Big enough and they disable tanks and tracked vehicles. A small sort can be whittled from thornbushes for guerrilla warfare—usually poisoned and quite nasty."

"But here this lethal toy is a geometrical projection, a drawing of the coordinates of a four-dimensional space-time continuum. Each spike is exactly ninety degrees from every other spike."

"But they aren't," I objected. "Each angle is more than a right angle."

"I said it was a *projection*. Sharpie, it's an isometric projection of four-dimensional coordinates in three-dimensional space. That distorts the angles, and the human eye is even more limited. Cover one eye and hold still, and you see only two dimensions. The illusion of depth is a construct of the brain."

"Far in the future you'll meet a tall, dark, handsome man, name of Richard Leakey."

"I'm not very good at holding still—"

"No, she isn't," agreed my bridegroom, whom I love dearly and at that instant could have choked.

"But I can close both eyes and *feel* three dimensions with my hands."

"Good! Close your eyes and pick this up and think of the prongs as the four directions of a four-dimensional space. Does the word *tesseract* mean anything to you?"

"My high-school geometry teacher showed us how to construct them—projections—with modeling wax and toothpicks. Fun. I found other four-dimensional figures that were easy to project. And a number of ways to project them."

"Sharpie, you must have had an exceptional geometry teacher."

"In an exceptional geometry class. Don't faint, but I was grouped with what they called overachievers after it became 'undemocratic' to call them gifted children."

"Be durned! Why do you always behave like a fritterhead?"

"Why don't you ever look beneath the surface, young man! I laugh because I dare not cry. This is a crazy world, and the only way to enjoy it is to treat it as a joke. That doesn't mean I don't read and can't think. I read everything from Giblett to Hoyle, from Sartre to Pauling. I read in the tub. I read on the john. I read in bed. I read when I eat alone, and I would read in my sleep if I could keep my eyes open."

Zebbie said, "Attention, class. The two prongs of the caltrop painted blue represent our three-dimensional space of experience. The third prong, painted yellow, is the *t*-time we are used to. The red fourth prong simulates both *tau*-time and *teh*-time, the unexplored time dimensions necessary to Jake's theory. Sharpie, we have condensed six dimensions into four, then either we work by analogy into six or we have to use math that apparently nobody but Jake and my cousin Ed understands. Unless you can think of some way to project six dimensions into three. You seem to be smart at such projections."

I closed my eyes and thought hard. "Zebbie, I don't think it can be done. Maybe Escher could have done it."

"It can be done, my dearest," answered my dearest, "but it is unsatisfactory. Even with a display computer with capacity to subtract one or more dimensions at a time. A superhypertesseract—*a* to the sixth power—has too many lines and corners and planes and solids and hypersolids for the eye to grasp. 'Cause the computer to subtract dimensions, and what you have left is what you already knew. I fear it is an innate incapacity of visual conception in the human brain."

"I think Pop is right," agreed Deety. "I worked hard on that program. I don't think the late great Dr. Marvin Minsky could have done it better in flat projection. Holovision? I don't know. I would like to try if I ever get my hands on a computer with holovideo display and the capacity to add, subtract, and rotate six coordinates."

SYSTEMS PROGRAMMERS

WIN YOUR OWN TERMINAL

Here's your chance to win your very own Terminal, for use as you wish in your own home. We're not asking you to guess a weight or fold paper planes, but enter a contest that zeroes in to your own professionalism and talent.

You know you're good, now have fun proving it. Every entry solution will be considered by a distinguished panel of judges made up of professional Systems Programmers who work for NCSS.

We are a firmly established leader in the information services field, with an outstanding record of growth and technical accomplishments, including the manufacture of our own line of super mini-computer systems.

Why are we running this contest? It's our unique way of showing the spirit of adventure, imagination and leadership that NCSS has in the computer field. If you like our thinking, perhaps you would like to work for us.

Our salaries are outstanding, with excellent benefits, and you'd be working with the latest state-of-the-art systems in a challenging and rewarding environment.

So this is a chance to own your own terminal, as well as improve your career. With your contest entry, you can also send your resume or inquiry. But we do want to reiterate—all that's necessary is your entry solution.

Send your solution to:
NATIONAL CSS, INC. Dept. O
542 Westport Ave.
Norwalk, Connecticut 06851

An Equal Opportunity Employer M/F/H

NCSS
makes your future happen

Employees and their relatives of NCSS or any of its affiliated or related companies cannot participate, as well as any personnel of their advertising agencies.

Entries must be received by November 15, 1979 for eligibility. Determination of the winning solution is at the discretion of NCSS. In case of a tie, winner will be selected by a random drawing.

"But why six dimensions?" I asked. "Why not five? Or even four, since you speak of rotating them interchangeably?"

"Jake?" said Zeb.

My darling looked fussed. It bothered me that a space-time continuum seemed to require three space dimensions but only one time dimension. Granted that the universe is what it is, nevertheless nature is filled with symmetries. Even after the destruction of the parity principle, scientists kept finding new ones. Philosophers stay wedded to symmetry, but I don't count philosophers."

"Of course not," agreed Zeb. "No philosopher allows his opinions to be swayed by facts. He would be kicked out of his guild. Theologians: the lot of them."

"I concur. Hilda, my darling, after I found a way to experiment, it turned out that six dimensions existed. Possibly more, but I see no way to reach them."

"Let me see." I said. "If I understood earlier, each dimension can be swapped for any other."

"By ninety-degree rotation, yes."

"Wouldn't that be the combinations taken four at a time out of a set of six? How many is that?"

Fifteen," Zebbie answered.

"Goodness! Fifteen whole universes? And we use only *one*?"

No, no, my darling! That would be ninety degree rotations of one Euclidean universe. But our universe, or universes, has been known to be non-Euclidean at least since 1919. Or 1886 if you prefer. I stipulate that cosmology is an imperfect discipline. Nevertheless, for consideration that I cannot state in nonmathematical terms, I was forced to assume a curved space of positive radius—that is to say, a closed space. That makes the universes possibly accessible to us either by rotation or by translation of *this* number." My husband rapidly wrote three sixes.

"'Six sixty-six,' I said wonderingly. 'The Number of the Beast.'"

"Eh? *Oh!* The Revelation of Saint John the Divine. But I scrawled it sloppily. You took it that I wrote 666, but what I intended to write was $(6^6)^6$ - six raised to its sixth power, and the result in turn raised to its sixth power. That number is *this*: $1.03144 + \times 10^{28}$ or written in full: 10,314,424,798,490,435,546,171,949,056. That's more than ten million sextillion universes in our group."

What can one say to that? Jacob went on: "Those universes are our next door neighbors, one rotation or one translation away. But if one includes *combinations* of rotation *and* translation—think of a hyperplane slicing through superhypercontinua not at the point of here-now—the total becomes indenumerable. Not infinite, because infinity has no meaning. Uncountable. Not subject to manipulation by mathematics thus far invented. Accessible to continua craft, but no known way to count them."

"Pop—"

"Yes, Deety?"

"Maybe Aunt Hilda hit on something. Agnostic as you are, you nevertheless keep the Bible around as history and poetry and myth."

"Who said I was agnostic, my daughter?"

"Sorry, sir. I long ago reached that conclusion because you won't talk about it. Wrong of me. Lack of data never justifies a conclusion. But this key number—one-point-oh-three-one-four-four-plus-times-ten-to-its-twenty-eighth-power—perhaps that *is* the Number of the Beast."

What do you mean, Deety?"

"That Revelation isn't history, it's not good poetry, and it's not myth. There must have been *some* reason for a large number of learned men to include it while chucking out several dozen gospels. Why not make a first hypothesis with Occam's Razor and read it as what it purports to be? Prophecy."

"Hmm. The shelves under the stairs, next to Shakespeare. The King James Version, never mind the three others."

Deety was back in a moment with a well worn black book, which surprised me. I read the Bible for my own reasons, but it never occurred to me that Jacob would. We always marry strangers.

"Here," said Deety. "Chapter thirteen, verse eighteen. 'Here is wisdom. Let him that hath understanding count the number of the beast: for it is the number of a man; and his number *is* six hundred threescore *and* six.'"

"That can't be read as exponents, Deety."

"But this is a *translation*. Pop. Wasn't the original in Greek? I don't remember when exponents were invented, but the Greek mathematicians of that time certainly understood powers. Suppose the original read 'Zeta, Zeta, *Zeta*,' and those scholars, who weren't mathematicians, mistranslated it as six hundred and sixty-six?"

"Uh, moondrift daughter."

"Who taught me that the world is not only stranger than we imagine but stranger than we *can* imagine? Who has already taken me into two universes that are *not* this one and brought me safely home?"

"Wait a halt!" Zebbie said. "You and Pop have tried the time-space machine?"

"Didn't Pop tell you? We made one minimum translation. We didn't seem to have gone anywhere, and Pop thought he had failed. Until I tried to look up a number in the phone book. No *J* in the book. No *J* in the *Britannica*. No *J* in any dictionary. So we popped back in and Pop returned the verniers to zero and we got out and the alphabet was back the way it ought to be and I stopped shaking. But our rotation was even more scary, and we almost died. Out in space with blazing stars—but air was leaking out, and Pop just barely put it back to zero before we passed out, and came to back here in Snug Harbor."

"Jake," Zebbie said seriously, "that gadget has got to have more fail-sates, in series with deadman switches for homing." He frowned. "I'm going to keep my eye open for both numbers, six sixty-six and the long one. I trust Deety's hunches. Deety, where is the verse with the description of the Beast? It's somewhere in the middle of the chapter."

"Here it is. 'And I beheld another beast coming up out of the earth; and he had two horns like a lamb, and he spake as a dragon.'"

"Hmm. I don't know how dragons speak. But it something comes up out of the earth and has two horns - and I see or hear either number—I'm going to assume that he has a black hat, and try to do unto him before he does unto us. Deety, I'm peaceable by policy, but two near-misses are too many. Next time, I shoot first."

I would as lief Zebbie hadn't mentioned black hats. Hard to believe that someone was trying to kill anyone as sweet and innocent and harmless as my darling Jacob. But they *were*, and we knew it.

I said, "Where is this time machine? All I've seen is a claptrap."

"Caltrop, Aunt Hilda. You're looking at the space-time machine."

"Huh? Where? Why aren't we in it and going somewhere *fast*? I don't want my husband killed; he's practically brand-new."

"Sharpie, stop the chatter." Zebbie put in. "It's on that bench across from you."

"All I see is a portable sewing machine."

"That's it."

"What? How do you get inside? Or do you ride it like a broom?"

"Neither. You mount it rigidly in a vehicle—one airtight and watertight by strong preference. Pop had it mounted in their car—not quite airtight and now kaput. Pop and I are going to mount it in Gay Deceiver, which *is* airtight. With better fail-sates."

"*Much* better fail-safes, Zebbie," I agreed.

"They will be. I find that being married makes a difference. I used to worry about my own skin. Now I'm worried about Deety's. And yours. And Pop's. All four of us."

"Hear, hear!" I agreed. "All for one and one for all!"

"Yup," Zebbie answered. "Us four, no more. Deety, when's lunch?" ∞

To be continued next month

"The room was beautifully lighted, well ventilated, and did not seem like a basement . . . I looked around for a time machine, could not spot . . . any I had ever read about."

ROCKET

CONTINUED FROM PAGE 75

overrides engine cut off manual capsule release escape release "It's got a big red panic button but the fail safe one won't be hooked up"

Below the astronaut but still in the pressurized shell ride the autopilot the telemetry equipment radio transceiver radar transponder controls for stabilization attitude indicators inverter oxygen and compressed air bottles capsule lock and release mechanisms

The language of all this is downright obscene The autopilot is a strapdown system using HIG gyros and pendulous accelerometers he says "a real beauty capable of being programmed to hold either a constant angle of ascent or a gravity turn after the initial kick"

How is the ship steered? "The gyro and the accelerometer signals are combined with a feedback signal from the thrust-chamber-position sensors"

The rocket's propulsion system the contained explosion is built around four Rocketdyne LR101 engines They are in effect the inspiration for the whole trip "When I saw those Atlas engines in the junkyard I had no fixed idea of what I might do with them but I just couldn't bear to see them bust 'em up For twenty-five bucks I said I'll buy 'em even if I have to use 'em for paperweights"

He rescued them from a scrap dealer in Ontario California who specializes in melting down stainless steel even though as Truax pointed out to the scrap man the engines were not stainless steel but nickel-plated which gives the appearance of stainless steel

Originally built as vernier engines for the Thor and Atlas they were used after the main engines cut out to give that last tweak to the velocity to give that last increment of speed to the missile that allowed it to hit its target with finite precision Giving 1 000 pounds of thrust apiece the engines were manifolded together by Truax to yield 4 000 pounds of thrust a comfortable margin of thrust over weight The gleaming engines look like large upside-down wine carafes ready to pour out fire

The tour goes on valve by valve Truax explains how these engines receive their flow of liquid oxygen (LO_2) and Jet A kerosene an ordinary jet kerosene that can be stored at room temperature and is a slightly cruder grade of the same stuff that fired the first stage of the Apollo *Saturn 5* the largest rocket ever built

The engine sits on four load cells rigidly attached to the launch platform The hold-down fittings in the center of the arrangement of the engines restrain the rocket even after the fires have started holding it down until the thrust builds up reaches a power equal to the weight of the rocket and surpasses it by a comfortable margin Then the instrumentation says, All systems go and the bird rises

All the rocket's valves poppets and joints have been altered slightly to fit the lovely pieces of discarded technology Unlike NASA designs very little of the X-1 is of ad hoc design "Overengineering that's where your tax dollar goes" says Truax For maximum effectiveness, one should do calculations on important issues apply rules of thumb on others and use a calibrated eyeball on the rest When to do which is the essence of engineering judgment He squints a calibrated eyeball into the sunlight

I try to use things that have been well developed as close to the original as possible The LO_2 and kerosene are pushed into the thrust chambers by the pressure of liquid helium held at −250°F in a titanium sphere There it is on the garage floor a shining beach ball of incredible strength able to hold up to 5 000 pounds per square inch (psi) of freezing liquid gas It was initially installed in a Titan 1 And here's the helium regulator a nice little pressure valve at one hundred twenty-five psi I traded a junkman some turbines for it It's gold-plated off the Lockheed Agena"

The electronics and telemetry overflow from a toolroom offside the carport a wired cave of oscilloscopes graphs galvanometers and other gadgets The oscillograph originally created for the B-52 and used to monitor H-bombs prior to their being dropped cost $14 000 new Truax picked one up—and the paper (usually $80 a roll) and a viewing table—for $75 It and other oscillographs will be used to monitor chamber pressures feed and tank pressures

And my piece de résistance! crows the rocketman The inertial platform unit—balls within balls of circuitry and floating rotating gyroscopes that measure latitude longitude altitude pitch roll and yaw

They were initially in the X-15" Truax beams "still the world's fastest plane but their development was started even before that for the Dyna-Soar That aptly named but still diabolic weapon was made obsolete by the ICBMs but it still remains one of the first reusable winged rockets It was a skipbomber that was designed in the Fifties as a manned gliding vehicle on top of a Titan 3 that would drop a bomb on the city of your choice skip back up to the fringe of space circle the world and return to base

"One out of the four X-15s crashed and I got the three other units at thirty-five dollars apiece I paid more for the mailing costs And the program that developed them cost twenty-five million dollars

And on it goes These pressure transducers cost me one hundred dollars for a whole mess of 'em I dickered They're usually three hundred and fifty dollars apiece The gyro flight package that's from the Polaris

Truax's single largest expense will be the propellant tanks They will be farmed out "We can't be profligate with our tank rates" he says The tanks will be fabricated from grade-250 maraging steel an incredibly strong alloy capable of handling up to 250 000 psi before it begins to yield (U S Steel makes the thinnest sheets of this material ever rolled, and they're still too thick for Truax's purposes) And while his potential welding company can furnish him with 078-inch thickness he wants it milled down to an incredible 05 inch fingernail-thin He's also trying to figure out a way of getting U S Steel to pay for the tanks "I'll have to work on their sense of patriotism and desire to grow with the times

Corporate backing has been a problem for this project because as Truax points out it may fail. 'After Evel's parachute had a premature ejection so to speak the company that furnished the chute went out of business Of course this is a different situation I had asked Evel to postpone the Snake River shot until I ironed out the difficulty with the chute but he said "No way not with all that TV money riding on it

"I'm not allowing this rocket to get out of my technical control I won't go up until I'm completely satisfied no matter which TV networks are waiting"

Ahead are months of testing the sound and fury of captive firings A moving-van company has donated a van to be used as both the static-test control center and the launch control center and the tests are being done in one corner of a local airfield

Despite his caution, Truax is willing to accept lower reliability statistics than NASA will "They have gone completely wacky insisting on first-time success The astronauts to a man are willing to accept a lower survival probability than the ninety-eight-percent survival and the ninety six-percent reliability for mission success These were set not out of consideration for their safety but because government administrators do not want to risk the embarrassment of failure

We all recognize it would take an infinite amount of money to obtain one-hundred-percent reliability We expect to achieve the extremely low cost by adherence to minimal objectives by strict simplicity of equipment by extensive use of well-proven but surplus components and quite frankly by asking the astronauts and sponsors to take a somewhat higher risk than is currently acceptable to NASA" Evel for example was willing to accept a 60-percent risk

If the trip is successful and Truax makes some money he plans to launch and relaunch the Volksrocket until he gets the funnies out of it and the reliability statistics are up Then he says we'll open up the barnstorming era of space travel We'll sell tickets Not quite a penny a pound around the fairground but maybe one hundred dollars a pound Once we can assure people that their chance of coming back in one hunk is ninety-five percent or better a lot of guys will be willing to pay ten thousand dollars for the ride of their lives"

What makes Truax think people will do it? "People are incurable optimists The X-1 is not more dangerous than the Indy 500

where people risk their lives for paltry rewards. Take Evel for example. He just wants to make money without working—greater risk for greater reward. Fast cars and faster women. Each person wants recognition some more than others. Me, I want to beat NASA with the first woman in space. First a man, then a woman, and, if I haven't killed anyone off by then, I'll send up some of the people who've been bugging me."

"I'd say of the millions of people in the Western world, there are maybe one thousand who've made a pile and who are not satisfied with their lives. It will cost me five thousand dollars. I'll make five thousand dollars. The world's first rocket spaceline!"

The glint is heavy in his eye. There are all kinds of show-biz possibilities: movies, TV, foreign rights, spin-off toys, T-shirts, although I'm not much of a T-shirt-and-button man," he smirks. But he's nothing corporate, either. "I always like to keep my hands dirty, everyone does. But in a big shop there's one little black box for the little guy, and he gets to get his hands dirty, but he doesn't know what the little black box is for. The supervisor keeps track of seventeen little black boxes, but he doesn't understand 'em, and the manager keeps track of thirty groups of supervisors, and the head of the whole business doesn't even know what a little black box is. He's so busy testifying before congressional committees and petitioning for money. Here, I can see the whole picture and get my hands dirty. I'm probably the envy of all the engineers in the aerospace industry."

However, Truax may have a bit of a corporate storm on his hands. Correa and Ramundo are beginning to vie for position now, and there could brew up a Battle of the Astronauts. Ramundo wants to hitch the Volksrocket up to a big-time media and promotion scheme, and although this will supply Truax with much-needed capital if it happens, it will take the rocket's usage somewhat out of his control. On the other hand, Correa can at best supply Truax with slow, steady increments of money. Yet with Correa, the company stays small. Correa, to escalate his involvement, has had his own dummy rocket built with *Arriba*, the name of the tortilla steamer he's invented, painted on its side.

Ramundo is getting anxious, saying the only thing standing between him and the stars is the "fortilla roller." Yet, so far, the tortilla roller is the only one who has laid down spendable cash for the project itself.

I tell Truax I want to visit Correa. "Well, expect headdress, feathers, paint, the whole thing. He's a bona fide Inca."

The Inca's secretary ushers me into his air-conditioned office at Mission Bell Bakery in Redwood City, a short trajectory from Saratoga. Correa is dressed in conventional California sport clothes, no gold or feathers. But he has the Inca cheekbones, the black, almond-shaped eyes. Yes, he did read about Truax in the *National Star*; he is a sky diver, a pilot, and feels it's his manifest destiny to be an astronaut. He tells me the great drawings on the Nazca plains of Peru, of course, were etched there by early Inca astronauts who flew hot-air balloons kept aloft in structures made of *tortoro*, a reedlike plant that grows at Lake Titicaca. And being a Rosicrucian, too, he advocates power of the mind. "We try to develop our consciousness, always amplifying awareness, exploring further into things. And, of course, the rocket is good for business, having *Arriba* painted on the side."

He brings out an Arriba steamer. It is a square box with a top of clear plastic, resembling a stereo turntable. "I noticed a problem with the store-bought tortilla," he explains. "They dry up and crack in the oven and get greasy on the stove. So I redesigned my baby daughter's vaporizer and came up with this device for rejuvenating the tortilla. The Tortilla Advisory Board is pleased with it, and if I sell three hundred and fifty thousand steamers this year, I will make five million dollars, plenty of money for the rocket."

When I left, he loaded me with a giant bag of tortillas and a pound of heavy white Mexican cheese. "We need private enterprise in space," he said, flashing a dazzling white smile. "In September I start training for zero-g."

The main problem is motivation," Truax explained later at the kitchen table as Sally pulled a loaf of Wonder Bread out of the freezer, plopped four slices on the Arriba, and watched as they puffed up like sponges from the steam. "You just have to get the idea you can do something. Hell, we knocked off the moon in ten years. We've got to stop thinking we're helpless."

"What gets people stirred up? Walt Disney? Wernher von Braun? The race with the Russians? I'm hoping to kick off private participation in the decision making as to what kind of space program we're going to have. Right now we've got only the bureaucratic way. You get only one approach, no studies for comparison. Competition gets the economic shakeout. I hope we'll get some spacelines out of this."

"Within fifty years, at least fifty thousand people will be working in space. And way downstream, in a thousand years, there'll be more people living in space than on Earth, and we'll have colonies. All the material in the solar system could be built into a habitat, a giant ring, say, within the orbit of Mercury, a solar collector on the inside, radiators on the outside, and everything our little hearts desire there. Compute the number of people it would hold. It would range in the upper billions."

"Once I thought going to the moon would be the challenge of a lifetime, and we finished that off in ten years. Now, after this project gets going, I want to finish off war and aging. I can devote all my time to it. Except when I'm appearing on TV."

"Whatever you do, stay away from that nut Pavlov."

THE ULTIMATE TRUTH MACHINE™

It gives you a straight answer even if someone else doesn't!

Use it anytime, anywhere. The Truth Machine is a new generation voice stress analyzer that flawlessly pinpoints deception. It is so small, lightweight and portable that it easily fits into a desk drawer or briefcase. You can use it with total discretion, because unlike the old fashioned polygraph it doesn't need wires connecting it to the body. . . so there is no way anyone can know they are being monitored.

TODAY YOU NEED A TRUTH MACHINE

You succeed by knowing the answers. By making the right decisions. To make the right decision you need the facts . . . you must know the whole truth. But unfortunately, almost everyone you deal with has a motive to practice at least some deception. Unless you're a mind reader you never know whether or not you're getting a straight answer when you ask,

* Is this your lowest price. . . your best offer?
* Have you mailed that check to me yet?
* Can you deliver my order on time?
* Have you told me everything I need to know?
* Can I depend on you?
* Are these figures correct?
* Are you confident about this investment?
* Will they settle out of court?

When you ask a direct question you deserve a straight answer. And that's the beauty of the Truth Machine, it will give you a straight answer. . . even if someone else doesn't. It's your best possible defense against doubt, risk and deception!

YES, IT'S ETHICAL!

It's simply a fast, efficient way to verify the truth and protect yourself against dishonesty. And after all, which is immoral - for a person to be deceitful or to have their dishonesty uncovered? There is nothing unethical about uncovering deceit and deception. In fact, you can usually prevent dishonesty, simply by letting everyone know that you own the Truth Machine. It's a powerful deterrent for anyone who is tempted to mislead you or tell you less than the truth!

IT'S AMAZINGLY SIMPLE!

Like many technological discoveries, voice stress analyzers grew out of military research during the Vietnam war. Army intelligence needed something better than the standard polygraph to interrogate prisoners. A simple method that could be used without the subject's knowledge. The voice stress analyzer was the result!

The principle is remarkably simple. Scientists already knew lying produced unconscious and uncontrollable stress that could be recorded by a polygraph. Researchers soon discovered that this stress also affected the muscles controlling the vocal cords, and caused an inaudible "microtremor" in the voice. All that was needed was a device sensitive enough to pick up and record these inaudible vibrations. And that was a relatively easy accomplishment considering the state of modern electronic technology.

BUSINESSMEN BECOME MIND READERS

In addition to police and intelligence agencies, many of the "Fortune 500" corporations have quietly been using voice stress analyzers for several years. Large industrial and retail companies use it to control employee theft and screen job applicants. And dozens of large insurance companies have been using voice stress analyzers to uncover false claims. They simply tape an interview with anyone filing a suspicious claim, then playback the recording and monitor it with a voice stress analyzer.

In the past only the largest, most profitable companies felt they could justify spending $1500 to $5000 to purchase a voice stress analyzer. However, like everything else in the electronics field, these high prices reflect the heritage of a prototype, and not the quality of a reliable voice stress analyzer.

The new cost-saving, solid state, micro-chip technology has made voice stress analyzers affordable. Today, for only $149.00 you can have a compact unit that is far more sensitive than the top-secret units originally used by the military! There is no better way to get at the truth. . . and remove the risk and uncertainty from those important decisions that face you every day!

AND IT'S ENTERTAINING!

Because it can pick up and analyze any audible statement, use of the Truth Machine is limited only by your imagination. Seeing the meter go wild when politicians and celebrities give their 'candid' views during television press conferences and talk shows can provide you with hours of amusement. And while no evidence uncovered by any type of lie detector can be used in court, you can gain personal satisfaction by finding the truth behind many intriguing and controversial subjects. Use the Truth Machine to evaluate the candor of Richard Nixon, Patty Hearst or James Earl Ray. You may be surprised!

EASY TO OPERATE!

Unlike the polygraph, there are no sophisticated operating techniques to learn. You can easily master the Truth Machine after only one weekend of practice. You simply turn it on and adjust the sensitivity calibrator knob for average stress in the speaker's voice. Then sit back and watch the meter. When the needle moves into the stress area, you know you're hearing less than the truth. And it's versatile. You can pick up the speaker's voice with the Truth Machine's sensitive, built-in microphone. Or use the special sensor that connects it to your telephone. You can even tape a conversation with any standard tape recorder, and analyze it at your convenience by attaching the special output jack and playing back the tape!

DEPENDABLE QUALITY

The Truth Machine from Microtronics is the ultimate voice stress analyzer. It features solid state electronics and is manufactured to the highest technological standards. Even its tough shatterproof case was designed to withstand the roughest handling. The Truth Machine is designed and built to guarantee you years of dependable use. It should never need servicing. But if anything ever does go wrong, Microtronics will repair it free of charge through their service-by-mail center and return it to you in a matter of days.

USE IT RISK FREE!

We would like you to use the Truth Machine without obligation for 30 days. Experience its advantages. Take it to the office and enjoy surprising people with your infallible new 'insight'. Use it at home for entertainment and add a whole new dimension to your television viewing pleasure. If you don't agree that being free of doubt makes it possible for you to really relax and enjoy life more. . . simply return it within 30 days for a prompt, courteous refund.

THE TRUTH MACHINE™

SIMPLY TURN IT ON AND IF ANYONE EVER TELLS YOU LESS THAN THE TRUTH. . . YOU'LL KNOW!

ONLY $149

CREDIT CARD ORDERS
Toll free service 1-800-331-1000

Please send me a Microtronics 'Truth Machine' for only $149.00! I must agree that I can't afford to be without it, or I can return it anytime within 30 days for a full, prompt and courteous refund.

☐ Enclosed is my check or money order for $149.00

☐ Charge my ☐ Diners Club ☐ VISA/Bank Americard or ☐ Master Charge bank no. _____ (4 digit number above name)

Credit card no. _____

Exp. date _____

Signature _____

Name _____

Address _____

City _____ State _____ Zip _____

(PA residents please add 6% sales tax)

TELESTAR, INC. Dept. 0-1079
200 S Front St, Wormleysburg PA 17043

DEALER INQUIRIES INVITED

CURRENTS

CONTINUED FROM PAGE 96

The worst and most damaging discovery of the past ten years relates to the now-obvious problem in storing radioactive wastes This has contributed significantly to the real energy crisis —*Richard Leakey, anthropologist*

The most significant development in architecture is an accommodation to the energy crisis in realistic, technical, and economic terms, rather than in expressionistic aesthetic terms —*Robert Venturi, architect*

Eventually individuals will be picking up a husky hunk of their energy off their rooftops and in their backyards There'll be additional amounts feeding in from grids These grids are probably going to be localized neighborhood, regional The goal is to make the loop as short as you can —*Denis Hayes, environmentalist*

A negative impact has been the continuing development of new chemicals that in some way threaten human health or the quality of the environment These chemicals never existed before in the natural world, and there are no evolutionary defenses against them —*Roger Revelle, former director of Scripps Institution*

Because of our loss of faith in nuclear power we now have a desperate situation and unless public and political opposition abates, we could face disaster We simply cannot manage without nuclear energy there is no alternative —*Clive Sinclair, pioneer of the first two-inch TV screen*

The worst development of this decade is the overdedication to the belief that we should be more dependent on nuclear energy —*Clive Jenkins, British trade unionist, representing scientific workers*

Technology and its potentials or options, is growing much faster than man's emotional or institutional ability to react —*Ieuan Maddock, secretary of the British Association for the Advancement of Science*

The decline in scientific funding has produced a disaster in the last ten years We've lost generations of bright young kids to fields of more immediate relevance This loss extends the energy crisis because it's going to be solved by an invention that nobody's working on right now —*Leon Lederman, director of Fermilab*

The worst thing today is the accelerating dependency on cartel-controlled sources of energy We do not have and for a long time haven't had, a free marketplace I'm sure a number of congressmen are in the pay of these cartels In effect, many governments are dominated by corporate interests —*Frank Herbert, author*

LIFELINES

CONTINUED FROM PAGE 98

I think we have created very few ideas since the nineteenth century certainly not in medicine There is nothing in our time I feel, to compare with the grandness of scale of the theory of evolution or the understanding that all living things are made essentially of the same kind of building blocks —*René Dubos, microbiologist, Pulitzer Prize winner*

A major breakthrough has been the discovery of the *basic unit* of operation of the association neocortex, which is 95 percent of the total human cortex and responsible for all higher brain functions The way is open to a wonderful new era in scientific understanding in a wide range of the neurosciences, with implications for the philosophical problem of brain-mind interaction —*Sir John Eccles, Nobel laureate in physiology and medicine*

One can't omit the first synthesis of a gene as a specific achievement, but the general shift in the scope of molecular biology is really more important. So perhaps the discovery of reverse transcriptase should go down as a turning point —*Gordon Rattray Taylor, futurologist and author of* The Doomsday Book

The coronary-bypass operation was the past decade's greatest advance in the treatment of heart disease In 1978 approximately 100,000 operations of this type were performed in this country But the number of potential candidates for this procedure may actually range between half a million and one million persons

The most important breakthrough in cardiology during the coming decade or beyond probably will be the development of new pharmaceutical agents to control cardiac arrhythmias and angina pectoris What is being handled surgically now may be replaced by medical therapy if answers come out of drug research —*Denton Cooley, implanter of the first artificial heart*

I don't think there has been any development in the past decade comparable to relativity or the discovery of the genetic code, but the decade has seen a number of well-designed and quite convincing experiments on psychic phenomena, such as the remote-viewing experiments of Targ and Puthoff and the metal-bending research of Hasted These may be regarded as highly significant in the future —*B. D. Josephson, Nobel laureate in physics*

There are countless wonders about us that do not need the flimflam or the trappings of pseudoscience to make them attractive subjects for research The problem is to dump the nonsense and return the beauty of the unknown —*James Randi, magician, investigator of psychic phenomena*

MICRO/MACRO

CONTINUED FROM PAGE 100

The most important breakthrough in my field was the emergence of X-ray astronomy and the boom in the subject, so that it is now an important branch of astronomy The most important event outside my field was probably the discovery by Penzias and Wilson of universal microwave radiation —*Jocelyn Burnell, codiscoverer of pulsars*

The most significant event outside my field has been the new ideas connected with black holes and their consequences for cosmology and physics —*Sidney Brenner, molecular biologist*

Of course I regard the so-called Weinberg-Salam model that unifies electromagnetic and weak forces as the most significant event of the past decade In the decade to come, obviously the attempts toward further unification will be important —*Karl Popper, philosopher of science, author of* The Logic of Scientific Discovery

The development of computer interactions and the growing interconnected linkages means that a great deal of data, often of a personal nature, can be made available to a large number of people The danger lies in threats to privacy and the Big Brother aspect of the computer-information revolution —*Roger Revelle, oceanographer, former director of Scripps Institution*

We are already seeing widespread uses of integrated circuits in washing machines, for example Talking computers, using synthesized speech, are likely and computers we can talk to should be feasible within a decade —*Clive Sinclair, pioneer of the first two-inch TV screen*

Most important was the development, starting from thermodynamics, of a general theory of systems in states far from equilibrium in which new and statistically improbable structures are spontaneously generated and multiplied The future implication of this is that it may lead to a unification of the physical and biological sciences, since it provides a physical theory of the formation of highly structured nonequilibrium, and in some cases, self-reproducing structures —*Sir Alan Cottrell, former chief scientific adviser to the British government*

Space exploration! I think it is analogous to coming out of the sea and tackling the dry land I am quite confident the stars are not forever beyond our reach I am not prepared to prophesy how it's going to be done—whether it's worm holes, space warps, or that the Einsteinian equations don't mean quite what they have been interpreted to mean physically —*Robert A. Heinlein, author*

CONTINUED FROM PAGE 94

pened in the universe The galaxies are now flying apart They were flying apart in the past when they were closer together If you run the movie backward far enough you see that they merged If you go back still further you find a nucleation a kind of lumpiness appearing out of a uniform gaseous background We can even observe that uniform gaseous background which we see very much red-shifted from its former white-hot condition But I think that's as far back as we know Now that's ninety-nine or ninety-nine point nine percent of the way back So that's a tremendous achievement

Omni: Let's turn to the search for extraterrestrial intelligence What do you think should be done in this area?

Morrison: I continue to feel very keenly that this world should spend some of its resources trying to test this hypothesis I think there is hardly anything more exciting that modern technology could find out than whether or not we are alone Since 1959 or 1960 when we attracted attention with this notion quite a few radio astronomers have tried something similar—more or less as pioneer efforts—on their own without much equipment or financial support just because they had some interest in it and the chance to do it

The first of course was Frank Drake with the famous Ozma Project who looked at three stars with the receivers he had on hand for two weeks There have also been a few searches by radio astronomers in the United States as well as in Canada and the Soviet Union The radio astronomers have done a splendid job in the pioneering phase but it hasn't been much of a search In the past twenty years they've done one thousandth of what one would call a worthwhile search

Now clearly what is needed is a change in style Fortunately we are technically able to make that change because in the past ten or twenty years there have been enormous decreases of cost and gains in the sophistication of computing techniques As a result we can now have really powerful computing apparatuses tied to radio telescopes making it possible to look not at one channel at a time—as some people did—or even at a thousand at a time—as the best people did—but to look at a million channels at a time Then any search becomes enormously more effective

Of course this requires some capital investment It requires putting some people to work And what we think it requires is making a systematic national effort We're not talking about a huge project billions of dollars we're talking about a modest project like many carried out by NASA or the universities But we must do it systematically year after year for five or ten years until we see what we want to do

Omni: What is being done now?

Morrison: Nothing

Omni: But I understand that NASA proposed fourteen million dollars for such a search to be carried out over a seven-year period in their fiscal year Seventy-nine budget

Morrison: Yes But that was for last year That proposal was turned down by Congress after a debate This year no such proposal was made in the NASA budget Another proposal will probably be made for FY Eighty-one or FY Eighty-two to modify the situation and get things together a little better to see if we can get it through

I think there is a good chance of the proposal's being passed at one time or another But you can never be sure

Omni: Do you think there is life out there? If so why?

Morrison: Well whether I think there is or not is really not very interesting What I think is that we now know a plausible means of finding out that which we never knew before And what we should do is try that plausible means and find out all we can

Americans who are probably more immersed than other people in this industrialized world, are disappointed by the failures of the social structure, which they blame on science.

Omni: UFOs are frequently associated at least in the popular imagination with emissaries from extraterrestrial civilizations Recently you wrote a paper The Nature of Scientific Evidence in which you discussed the UFO problem as one example Can you tell us about that?

Morrison: Of course it's a very vexing problem About ten years ago I became quite interested in the repeated reports of flying saucers and in the Condon studies at the time they were being carried out I personally went to talk to some of the most experienced and enthusiastic people But I came away very disappointed in what they regard as evidence

Since then I've talked to many people and listened to many accounts And I finally came to the conclusion that there are many phenomena in the sky that people see But there are so many jumps between a sensory experience and its interpretation The real question is Is what people see compatible with the criteria of scientific evidence? And the answer is no

Now the best point I made in the paper you referred to—and for me it was the key understanding I got about the whole business—is that things like this are not improved by having scientific instruments It won't work because the perceptions are too fleeting You're not going to have your apparatus in the right place at the right time We looked into that rather carefully and we could see that the systematic apparatus that is looking at the sky never sees any flying saucers

We have to wait for a good example—the famous flying saucer landing in front of the White House Then we'll all believe it But I just can't accept the stories of people who come and tell me they've flown in flying saucers with little green men and don't bring back even a cocktail napkin from the flying saucer so I can see something

Omni: You've always shown a great enthusiasm for science which you try hard to communicate to the general public However there is a growing antagonism toward science and the impersonal technology it represents To what do you attribute this?

Morrison: I think one of the main roots of the difficulty is the following Although I am an enthusiast for science I see in it one great fault There is a kind of arrogance characteristic of scientists especially of brilliant scientists The result of their confidence in their work when translated down to the public through the media in particular has been I think to give a false promise that science would solve all the social problems in the world which is not the case Those problems did not originate in science and will not be solved by science They will be solved by changing the nature of social relationships among humans

Americans who are probably more immersed than other people in this industrialized world and disappointed by the failures of the social structure blame these failures on science

I think the search for alternatives is essentially wishful thinking All the hope of the irrational the notion that Tarot cards or astrology will save you—these are clearly mere straws in the wind I don't oppose them as bitterly as some scientists do I don't believe in them but I think they form a kind of unofficial psychotherapy or social therapy And if people derive benefit from them who am I to say they should not?

Omni: Recently you were one of the main collaborators along with other members of the Boston Study Group on a book called *The Price of Defense A New Strategy for Military Spending* How did that study come about and why?

Morrison: We have spent four or five years seriously trying to look at the American military structure which is the most powerful in the world the prototype for all others and which has indeed taken the initiative in most of the technical developments of warfare We have asked what we need to defend American foreign-policy values and interests And we have come to the conclusion that we need *much less* than what we are presently developing

Between the surface area of the earth

and the increased production of weaponry the human species is being pressed. Now that pressure is great but it is going to get worse and worse and worse. And it's against that that I think we must act.

I'm convinced that after a third world war everybody would agree with me. But there would not be many people left. The question is, Can we avoid that experience and try to learn in another school?

We feel that the growth of weapons strength, matching weapons, and the arms-race game are essentially suicidal. Somebody must begin to say no. And the one who can say no is the one with the best possibility: the United States.

Omni: One of the elements in the new strategy for military spending proposed in your book is a "zero based budget" for military expenditures. What are the most important features of that?

Morrison: The idea is that as in every other activity of government, you should get what you need.

You should decide what your goals are, what you need in order to accomplish those goals, allowing prudent margins for error and lack of judgment and change. You should not assume automatically in a whole lot of stereotyped ways that more is always better and bigger is always better.

We've seen that happen in industry where everyone took that view. The bigger the automobiles, the better. Well, no one thinks that so strongly anymore. And exactly that kind of thing *has* to happen in the military world.

So we asked the question: If we want to defend our NATO allies—and they need some defense—and we want to defend the Japanese—with whom we have some longstanding half-guarantees of defense—and we want to preserve freedom of the seas, what do we need? Then we looked carefully at what the different theaters of war might be in terms of what the enemy—the Russians, the Chinese, whoever—might bring into that theater. Add all of them up, and you have what you need. That's the sensible way to do it.

When you do that, you discover that about forty percent of what we have is surplus—it's unnecessary, obsolescent, even dangerous and uneconomical. It doesn't get you what you want.

Omni: What do we need?

Morrison: We need fewer infantry suitable for fighting in the Third World, fewer infantry suitable for manning beaches. We're not going to be doing any of those things on a large scale anymore.

We must get rid of the most expensive and dangerous part of the navy—the aircraft carriers that were splendid for fighting the Japanese war but that have since then lost a good deal of utility. They are by no means worth the money they cost and the ships and men needed to support them.

And we should reduce the intense and aggravating overkill in strategic weapons so that we're not always living in a dangerous and more threatening world that induces the other side to be more dangerous and more threatening in a rat race that everybody understands.

These are the main changes. And all these changes add up to quite a lot.

Omni: What do you think of the SALT II agreement?

Morrison: I think that to some extent the passage of the agreement would put us a small step forward with regard to the arms race, while its defeat would put us many steps backward. It just means that you've put the clock back. You still have to find a solution. Then you can say, "We can breathe a little more easily." They are not so ready to go. . . . I am beginning to draw back, maybe others will begin to draw back." I think we have to try this.

Omni: If we continue as we are going, what do you think the future will look like?

Morrison: Like the present, but more troublesome. For thirty-five years we have had more weapons—readier, bigger, grander—but I don't think most people feel safer. Sooner or later someone will take a chance, or errors will be made, or misunderstandings and misapprehensions will occur, and the weapons will be used.

And the human race will not survive it—or not much. *That* is the thing that we feel must sooner or later be recognized. And the great powers must somehow begin to wind it down. ∞

THE TEST

CONTINUED FROM PAGE 88

that Boerst had stationed himself in the prescribed place, a step away from the gangway and that he was standing at attention, his hands pressed flat against the rubber air bladders of his space suit.

On him that wacky costume looks tailor made, Pirx thought, *and on me it looks like a bunch of soccer balls.* How come Boerst's looked uninflated and his own all puffy in places?

He caught only snatches of what was said to Boerst, and ramrod-stiff, Boerst fired off his answers so quickly that Pirx didn't stand a chance. Then it was his turn. No sooner had the CO started addressing him than he suddenly remembered something. There were supposed to be three of them flying. Where was the third? Luckily for him, he caught the CO's last words and managed to blurt out, just in the nick of time, "Cadet Pirx, ready for lift-off."

"Hm . . . I see," said the CO. "And do you declare that you are fit, both physically and mentally, ahem . . . within the limits of your capabilities?"

The CO was fond of lacing routine questions with such flourishes—something he could allow himself as the CO.

Pirx declared that he was fit.

"Then I hereby designate you as pilot for the duration of the flight," the CO said, repeating the sacred formula, and he went on.

"Mission: vertical launch at half booster power. Ascent to ellipsis B-sixty-eight. Correction to stable orbital path, with orbital period of four hours and twenty-six minutes. Proceed to rendezvous with shuttlecraft vehicles of the JO-two type. Probable zone of radar contact: sector three, satellite PAL, with possible deviation of six arc seconds. Establish radio contact for the purpose of maneuver coordination. The maneuver: escape orbit at sixty degrees, twenty-four minutes north latitude, one hundred fifteen degrees, three minutes, eleven seconds east longitude. Initial acceleration, two-point-two-g. Terminal acceleration, zero. Without losing radio contact, escort both JO-two ships in triformation to moon, commence lunar insertion for temporary equatorial orbit as per LUNA PELENG, verify orbital injection of both piloted ships, then escape orbit at acceleration and course of your own discretion, and return to stationary orbit in the radius of satellite PAL. There await further instructions."

"Pilot Pirx, are you ready for blast-off?"

"Ready!" Pirx replied. Right now he was conscious of only one desire: to be in the control cabin. He dreamed of the moment when he could unzip his space suit, or at least the neck ring.

The CO stepped back.

"Board your rocket!" he bellowed in a magnificent voice—a voice that rose above the muffled roar of the cavernous hangar like a cathedral bell.

Pirx did an about-face, grabbed the red pennon, bumped against the railing, but regained his balance in the nick of time and marched down the narrow gangway like a zombie. He was not halfway across when Boerst, looking for all the world like a soccer ball from the back, had already boarded his rocket ship.

Pirx stuck his legs inside, braced himself against the metal housing, scooted down the flexible chute without touching the ladder rungs—"Rungs are only for the goners" was one of Bullpen's pet sayings—and proceeded to button up the cabin.

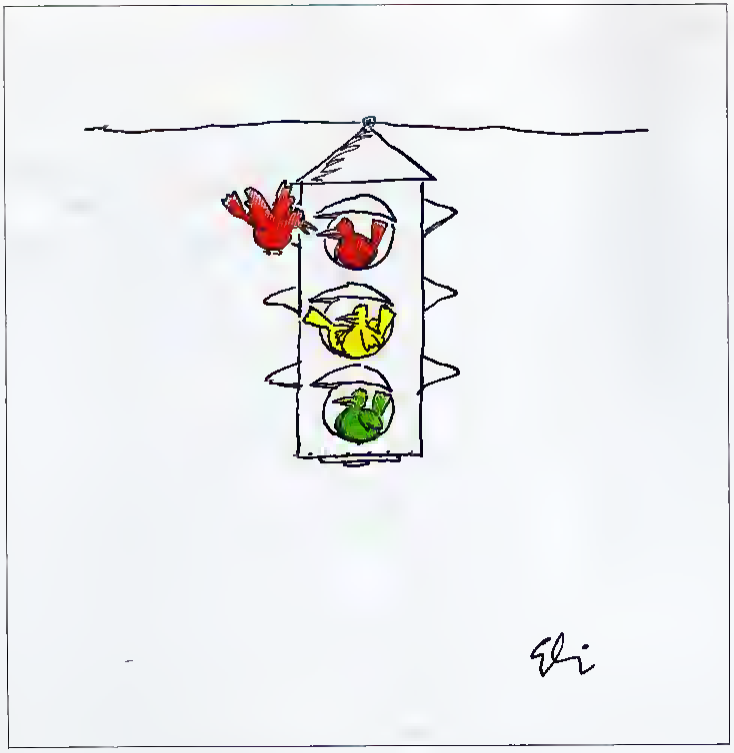
It crossed his mind that while he was still busy turning the manhole cover, Boerst was probably already settled in his glass cocoon. *But then,* he asked himself, *what is the rush?* The lift-offs were always staggered at six-minute intervals to avoid a simultaneous launch. Even so, he was anxious to get behind the controls and hook up the radiophone—if only to listen in on Boerst's commands. He was curious to know what Boerst's mission was.

The interior lights automatically went on the moment he closed the outside hatch. After sealing off the cabin, he climbed a small flight of steps padded with a rough but pliant material, before reaching the pilot's seat.

Now why in hell's name do they have to squeeze the pilot into a glass blister three meters in diameter when these one-man rockets are cramped enough as it is? Pirx wondered. The blister, though transparent, was made not of glass, of course, but of some Plexiglas material having roughly the same texture and resilience as extremely hard rubber. The pilot's encapsulated contour couch was situated in the very center of the control room proper. Thanks to the cabin's cone-shaped design, the pilot, by sitting in his "dentist's chair"—as it was called in space pilot's parlance—and rotating on its vertical axis, was able to monitor the entire instrument panel through the walls of the blister, with all its dials, video screens (located fore, aft, and on one side), computer displays, and astrograph, as well as that holy of holies, the trajectometer.

Once in the proper reclining position, he had trouble bending over at the waist to attach all the loose cables, hoses, and wires—the ones dangling from his suit—to the terminals sticking out of the seat. Every time he leaned forward, his suit would bunch up in the middle, pinching him, so that it was no wonder he confused the radio cable and the heating cable. Luckily each was threaded differently, but he had to break out in a terrific sweat before discovering his mistake. As the compressed air instantly inflated his suit with a whishing noise, he leaned back with a sigh and began to fasten his thigh and shoulder straps, using both hands.

The right strap snapped into place, but



the left one was more defiant Because of the balloon sized neck dam he had trouble turning around So he had to fumble around blindly for the large snap hook Just then he heard muffled voices coming over his earphones "Pilot Boerst aboard AMU eighteen! Lift-off on automatic countdown of zero Attention are you ready?"

Pilot Boerst aboard AMU eighteen and ready for lift-off on automatic countdown of zero! the cadet fired back

Damn that hook anyhow! At last it clicked into place and Pirx sank back into the soft contour couch as bushed as if he'd just returned from a deep-space probe

Minus twenty-three twenty-two twen— The count rambled on in his earphones with a steady patter

'Zero!' a voice blared in his earphones All at once Pirx heard a muffled but prolonged rumble his contour couch shook and flickers of light snaked across the glass canopy under which he lay staring up at the ceiling panel taking readings astrograph air-cooling gauges main-stage thrusters sustaining and vernier jets neutron flux density isotopic-contamination gauge not to speak of the eighteen other instruments designed almost exclusively to monitor the booster's performance The vibrations then began to slacken the sheet of racket tapered off overhead and the thunderous roar grew fainter more like a distant thunderstorm before giving way to a dead silence

Then a hissing and a humming but so sudden he had hardly any time to panic The automatic sequencer had activated the previously dormant screens which were always disconnected by remote control to protect the camera lenses from being damaged by the blinding atomic blast of a nearby launch

These automatic controls sure come in handy thought Pirx He was still miles away in his thoughts when his hair suddenly stood on end underneath his dome-shaped helmet

My Gawd I'm next Now it's my turn! suddenly flashed through his mind

"Pilot Pirx aboard AMU-twenty-seven!" The voice booming into his ear roused him from his predicament "Lift-off on automatic countdown of zero! Attention are you ready pilot?"

Not yet! he felt like yelling, instead he said "Pilot Boer—Pilot Pirx aboard AMU-twenty-seven and ready for uh , lift off on automatic countdown of zero "

He had been on the verge of saying Pilot Boerst because he still had Boerst's words fresh in his memory 'You nut ' he said to himself in the ensuing silence Then the automatic countdown—why did these recorded voices always have to sound like an NCO?—barked Minus sixteen fifteen fourteen

Pirx broke out in a cold sweat There was something he was forgetting—something terribly important a matter of life and death

six five four

His sweaty fingers squeezed the handgrip Luckily it had a rough finish *Does everyone work up such a sweat?* he wondered *Probably*—it crossed his mind just before the earphones snarled "Zero!"

His left hand instinctively pulled back on the lever until it reached the halfway mark There was a terrific blast and his chest and skull were flattened by some resilient rubberlike press *The booster!* was his last thought before his eyesight began to dim But only a little and then not for long Gradually his vision improved though the unrelenting pressure had spread to the rest of his body Before long he could make out all the video screens—at least the three opposite him—now inundated with a torrent of milk gushing from a million overturned cans

I must be breaking through the clouds he thought

He was just starting to make himself comfortable pressing the armrest to raise the seat in back when he suddenly went numb all over

The crib! Where's the crib sheet?

This was that awfully important detail he couldn't remember at the time He scoured the deck with his eyes now totally oblivious of the swarm of pulsating gauges The crib sheet had slipped down under the contour couch He tried to bend over but he was held back by his torso straps without a moment to lose with a sinking sensation as if perched on top of some collapsing tower he flipped open his navigation book—which until now had been stored in his thigh pocket—and yanked the flight plan from the envelope A mental blackout *Where the hell is orbit B-sixty-eight anyway? That must be it there!* He checked the trajectory and went into a roll Much to his surprise it worked

Being strapped to his seat except for a feeling of weightlessness he hardly noticed the loss of gravitation The forward screen was blanketed with stars with a brilliant white border skirting the very bottom The lateral screens showed nothing but a star-studded black void But the deck screen—ah! Earth was now so immense that it took up the whole screen and he feasted his eyes on it as he flew over at an altitude of seven hundred kilometers at pergee and twenty-four hundred kilometers at apogee *Hey isn't that Greenland down there?* But before he could verify what it was he was already sailing over northern Canada The North Pole was capped with iridescent snow the ocean stood out round and smooth—violet-black like cast iron—there were strangely few clouds and what few there were looked like gobs of watery mush splattered on top of Earth's highest points of elevation

He glanced at the clock He had been spaceborne for exactly seventeen minutes

It was time to pick up PAL's radio signal to start monitoring the radar screens as he passed through the satellite's contact zone *Now what were their names again?*

RO? No—JO. And let's see, their numbers were. He glanced down at the flight plan, stuck it back into his pocket along with the navigation book, and turned up the intercom on his chest. At first there was just a lot of screeching and crackling—cosmic interference. *What system was PAL using? Oh, yeah—Morse code.* He listened closely, his eyes glued to the video screens, and watched as Earth slowly revolved beneath him and stars scudded by—but no PAL.

Then he heard a buzzing noise.

Could that be it? he wondered, but immediately he rejected the idea. *You're crazy. Satellites don't buzz. But what else could it be? Nothing, that's what. Or was it something else?*

A critical malfunction?

Then he spotted it.

It was a giant of a fly, one of those ugly greenish-black brutes specially designed to make life miserable—a pestering, pesky, idiotic, and by the same token shrewd and cunning fly which had miraculously—and how else?—stowed away in the ship's control cabin and was now zooming about in the space outside the blister, occasionally ricocheting off the illuminated instrument gauges like a buzzing pellet.

Whenever it took a pass at the computer, it came over his earphones like a four-engine prop plane. Mounted on the computer's upper frame was a backup microphone, which gave a pilot access to the computer outside the encapsulated seat in the event his on-board phone was disconnected and he found himself without a laryngophone. One of the many backup systems aboard the ship.

Bzzzzz. He winced, the fly was crawling around on the computer in the vicinity of the mike. Then nothing, dead silence, as it stopped to preen its wings. *You lousy bastard!*

Then a faint but steady bleeping came over his earphones: dot-dot-dot—dash—dot-dot—dash-dash—dot-dot-dot—dash.

Okay, Pirx, now keep your eyes peeled! he told himself. He raised the couch a little, as if to take in all three video screens at once, checked the sweeping phosphorescent radar beam, and waited. Though nothing showed on the radar screen, he distinctly heard a voice calling: "A-seven Terraluna, A-seven Terraluna, sector three, course one hundred thirteen, PAL PELENG calling. Request a reading. Over."

Oh, crap, how am I ever going to hear my two JOs now?

The buzzing in his earphones suddenly stopped. A second later a shadow fell across his face, from above, much as if a bat had landed on an overhanging lamp. It was the fly which was now crawling across the blister and exploring its interior. The blips were coming with greater frequency now, and it wasn't long before he sighted the eighty-meter-long aluminum cylinder mounted with an observation spheroid, as it flew over him at a distance of roughly four hundred meters, possibly more, and gradually overtook him.

"PAL PELENG to A-seven Terraluna, one-hundred-eighty-point-fourteen, one-hundred-six-point-six. Increasing linear deviation. Out."

"Albatross-four Aresterra calling PAL Central. PAL Central. Am coming down for refueling, sector two. Am coming down for refueling, sector two. Running on reserve supply. Over."

"A-seven Terraluna calling PAL PELENG. ..."

The rest was lost in the buzzing. Then silence.

"Central to Albatross-four Aresterra, refuel quadrant seven. Omega Central, refuel quadrant seven. Out."

They would pick out this spot to rendezvous, thought Pirx, who was now swimming in his sweat-absorbent underwear. *This way I won't hear a thing.*

The fly was describing frenetic circles on the computer's console, as if hell-bent on catching up with its own shadow.

"Albatross-four Aresterra. Albatross-four Aresterra to PAL Central, approaching quadrant seven. Request radio guidance."

The radio static grew steadily fainter until it was drowned out by the buzzing. But not before he managed to catch the following message: "JO two Terraluna, JO-two Terraluna calling AMU-twenty-seven, AMU-twenty-seven. Over."

I wonder who he's calling. Pirx mused, and he nearly jumped out of his straps.

AMU, he wanted to say, but not a sound could he emit from his hoarse throat. His earphones were buzzing. The fly. He closed his eyes.

"AMU-twenty-seven to JO-two Terraluna, position quadrant four, sector PAL, am turning on navigation lights. Over."

He switched on his navigation lights—two red ones at the side, two green ones on the nose, a blue one aft—and waited. Not a sound except for those made by the fly.

"JO-two ditto Terraluna. JO-two Terraluna calling. ... Buzz-buzz, hum-hum. ..."

Does he mean me?

"AMU-twenty-seven to JO-two ditto Terraluna, position quadrant four, perimeter sector PAL, all navigation lights on. Over."

When both JO ships started transmitting at the same time, Pirx switched on the sequence selector, but there was too much interference. The buzzing fly of course.

I'll hang myself! It never occurred to him that such a remedy was out of the question because of the effects of weightlessness.

Just then he sighted both ships on the radar screen. They were following him on parallel courses, spaced no more than nine kilometers apart, which was prohibited, being in the pilot ship, it was up to him to make them adhere to the prescribed distance of fourteen kilometers. Just as he was checking the location of the blips on the radar screen, his old friend the fly landed on one of them. In a fit of anger he threw his navigation book at it, but the book was deflected by the blister's Plexiglas wall, instead of sliding down, it bumped against the ceiling, where, because of the zero gravity, it fluttered aimlessly about in space. Seemingly unruffled, the fly strolled merrily on its way across the screen.

"AMU-twenty-seven, Terraluna to JO-two, ditto JO-two. I have you in range. You are hard aboard. Switch over to parallel course with a correction of oh-point-oh-one. Stand by on completion of maneuver. Out."

Gradually the distance between the blips began to widen, all communication being temporarily interrupted by the fly as it embarked on a noisy little promenade around the computer's microphone. Pirx had run out of things to throw, the flight book was still hovering overhead, lithely flapping its pages.

"PAL Central to AMU-twenty-seven, Terraluna. Abandon outer quadrant, abandon outer quadrant, am assuming transsolar course. Over."

He would try to screw things up! Pirx mentally fumed. *What the hell do I care about the transsolar? Anyone knows that spaceships flying in group formation have priority.* He began shouting in reply and in this shouting of his there was vented all his impotent fury caused by the fly.

"AMU-twenty-seven, Terraluna to PAL Central. Negative, am not abandoning outer quadrant to hell with your transsolar, am flying in triformation. AMU-twenty-seven, JO-two ditto JO-two, squadron leader AMU-twenty-seven, Terraluna. Out."

I didn't have to say "To hell with your transsolar," he thought. *That'll cost me a few points for sure. Oh, they can all damn well go to hell! I'll probably get docked for the fly, too.*

It could only have happened to him. A fly! Wow, big deal! He could just see Smiga and Boerst bursting a gut when they got wind of that crazy-assed fly. If was the first time since lift-off that he caught himself thinking of Boerst. But right now he didn't have a moment to lose, because PAL was dropping farther and farther behind. They had been flying in formation for a good five minutes.

"AMU-twenty-seven to JO-two ditto

> *Pirx stuck his legs inside, braced himself against the metal housing, scooted down the flexible chute without so much as touching the ... rungs. "Rungs are ... for goners."*

JO-two Terraluna. It is now twenty hours seven minutes. Insertion parabolic orbit Terraluna to commence at twenty hours ten minutes. Course one hundred eleven. " And he read off the course data from the flight sheet, which, by a feat of acrobatics, he was able to retrieve from overhead. The two JO ships radioed their reply. PAL dropped out of sight, but he could still hear it signaling ever so faintly. Or was that the fly he was hearing?

For a moment the fly seemed to multiply to be in two different places at once. Pirx rubbed his eyes. It was just as he suspected. There was not one, but two of them. Where did the second one come from?

Now I'm really a goner, he reflected with absolute calm, without a sign of any emotion. He even felt relieved somehow, knowing that it no longer mattered. Either way he was sunk. His thoughts were diverted by a glance at the clock. It was 2010 hours, the time he himself had scheduled for the maneuver, and he had yet to even place his hands on the controls.

The daily grind of training exercises must have taken its toll, because without a moment's hesitation he grabbed both control sticks, pressed first the left one and then the right, and all the time kept his eye on the trajectometer. The engine responded with a hollow roar, until it gradually tapered off to a whisper. *Ouch!* Something landed on his forehead, just under his visor and remained stationary. The navigation book! It was blocking his vision, but he couldn't brush it aside without removing his hands from the controls. His earphones were alive and astir as the two flies went about pursuing their love life on the computer. *If only I had a gun on me*, he thought, feeling the navigation book start to flatten his nose with the increase in acceleration. In desperation he began tossing his head around like a madman, he had to be able to see the trajectometer for crying out loud! Suddenly the book crashed to the floor with a bang—and small wonder. At four-g it must have weighed nearly three kilos. He immediately decelerated to the level required by the maneuver, and at two-g he put the levers on hold. He threw a glance at the mating flies. They were not the least bit fazed by the acceleration, on the contrary, they looked to be in seventh heaven.

From now until the end of the accelerated flight he would have a little time to kill. Two-g was tolerable, despite his combined weight of one hundred forty-two kilos. How many times had he spent up to a half-hour in the centrifuge at four-g?

He verified the position of the two ships and again thought of Boersf, picturing to himself how very much the movie star he must have looked. What a jaw that guy had! Not to mention that perfectly straight nose, those steely gray eyes. . . . *You can bet he didn't have to rely on any crib sheet! But come to think of it, so far neither have I.*

He adjusted the automatic reducer to achieve a zero acceleration after eighty-three minutes, as instructed, and then saw something that turned his sweat-absorbent underwear to ice.

Above the dashboard a white panel had come unclamped. Not only that, but it was starting to work its way down a millimeter at a time. It had probably been loose to begin with, he reasoned, and all the vibrating during the recent yaw maneuvers—Pirx's handling of the ship hadn't exactly been gentle—had loosened the pressure clamps even more. With the acceleration still running at one-point-seven-g, the panel kept inching its way down as if it were being pulled by an invisible thread. Finally it sprang loose altogether, slid down the outer side of the Plexiglas wall, and settled motionlessly on the deck, exposing a set of four gleaming copper high-voltage wires and fuses at the back.

Why all the panic? he thought. *An electrical panel has come loose. So big deal! A ship can get along without a panel, can't it?*

There were still twenty-seven minutes of accelerated flight to go when it hit him that once the engines were shut down the panel would become weightless. *Could it do any damage?* he wondered.

What were the flies up to? He followed them with his gaze as they zoomed and buzzed and circled and chased each other around the outside of the blister before landing on the back of the fuse panel. That's when he lost track of them.

He took a reading of the two JO ships on the radarscope. Both were on course. The face of the moon now loomed so large on the front screen that it took up half of it. He recalled how during a series of selenographic exercises in the Tycho Crater Boerst, with the help of a portable theodolite. . . . *Damn it, what a pro that guy was!* Pirx kept an eye out for Luna Control on the outer slope of Archimedes. It was camouflaged so well among the rocks that it was almost invisible from high altitude, all except for the smooth surface of the landing strip with its approach lights—when in the night zone, that is, and not, as presently, when it was illuminated by the sun. At the moment the base was straddling the crater's shadow line; the contrast with the blinding lunar surface being so intense that it overpowered the weaker approach lights.

That's funny—I don't hear any more buzzing. He glanced sideways and flinched.

One of the flies was sitting and cleaning its wings on the exposed side of the panel, while the other fly was busy courting it. A few millimeters away, its copper terminal gleaming below the spot where the insulation ended, was the nearest cable. All four cables were exposed, about as thick in diameter as a pencil, and all in the one-thousand-volt range, with a contact clearance of seven millimeters. It was just by accident that he knew it was seven. Once, as an exercise, they had torn down the entire circuitry system, and when Pirx couldn't come up with the exact clearance, his instructor had read him off the riot act.

In the meantime, the one fly took time off

BEFORE YOU BUY COMPUTER #1, VISIT #1 COMPUTERLAND

If the truth is that you want a computer, then we want to be your computer store.

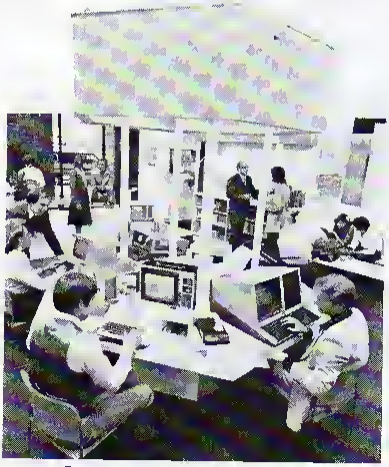
We're ComputerLand, the #1 computer store chain in the U.S. What's meaningful about that fact is, that ComputerLand has been chosen by more people as having what they've been looking for. And since you're looking, let us tell you what you'll find, when you visit a ComputerLand store.

You'll find a product line that's continually evaluated to provide you with the widest and best selection in quality, brand name microcomputers anywhere. You'll find an enthusiastic and knowledgeable staff able to interpret all the equipment specifications, in terms of how they apply to you, and in a way you'll understand. You'll find demonstration areas where you can get a firsthand experience of running a computer yourself.

COMPUTERS FOR BUSINESS

You'll find educational materials to give you a total insight into the world of microcomputers.

You'll find a fully equipped service department to provide whatever assistance is required to keep your computer running in top-notch condition. You'll find computer user's clubs to join, where you can share ideas with people as enthusiastic as yourself. And, with each new visit, you'll find excitement—from the people you deal with, the equipment they offer, and from your own ever growing personal involvement.



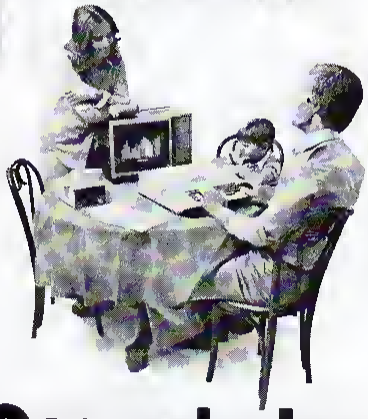
Enough about us. How about what computers do. To attempt to describe all the things your computer might do, would be to describe your imagination. So instead, we'll briefly list some of the many things for which small computers are already being used.

In business, the advent of the versatile and compact microcomputer has put the benefits of computing within reach of small companies. With systems starting at less than $6000, the businessman can computerize things like accounting, inventory control, record keeping, word processing and more. The net result is the reduction of administrative overhead and the improvement of efficiency which allows the business to be managed more effectively.

In the home, a computer can be used for personal budgeting, tracking the stock market, evaluating investment opportunities, controlling heating to conserve energy, running security alarm systems, automating the garden's watering, storing recipes, designing challenging games, tutoring the children, and the list goes on.

In industry, the basic applications are in engineering development, process control, and scientific and analytical work. Users of microcomputers in industry have found them to be reliable, cost-effective tools which provide computing capability to many who would otherwise have to wait for time on a big computer, or work with no computer at all.

COMPUTERS FOR THE HOME



COMPUTERS FOR INDUSTRY

And now we come to you, which leads us right back to where we started. **If you want a computer, then we want to be your computer store.**

Whether you want a computer for the home, business or industry, come to ComputerLand first. We'll make it easy for you to own your first computer. Because, simply put, we really want your business. When you come right down to it, **that's what makes us #1.**

ComputerLand®

WE KNOW SMALL COMPUTERS

14400 Catalina St., San Leandro, CA 94577 (415) 895-9363 • FRANCHISE OPPORTUNITIES AVAILABLE WORLDWIDE

from its wooing and started venturing out along the live terminal. A harmless enough thing to do—unless, of course, it suddenly got an urge to hop over to the next one, and, judging by the way it sat there, humming, at the very end of the terminal, that's precisely what it intended to do. As if it didn't have room enough in the cabin! Now Pirx thought, what would happen if it put its front feet on the one wire and kept its hind feet on the other? Well, so what if it did! In the worst case it might cause a short circuit. But then—a fly! Would a fly be big enough to do that? But even if it were, nothing much could happen, there would be a momentary blowout, the circuit breaker would switch off the current, the fly would be electrocuted, and the power would be restored—and goodbye fly! As if in a trance, he kept his eyes fixed on the high-tension box, secretly cherishing the hope that the fly would think better of it. A short circuit was nothing serious, a minor foul-up, but who knows what else might happen . . . ?

Only eight more minutes of gradual deceleration until touchdown. He was still staring at the dial when there was a flash. Then the lights went out. It was a momentary blackout, lasting no more than a fraction of a second. *The fly!* he thought, and he waited with bated breath for the circuit breaker to flip the power back on. It did.

The lights stayed on for a while—dimmer and more orange-brown than white—before the fuse blew a second time. A total blackout. Then the power came on again. Off again. On again. And so it went, back and forth, with the lights burning at only half their normal amperage. What was wrong? During the brief but regular intervals of light he managed, with considerable squinting and straining of the eyes, to pinpoint the trouble. The insect was trapped between two of the wires, a charred sliver of a corpse that continued to act as a conductor.

Pirx was far from being in a state of panic. True, his nerves were a trifle frayed, but, then, when had he ever been completely relaxed since the launch count? The clock was barely legible. Fortunately the instrument panel operated on its own lighting system, as did the radarscope. And there was just enough juice being supplied to keep the backup circuits from being tripped, but not quite enough to light the cabin.

Only four minutes left until engine cutoff. Well, that was one load off his mind—the reducer was programmed to shut the engine down automatically. Suddenly an icy chill ran down his spine. How could the kill switch work if the circuit was shorted?

For a second he couldn't recollect whether they operated on the same circuit, whether these were the main fuses for the rocket's entire power supply. Of course they had to be. But what about the reactor? Surely the reactor must have had its own power network.

The reactor, yes, but not the automatic switch. He knew because he had set it himself. Okay, so now all he had to do was to shut off the power. Or maybe he should just sit back and give it a chance to work on its own.

The engineers had thought of everything—everything except what to do when a fly gets into your cabin, a fuse panel comes unclamped, and you wind up with such a screwy short circuit!

Meanwhile the lights kept shorting out. Something had to be done about it. But what?

Simple. All he had to do was to flip the master switch, located in the floor behind his seat. That would shut off all the main power circuits and trip the emergency system. Then all his worries would be over. *Hmm*, he thought, *not bad the way these buckets are rigged.*

He wondered whether Boerst would have been as quick on his feet. Probably if not quicker. Yikes, only two minutes left! Not enough time for the maneuver! He sat up. He had clean forgotten about the others.

"AMU twenty-seven, squadron leader

> *The fly . . . embarked on a . . . promenade around the computer's microphone. Pirx had run out of things to throw, the flight book was still hovering overhead lithely flapping its pages.*

Terraluna calling JO-two, ditto JO-two. Reporting short circuit in control room. Will be necessary for me to postpone lunar-insertion maneuver for temporary equatorial orbit . . . uh . . . indefinitely. Proceed to execute maneuver at previously designated time. Over."

"JO-two, ditto to squadron leader Terraluna. Will commence joint lunar-insertion maneuver for temporary equatorial orbit. You are nineteen minutes away from lunar landing. Good luck. Good luck. Out."

Pirx hardly heard a word because in the meantime he had disconnected the radiophone cable, the air hose, and another small cable (his straps were already undone). No sooner had he made it to his feet than the kill switch flashed a ruby-red. The cabin sprang briefly out of the dark, only to be plunged back into an orange-brown blur. The engine cutoff had failed. The red signal light kept staring at him from out of the dark, imploringly. A buzzer sounded the warning signal. The automatic reducer was inoperative. Fighting to keep his balance, Pirx jumped behind the contour couch.

The master switch was housed in a cassette inserted in the floor. The cassette turned out to be locked. Natch! He tried yanking on the lid. It wouldn't give. The key. Where was the key?

There was no key. He tried forcing the lid again. No luck.

He sprang to his feet and stared blindly into the forward screen, where its surface no longer silver but an alpine snow-white there now loomed a gigantic moon. Craters came into view, their long, serrated shadows creeping stealthily along the surface. He could hear the radar altimeter clicking steadily away. *How long has it been operating?* he wondered. Little green digits flashed in the dark, and he read off his present altitude: twenty-one thousand kilometers.

The ship was now flying a perfectly straight course, gaining velocity as the residual acceleration reached point-two g, and the moon's gravitational pull grew stronger. What to do? What to do! He rushed back to the cassette and kicked it. The metal casing refused to budge.

Hold everything! My Gawd, how could I have been so stupid! All he had to do was to find a way to reach the other side of the blister. And there was a way! Near the exit, at the point where the blister narrowed tunnellike to form a funnel ending with the air lock, there was a special lever painted a bright enamel red, beneath a plate that read FOR CONTROL SYSTEMS EMERGENCY ONLY. One switch of the lever was all that was needed to raise the glass cocoon a meter off the ground, leaving just enough clearance underneath. Once on the other side, all he had to do was to clear the lines, and with a piece of insulation.

He was at the handle in less than no time.

You moron! he thought, and he grabbed the metal handle and yanked until his shoulder joint cracked. The lever, its metal rod glistening with oil, was fully extended, but the blister hadn't wiggled an inch. In stunned bewilderment, he stood staring at the glass bubble, at the video screens ablaze with moonlight, at the blinking light overhead. He jerked on the lever again, even though it was out as far as it would go. Nothing.

The key! The key to the cassette! He fell flat on the floor and searched under the seat. There was nothing to be seen except the crib sheet.

The lights blinked, the circuit breaker switched. Now when the lights dimmed, the moonlight cast everything in a stark skeleton-bone white.

It's all over, he thought. Should he fire the ejection rocket and bail out in the encapsulated seat? No, it wouldn't work without any atmospheric drag; the parachute wouldn't brake. *Help!* he wanted to yell, but there was no one to whom he could call in distress. He was all alone. What to do? There just *had* to be a way out!

He scrambled back to the emergency lever and almost tore his arm out of its socket, now so frantic he wanted to cry. It was all so dumb . . . Where was the key?

And why the malfunction in the emergency lever? The altimeter. With one sweeping glance he read off the displays: ninety-five hundred kilometers. The saw-toothed ridge of Timocharis now stood out against the luminous background in sharp relief. He even had visions of where his ship was about to drill a hole in the pumice-covered rock. A loud crash... a blinding explosion, and

During a brief interval of light, his frantically shifting gaze fell on the set of four copper wires. The little black speck spanning the cables—all that was left of the incinerated fly—was clearly discernible, even from a distance. Sticking out his neck and shoulder like a soccer goalie about to make a flying save, Pirx lunged forward with all his weight. He was knocked almost unconscious by the force of the collision. He bounced off the blister's Plexiglas wall like an inflated inner tube and crumpled to the floor. The outer shell did not so much as jiggle. Struggling to his feet, panting with a bleeding mouth, he got ready to make another flying lunge at the Plexiglas wall.

That's when he happened to glance down.

The manual override. Designed to give rapid, full-thrust acceleration in the ten-g range. Operated by direct mechanical control and capable of providing an emergency thrust lasting less than a second.

But the greater the rate of acceleration, he suddenly realized, the faster his descent to the lunar surface. Or would it be? No, it would do just the opposite; it would have a braking effect. But wouldn't the reaction be too short to act as a brake? The braking had to be continuous. So much for the override. Or was it?

He made a dive for the control stick, grabbing it on his way down, and pulled for all he was worth. Without the contour couch to cushion his impact, he could have sworn all his bones had been fractured when he hit the deck. Another pull on the stick, another powerful lurch. This time he landed on his head, and if it hadn't been for his helmet's foam-rubber liner, his skull would have been shattered.

The fuse panel started sizzling; the blinking suddenly stopped; and a soft and steady electric light lit up the interior of the cabin.

The two bursts of acceleration, fired in quick succession by manual control, had been enough to dislodge the tiny sliver of carbon from between the wires, thus eliminating the short circuit once and for all. With the salty taste of blood in his mouth, Pirx made a diving leap for the couch, but instead of landing in it, he sailed high up over the back and rammed his head into the ceiling; the blow softened only somewhat by his helmet.

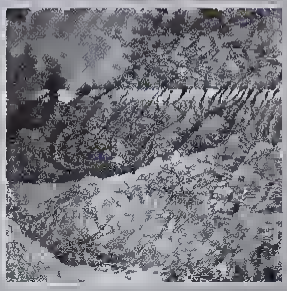
Just as he was getting set to leap into the air, the now-activated kill switch cut off the rocket, and the last trace of gravitation disappeared. Propelled by its own momentum, the spacecraft was falling straight toward the rocky ruins of Timocharis.

NEXT OMNI

HOUSE

TOYS

ALIENS



ANTIMATTER

ULTIMATE FUEL—When matter strikes antimatter, they explode with hundreds of times as much power as is produced by nuclear fission. A mere 30 milligrams of antimatter could take a one ton AstroCruiser to the moon in four hours. Ten grams could put a ten ton vehicle on Mars in a week. Antimatter is already being created, captured, and stored for days on end in laboratories all over the world. Generators that will make grams of it at a time are already on the drawing boards. In the November *Omni* physicist Robert Forward tells how we'll use the fuel that could let you spend a 21st-century weekend basking in the sun on Mare Imbrium.

ILLEGAL ALIENS—By law the first intelligent extraterrestrials to step from a flying saucer won't be ambassadors from a distant planet. They'll be *ferae naturae*, wild animals, and fair game for any hunter who wants a really unique trophy. Even if lawyers accept them as people—it will take a quick change in some very xenophobic definitions—the fact that they have violated immigration statutes will be only one problem faced by the aliens. Will telepaths who eavesdrop on people's bedrooms be guilty of telerape? Will the jury that hears their case have to contain at least one extraterrestrial? And what about ET/human marriage? For the legal ins and outs of intergalactic contact, see our alarming report in next month's *Omni*.

DREAM HOUSE—Don't let energy "experts" con you. The Solar Age is already here. High on a snow-covered mountain overlooking Lake Tahoe, Tom Smith spent last winter nestled snug in a house radiantly heated almost entirely by the sun. Smith's home has no bizarre collectors or complex plumbing. It looks like many other houses in the resort area and costs less to build than the regional average. Writer Ronald Dans gives the exciting details in the next issue of *Omni*.

TOYS—Playthings have come a long way, baby, since the Barbie Doll's heyday. The Computer Revolution has hit toymakers hard. On the market this Christmas, you'll find *Star Trek* phasers that shoot infrared rays, hand-held video games with their own built-in screens, and talking robots with microchip brains. In 1977 first-generation electronic games—there were only four hand-held brain teasers—grossed $21 million. This year we'll choose from hundreds of games and spend over $1 billion on them. For a dazzling preview of the high-tech wonders being stockpiled in Santa's cybernetic workshop, don't miss the November *Omni*.

He bounced off the ceiling and spit, and the bloody saliva floated next to him in a galaxy of silver-red bubbles. Frantically he twisted and turned and stretched out his arms toward the couch. For added momentum he emptied his pockets and threw their contents behind him, the force of which propelled him downward, gradually and gently. His fingers, now so taut that his tendons threatened to snap, at first barely scraped the nickel-plated tubing before getting a firm grip on the frame. He didn't let go. Like an acrobat doing a handstand on parallel bars, he tucked in his head and pulled himself into an upright position, grabbed hold of the seat belt, and lowered himself down on it, at the same time wrapping the belt around his trunk. Not stopping to buckle the belt, he stuck the loose end between his teeth; it held. Now for the control levers and the braking pedals!

The altimeter showed eighteen hundred kilometers to lunar surface. Would he be able to brake in time? Impossible—not at a velocity of forty-five kilometers per second. He would have to pull out of the nose dive by describing a steep turn. There was no other way.

Firing his pitch rockets, he accelerated to two, three, four gs. Not enough! Not nearly enough!

As he applied full thrust for the pullout, recovery, the lunar surface, shimmering quicksilverlike on the video screen, and so like a permanent fixture until now, began to quiver and slowly subside; his contour couch squeaking under the increasing pressure of his body. The ship was going into a steep arc directly over the lunar surface—an arc with a radius large enough to compensate for the tremendous velocity. The control stick was pushed to the limit. Pressed against the spongy backrest with his space suit not connected to the air compressor, he could feel the air being squeezed out of his lungs and his ribs being bent inward. He began seeing gray spots and waited for the blackout; his eyes riveted to the radar altimeter which kept grinding out one set of digits after another: nine hundred ninety... nine hundred eight hundred forty... seven hundred sixty...

His eyesight began to dim—the five gs were beginning to exact their toll—but he remained conscious. He lay there, partially blind, his fingers tightly gripping the controls, and felt the seat's foam-rubber cushion give way under the g force. Somehow he couldn't quite bring himself to believe that he was done for. Unable to move his lips, he started counting mentally in the dark, slowly and deliberately: *Twenty-one, twenty-two, twenty-three, twenty-four...*

At the count of fifty it crossed his mind that if there were to be an impact, it would have to be now. Even so, he kept his hands on the controls. It was starting to get to him now—the suffocating sensation in the chest, the ringing in the ears, a throat all clogged with blood, the reddish-black in

the eyes. He'd reached his physical limits.

His fingers relaxed their grip, and the control stick slid back of its own. He saw nothing, heard nothing. By degrees the darkness began to lift and turned grayer, and breathing became easier. He tried opening his eyes only to discover that they had been open the whole time—his eyelids were completely dried out.

He sat up.

The gravimeter showed two gs; on the forward screen, nothing but star-embellished blackness. Not a sign of the moon. What had happened to it?

It was there, all right—below him. He had pulled out of his deadly nose dive and was now cruising up and away with a diminishing escape velocity. He wondered how close he had shaved it. The altimeter must have recorded the exact amount of clearance, but somehow he was in no mood to take a readout. Suddenly the alarm signal stopped. *My Gawd, it has been on the whole time! A big help* that *was! Why not hang a church bell from the ceiling? If you're headed for the cemetery, then at least let a guy go out in style!* There was another buzzing noise, this time very faint. The other fly! It was alive, the bastard! Alive and buzzing the blister's ceiling. Suddenly he had an awful taste in his mouth, a taste similar to that of coarse canvas . . . The safety belt. He had been munching on it absentmindedly the whole time.

He fastened the safety belt and grabbed hold of the controls, he still had to steer the ship back onto the assigned orbit. The two JO ships were nowhere in sight, which came as no surprise. Even so, he had to complete the mission and report to Luna Navigation. Or should he report first to Luna Control—because of the malfunction? Damned if he knew. Or maybe he should just keep quiet. No way! The moment he touched down, they would spot the blood—which, as he now noticed for the first time, was splattered all over the ceiling. Besides, the on-board flight recorder would have the whole story on tape—the way the circuit breaker went berserk, the malfunction in the emergency lever. . . *Boy, a swell piece of machinery these sports give us! They might as well send us up in a coffin!*

Okay, so he'd report it. But where? Then he had a brainstorm. He leaned forward, loosened his shoulder strap, and groped under the seat for the cnb sheet. Why the hell not? Now's when it could really come in handy.

At that instant he heard something creak behind him, as if a door were being opened.

A door? Behind him? He knew perfectly well there was no door behind him. But even if he'd wanted to, he couldn't have turned around because of the straps. A streak of light fell across the screens, wiping out the stars still visible on them, and the next thing he heard was the CO's soft and subdued voice. "Cadet Pirx."

He made an attempt to get up, was restrained by the straps, and fell back against the seat, convinced that he was hallucinating. Out of nowhere the CO suddenly appeared in the passage separating the glass shell from the rest of the cabin. He stood before him in his gray uniform, fixed him with his gentle gray eyes, and smiled. Pirx was altogether confused.

The moment the glass bubble went up, Pirx automatically started undoing his straps, then rose to his feet. The video screens behind the CO went blank.

"A good performance, Pirx," the CO said. "Quite good."

Pirx was still dumbfounded. Then, as he was standing at attention in front of the CO, he did something that was strictly against the rules. He turned his head around, twisting it as far as his partially inflated neck dam would let him.

To his amazement, the entire access tunnel had been dismantled, hatchway and all, making it look as if the rocket ship had broken in half. In the evening light he made out the catwalk, where a group of people were now standing—the cable railings, the ceiling girders. Pirx stared at the CO with a gaping mouth.

"Come along, son," said the CO, who reached out and shook Pirx's hand firmly. "On behalf of Flight Command, I commend you and . . . offer you my personal apology. Yes, it's . . . only right. Now come along. You can clean up at my place."

The CO started for the exit with Pirx trailing his footsteps, still a little stiff and wobbly on his feet. It was chilly outside. A breeze was blowing through the sliding panel in the ceiling. Both ships were parked in the exact same place as before. Attached to the nose of each were several long and thick cables, droopingly suspended in space. They had not been there before.

His instructor, who was among those waiting on the catwalk, made a remark which Pirx had trouble hearing through his helmet.

"What?" he instinctively blurted out.

"The air! Let the air out of your suit!"

"Oh, the air . . ."

He pressed the valve, and the air made a hissing sound as it was released. From where he stood on the catwalk, he could make out the two men in white smocks waiting behind the railing. His rocket ship looked as if it had a fractured beak. At first he felt only a strange apathy which turned to amazement, then disillusionment, and finally anger—pure and unmitigated anger.

They were opening the hatch of the other ship. The CO was standing on the catwalk, listening to something the men in white smocks were telling him.

A faint banging noise could be heard coming from inside.

Then, from out of the cabin staggered a writhing hulk of a man in a brown uniform, his helmetless head bobbing around like a blurry blotch; his face contorted in a mute shriek.

Pirx's knees buckled. ∞

CONTINUED FROM PAGE 64

computer therapy seriously To see how a computer might interrogate a patient with mental problems Colby turned the experiment around In the early 1970s he created a program that could converse in English and respond to questions as if it were a human paranoid

Called PARRY it was given the identity of a twenty-eight-year-old man who lived with his parents and bet heavily on horses PARRY was obsessed with the idea that he was being stalked by a vengetul bookie In one experiment six psychiatrists interviewed both PARRY and a real paranoid through a terminal Asked which was human they guessed wrong often as not

Interesting as these achievements are they are all microworld research that deals with restricted domains of knowledge and limited vocabularies The question is how to extend this to the real world

Roger Shank of Yale is teaching computers "scripts" about human social situations, hoping to learn how we draw on expectations to extracf implicit meaning from ambiguous statements One of his scripts enables a computer to answer questions about what happens when it goes to a restaurant recalling that paying the check presumes having eaten, and so on

Other programs developed at Yale can scan a newspaper article, summarize the major points and then update the summary daily as new details untold in the press Whether or not this research will someday lead fo the use of stored knowledge tor understanding language, it's now only a simplistic model of human cognition

Ten years ago AI researchers thought that it they could teach a computer to talk about some artificial situation they could then extend this language ability to the real world Now they are less sure The issue once again is context and experience One often-repeated story tells of a machine that translated the biblical verse "The spirit is willing but the flesh is weak" from English to Russian and back again The computer came back with "The wine is agreeable, but the meat has spoiled."

We also acquire much of our knowledge visually and if computers are going to equal our intelligence they must do the same The punch line here is that visual perception may be even more complex than language It's easy enough to dump visual information into a computer Any color TV camera can easily pick up a deluge of data The problem is in what happens next No one understands how the brain makes sense of the information our eyes supply How can we effortlessly process a jumble of light shadow movement, and color to recognize that the car speeding past is this year's new Jaguar, even when we have never seen one before?

The information continuously processed by the eye is so far beyond any computer's capacity that AI researchers have begun to suspect that the eye and brain somehow cheat Perhaps they reduce the data to manageable proportions by pulling some trick to avoid processing redundant stimuli

In hopes of simplifying the visual information a computer must deal with to digest an image MIT's David Marr has tried to convert an incoming picture into what he calls a primal sketch The light intensities in a real image are converted into a "rich symbolic description" of the way they change over a visual field By remembering only where the change occurs rather than everything in its field of view the computer can cut its data processing markedly

Minsky thinks our brain may store a number of handy reference pictures which he calls frames Suppose he says we are standing in a living room we have never seen before We already have a rough idea of what we'll find in a living room and where things will be So we don't have to start from scratch and ponder everything in detail

Not surprisingly research in computer vision inevitably leads us back to the matter of human experience As in language programming academic researchers have found that human intelligence is intimately tied with human perception It's going to be very hard to duplicate one without also duplicating the other.

We may never need to mimic the eye's exact mechanisms however Our eye is a general-purpose instrument that may work as it does only because it had to grow from a single cell Computer vision systems may someday surpass the eye's data-gathering ability precisely because they do work differently Industrial vision systems already improve on human performance in that they don't get bored or show up at work bleary eyed from a hangover

In the early 1960s scientists at Johns Hopkins University created one of the first mobile robots affectionately known as the Hopkins Beast Said to resemble a garbage can on wheels, it was entirely self-contained with no external computer link Its sole activity was to whir up and down the corridors of its building in a sonar search for electrical outlets Whenever it spotted one it would home in, screech to a halt, insert its plug, and feed When sated, it pulled away and began its quest for the next outlet It had eyes for only one thing electric-outlet coverplates Its search for "food" was the one "instinct" that kept it going

SRI International, then known as the Stanford Research Institute built a more sophisticated mobile robot in 1968 Dubbed Shakey because if always seemed unsure of its footing it was about the size of a small desk-top copy machine, perched on a mobile base its "head" was a TV camera and range finder topped by a radio antenna Guided by radio from a large nearby computer Shakey could decipher English commands and figure out ways to obey them Told to retrieve a box

sitting out of reach on a platform. Shakey was smart enough to survey the room, find a ramp and shove it against the platform, then motor up to claim his objective. He could see, move, touch, and reason.

Unfortunately, Shakey never learned to leave his microworld playpen. His intelligence was far too limited for him to roam abroad. The conclusion that unlimited mobility requires human sophistication halted university research on sentient robots.

Robot research now rests mainly in the pragmatic hands of industry, which asks only that machines be smart enough to handle their jobs. Although manipulators and so-called blind robots are nothing new to the industrial scene, until recently they had no sight, no sense of touch, and no "brain." Without these they will cheerfully screw a bolt into thin air if somebody forgets to put the socket in exactly the right place.

This is all about to change. General Motors' vision-equipped manipulators, called hand-eye machines, are now entering the assembly lines. The GM system identifies unoriented parts as they come down a conveyor belt and maneuvers a hand to pick them up and fit them to a car body or discard them into a reject bin if they're not the right size. A robot system recently developed at SRI International sports both eyes and a sense of touch, enabling it to sense when a bolt is not screwed in properly. Vision-equipped robots are slowly going to revolutionize the assembly line. Kawasaki Ltd. is even planning factories run entirely by robots.

Charles Rosen, SRI's former director for robotics, says, "Although ten to fifteen percent of assembly jobs will still be done by people for many years, a heck of a lot of other jobs can be done by robots." He thinks robots will eventually cut the workweek, shift people into service jobs, and make low-cost custom products possible.

For years AI's most widely known use has been in computerized chess. Though machines must struggle to compete with human sight and language, they have much less trouble with analytic manipulations. Grand Master David Levy recently won his ten-year-old bet, made against several AI experts, that no computer chess program could beat him by 1978. (See Interview, April 1979.) However, Levy took only three out of five games against the program "CHESS 4.7," and he is not planning to renew his bet for another decade.

Computers became unbeatable in checkers several years ago, and Nicholas Findler at the State University of New York at Buffalo seems well on his way to developing a program that can beat most poker players, regardless of their style. Poker is particularly interesting, since winning demands a lot more than simple logic. Human psychology is the key to this game. Significantly, the program's opponents, isolated and playing through a keyboard and TV screen, often cannot tell which of the other players is the computer.

Games may seem trivial, but scientists believe they provide important models of human problem solving—a major goal of all AI research. But if computers can play championship chess, mustn't they surely be capable of simulating the human problem-solving process? Unfortunately, no.

Quite simply, no one knows how we acquire our "common" knowledge, or how we relate it to new situations to produce "understanding." Some researchers are now concluding that intelligence is so entwined with life itself that it can never be fully reproduced in a box of silicon chips.

The academic debate over what constitutes human intelligence is far from settled. AI researchers interested in practical problem solving spend little time worrying about it. And although these uses haven't taken the world by storm, they have shown that computers can do more than play chess.

The PROSPECTOR system at SRI aids in mineral exploration. A program at Stanford, called DENDRAL, is being used to deduce molecular structures from the output of mass spectrometers. At MIT, MACSYMA does high-level algebra for mathematicians. J. D. Meyers at the University of Pittsburgh Medical School is developing a diagnostic program called INTERNIST, which incorporates his own experience as a physician into a simulation of clinical "judgment." And at Stanford, MYCIN will soon aid in diagnosing blood infections and meningitis.

The thread that connects these programs is that they are restricted to a narrow range of facts. They are what Stanford's own Ed Feigenbaum calls "knowledge engineering." They do not pretend to be exact replicas of human thought processes. Rather, they use the computer's vast memory and high speed to sift through what for human beings would be an overwhelming mountain of information. We avoid being overloaded with data by using judgment to focus on what is important. Thanks to their speed, computers can arrive at the same result by looking at all their data every time. They may appear "intelligent," but they tell us very little about how the human mind works.

So far, AI research hasn't even come close to reproducing human intelligence. AI has painfully discovered that our type of intelligence cannot really be isolated from the rest of human life and experience. Attempts to process visual images, create language, and solve problems have given us a new appreciation of just how complex the brain's functions must really be.

Yet machine intelligence, with computers doing things their own way, has almost limitless potential. Sooner or later computers will probably duplicate most everyday human tasks. An artificial intelligence is indeed arising, but it is a species different from human intelligence. It is evolving rapidly and, despite its alien character, is adapting nicely to man's world. We have yet to face the psychological or social implications of its Faustian success. ∞

GAMES

ANSWERS TO GAMES (page 176)

370 The next-highest cube-sum number is 371 The number 370 read upside-down with a Spanish accent is *OLE*

IMPROMPTU MAGIC

These seven feats, and hundreds of others are described in Gardner s *Encyclopedia of Impromptu Magic* published by Magic Inc

a Anyone can produce a tiny puff of 'smoke from an 'invisible cigarette ' Keep your mouth tightly closed and by pressure of the mouth and cheeks compress the air inside your mouth as much as possible Then open your mouth and let the air drift out Under the right humidity conditions the sudden expansion of the air causes it to condense and produce a small cloud of vapor

b A 50 cent piece under the tablecloth absorbs the cigarette s heat so that the cloth doesn t get hot enough to burn or be scorched

c A bit of earwax on the end of the match does the trick

d The distance from the right side of the shield on the eagle to the right margin of the bill is one inch. *United States* at the top of the green side is two inches wide The rectangle containing the words *Federal Reserve Note* at the top of the bill's face is three inches wide The bill itself is three sixteenths of an inch longer than six inches, eliminate one margin and you come very close to a six-inch rule

e Hold the watch flat pointing the hour hand toward the sun Imagine a line running from the center of the dial through a point midway between the hour hand and 12 This line will point due south If the time is before six in the morning or after six in the afternoon this line points north instead of south If you are south of the equator these rules are reversed

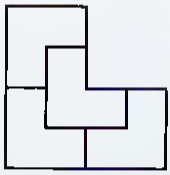
f Hold a raw unpeeled potato in the left hand and a straw in the right between the thumb and middle finger with the index finger covering the end of the straw With practice it is possible to drive a paper straw completely through a potato A quick straight thrust does it, the air column trapped in the straw keeps it momentarily rigid enough to cut through the potato

g To remove a vest without removing one s coat first tuck the left side of the coat into the left armhole of the vest from outside Work the armhole over the left shoulder and down over the arm and hand—the hole will then circle the coat in back of the left shoulder. Work the hole toward the right shoulder, and pass it over the shoulder arm hand and right side of the coat Push it halfway down the right side of the coat Reach up the sleeve seize the vest and extract it through the sleeve

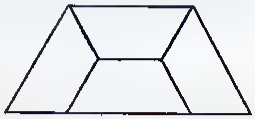
PUZZLES

1. CUT-UPS In both cases the unique solution involves parcels that have the same shape as the original lot but that are one fourth its size

Gardner takes these puzzles another step and asks whether it is possible to dissect a



square into *five* congruent parts As with these problems the pieces may be of



any design no matter how complex or bizarre as long as they are identical in size and shape An asymmetric piece is considered congruent with a mirror-image flopped-over version of itself The answer to Gardner s problem of parceling a square into five pieces is unique There s only one way to do it We'll show you how next month

2 OIL AND VINEGAR Since oil floats on vinegar the efficiency expert can easily pour the oil from the top of the bottle He then inverts the corked bottle and loosens the cork just enough to let the desired amount of vinegar dribble out

3. SYMBOL 2 3

4 'EENY' DOESN'T COUNT Deny

5 GOLD! A pound of gold is worth twice as much as a half-pound of gold

6 THE MONK ON THE MOUNTAIN Imagine two monks walking on the same day one up and one down both following precisely the path that the real monk had taken and both proceeding at the same rate of speed as the real monk The two imaginary monks must meet somewhere and that is the spot that the monk had occupied on both trips at exactly the same time of day

COMPETITION We apologize for going back on a promise, but space limitations have prevented us from publishing the results of *Omni* Competition Number 6 (partly baked ideas) in this issue They will appear next month however And that s a promise **OO**

RENT

CONTINUED FROM PAGE 116

street. The light became normal.

Terry touched Edith again, this time laying his hand gently on her bare back. Outside the window everything stopped, as when a switch is thrown on a projector to arrest the movement. Terry let out his breath audibly. Then he said, "Wake up, Edith. I've got something to show you."

They never understood it, and they told nobody. It was relativity, they decided. They had found, indeed, a perfect place together, where subjective time raced and the external world stood entirely still.

It did not work anywhere but in her loft bed—and only when they touched. They could stay together there for hours or days, although there was no way they could tell how long the "time" had really been, they could make love, sleep, read, talk, and no time passed whatever.

They discovered, after a while, that only if they quarreled did it fail, and then the clock and watch would run even though they were touching. It required intimacy, even of a slight kind—the intimacy of casual touching—for it to work.

They adapted their lives to it quickly, and at first it extended their sense of life's possibilities enormously. It bathed them in a perfection of the lovers' sense of being apart from the rest of the world and better than it.

Their careers improved; they had more time for work and for play than anyone else had. If one of them was ever under serious pressure—of job competition, of the need to make a quick decision—one could get the other in bed and they would have all the time necessary to decide, to think up the speech, to plan the magazine cover, or to review the details of the case going to trial.

Sometimes they took what they called Weekends, buying and cooking enough food for five or six meals, and just staying in the loft bed, touching, while reading or meditating or making love or working. He had his art supplies in shelves over the bed now, and she had reference books and note pads on the ledge. He had put mirrors on two of the walls and on the ceiling, partly for sex, partly to make the small place seem bigger, less confining.

The food was always hot, unspoiled; no time had passed for it between their meals. They could not watch television or listen to records while in suspended time; no machinery worked while they touched.

Sometimes, for fun, they would watch people out the window and stop and start them up again comically, but that soon grew tiresome.

They both got richer and richer, earning promotions and higher pay, and the low rent helped them to save plenty of money. Of course there was now truly no question of leaving the apartment, there was no other bed in which they could stop time—no other place.

For about a year they would always stay later at parties than anyone else, they would taunt acquaintances and colleagues when they were too tired to accompany them to all-night places for scrambled eggs or a final drink. Sometimes they annoyed colleagues by showing up bright-eyed and rested in the morning, no matter how late the party had gone on, no matter how many drinks had been drunk, no matter how loud and fatiguing the revelry. They were always buoyant, healthy, awake, and just a bit smug.

But after the first year they tired of partying, grew bored with friends, and went out less often. Somehow they had come to a place that they were never bored with, and Edith referred to it as "our little loft bed." The center of their lives had become a king-sized foam mattress with a foot-wide ledge and a few inches of head and foot room at each end. They were never bored when in that small space.

What they had to learn was not to quarrel,

"Each was obsessed with one single notion, immortality. They could live forever in the loft bed. Deep in themselves they became a pharaoh's dream of time without end."

not to lose the modicum of intimacy that their relativity phenomenon required. But that came easily too, without discussing it: each learned to give only a small part of self to intimacy with the other, to cultivate a state of mind that was distant, remote enough to be safe from conflict, yet with a controlled closeness. They practiced yoga for body and spirit and Transcendental Meditation. They never told each other their mantra. Often they found themselves staring at different mirrors. Now they seldom looked out the window.

It was Edith who made the second major discovery. One day when Terry was in the bathroom shaving, and his watch was running, he heard her shout to him, in a kind of cool playfulness. "Quit dawdling in there, Terry. I'm getting older for nothing." There was some kind of urgency in her voice, and he caught it. He rinsed his face off in a hurry, dried, and walked to the bedroom. "What do you mean?" he asked.

She didn't look at him. "Get on up here, Dum-dum," she said, still in that controlled, playful voice. "I want you to touch me."

He climbed up and laid a hand on her shoulder. Outside the window a walking man froze in mid-stride and the sunlight darkened as if a shutter had been placed over it.

"What do you mean, older for nothing?" he asked.

She looked at him thoughtfully. "It's been about five years now in the real world," she replied. "The real world—for them—meant the time lived by other people. But we must have spent five years in suspended time here in bed. More than that. And we haven't been aged by it."

He looked at her. "How could—?"

"I don't know," she said. "But I know we're not any older than anybody else."

He turned toward the mirror at her feet and stared at himself in it. He was still youthful, firm, clear-complexioned. Suddenly he smiled, at himself. "Maybe I can fix it so I can shave in bed."

Their Weekends became longer. Although they could not measure their special time, the number of times they slept and the times they made love could be counted; both those numbers increased once they realized the time in bed together was free—that they did not age while touching in the loft bed, while the world outside was motionless and the sun neither rose nor set.

Sometimes they would pick a time of day and a quality of light they both liked, and they'd stop their time there: at twilight, with empty streets and a soft ambience of light. They would allow for the slight darkening effect, and then they'd touch and stay touching for eight or ten sleeping periods, six or eight orgasms, fifteen meals.

They had stopped the omelets because of the real time it took to prepare them. Now they bought pizzas and prepared chickens and ready-made desserts and quarts of milk and coffee and bottles of good wine and cartons of cigarettes and cases of Perrier water, and they filled shelves at each side of the window with them. The hot food would never cool as long as Edith and Terry were touching each other in the controlled intimacy they now had learned as second nature. They could look at themselves in their own mirror and not even think about the other in a conscious way, but if their fingertips were so much as touching, as if the remote sense of the other was unruffled by anger or anxiety, then the pizzas on the shelf would remain hot, the Perrier cold, the vehicles in the street motionless, and the sky and weather without change forever. No love was needed now, no feeling whatever—only the lack of unpleasantness and the slightest of physical contact.

The world outside became less interesting for them. They both had large bank accounts, and both had high-level yet undemanding jobs; her legal briefs were prepared by assistants, three young men in his studio made the illustrations that he designed on drawing pads in the loft bed. Often the nights were a terrible bore, and they had to let go of each other if they

wanted morning to come—just so they could go to work a change of pace

But less and less did either of them want the pace to change Each had learned to spend "hours motionless staring at a mirror or out of the window preserving his or her youth against the ravages of real time and real movement Each became obsessed without sharing the obsession with a single idea immortality They could live forever, young and healthy and fully awake in this loft bed There was no question of interestingness or of boredom, they had moved deeply in their separate souls, far beyond that distinction that rhythm of life Deep in themselves they had become a pharaoh's dream of endless time they had found the pyramid that kept the flow of the world away

One autumn morning that had been like two weeks for them he looked at her after waking, and said "I don't want to leave this place I don't want to get old "

She looked at him before she spoke Then she said, "There's nothing I want to do outside "

He looked away from her smiling "We'll need a lot of food " he said

They had already had the apartment filled with shelves and a bathroom was installed beneath the bed Using the bathroom was the only concession to real time to make the wafer flow it was necessary for them not to touch

They filled the shelves that autumn afternoon with hundreds of pounds of food—cheeses and hot chickens and sausages and milk and butter and big loaves of bread and precooked steaks and pork chops and hams and bowls of cooked vegetables all prepared and delivered by a wondering caterer and five assistants They had cases of wine and beer and cigarettes It was like an efficient miniature warehouse

When they got into bed and touched she said "What if we quarrel? The food will all spoil"

"I know " he said Taking a deep breath he added "What if we just don't talk?"

She looked at him for a long time Then she said "I've been thinking that, too "

So they stopped talking and they turned toward their own mirror and thought of living forever back to back touching

No friend found them, for they had no friends But when the landlord came in through the empty shelves on what was for him the next day he found them in the loft bed, back to back each staring into a different mirror They were perfectly beautiful with healthy clear complexions youthful figures dark and glistening hair But they had no minds at all They were not even like beautiful children, there was nothing there but prettiness

The landlord was shocked at what he saw But he recognized soon afterwards that they would be sent somewhere and that he would be able to charge a profitable rent at last from someone new ∞

LOST CULTURE

CONTINUED FROM PAGE 106

Maybe a variation on the old Vestal Virgins cult. This is incredible! I can't stand it!"

The leader cut in hastily. "Settle down, all of you. Let's not go off the deep end. One thing is obvious to me at least. Every theory we've ever held about this curious civilization is now called into question. Let's bring a semblance of order to this meeting. First off, I'm going to assign you and, yes, you too"—he indicated two of the more solemn scholars—"to come up with some kind of theory or a rational explanation, if possible, of what the word *commercial* meant. What were they trying to do? Perhaps these were recorded messages directed at us."

The two scholars nodded solemnly as they began taking notes.

And you, over there. Your assignment is to decipher B B D and O. Was it perhaps a religious order? It'll be a tough one to crack, but it may be the key. While you're at it, if any of you have any ideas about this tee vee business, I want them in writing. That phrase, as you know, has appeared over and over in other digs."

"Sir?" a youngish, eager-looking scholar interjected.

"Yes?"

"Respectfully, sir, a monograph was recently published by Sponlak Seven, in which he suggested that, for the purposes of scholarship, we apply the official designation of the Tee-Vee Culture to this tribe. Do you..."

The leader interrupted. "Yes, yes, I read it, of course. He may be right, but those golden arches may change things. We'll just have to wait and see. All right, have you got that next spool ready?"

A voice from the darkness at the rear of the room mumbled. "I think so. This crazy machine is a bugger to work."

The leader cut him off. "Let's be tolerant. Remember, we're dealing with a people of very minimal technical skills."

The lights dimmed, the machine whirred, the mystic symbols marched again across the screen, followed by a brief second or two of blackness, and then the screen was filled with a great mass of silvery, gleaming metal, some sort of massive grille. The scene widened to show a large, gaudily painted wheeled machine covered with strips of silvery material. Again a native family group cavorted around it, their eyes gleaming with emotion. The dominant male ran his hands lovingly over the machine as a chorus chanted:

Hot dogs, apple pie, and Chevrolet.

A large, furry animal leaped about, making guttural barking noises. Smaller natives, apparently the young, opened and closed metal hatches, emitting squeals that possibly denoted pleasure.

"Yes, America, Chevy's done it again," the voice boomed. The chorus chanted:

Hot dogs, apple pie, and Chevrolet.

as the little band of ancients entered the machine, finally joined by the mysterious fuzzy animal, still busily issuing its ugly barking sounds. The dominant male, now strapped in the machine, appeared to be holding some kind of large hoop, attached to it, in his hands.

Hot dogs and apple pie.

The screen went dark.

The lights came up in the room to show a very pensive group of researchers. Someone in the rear finally broke the silence.

"Well, no arches in that one, that's for sure."

Another voice picked up the theme. "It's that *furry* thing that scares me. Do any of you know what language it was speaking?"

A third asked, "That machine? What savage use of colors! They certainly weren't inhibited. I'm very impressed by their childlike exuberance, and..."

"Just wait a minute," the leader broke in. "That machine, as you call it, has appeared often in what fragmentary images have survived from that time. I frankly believe it wasn't a machine at all, but a habitation of some sort. They apparently *lived* in those."

> *"The childish scrawls had dealt mainly with the endless pursuit of something called sex or, even more curious, self-fulfillment. But little mention was made of daily existence."*

"Uh... sir?" the young scholar timidly asked. "Is it possible, sir, that Chev-vee or its variation Chev ro-lay, was the name they gave to one of their benevolent gods? In what we have just seen, he appears to have given them something for which they are grateful."

"That's the trouble with you radicals," the leader said, "always jumping on every bandwagon that comes around. That's an interesting thought, and I don't want to inhibit you, but they also had other quasi gods. Don't forget, we're dealing with a highly superstitious culture."

He glanced around expectantly, encouraging discussion.

"What were those hatches and that furry thing? Is it possible that he was their leader? Perhaps they were enslaved by..."

The leader imperiously motioned for silence. "Save all this for later, when we get down to specifics."

He stood, facing the team. "I want none of this released. You hear me? Do not speak to anyone outside this room about anything you have seen. As you no doubt already suspect from what little we have examined today, there will be enormous repercussions. The religious questions alone are staggering. Reputations built over a lifetime of study and toil will, I shall repeat, *will* come crashing down."

He glanced meaningfully around the room. They sat silently and yet it was obvious that they were seething with excitement. From somewhere a hoarse whisper: "Apple pie... apple pie. My god, do you know what that could mean?"

Several nodded pensively. The leader gestured again for silence.

"There, see what I mean? Let's just try to remember that we are scientists."

Refreshments were brought in. Little groups of excited researchers gathered in corners, discussing the incredible visions they had just watched. One, who had said little up to now, spoke to his comrades:

"I never thought I'd live to see anything like this. It's as if we were privileged to watch the Romans in their daily lives, or the barbaric Huns at play. I tell you, this is a turning point, a..."

"Shhh," his friend hissed, "back to work."

They took their seats as the leader returned to the room, his face grave, yet with a hint about him of tightly controlled elation. After the group had quieted down, he spoke:

"I have been in communication with the Supreme Foundationman. Naturally, I did not go into details, because of the sensitive nature of some of the things we have witnessed today." A sly smile creased his face. "I don't have to tell you what this will mean for next year's funds."

There were a few muffled cheers from the rear. The leader continued. "As you know, you were carefully selected from among the world's experts for your specific knowledge of the dead language we are hearing today, for the first time spoken by those who actually used it. We are a chosen few. Before we continue viewing, are there any questions?"

A hand was raised.

"Yes?"

"Ah... It's not exactly a question, sir. But as you know, some time back I published a monograph on the symbol 'Y & R,' which I proved conclusively stood for the words *young and rubicam*, and..."

The leader cut in: "What's your point?"

The speaker continued nervously. "Well, sir, we know the word *young* means 'an immature state,' but *rubicam* has been more difficult. I believe it is a misspelling of a legendary river, which was also called Rubi-*con*. Perhaps, using my methodology applied to B B D & O, I could conceivably..."

The leader interrupted again. "Are you suggesting that there might be a connection between Y & R and these B B D & O symbols?"

"Er... just possibly, sir. I note that bits of material bearing the Y & R symbol were found in the vicinity of this recent dig. There might just possibly be some parallels..."

The leader motioned for silence. He appeared deep in thought for a moment. "Hmmm. Possibly. Just possibly. But these people seem to have had hundreds of cults bearing indecipherable symbolic names. We know of NCR, RCA, TRW, NBC, and who knows how many others? I'll leave that sort of study to the dusty ones who spend their lives working on puzzles that lead nowhere. But never let it be said that I stood in the way of research. So if you want to play around with the idea, go ahead. It's an interesting thought. Anyone else?"

No one volunteered.

"Well, then, let's push on," said the leader impatiently.

The lights dimmed. They leaned forward, some scarcely breathing. Whirrr. Clackety-clack-clack. A muffled curse from the rear of the room. The leader's voice boomed out. "What's the trouble?"

"I'm sorry," a voice replied, laced with exasperation, "this thing got all unwound from the spool and is tangled up."

The lights came back up. More muffled swearing. The leader stared at the ceiling, feigning great boredom. A few laughed. Most were afraid to.

"Sir, I think I've got it. Those old-timers must have had some trouble with this dumb monster."

Whirrr. Darkness fell. 5-4-3-2-1-BEEP.

Seven multicolored, furred and bewhiskered tiny monsters danced on the screen.

"*Meow meow meow meow meow meow meow meow.*"

A large, lumpy female appeared, dancing in unison with one of the furry creatures. Together they sang:

Purina Cat Chow
Chow chow chow!
Purina Cat Chow
Meow meow meow meow meow meow meow meow.

The leader faced the rear and bellowed, "Are you sure you have that thing hooked up right? This is incredible!"

"Yes, sir, I can't help what..."

The leader barked an order. "Put that one aside for special study."

The room bristled with excitement. The leader asked what was obviously a rhetorical question.

"Now what in the world was *that*!"

The eager young scholar piped. "That creature was what they called a cat. The ancient Egyptians had them, too. In fact, they worshiped them."

The leader, lost in thought, muttered, "Meow. Does anyone here know the meaning of *that*? Meow."

The technician called out from the rear. "I have another one threaded on this thing, sir. Should I run it?"

The leader grunted in affirmation. He leaned to his left and whispered to his trusted lieutenant. "You realize that this could mean my directorship, at last. I can tell you now that I was worried toward the end of the dig that it was just another dry hole, but I always knew that there just had to be *something* of importance in the Madison Ah-vay Littoral. I just knew it. It had to be."

He glanced to the rear where the operator was struggling with the machine. His lieutenant politely asked, "Why do they call that area Madison Ah-vay?"

The leader, always delighted to show his superior erudition, went on expansively. "Canmut Nine's first dig years ago came across a plaque or shield of some sort bearing that name in the area, and you know how *he* was. He immediately gave the dig that name, significant or not."

The assistant leaned forward. "Does Madison Ah-vay mean anything?"

"Yes, I suppose it does. Canmut at least thought so. Madison was the name of one of their early patriots or generals, and Ah-vay is a Latin word meaning 'prayer' or 'sacred song.' If Canmut was right, the area might well have been a sacred place of leaders. Or perhaps of high priests."

His lieutenant, now thoroughly interested, asked, "You mean it's possible that these commercials, as we call them, could be some sort of scripture or...?"

"None of them, in spite of earlier optimism, had the vaguest idea that they were about to make a strike that would probably surpass the discovery of the fabled Rosetta Stone."

"Shhh." The leader motioned for silence. "Never give away your theories for free, especially in this crowd."

3-2-1-BEEP. A magnificent pastoral scene burst upon them: green trees, grass, but above all, another wildly enthusiastic group of celebrants, young and old. At the center was a rapidly revolving device bearing mysterious wooden animals, upon which many of the young were seated. Pennants and banners flew. This curious scene was accompanied by loud pagan music. There was revealed, high over them all, another revolving device gleaming in the sunshine. It resembled a vast spinning container bearing the likeness of a benevolent white-bearded ancient.

The voice boomed. "When Mother needs a rest, give her a day off. Go to the Colonel's!"

A group appeared, bearing containers exactly like the one in the sky but miniature. They began devouring the contents, while looking upward in rapt adoration at the bearded ancient's image.

"The Colonel's eleven secret ingredients make it finger-lickin' good...' A chorus, accompanied by native drums, screamed *FINGER-LICKIN', FINGER-LICKIN', FINGER-LICKIN' GOOD!*

Various disjointed phrases echoed around the room. The leader's lieutenant hissed into his ear, "You could be right. That revolving icon must have been one of their major priests!"

The leader, his face stony, nodded. "Shhh. Don't tip your hand."

The technician, who seemed to have gotten the hang of the primitive machine, almost immediately announced that he had another spool ready for action.

5-4-3-2-1-BEEP. An interior of a colorful repository of some sort appeared, row upon row of shelves adorned with gaudy cubes. Three females in bizarre costumes moved into the foreground. They were pushing spidery, wirelike contrivances filled with more cubes. The three of them stopped and reverently picked up some mysterious white circular rolls. Their eyes glazed in ecstasy. They fondled the rolls. A stern male arrived, clad in a white uniform. He resembled a guard, or perhaps an officer of some kind—definitely a figure invested with authority.

"Ladies, *please*, don't squeeze the Charmin!" The three females continued to fondle the rolls with even more intensity. The guard, overcome by emotion himself, began to squeeze a pair. One female piped, "I just can't help it, Mister Whipple." Nervously, the guard squeezed even harder.

"See, Mister Whipple, they're so squeezably soft!"

The scene concluded with all four of them fondling the rolls in high excitement.

As the lights came back on, there was a barely suppressed roar of conversation in the room. The leader stood and cut through the hubbub with his voice of command.

"All right, that's more than enough for our first session. Tomorrow I want to hear some of your theories on what we've seen. Remember, no leaks. I repeat, we must not allow any of this to get into the wrong hands. Get some rest. We'll see you on the morrow."

He and his lieutenant moved toward the exit. As they left the chamber, the leader, his voice low and trembling with emotion, said, "We are right. Now it's clear to me. Those tightly rolled white scrolls... they were *worshiping*! Are you ready for a cosmic theory?"

They both glanced around conspiratorially as they moved toward their conveyance.

"Yes, yes. What is it, sir?"

The leader muttered almost to himself, "If we can find out what was *on* those scrolls, or what they were *used* for, I believe we would know what their civilization was all about, what they believed in. Do you follow?"

The lieutenant gasped. "By Karnak, you could just be right. Yes, you could just be right!"

In high triumph they moved off. ∞

BRAVE NEW WORLD

EXPLORATIONS

By Susan Mazur

A visit to the Arabian Gulf quickly dispels Western images of sheikhs luxuriating in conspicuous consumption. The petrodollar has sparked a diverse scientific revolution that promises to transform these desert monarchies into leading centers of technology and innovation. Now emerging on Arabian sands is a prototype for space colonization that features clean energy from solar power, quality living space, and the beginnings of climate by design.

Arab governments seem particularly receptive to high technology and its potential. The West would do well to imitate Kuwait's new low-cost solar-housing program. "In my country," says Dr. Safwat Moustafa, a director of the Kuwait Institute for Scientific Research, "the question arises: Why should we develop solar energy when there's so much oil? But we are not only in the oil business. We are in the *energy* business, and we want to stay in this business."

Omni travelers curious about where their gas dollars go will probably find the Arabian Gulf region inviting. *Middle East* magazine reports: An estimated $200 billion is being spent by the Middle East market to get U.S. construction companies to build roads, pipelines, telecommunications systems, medical centers, sports arenas, hotels, residential accommodations, and schools for thousands of foreign participants in these projects — which will then be turned over to the various governments after construction has been completed.

Saudi Arabia is committing $142 billion as part of a five-year plan to develop its resources and to industrialize. Two billion dollars will finance a new international airport north of Riyadh, the Saudi capital. This complex is expected to serve 15 million travelers annually by the year 2000 and will include a community for 3,000 airport workers, four schools, a mosque, and commercial, medical, and government facilities. A modern air terminal will accommodate both jumbo jets and the Concorde, which may soon fly a six-and-a-half-hour Mideast–New York route. The government of Abu Dhabi has retained the architect of the Charles de Gaulle Airport to design an airport for Abu Dhabi. Qatar is moving ahead on its own airport at a cost of 100 million Qatari riyals. Kuwait is expanding its air facilities.

Arabsat, the Arab Satellite Organization, expects to launch its first communications satellite in July 1982, linking earth stations in the Arab world. The package will handle the equivalent of 10,000 telephone lines, seven television channels, and a channel for general educational purposes, in addition to providing direct links among computers in Arab countries.

Despite some frenzy to build quickly and thus avoid spiraling construction costs, the Gulf countries are refusing to be ripped off. Hisham Qaddoumi, technical adviser to Qatar's emir Sheikh Khalifa bin Hamad al-Thani, said in a recent interview: "Instant cities are precisely what we don't want. We should have a total concept of what each section will look like at the end. . . . We have about twenty projects on our active file [referring to the New Doha development scheme to accommodate the country's population increase by the year 2000], and we are being very selective as to each one's economic, functional, and architectural feasibility."

Kuwait is insuring its future by setting aside 700 million Kuwaiti dinars — roughly $2 billion (effective July 1977) — to which it continually adds 10 percent of the annual state revenue, along with cumulative interest, and by current project spending which will exceed $17 billion next year. Such projects include Bedouin housing, new hospitals, road construction, and a three-kilometer-wide recreational belt designed to encircle the city of Kuwait with open-air theaters, a monorail, a swimming pool, sports grounds, an ice-skating/roller rink, museums, and a cafeteria.

Private investment also is future-oriented. Kuwait's Alghanim family (of *America for Sale* fame) has introduced plans for a worldwide Mideastern gourmet fast-food chain, orchestrated by Hungarian gourmand George Lang, and for Kuwait's first ice-cream factory. The Alghanims are even commissioning fashion designer Betsey Johnson to design Lycra/Spandex uniforms for their

Water reservoirs combine with revolving restaurants and gardens to form Kuwaiti Towers

new international travel company

However of the $17 billion the Kuwaiti government is allocating for projects, a significant amount will fund scientific research

Dr Richard Williams associate dean of engineering at Georgia Tech, supervised the design and installation of the first solar-heating and air-conditioning systems in Kuwait three years ago The success of Dr Williams's solar mobile homes and greenhouses has enabled Persian Gulf countries to realize the urgency of designing a future based on alternative energies Williams has also directed an assessmenf of the feasibility of solar-sysfems commercialization in Kuwait which was funded by the Kuwait Institute for Scientific Research (KISR) "There is no organization in the Gulf like KISR " Williams says

Under fhe direction of Dr Adnan Shab Eldin, a nuclear physicist schooled at the University of California at Berkeley in the 1960s KISR has become an important voice in determining the feasibility of new technology for fhe Gulf Staffed with young and vital scientists the institute recently introduced a design for solar-powered water desalination a process now accomplished directly through electricity This large-scale solar operation should prove invaluable to Kuwaif a country that only 25 years ago imported all its drinking water by ship from Iraq

Spaces for storing this fresh water have been appropriafely enhanced One such structure is the Kuwaiti Towers along Arabian Gulf Sfreet opposite Kuwait's Hilton Hotel The tallest of the fhree white columns comprising this mosaic landmark is 180 meters high and supports a large water reservoir in its lower sphere atop which sit a restaurant and gardens with a revolving cafeteria and viewing platform in the sphere above A second tower rises 140 meters also supporting a reservoir, like the first it has a capacity of 4,000 kiloliters In the evening from one's ferrace at the Hilton one can see a magnificent light show while the third column floods the towers and surrounding sea with color

There are 32 striped water towers the Mushrooms fhroughout Kuwait Four underground reservoirs will be built within the next year of reinforced concrete In the Al Aqeela, Mina Abdulla and Muflaa areas—each wifh a capacity of 1 9 million kiloliters

By next May KISR expects to have established a community of about 50 families in a remote desert area of Kuwait These families will get all their fresh drinking water through solar energy All fheir energy needs such as the water required for agriculture electrical power heating and air conditioning, will be mef by solar energy

According to Dr Moustafa fhis 100-kilowatt "solar farm" being builf now in Sulaibiyah, in conjunction with the government of West Germany and Messerschmitt-Bölkow-Blohm of Munich follows the design concept of the distribufed absorber system Sixty-six mirrored "dishes" each having a diameter of five meters, will concentrate the sun's rays in a ratio of 300 to 1

"This type of collector has never been built before " Moustafa says "It's the first station of its kind and we are investing heavily in developing the know-how for the projecf There is also going to be a storage capability in fhe parkland of a hot tarlike organic liquid fhough electricity needed at night will be much less We expect a problem with sand adhering to the mirrors So fhere will be a special liquid that will

GULF OASES

Failaka island	Excavation site of Bronze Age settlements; Temple of Artemis and other ruins of fortress town connected with Alexander the Great s eastern expedition in 334 B C Two hours by dhow from Al Kuwait
Science and Natural History Museum of Kuwait	One thousand exhibits of science and nafural hisfory Petroleum gallery and small planetarium
Jara town	Agricultural center 30 kilometers from Al Kuwait on Basra Road
Bronze Age burial mounds, many dating from 3000 to 2000 B C., and untouched	Bahrain, Hili, Um an-Nar Off coasf of Abu Dhabi, Al Ain
Reputed castle of Queen of Sheba	Ras al-Khaimah Emirate
Hot springs	Throughout the Sultanafe of Oman
Dubai Museum	Silver jewelry
Qatar National Museum	Doha, 47,500 square mefers Resfored buildings of Old Amiri Palace, re-created dhow lagoon and marine museum

wash the collectors if that happens.

As for designing climate, though not yet at the stage of weather sculpture, Kuwait is attributing its distinct increases in humidity and precipitation to its new ecology: those fabulous gardens adorning multimillion-dollar villas that *Architectural Digest* cannot get in to photograph, embassy gardens, public gardens, even those of middle-income villa owners, and numerous produce and dairy farms.

Kuwait's ministry of information notes: "A comparatively new attraction in Kuwait—to those interested in natural history—is bird life. The building of the oil town of Ahmadi and rapid expansion of the urban sprawl elsewhere have produced new migratory trends in the region. The Ahmadi Natural History and Field Studies Group, for instance, has recorded nearly 320 species or subspecies in Kuwait."

Abu Dhabi, too, is engineering its rainfall by foresting a 4-million-square-meter area where no rain is said to have fallen for three years. At a cost of 500,000 dirhams, 80,000 acacias and cedar saplings will be planted around a Bedouin village, adding to the 200 million square meters already planted in another part of the country.

Agricultural centers are rising all over the Middle East, and they plainly reflect the dream of Gerard K. O'Neill's *High Frontier*. With iodine-treated plastic roofs overhead and cooling seawater streaming down side walls, plants that are hydroponically fed—receiving every bit of nutrient by tube, drop by drop—produce tons of vegetables and fruits every day at Sadiyat, an island off the coast of Abu Dhabi; in Dubai; at Al Ain in the Buraimi oasis on the border with Oman; in Saudi Arabia; and in Kuwait.

The emptiness of space is something familiar to all desert people. While the West may have the technical skills for future development of civilizations, it is becoming increasingly apparent that the peoples of the Arabian Gulf have the courage to build a new world.

IN TRANSIT

Saudia, the Saudi Arabian airline, prides itself not only on its kibbe, stuffed vine leaves, and Arabic coffee but also on the most modern fleet in the Mideast with TriStar 1011, Jumbo 747, 707, and 737 flights to most major cities of the world—including a nonstop New York–Dharhan flight four times a week. Saudia is at 747 Third Avenue, New York, N.Y. 10022 (tel. 212-758-4727).

As for accommodations, Kuwait's Hilton Hotel offers more efficient service than some four-star hotels in Paris. Reservations should be made at least a month in advance, or two if traveling during April or October. Contact: Hilton International, 605 Third Avenue, New York, N.Y. 10016. The telephone number is 212-688-2240. DO

PHENOMENA

The quiet of a mountaintop is shattered by the sound of two bighorn sheep butting heads in this unique photograph by Marty Stouffer. Bighorn sheep, native to North America, are known throughout the world for their fierce mating rituals. The resulting sound can be heard for a mile or more.

Butting between two rams can occur at almost any time, but it is more frequent during the reproductive, or rutting, season. Usually one male establishes superiority over another through these fights, thus winning the "right" to breed with one or more females.

Stouffer took this picture with a Nikon F camera, equipped with a 200mm telephoto lens, in the mountains of Banff National Park in Canada. The photograph is reprinted, by permission of Macmillan Publishing Company, Inc., from the forthcoming book entitled *The Peaceable Kingdom*, by Ann Guilfoyle.

FORUM

CONTINUED FROM PAGE 16

censorship. As concerned scientists and journalists, you should come out at least with a strong editorial condemning censorship and the secrecy surrounding nuclear power. If *Omni* does not support the *Progressive* now, *Omni* might well be the government's next target.

Intellectual freedom, in fact freedom in general, is essential to both scientific and social progress. We're all in this together, and we're going to have to fight if we want to regain our freedom.

Fred N. Breukelman
Dover, Del.

We agree that the prior restraint used against the Progressive *is a threat to the First Amendment, and we condemn the action. However, we also feel, along with many other journalists and publishers, that the course of action taken by the* Progressive *was not a sensible one. You don't send a controversial article to the government and ask it for its approval, which in effect is what the* Progressive *did. We can assure you that* Omni *will publish first, and then take the consequences. This is one of the strongest ways of preserving freedom of the press.*—Ed.

Fear of Nukes

A number of nuclear-power-plant accidents involving the release of radioactivity into the environment have occurred, and at least three grisly deaths have been directly caused by a reactor accident (at the SL-1 reactor near Idaho Falls, Idaho).

I agree with Mr. Kendig's statement [First Word, June 1979] that nuclear power isn't inherently evil. No form of technology is inherently evil; only its applications can be considered right or wrong. One mistake made by many persons on both sides of the nuclear controversy has been their equating the antinuclear movement with antitechnology feelings.

David Forest
Waller, Tex.

Poor Argument

I wish to call your attention to a letter from W. A. Weronko in *Omni*'s July issue. Lieutenant Weronko took a pronuclear stand because of this stand, *Omni* disregarded his opinion, using the poor Three Mile Island argument. The fact remains that not one death can be attributed to the U.S. nuclear-power industry since the nuclear submarine USS *Nautilus* was launched on January 21, 1954. This is a far better safety record than the fossil-fuel industry has achieved. I believe the American public has been coerced by the yellow press long enough.

Douglas Love
New York, N.Y.

We're certain that the many people living in and around Harrisburg, Pennsylvania, would agree that the Three Mile Island argument is anything but "poor."—Ed.

Tranquilizing America

Dr. Bernard Dixon's article in the July issue of *Omni* ["Ill-Defined Parameters"] is cause for a great deal of concern. This is not so much because of what the FDA is preventing from being prescribed but because of Dr. Dixon himself and his rationale for proposing that we blindly accept capsulized nirvana from the medicos.

As is usually the case with proponents of massive drugging of the population for "pathological" or "abnormal" behavior, Dr. Dixon blithely classifies rashes, vomiting, and hallucinating as "bothersome, although relatively harmless." What incredible, unmitigated gall!

Legalized drug addiction through the continual prescription of tranquilizers, mood elevators, etc., which is unquestioningly paid for by insurance companies, has gone far beyond the epidemic level. According to the National Institute on Drug Abuse, some 98.5 million prescriptions for "minor tranquilizers" were filled between May 1976 and April 1977. Among these "minor tranquilizers" was the ubiquitous Valium, which accounted for no fewer than 57.1 million prescriptions. According to the same source, there were 34 million prescriptions of Darvon in the same time period.

Dr. Dixon equates concern about drugs and their use and abuse with a "Puritan ethic"; he asks the rhetorical question, "Who would deny them medication?" I am afraid that his blustering comes about 20 years too late. As a society we long ago gave up control over the doctors and psychiatrists who prescribe psychotropic medications whose side effects do indeed make rashes and vomiting from oxyprenolol look like child's play.

I would suggest that Dr. Dixon write himself a prescription for a few Valiums and take a leisurely drive to calm down a bit. I do hope that he does not run into an oxyprenolol patient whose driving is now calmer except when he has the "relatively harmless" hallucination that the freeway is actually a demolition derby.

Stephen C. Kozachik
Citizens Commission on Human Rights
Seattle, Wash. ☒

PHOTO CREDITS

Page 10, 20th Century-Fox; Jay Kay Klein; Franz Rottensteiner; Fay Godwin; David Palmer. **page 18**, American International Pictures. **page 20**, Nicholas Foster. **page 24**, Jet Propulsion Laboratories. **page 26**, Nicholas Foster. **page 28**, Helmut Wimmer. **page 34**, PBS. **page 38**, ABC. **page 42**, Pat Hill. **page 44**, Chris Foss. **page 52 left**, Wide World; **page 52 right**, Movie Star News. **page 53 left**, Lois Wickstrom. **page 53 right**, Sovfoto. **page 55 left**, George Holton/Photo Researchers. **page 55 right**, College Entrance Examination Board. **page 56 left**, Jim Ball; **page 56 right**, Pat Hill. **page 57 left**, Pat Hill. **page 57 right**, Steve Schapiro/Black Star. **page 58 left**, Bob Kalmbach/University of Michigan. **page 58 right**, Leonard Lee Rue III/Photo Researchers. **page 101**, Celestron International. **page 108**, Yoshikazu Shirakawa/Image Bank. **page 110**, John Hunt. **page 111**, John Hunt. **page 158**, Dan McCoy/Rainbow; H.R. Geiger; Mati Klarwein. **page 169**, Joseph B. Brignolo/Image Bank.

Music

CONTINUED FROM PAGE 42

I was reminded of a show I saw by Vito Acconci where one wandered through corridors of walls and, by listening closely could hear personal dialogues being played back through loudspeakers in the walls. I was reminded of an installation of La Monte Young's 'Dream House' where electronic drone tones went on endlessly, where time seemed irrelevant and where one was free to wander around a large space, picking up different combinations of the sounds for as long as one liked.

One might even suggest that gallery music, or musical "installations," as they are often called, comprises one of the most important categories of musical expression to evolve in our time. The category is quite distinct. It brings visual and aural elements together in ways very different from other audiovisual media. It opens up fresh approaches to audience participation and it allows the audience to come as close to or remain as distant from the artistic experience as they wish.

But perhaps most important, it completely does away with beginnings and endings. Most music is created with the assumption that the listener will hear it from beginning to end, but installations must be created with the assumption that the exhibition will be open from, say one to five every afternoon and that visitors will be able to experience the work regardless of when they arrive. In such a situation one must give up traditional concerns with climaxes with thematic development, and with neat formal structures. At the same time one finds many fresh possibilities.

Vogel obviously understands all this. He also understands the importance of technology in making it happen. It is obviously not very sensitive to expect live musicians to perform for torturously long hours in galleries where people will not even be listening much of the time. But such a role is eminently appropriate for electronic equipment, and Vogel is quite at home in this area. He studied physics for seven years and worked in neurophysiological research and development before deciding to concentrate all his energies on artistic work. Thus, he is able to design his own circuitry and he is as familiar with electronics as he is with music and sculpture.

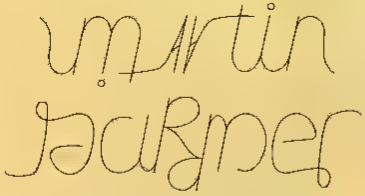
This German artist, now forty-two, has exhibited all over Europe. With this, his first American show, his work is likely to become widely known here as well, though not necessarily in galleries. Vogel also creates larger pieces, some of which he conceives as stage sets that can be controlled by improvising dancers. Next year he hopes to be able to collaborate with Richard Bull's New York–based dance company, the Improvisational Dance Ensemble, in a context of this sort. I suspect that the dancers will be in for a few surprises, just as the visitors at the Arras Gallery were. ∞

Festschrift
for the Master Gamesman

GAMES

By Scot Morris

A few years ago the NASA scientists at Goddard Institute in New York City had a computer that was maintained by an outside firm. Occasionally the programmers took the computer down for a day or so to make sure it was running properly. Carl Frederick, who worked at the Goddard Space Flight Center at the time, tells me that it gradually became apparent that these maintenance checks had a strange periodicity. The computer was being regularly removed from NASA's hands around the first of every month, for no apparent reason. Finally an explanation surfaced. The first of the month was when *Scientific American* came out. The computer experts were borrowing NASA's machine in order to work out the puzzles in Martin Gardner's popular Mathematical Games column.



Gardner has been delighting scientists with his monthly intellectual diversions since 1957. He will be sixty-five on the twenty-first of this month. To celebrate the occasion, we devote this month's Games to the man *Time* magazine called "The Mathemagician."

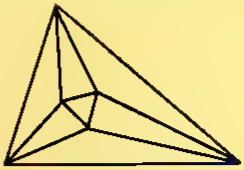
Gardner has more than 30 books in print—not counting numerous children's books and volumes sold only in magic stores. The ninth collection of his "Mathematical Games" columns, titled *Mathematical Circus*, will be published by Knopf this fall. His productivity and versatility, combined with his shyness—he consistently declines all public appearance offers—have given rise to the rumor that Gardner is not one person but is, in fact, a pseudonym used jointly by Carl Sagan and Isaac Asimov.

Gardner is indeed real—a kind, impish, generous man. Since the first issue of *Omni*, Martin, whom some narrow-minded persons might consider a competitor, has selflessly shared his ideas, contacts, and files. It was he who first showed us the strange symmetrical signatures of Scott Kim, which we introduced here last month in *Omni* Competition #9. Kim created the upside-down "designatures" (at left) to honor the man he has so long admired.

Gardner's home in suburban New York (appropriately on Euclid Avenue) is filled with curiosities, models, and illusions. His office on the third floor is filled with shelves of rare books and stacks of files. He even has a file for *numbers*. If there is anything interesting to say about the number 32, for example, it's there in the file. An object falling to Earth accelerates at 32 feet per second per second, water freezes at 32°F, there are 32 crystal classes, a human has 32 teeth, water can be pumped by a vacuum to 32 feet under normal atmospheric pressure, there are 32 electrons in the filled fourth energy level of atoms, there are 32 fundamental long-lived particles, Eddington's fine-structure constant 137 is the thirty-second odd prime, and, of course, 32 is 2 raised to the power obtained by adding the digits 3 and 2.

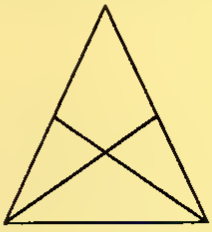
James Randi, working as a consultant to IBM and preparing a promotion for IBM's series 370 computer, once called Gardner to see whether he had any esoterica about the number. Gardner checked his files, then said, "Yes, three hundred seventy is a very interesting number. It is the sum of the cubes of each of its digits. There are only three numbers with this property, and three hundred seventy is in the middle. Can you guess what the next-highest cube-sum number is? When you do, it will be an 'aha!' experience." (Randi could not, on first hearing, and neither could we. Can you? See Answers, page 163.) Another thing," said Gardner, "if they'll be selling computers in Mexico or Spain, you might turn the number upside down for an interesting surprise."

Gardner's files overflow with mathematical surprises. Under "triangles" you might find Morley's Triangle, which hides unassumingly inside every triangle no matter what its shape. Trisect the three angles of any triangle and the lines always meet at three points to form an equilateral triangle. The appearance of that perfect little equilateral triangle is totally



unexpected. Euclid could have found it with his own theorems, but he didn't, probably because trisections with a ruler and compass were proved impossible, so nobody explored trisection problems. This* geometrical gem wasn't discovered until the turn of the century by Johns Hopkins mathematician Frank Morley, the father of writer Christopher Morley.

Another triangle curiosity is this: If the internal bisectors of the two base angles of a triangle are of equal length (below), it is intuitively obvious to any geometry student that the triangle is isosceles. But in fact, most geometry teachers would have difficulty constructing a formal proof. Gardner calls this the most insidiously deceptive problem in all of elementary geometry—a full Euclidean proof may take ten pages or more. He refers interested readers to a 40-page paper by Archibald Henderson, a 1937 paper



Henderson calls "an essay on the internal bisector problem to end all essays on the internal bisector problem."

A lifelong student of magic, Gardner

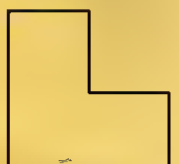
enjoys amusing his friends with whatever is at hand. At a dinner table he might (a) put an invisible cigarette in his mouth and blow out a tiny puff of smoke or (b) let a real lit cigarette rest on a tablecloth without burning the cloth. (c) He'll shake pepper into a glass of water until the surface is covered, then with the end of a paper match he'll draw an *X* on the pepper, which separates where it has been touched, leaving the shape of a cross on the water's surface. Later he might reveal such esoterica as (d) how to use a dollar bill as a ruler or (e) how to use a watch as a compass. If you are a sufficiently appreciative audience, he might (f) drive a paper straw through a raw potato or (g) remove his vest without removing his coat.

Guess how you would perform each of these seven miracles, then check the Answer Page.

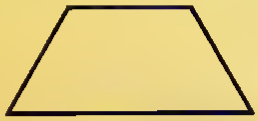
Gardner recently told me that he is thinking of retiring and turning his column over to someone younger and better acquainted with modern computer techniques. This month's games, some of the best short puzzles that have appeared in his column over the past 22 years, are a festschrift for Gardner's sixty-fifth birthday in the name of all the *Omni* readers who hope, with us, that the Master Gamesman will never retire.

Here are ten problems. The answers to the first six problems appear on the Answer Page; those for the last four in Gardnerian tradition will be saved for next month.

1. CUT UPS. A man owns an L-shaped lot (below), a square with a smaller square, one fourth its size, cut from one



corner. He wills the land to his four sons, provided they subdivide it into four congruent parcels—all exactly the same size and shape. In another version of this puzzle the lot is shaped like the truncated equilateral triangle (below), with a smaller



one-quarter-size triangle taken away. In each case the solution is unique. There is one and only one way to do it. How?

2. OIL AND VINEGAR. An efficiency expert named Gartin promises to bring oil and vinegar to a picnic but shows up with both in the same bottle. "That's stupid," his wife, Charlotte, says. "I like a lot of oil and very little vinegar, but Janice likes a lot of vinegar and—"

"Not stupid at all, my dear," he says, proceeding to pour from the bottle exactly the right proportions of oil and vinegar each guest wants.

How did he do it?

3. SYMBOL. Place a familiar mathematical symbol between 2 and 3 to express a number greater than 2 and less than 3.

4. 'EENY DOESN'T COUNT. What four-letter English word ends in "eny"?

5. GOLD! Which is worth more, a pound of $10 gold pieces or half a pound of $20 gold pieces, or are they worth the same?

6. THE MONK ON THE MOUNTAIN. One morning at sunrise a Buddhist monk began to climb a narrow path to a temple at the top of a tall mountain. He did not walk at a constant speed but stopped occasionally to eat or rest and reached the temple shortly before sunset. The next morning he descended the same path, starting at sunrise and again walking at varying rates but generally at a faster pace than his average climbing speed.

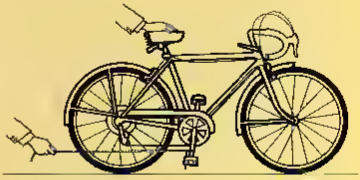
Prove that there is a spot along the path that the monk will occupy on each trip at precisely the same time of day.

7. TALE OF A TUB. A boy in a bathtub is sailing a plastic boat loaded with nuts and bolts. If he dumps all the cargo into the water, allowing the boat to float empty, will the water level in the tub rise or fall?

8. THE TRUCK DRIVER AND THE PIGEONS. A truck driver stops just short of a rickety bridge. He gets out and pounds on the side of his truck with his hands. A farmer asks him why. "I don't trust that bridge. I've got two hundred pigeons in there, and I'm afraid they're too heavy for it. I'm trying to get them to fly around, to lighten the load until I get across."

If the truck's compartment is airtight, what can be said of the driver's reasoning?

9. BIKE TRICK. A rope is tied to the pedal of a bicycle. If someone pulls back on the rope while another person holds the seat lightly to keep the bicycle balanced, will the bicycle move forward, backward or not at all?



10. THE ROBBER AND THE BELL ROPES. In a high church steeple, two bell ropes hang down to the concrete floor through two small holes a foot apart in the ceiling. An acrobatic thief wants to steal as much of the rope as he can, but there are no stairs above the ceiling and no ladders or other objects on which he can stand. He must accomplish his deed by climbing up the ropes, hand over hand, and cutting them with his knife at points as high as possible. The ceiling is so high, however, that a fall from even a third of its height would surely be fatal. Assuming he has enough time before the clanging bells wake the custodian, by what means can he obtain the maximum amount of rope? ∞

Answers, page 163

WHERE DOES THE TIME GO?

LAST WORD

By Ursula K. LeGuin

The hypothesis put forward by James Osbold of the Lick Observatory though magnificently comprehensive, presents certain difficulties to agencies seeking practical solutions to the problem. Divested of its mathematical formulation, Dr. Osbold's theory may be described in very approximate terms as positing the existence of an anomaly in the space-time continuum. The cause of the anomaly is a failure of reality to meet the specifications of the General Theory of Relativity although only in one minor detail. Its effect on the actual constitution of the universe is a local imperfection, or flaw, that is, a hole in the continuum.

The hole, according to Osbold's calculations, is a distinctly spacelike hole. In this spatiality lies its danger, since the imbalance thus constituted in the continuum causes a compensatory influx from the timelike aspect of the cosmos. In other words, time is running out of the hole. This has probably been going on ever since the origin of the universe 12 to 15 billion years ago, but only lately has the leak grown to noticeable proportions.

The propounder of the theory is not pessimistic, remarking that it might be even worse if the anomaly were in the temporal aspect of the continuum, in which case space would be escaping, possibly one dimension at a time, which would cause untold discomfort and confusion, although, Osbold adds, "In that event we might have time enough to do something about it."

THE NONBIODEGRADABLE MOMENT

A totally different explanation of the time shortage is offered by a research team of the Interco Development Corporation. Their approach to the problem, as presented by N. T. Chaudhuri, an internationally recognized authority on the ecology and ethology of the internal-combustion engine, is chemical rather than cosmological. Chaudhuri has proved that the fumes of incompletely burned petroleum fuel, under certain conditions—diffused anxiety is the major predisposing factor—will form a chemical bond with time, "tying down" instants in the same manner as a nucleating agent "ties down" free atoms into molecules. The process is called chronocrystallization or, in the case of acute anxiety, chronoprecipitation. The resulting compact arrangement of instants is far more orderly than the preexistent random "nowness" but unfortunately this decrease in entropy is paid for by a very marked increase in bioinsupportability. In fact, the petroleum/time compound appears to be absolutely incompatible with life in any known form, even anaerobic bacteria, of which so much was previously hoped.

The present danger then, as described by team member F. Gonzales Park, is that so much of our free time, or radical time properly speaking, will be locked into this noxious compound, which she refers to as petropsychotoxin (PPST), that we will be forced to bring up the vast deposits of PPST that the U.S. government has dumped or stored in various caves, swamps, holes, oceans, and backyards and deliberately break down the compound, thus releasing free temporal radicals. Senator Barry Goldwater and several conservative Democrats have already protested. Certainly the process of reclaiming time from PPST is risky, requiring so much oxygen that we might end up, as O. Heiko, a third member of the team, puts it, with plenty of free time but no air.

Heiko states that a single gas-powered lawn mower moving at less than five kilometers per hour can petrolize three solid hours of a Sunday afternoon in an area of one city block.

BLEEDING HEARTS? THE TEMPORAL CONSERVATION MOVEMENT

Willing to listen to the cosmological and chemical hypotheses, but uncommitted to either, is a growing consortium of scientists and laypersons, many of whom have grouped themselves into organizations such as Le Temps Perdu (Brussels), Protestants Concerned about the Waste of Time (Indianapolis), and the driving, widespread Latin American action group Mañana. A Mañanista spokeswoman, Dolores Guzman McIntosh, of Buenos Aires, Argentina, states the group's view: "We have—all of us—almost entirely wasted our time. If we do not save it, we are lost. There is not much time left." The Mañanistas so far have carefully avoided political affiliation, bluntly asserting that the time shortfall is the fault of Communist and capitalist governments equally. A growing number of priests from Mexico to Chile have joined the movement, but the Vatican recently issued an official denunciation of those "who, while they talk of saving time, lose their own souls."

A group of social scientists in Cambridge, England, continues meanwhile to investigate the as-yet-unproved link of the time shortage with shortage of temper. "If we could show the connection," psychologist Derrick Groat says, "the temporal-conservation groups might be able to act more effectively. As it is, they mostly quarrel." Groat mentioned the "time stretcher," marketed by General Substances under the trademark Sudokron, withdrawn last year after tests had indicated that moderate doses caused laboratory mice to turn into Kleenex. Informed that the Rand Corporation was devoting massive funding to research into a substitute for time, he said, "I wish them luck. But they may have to work longer hours at it!" The British scientist was referring to the fact that the United States has shortened the hour by ten minutes while retaining 24 hours per day, while the EEC countries, foreseeing increasing shortages, have chosen to keep 60 minutes to the hour but allow only 20 hours to the "devalued" European day.

Meantime, the average citizen in Moscow or Chicago, while often complaining about the shortage of time or the deteriorating quality of what remains, seems inclined to scoff at the doomsday prophets and to put off as long as possible such extreme measures as rationing. Perhaps he feels, along with Ecclesiastes and Ronald Reagan, that when you've seen one day, you've seen 'em all.